MANAGEMENT OF INNOVATIVE TECHNOLOGIES CREATION OF BIO-PRODUCTS

V. Lykhach · A. Lykhach
M. Duczmal · M. Janicki
M. Ohienko · A. Obozna
O. Kucher · R. Faustov

MANAGEMENT OF INNOVATIVE TECHNOLOGIES CREATION OF BIO-PRODUCTS

Monograph

The Academy of Management and Administration in Opole
National University of Life and Environmental Sciences of Ukraine

V. Lykhach, A. Lykhach, M. Duczmal, M. Janicki,
M. Ohienko, A. Obozna, O. Kucher, R. Faustov

MANAGEMENT OF INNOVATIVE TECHNOLOGIES CREATION OF BIO-PRODUCTS

Monograph

Opolu, Poland
Kyiv, Ukraine
2020

Reviewers:

Gworys Wiesław – Professor, doctor habilitated, Higher School of Hospitality and Tourism in Czestochowa, Poland;

Povod Mykola – Professor, doctor of agricultural sciences, Department of Feed Technology and Animal Feeding, Sumy National Agrarian University, Ukraine.

Authors: V. Lykhach, A. Lykhach, M. Duczmal, M. Janicki, M. Ohienko, A. Obozna, O. Kucher, R. Faustov

Management of innovative technologies creation of bio-products: monograph / V. Lykhach, A. Lykhach, M. Duczmal, M. Janicki, M. Ohienko, A. Obozna, O. Kucher, R. Faustov. Opole-Kyiv, 2020. 222 p. 85 tab. Fig. 14

ISBN 978-83-66567-16-0

The monograph presents the scientific substantiation, experimental developments on the management of innovative technologies in industrial pig breeding, taking into account the internal division of enterprises into production shops.

For managers and specialists of industrial enterprises for pork production, teachers and students of the faculties of management and technology of production and processing of livestock products of agricultural educational institutions, graduate students, doctoral students, researchers.

Publishing House: Wyższa Szkoła Zarządzania i Administracji w Opolu 45-085 Polska, Opole, ul. Niedziałkowskiego 18 tel. 77 402-19-00/01

ISBN 978-83-66567-16-0

© V. Lykhach, A. Lykhach, M. Duczmal, M. Janicki, M. Ohienko, A. Obozna, O. Kucher, R. Faustov, 2020
© Publishing House WSZiA, 2020

CONTENT

LIST OF SYMBOLS, SYMBOLS, UNITS, ABBREVIATIONS AND TERMS

AF - agricultural firm;
AMA - American Marketing Association;
APC - agricultural production cooperative;
BAFA - biologically active feed additives;
LLC - open joint stock company;
WB - a large white breed;
WB (FS) - a large white breed of foreign selection;
GNP - gross national product;
G - Hampshire breed;
D - breed Duroc;
RF - research farm;
SE - state enterprise;
DUSS - intra-breed type of pigs of the Duroc breed of the Ukrainian selection «Stepovy»;
EIA - entropy-information analysis;
Feed from - feed unit;
L - Landrace breed;
IEC - multienzyme compositions;
MOS - mannan oligosaccharides;
NAASU - National Academy of Agrarian Sciences of Ukraine;
OR - the basic diet;
P - petren breed;
PJSC - public joint stock company;
POP - private rental company;
PE - private enterprise;
PJSC - private joint stock company;
LLC - a limited liability company;
UVB - intrabreed type «Ukrainian Great White»;
UM - Ukrainian meat breed;
Y - Yorkshire breed;
Cv - coefficient of variation;
df - the number of degrees of freedom;
F - the dispersion ratio;
MS - middle square;
n - the number of animals;
$\eta 2$ - force of influence of the factor;

P - the probability of the difference;
p - level of significance;
SS - the sum of the squares of the deviations;
$\overline{X}$ - arithmetic mean;
$S_{\overline{X}}$ - arithmetic mean error;
* - P> 0.95;
** - P> 0.99;
*** - P> 0.999.

INTRODUCTION

The welfare of the population is closely linked to the development of livestock industries, whose share in the food structure is more than 45%, in particular the pig industry occupies about 40%, in the population provided with meat products. The cost of pork is in third place after lamb and beef, and for its nutritional and culinary benefits, pork ranks first among other meat products [388-390, 397].

An important part of the technology of pig production, on which the further progress of the industry depends, is the introduction of intensive technologies that use high-yielding genotypes, complete feeding, high-tech equipment for keeping and feeding pigs, manure removal, ventilation and more. In modern pig farming use different technologies for large, medium and small enterprises, which differ in the nature of production [75, 175, 253, 453].

A necessary condition for the further development of pig breeding in Ukraine is the accelerated transition to the production of competitive meat pork. The problem of optimization of the industry cannot be solved only by introducing the experience of foreign countries. The process of resuscitation of the industry and further development should be based on: national mentality, use of domestic gene pool, fodder resource, natural and climatic conditions, preservation of rural areas and job creation for the rural population [251, 252, 455, 470, 473].

Intensive production of pig products makes new increased demands on the technological features of the industry. In recent years, in industrial pig breeding, along with the general increase in production intensity, there has been an exacerbation of a number of problems. First, the decline preservation calves, increased emergency farrowing, pro-hololys in breeding stock, fattening calves slow performance and more. To overcome these negative trends, it is necessary to develop new intensive-technological solutions to create optimal conditions for keeping, feeding and breeding and breeding work on small, medium and large pig farms.

Today there are global and domestic trends in increasing prices for feed, construction, technological and constructive means, there are new scientific explanations for the formation of viable and productive properties of pigs, a new legal framework, including laws on animal protection, which requires some reorientation. in the development and implementation of new technological solutions for pork production.

This opinion is shared by many researchers who study and develop ways to improve the domestic pig industry [75, 88, 175, 252, 371, 388, 470] when identifying the key problem and forming the main issues for its solution. There are some absolutely formed methods and ways of modern technologicalization of the industry [53, 155, 183, 188, 251, 392, 601], there are problematic publications [77, 89, 217, 609, 648], but all modern scientific research shows that pig farming must develop in a world of new requirements.

To maintain a high level of productivity of pigs in modern industrial technology, it is necessary to adhere to a clear internal specialization of production shops, to use innovations aimed at improving the technological process of production of pig products in terms of resource conservation. Today, the technology of competitive pork production has been formed and recognized by many specialists and its improvement is possible only with the development and implementation of certain intensive technological solutions for livestock reproduction, housing and feeding conditions, the impact of certain design features of easel equipment on pig productivity of different production groups, rational use of specialized meat genotypes to increase the production of meat and bacon pork, the impact of stress factors of industrial technology on animals, as well as the possibility of objective analysis of production results using information technology.

In this regard, the rationale, development and implementation of innovative technological solutions, taking into account modern requirements for technological management of the production process of pig products, are relevant.

SECTION 1.
MODERN AND TRENDS IN THE DEVELOPMENT OF INNOVATIVE PROCESSES IN THE PIG INDUSTRY

From the health of the population of Ukraine and, in fact, food security, are largely related to the level of production and consumption of animal proteins, the main source of which is meat and meat products. This problem became especially acute due to a significant decline in meat production due to inconsistent market reforms in Ukraine, the critical condition of agricultural enterprises, which are the raw material base for the development of processing and food industries, deteriorating financial situation of rural workers [6, 97].

Solution problems increase meat production and increased maintenance of the population meat products, to a large extent, depend on the development of pig features which allow you as soon as possible to ensure an increase in the number of pigs and achieve the required amount of meat. In terms of its economic importance, pig farming, as a nationally identical industry in Ukraine, traditionally ranks first among other livestock industries. After all, in crisis situations, it often became the main source of rapid increase in meat production [542]. In addition, pig farming at one of the key industries, providing Ukraine greasy meat products. However, in Ukraine due to the crisis in the agricultural sector pork production has decreased significantly, but this industry remains one of the most promising in the formation of food security, ensuring domestic demand for meat products of domestic production [15, 253].

At the present stage in Ukraine, pork production is mainly engaged in two categories of producers: homesteads and agricultural enterprises. At the same time, about 50% of the total number of animals is kept in homestead farms [14, 181]. The annual dynamics of the pig population depending on the category of the farm is shown in Figure 1.1.

Observing the annual dynamics of the number of pigs in different categories of farms, it should be noted that as of 2009 in all categories of farms keep 6526 thousand pigs, and in 2010 - 7577 thousand heads, which is 16,1% more of the previous year [415]. This number convincingly testifies to the increase in pig population in Ukraine.

It should be noted that in 2011 the main producers of pork in Ukraine were homesteads, which accounted for 54,5 % (4335 thousand heads). The increase in the number of pigs in homesteads was primarily due to the objective reaction of the population to the general crisis of the economy as

a whole and the decrease in the number of pigs in agricultural enterprises [414].

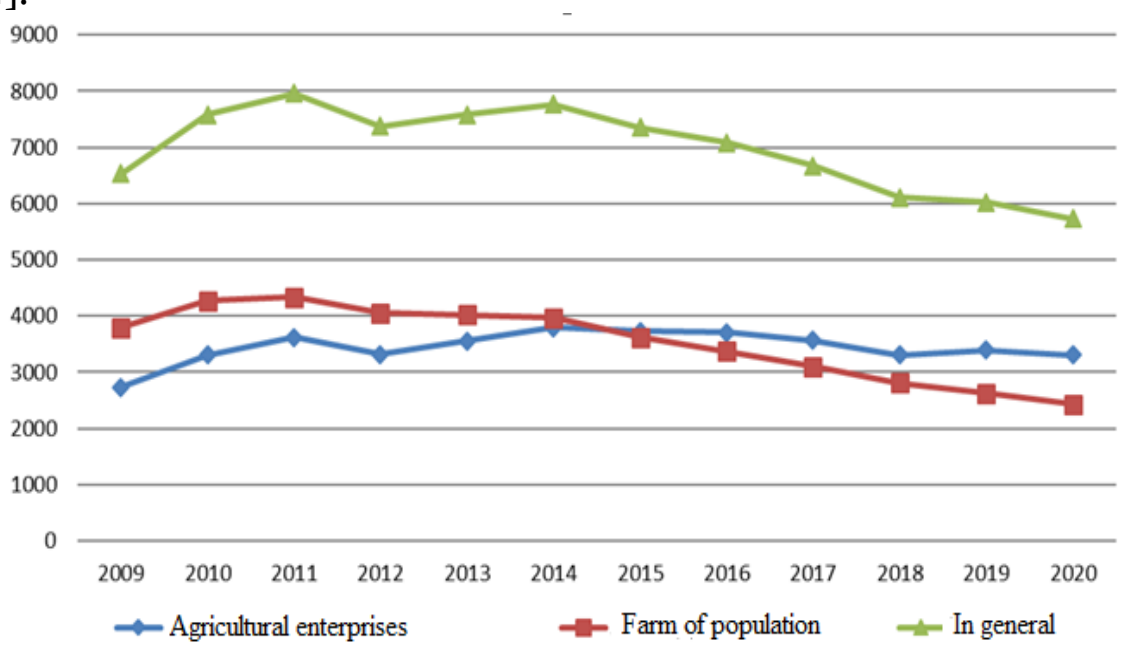

Fig. 1.1. **Annual (2009-2020 years) dynamics number of pigs in the various categories of farms**

As of 2012, which turned out to be ambiguous for the livestock and pig industry in particular. Both motivating factors and difficulties were observed during the year. Favorable factors include: positive price trends in the market of slaughter pigs, full supply of feed due to high yields and low prices for them. Among the main difficulties are the abolition of state subsidy support and an increase in the supply of imported pork. All this led to the fact that the total number of pigs was as follows by category of farms: 45, 1 % of pigs (3,319 thousand heads) were kept by agricultural enterprises, and the remaining 54, 9 % (4054 thousand heads) – homesteads [115].

There is a noticeable tendency to reduce the number of pigs in homesteads, which, in our opinion, has a clear seasonality (see Fig. 1.1). In particular, the reduction of pigs occurs during the New Year, Christmas and Easter holidays, which is explained by the increase in meat consumption during mass celebrations. With regard to agricultural enterprises, the number of pigs kept here is not so sharp amplitude of fluctuations.

Production performance in 2013 was significantly better. An additional stimulus for the development of the pig industry this year was the temporary restriction on imports of Brazilian meat, which is known to dominate among all imports. In turn, the price situation was favorable for producers, and the increase in domestic consumption and reduction of total

imports had a positive effect on the state of the pig industry. In terms of categories, it should be noted that 3557 thousand pigs were kept in agricultural enterprises, which is almost 10% more than in 2012 [115]. This confirms the fact that the overall growth in the industry is due to capacity building by industrial pork producers. As for homesteads, the number of pigs remained almost unchanged.

In 2014, there was a downward trend in the number of pigs in homesteads, and, conversely, an increase in agricultural holdings compared to 2013 by almost 1% and 6%, respectively [481]. Compared to last year, only six regions of Ukraine – Ivano-Frankivsk, Kyiv, Lviv, Ternopil, Kharkiv and Khmelnytsky – were able to maintain positive dynamics.

It should be noted that 2015 is unprecedented for Ukrainian pig farming, as the number of pigs in agricultural enterprises is higher (37 33 thousand heads) than in the homestead sector (3 618 thousand heads). This indicates that industrial pig farming is increasing production capacity. The situation in homesteads can be explained by the difficult political situation in the country, where the largest losses were suffered by pigs in Donetsk and Luhansk: 20% and 30% less than in 2014, respectively [51].

It is worth noting that during the second quarter there was a positive trend in the number of industrial livestock. However, in July, a slight reduction in agricultural pigs took place in ten oblasts and will probably continue for some time to come. The reason for this is the spread of African swine fever (ASF), as a result of which pigs eliminate not only those farms that are at risk of spreading the disease, but also those who cannot increase the level of biosafety to the desired [51].

The decrease in the number of pigs in the industrial sector is explained by the fact that small enterprises (up to 300 sows) due to low efficiency, could not withstand the pressure of economic circumstances in Ukraine and, as a result, stopped working.

In 2016-2020, there is a tendency to increase the number of pigs in agricultural enterprises compared to households. However, it is worth noting the fact of a rapid decline in the number of pigs, regardless of the category of farms in the period from 2016 to 2020, where the main reason for this negative phenomenon is the spread of African swine fever (ASF).

Thus, providing the distribution of pigs by different categories of farms, we report that the number of pigs in Ukraine from 2009 to 2020 years has changed differently, table. 1.1. Dor table clearly show that the most

favorable year of the city to increase the number of pigs in Ukraine was in 2011.

Table 1.1

Dynamics of pig population in Ukraine, 01.01 (2009-2020)

Years	Total number of pigs, million heads
2009	6, 526
2010	7, 5 77
2011	7, 960
2012	7, 373
2013	7, 577
2014	7, 764
2015	7.3 51
2016	7.0 79
2017	6,669 the most common
2018	6.1 10
2019	6,025 the most common
2020	5,731 the most common

*Note: *- data are given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.*

The main reasons for the significant reduction in the number of pigs in the country, in our opinion, include: the disparity in prices for agricultural and industrial products; rising feed prices; the inability of most domestic producers to use the latest technologies for keeping and fattening pigs; liquidation of specialized pig farms (up to 300 sows); saturation of the domestic market with raw materials of foreign production; reduction of state support; complications of episootological situation (ASF); difficult economic situation of ordinary Ukrainians [51, 477].

Now in Ukraine more than a dozen breeding pigs of different breeds of domestic and foreign origin as well as special types and lines. An appropriate breeding base has been established in the country, which is the property of the state and many years of work of breeding scientists together with specialists and farm managers [405].

Regarding the breed composition of pigs in Ukraine, it should be noted that the traditional for Ukraine is the pig industry, when the classic commercial breeds are large white – 183910 heads, which is a percentage of almost 52% and Landrace – 132334 heads, which is 37% (table 1.2) [106].

Table 1.2

Dynamics of pig population in Ukraine, 01.01. (2009-2020)

Breed	Total heads	Number of goals, %	Including main sows, heads
Big white	183910	51.9	13551
Landrace	132334	37.3	15518
Ukrainian meat	10033	2.8	801
Potava meat	8980	2.5	617
Red white belt	6444	1.8	463
Duroc	3767	1.1	309
Pietren	2581	0.7	255
Myrhorod	2056	0.6	171
Large white (English selection)	1615	0.5	133
Ukrainian white stepova	1495	0.4	283
Big black	1076	0.3	215
Welsh	313	0.05	100
Ukrainian ripples stepova	92	0.05	21
Total	354696	100	32437

The top three is closed by the domestic breed - Ukrainian meat breed, with a total population of 10033 heads with 801 main sows, where of the total number it accounts for almost 3%.

However, it is not the livestock that is important, but the volume of meat produced and sold. Thus, in 2020, Ukraine produced 324.5 thousand tons of live weight gain, which is almost 38.3% less than the volume of pork grown in 2015, Fig. 1.2.

We note that during the analyzed years, the least pork was produced in the year 2020, where the main cause of this phenomenon were adverse weather conditions, global and national economic crisis caused by the massive coronavirus pandemic COVID -19. This indicator shows that more than 70% of pork in Ukraine is produced extensively, while the number of pigs in the EU, Canada, Brazil, USA will be produced, and 70% more pork is produced [97, 106].

Half of the obtained increase in live weight of pigs falls on the five areas where the pig industry is actively developing. However, according to O. Bondarska [51], only in Kyiv and Ivano-Frankivsk oblasts the positive dynamics remained, while in Donetsk, Dnipro and Poltava oblasts the volumes of pig breeding decreased slightly.

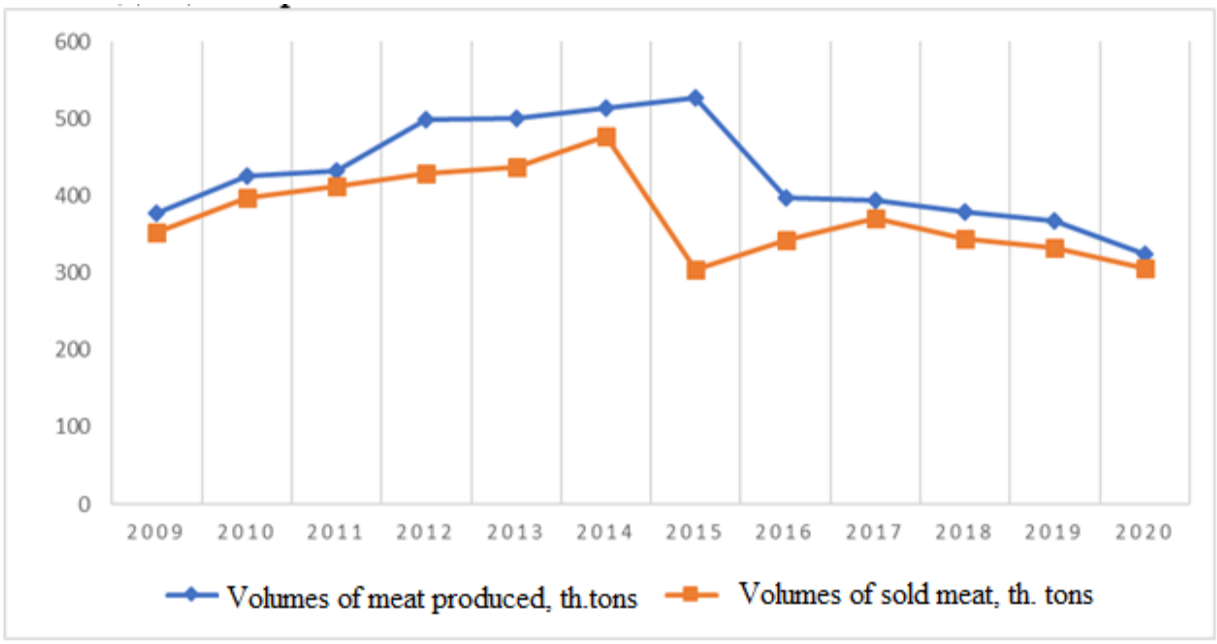

Fig. 1.2. **Annual (2009-20 20 years) dynamics volume of production and sales of pork**

(data are given without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and parts of the temporarily occupied territories in Donetsk and Luhansk regions).

However, the increase in live weight gain was due to pig farms in Rivne region - by 32%, in Ternopil region - by 30%, and in Zhytomyr region – by 20%. On average, during the analyzed period, industrial livestock increased by 483 g per day [115].

As for the indicator of pork sales, it should be noted that the highest indicator was recorded in 2014 and amounts to 477.5 thousand tons of pork. During 2011-2013, approximately the same amount of pork was sold in the country - in the range of 412.9-437.1 thousand tons. Almost 93% of the received gains, namely 304.8 thousand tons, were sold for slaughter in 2015. The main deterrent was played by enterprises of Donetsk and Poltava regions, which reduced sales for slaughter by 5.8 and 3 thousand tons, respectively, compared to 2014. It is worth noting the fact that from 2014 to 2020 the volume of pork sales tended to decrease and as of 2020 this figure was - 305.7 thousand tons. The volumes of sales for slaughter by enterprises of Luhansk region and Chernivtsi region fell sharply, where this indicator decreased by half and by a third, respectively [51, 115].

Given the price situation in the period from 2009-20 0 years, we report that purchase prices for pigs in live weight were constantly growing, Fig. 1.3.

Fig. 1.3. **Annual dynamics of purchase prices for pigs depending on the category, UAH / kg**

Thus, as of 2010, purchase prices for meat-type pigs stopped at UAH 18.5/kg. This is 2.3% higher than the price in 2009, which indicates a decrease in imports and, accordingly, an increase in demand for domestic pork. Prices for meat and fat pigs (category II) remained at 16.5 UAH/kg [114].

In 2011, there was a significant reduction in pork imports, which was reflected in domestic animal prices. Thus, the domestic market reacted to such a reduction in meat imports quite logically: to maintain production volumes, which, in turn, caused an increase in prices for finished products. Thus, the purchase price for category I pigs increased by 5% and amounted to UAH 19.45/kg, but the price for category II pigs fell to UAH 15.5/kg.

The average annual purchase prices for meat pigs in 2012 were UAH 21.6/kg, which was 11% more expensive than last year. Although at the end of December of the same year the minimum price was 18.8 UAH/kg of live weight. This downward trend in prices was due to the low purchasing power of the population, a significant share of imported pork in the market and the dumped policies of the largest pork producers. As for category II pigs, the average annual price for them also increased: 18.3 UAH/kg in

2012 compared to 15.5 UAH/kg in 2011.

The year 2013 was quite dynamic in terms of price trends in the market of live pigs [314]. In addition to seasonality, important price-setting factors were weather conditions, imports and world market prices. However, compared to 2012, prices for category I pigs were in a narrower range - UAH 21.00/kg.

In the market of purchase prices for pork in 2014 and 2015, the price resumed the upward movement by 5-7 UAH/kg and 15-17 UAH/kg, respectively. This increase is associated with a decrease in consumer activity, a reduction in the number of agricultural enterprises and an increase in the price of fodder crops.

In addition, purchase prices in 2016 for first-category slaughter pigs were significantly lower than last year due to very weak export activity compared to 2015 and rather sluggish domestic demand, which for most of the year could not keep prices at last year's level. It also had an impact on the retail price of pork, reducing its average annual level by 2-5%, as well as significantly «smoothing» its surges. Therefore, we state that the purchase price of category I pigs was UAH 34.6/kg, and category II pigs - UAH 31.5/kg.

In 2017, we note another increase in prices for cuttings of the I category – 46.1 UAH/kg, II – 43.0 UAH/kg, respectively.

In 2018, the pork market in live weight saw an upward trend in purchase prices. In fact, such a rise was caused by more active procurement of raw materials by meat processing enterprises. Over time, this grew into a gradual upward movement of prices in the pre-New Year period. Therefore, the purchase prices for pork of the I category jumped to the mark of 60.0 UAH/kg, and the second – 54.7 UAH/kg. In general, changes in live weight pork prices depend on a number of factors: consumer activity, which is affected by both seasonal fluctuations in demand and purchasing power; seasonal fluctuations in demand / supply of cuttings; expectations of market players; liveliness of foreign trade; price dynamics in the resource market (feed, veterinary drugs, energy and electricity, etc.), which in turn depends on exchange rate fluctuations.

Compared to 2019 and 2020, we note that the prices for cuttings decreased slightly compared to 2018 and amounted to 48.5 and 46.0 for category I pork, 46.2 and 43.0 - for category II pork, respectively.

It is also worth remembering that pork is not the most expensive to buy in Ukraine. Thus, in European countries pork prices are slightly lower or comparable to Ukrainian, in Russia a kilogram of cuttings costs 44 UAH,

in Italy – almost 45 UAH/kg, in China - more than 60 UAH/kg.

Thus, the effectiveness of pig breeding depends on genetics, technology of cultivation and feeding, animal health and feed. In the cost structure of pork the largest share is the cost of feed (up to 70-80%). Lack of nutrients, especially protein, as well as amino acids, vitamins, macro-and micronutrients, leads to reduced growth, increased fattening time, overconsumption of feed and, consequently, the cost of pork, which is higher than in the EU. Given the current pork production, the question arises as to whether we are using the resource we have correctly. Over the past year, Ukraine has produced 3% of the world's cereals (as well as Brazil and Canada), and pork only 0.5% (Brazil 3%, Canada 2%) [181].

Given the above, we propose to consider the dynamics of prices for feed crops for feeding pigs, table 1.3.

Table 1.3

Dynamics of feed prices in Ukraine

Years	Average cost of fodder crops, UAH / t					
	wheat	barley	corn	sunflower meal	soybean meal	soybean meal
2009	1400	1200	1500	1580	3120	3500
2010	1570	1500	1650	1750	3200	3900
2011	1700	1700	2000	2200	3700	4200
2012	1800	1790	1400	2350	3750	4600
2013	2500	2300	2500	3200	4400	5200
2014	3100	2750	2900	3900	5300	6700
2015	3400	3300	3000	5300	8100	10500
2016	4126	3550	4010	5500	9250	13100
2017	4710	4407	4106	6400	10500	13600
2018	5850	6300	4500	7100	11600	14100
2019	6100	5600	4650	10350	11950	14000
2020	6225	5420	4840	10400	12150	14500

Since the beginning of the new year 2010, grain prices in Ukraine have been growing rapidly due to low crop yields, as well as responding to the state of the world market. According to grain market operators, the price of wheat fluctuated in the range of 1570-1650 UAH/t., For barley – 1450-1500 UAH/t., Corn was in the same price range – 1600-1650 UAH/t. [51, 115]. In turn, the weighted average prices in Ukraine for sunflower meal amounted to 1750 UAH/t., which is 10.8% higher than in the previous year 2009.

The tendency to increase the price was also observed for soybean meal and meal, which stopped at UAH 3200/t. and 3900 UAH/t. in accordance.

The increase in feed prices in Ukraine has a stable trend for 2011-2020, which is associated with low yields, insufficient storage capacity, reduced purchasing activity in the Ukrainian market and more. Therefore, we state that according to the State Statistics Committee of Ukraine [115] as of 2020 the price of wheat per ton increased to 6225 UAH, barley – 5420 UAH, corn – 4840 UAH, sunflower meal – 10400 UAH, soybean meal - 1215 0 UAH and meal soy – 14 500 USD, accounting for 2,1%, - 3.2%, 4.1%, 0.5%, 1.7% and 3.6% compared with the previous 2019 year, respectively.

Due to the above-mentioned circumstances in the field of pig breeding in Ukraine, the volume of pork consumption has significantly decreased. Thus, in 2009 the average Ukrainian consumed 16.2 kg of pork per year, which is 54% less than the minimum recommended consumption of pork per person (Fig. 1.4) [479, 480].

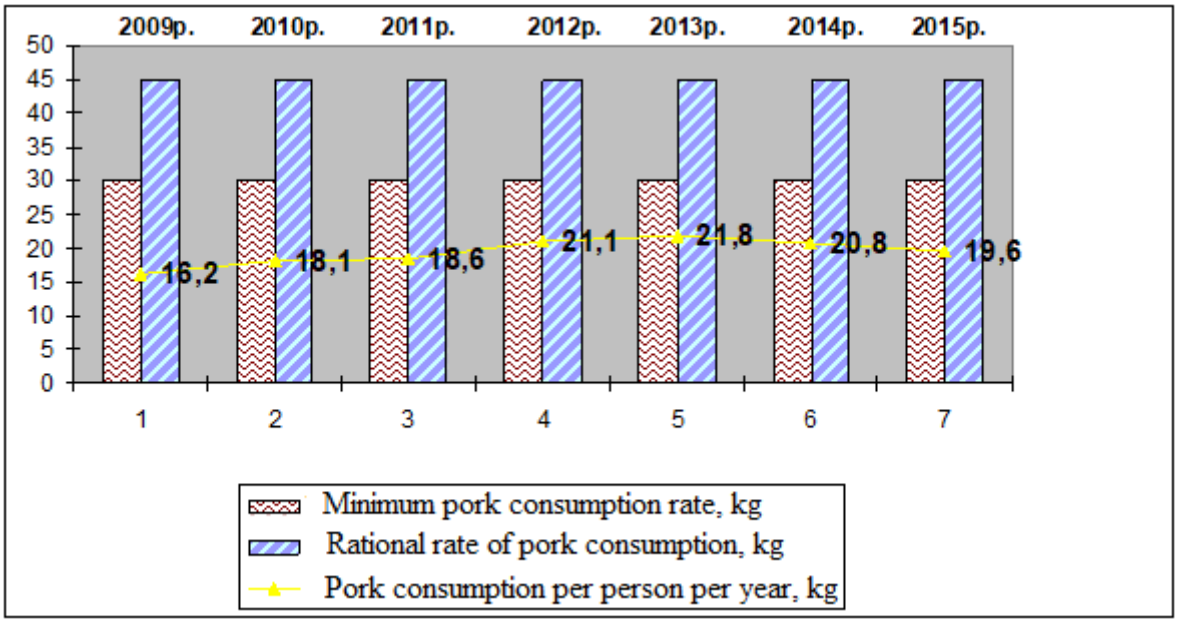

Fig. 1.4. **The amount of pork consumption is average Ukrainian during 2009-2015.**
(*according to the State Statistics Service of Ukraine*)

As can be seen from Fig. 1.4, Ukrainian pork consumption is starting to increase every year and in 2013 this figure is 21.8 kg per year. This level of consumption is usually not even the minimum consumption of pork, but it is still higher than meat consumption in 2009 – by 34%.

What cannot be observed, unfortunately, during the last two years, where the consumption of pork by Ukrainians is constantly declining.

As of 2015, this figure per average Ukrainian is 19.6 kg, compared to the highest value of this figure, which was recorded in 2013. This negative

phenomenon in society is primarily due to a number of reasons: low solvency of the population, low living standards of Ukrainians, reduction of live weight meat production by farmers, increase in feed prices for pigs, reduction of meat imports by 28%, etc.

According to V. Hvorosyatny and analysts of the Ukrainian Agrarian Association (UAA), having studied the internal structure of the meat market and found out how many kilograms of meat per year (and what types) consumes on average each Ukrainian, three interesting trends [480]. The first is that the amount of meat consumption per year by one Ukrainian in 2017-2020 has hardly changed and fluctuates slightly: in 2017 – 48.98 kg (4.08 kg per month), in 2018 – 48, 45 kg (respectively – 4.04 kg), 2019 – 46.72 kg (3.8 kg per month), 2020 – 44.25 kg (3.2 kg per month).

The second - the overall structure of annual consumption is also stable, it is dominated by the share of poultry meat. She is half Ukrainian ordinary diet and its share is growing: in 2017th district – 24.34 kg per capita (49.7% of total consumption for the year), 2018th district – 25.15 kg (51.9%), 2019 th – 26.14 kg (55.9%), 2020th – 27.1 kg (61.2%).

The third - three types of meat from the annual diet of Ukrainians has remained virtually unchanged in recent years. In addition to poultry meat, it includes: 2nd place – pork: 2017 – 13.8 kg (6.76%), 2018 12.6 kg (6.10), and 2019 – 13 kg (1.97%), and 2020 – 10.9 kg (2.43%); 3rd place – beef: 2017 – 3.09 kg (6.3%), 2018 – 5.4 kg (2.62%), 2019 – 4.8 kg (0.73%), 2020 – 3.6 kg (0.81%), (Table 1.4).

Table 1.4

Dynamics of annual meat consumption by the average Ukrainian, kg

Types of meat	Years			
	2017	2018	2019	2020
Poultry meat, kg	24.34	25.15	26.14	27.1
Pork, kg	13.80	12.60	13.00	10.90
Beef, kg	3.09	5.40	4.80	3.60
Meat of other species, kg	7.75	5.30	2.78	2.78
In general, kg	48.98	48.45	46.72	44.25

This information shows that pork imports in recent years have fallen significantly without an increase in exports, caused by a catastrophic decline in pigs (over 23% in 5 years) and ineffective measures to prevent the spread of ASF. However, the demand for pork in Ukraine is traditionally high, which leads to a further rise in prices for such products, which, in turn,

together with a relatively short production cycle encourages producers to increase the rate of pork production.

Today the structure offers significant share of domestic production covers foreign production volumes which began to rapidly increase from 2009 (Table. 1.5). However, the quality of products imported into our country is quite low [514].

Table 1.5

Dynamics of pork imports in Ukraine

Years	Volumes of pork imports, thousand tons
2009	225
2010	179
2011	146
2012	273
2013	234
2014	115
2015	96
2016	284
2017	304
2018	234
2019	219
2020	251

In recent years, the composition of major importing countries has not changed. Thus, since 2014, Germany has increased its share in pork imports to Ukraine, and the United States and Brazil have lost their positions. Brazil suffered the largest losses: the value of supplies from this country decreased sevenfold (for comparison, the value of the contract for the import of one ton of pork from Brazil in 2012 was 2019 USD). Currently, the main suppliers of imported pork to Ukraine are: Poland - by $ 17.74 million (42.39%); Germany - by 7.27 million dollars (17.38%); The Netherlands - by $ 5.65 million (13.51%); other countries of the world - by 11.18 million dollars (26.72%) [51].

According to tabular data, the total volume of pork imports in 2014 decreased by five, and in 2015 - all seven. In the period from 2016 to 2017, the volume of pork imports increased to 304 thousand tons, and then until 2020 fluctuated between 219-251 thousand tons. However, Ukraine is increasing the volume of pork exports.

In this regard, an important place is given to the leading pork producers in Ukraine: JSC «APK-Invest» (the total number of 286.339 pigs, 24.702 heads of breeding stock, 57.931 sold pigs for slaughter in live

weight), LLC «Niva Pereyaslavshchyny» (221813 total pig population, 14887 heads of breeding stock, 38575 sold pigs for slaughter in live weight), LLC «Goodwell Ukraine» (187905 total pig population, 14095 heads of breeding stock, 37159 sold pigs for slaughter in live weight), LLC «SPE Globinsky pig farm» (154.300 total pig population, 12.500 head of breeding stock, 34.000 sold pigs for slaughter in live weight), PAP «Agroprodservice» (67500 total livestock of pigs, 8800 heads of breeding stock) livestock, 18768 sold pigs for slaughter in live weight) .

Thus, to ensure the profitability of pig farming in Ukraine, it is necessary to carry out state interventions in the market of pig products. This will make it possible to ensure food security in the country, guarantee producers minimum prices for meat products, increase their economic interests and incentives, saturate the domestic market with pork in full, based on scientifically sound standards of meat consumption per capita. Also, it would be advisable to provide regular credit support (credit subsidy) to livestock producers, which can be aimed at modernizing production for the integrated application of intensive technologies, which, in turn, will affect the competitiveness of products.

Prospects for the development of the pig industry, in our opinion, are:

1. Increasing the number of pigs in all categories of farms to 11678.9 thousand heads;
2. Reducing feed conversion to 2.5-3.2 kg, reducing the age of slaughter of animals to 165-170 days;
3. Receiving from a sow for the year 25-28 «business» piglets;
4. Preservation of local domestic breeds.

To implement these prospects, the following tasks should be solved:

- to carry out structural restructuring of the pig industry with the priority of industrial pig breeding development in agricultural enterprises;
- to carry out systematic technological modernization of pig production, providing priority to intensive and resource-saving technologies of meat production with competitive qualitative and quantitative parameters;
- to perform a system of technical transformations in the field of pig breeding on the systems of keeping, feeding, distribution of feed, microclimate, removal and utilization of manure with the possibility of automation of production pig facilities;
- to ensure the formation of the breeding stock of pigs in the country on the basis of the best world and domestic genotypes;
- to ensure the protection of domestic pork producers in the product market, pursuing an effective policy of price regulation in the pork

market;

- to form national standards and normative base for pig products, which will be in harmony with world norms;
- to modernize the grain sector of agriculture;
- to develop and provide the program of development of domestic science and technology of production of pig production and innovative projects of modernization of branch on the basis of new domestic design-consulting and technopark structures;
- to ensure the modernization of the system of training and retraining for the pig industry.

So, summarizing the above, we emphasize that at the present stage in Ukraine the task is to radically revive the pig industry and transfer it to industrial technology, as well as to ensure that it can provide cheap, high quality and competitive products. To do this, our country has the necessary breeding gene pool and breeding base of pigs, has fertile land to form an appropriate feed base, as well as a highly qualified potential of scientists and producers for the rational management of the pig industry.

SECTION 2.
THE IMPACT OF INNOVATIVE TECHNOLOGIES AND THE FORMATION OF PIG

The historical development of pig farming is due to the need of man to obtain food of ever higher quality while minimizing the cost of their production.

The emergence of industrial technology in pig farming dates back to the 60s of last century. The main impetus for its creation was a sharp increase in the production of grain feed mainly due to the widespread use of mineral fertilizers and increased productivity of agricultural machinery for tillage and harvesting in crop production. It has been scientifically proven that the transition of pig farming to an industrial basis involved the creation of large highly specialized farms and complexes, which make it possible to significantly increase the number of products per unit area and increase the level of profitability. Compared to traditional farms, industrial enterprises use uterine livestock 35% more intensively and 74% higher level of pig productivity during rearing and fattening [12, 113].

The basis of industrial technology is the principles of flow and rhythm of the production process, which provide a uniform, stable throughout the year production, rearing and fattening of pigs. Year-round flow-rhythmic reproduction creates real opportunities to rationally plan and effectively use production facilities, livestock, premises. Optimally and efficiently load equipment, machines and mechanisms, properly organize the production process and the process of storage, processing and sale of products [290].

It is known that the main structural unit in the industrial production of pork is a technological group. Several technological groups make up the production group or technological period. The following production groups of pigs are formed at each complex: breeding boars; repair pigs; sows: single, conditionally pregnant and with established gestation, suckling sows; suckling piglets; piglets for rearing and pigs for fattening. In the former Soviet complexes with a capacity of 108 thousand goals. the percentage of individual production groups of pigs was, %: adult and repair boars - 0.4; sows - 7.1; repair pigs - 1.4; suckling piglets - 10.8; piglets on rearing - 32.7; on fattening - 47.6 [12].

In turn, the improvement of methods of keeping and breeding pigs was achieved only by increasing the concentration of livestock and specialization of production, which allow mechanization and automation of basic technological processes.

In the early 60's of last century used a variety of options for keeping pigs, there was a search for the optimal system of keeping on an industrial basis. There were farms with free-range pigs in light piggeries with a canopy, where the animals consumed food [604]. The system of keeping in capital pig farms with fattening in large groups with compartments for animals with a live weight of 25 to 50 kg, from 50 to 75 kg and from 75 kg until the end of fattening was used [558]. In Great Britain, piglets were kept from birth to the end of fattening in the same machine, and single and pregnant queens were kept on a leash [620, 651, 652]. A similar system of keeping queens in the 60's spread in the Scandinavian countries and Germany [617, 628, 643, 654].

However, gradually the system of keeping pigs depending on age and live weight in different piggeries in a controlled microclimate using a slotted floor came to the fore [578, 606, 626, 627]. It proved to be the most acceptable and gave impetus to the improvement of many elements of industrial technology, such as the design of farrowing machines [584, 596], the density of animals [560, 596, 625, 662], distribution technology, feed moisture, feed preparation and feeding rate. [552, 554, 581, 598, 617, 624, 631, 655].

The rapid development of industrial technology for keeping pigs had a number of positive aspects. First of all, it concerns the increase of labor productivity due to mechanization and partial automation of production processes [552, 596]. In Germany, for example, sow maintenance costs have fallen from 30 to 40 people per hour. on small farms, up to 10 people/hour. on large farms with the use of automation and mechanization [568]. In the United States in the 1970s, a comparison of large-scale industrial production with enterprises that used grazing maintained showed that a significant (15%) reduction in feed costs for keeping pigs indoors reduced the cost of pork by 8%. [444].

The construction of large complexes with a high degree of mechanization of production processes contributed to the solution of technical and economic and major social problems. The increase in labor productivity in enterprises with industrial production technology compared to small farms in the USSR was 1.5-4.5 times [1, 184].

In the former Soviet Union, according to the nomenclature, pig farms were built with the following capacity: breeding farms for 100, 200, 300, 400 and 600 main sows; fattening farms for 2, 3, 4, 6, 8 and 12 thousand heads, pig fattening factories for 16, 24, 32 and 40 thousand heads and mixed pig farms for 50, 100 and 200 main sows [92].

According to the location of the machines, piggeries were divided into the following types:

1. Piggeries with a two-row location of machines (along the outer longitudinal walls) with one (in the middle of the room) passage for the supply of feed and bedding and manure removal;

2. Piggeries with two-row machines (at some distance from the outer longitudinal walls) with one passage for the supply of feed and manure;

3. Piggeries with a two-row location of machines (in the middle of the room) with two passages (along the outer longitudinal walls) for feed delivery and manure removal;

4. Pigsty with four-row machines with three passes for feed delivery and manure removal [1, 28, 34, 80].

Labor costs for the production of 1 quintal of pork in compliance with the technological parameters of pig productivity did not exceed 7 man-hours/quintal [92, 380, 381]. But the effect of the introduction of intensive industrial technology has affected not only productivity. Pork production has acquired a uniform, streamlined nature, which has led to a more rational use during the year of the main herd, production facilities and process equipment [82, 283, 307, 411].

In general, in the USSR, enterprises with industrial production technology in 1980 used the uterine herd 35% more intensively, 74% higher productivity of young pigs, 1.6 times more products per pig, which was at the beginning of the year, per 1 quintal of growth saved 1.6 quintals of feed. units, compared with conventional farms [411].

In the USSR, on average, industrial enterprises before 1980 compared with conventional farms, pork production per capita, which was at the beginning of the year, increased by 30%, feed costs per 1 quintal of growth decreased by one third, labor productivity increased 3 times [82].

More intensive use of the uterine herd, primarily due to the reduction of the suckling period, which was reduced from 60 days, as was customary in most farms with a traditional system of pig farming, to 26-35 days in industrial complexes. The transition from the tour system of formation of production groups of ewes, when the average duration of the period from weaning to fertilization of ewes could reach 2 months, to cyclic, had a positive effect. In which most queens are successfully fertilized for 5-7 days after weaning piglets [92, 289].

The sharp increase in the average daily gain of young animals was facilitated by the improvement of recipes for premixes and compound feeds for all sex and age groups of animals. More intensive growth due to better

feeding has dramatically increased the profitability of the industry, which in the early 80's of last century reached 50-100%. Feed costs for pork production on average at the complexes decreased by 1.4 times with a corresponding increase in the average daily gain of live weight [82].

Improvement of industrial technology began almost immediately after the commissioning of the first pig farms. Thus, after the state tests of the pig complex «Kalita» of Kyiv region it was decided to build and repair the main herd for industrial complexes for 54 and 108 thousand pigs per year to build breeding breeding farms for 300 and 600 main sows, where to grow repair young for special program. Prior to that, repair pigs were reared in the industrial zone of the pig farm.

The reproduction system, contrary to the original technology, was transferred to artificial insemination. This reduced the number of main boars from 264 to 72. Instead of the designed purebred breeding, the introduction of industrial crossbreeding of pigs of the meat direction of productivity began [184]. In 1975, there were only 3 pig farms in the Republic of Ukraine, in 1985 there were already 48, and in 1987 there were 96 industrial pig farms. The share of industrial farms in total pork production during this time increased from 8.4 to 62%.

By 1990, there was a general structure of pig enterprises, which continued to operate, the share of pork produced by industrial pig enterprises exceeded 80% of total production. The most widespread enterprises with a completed production cycle with a capacity of 12, 24, 54 and 108 thousand heads of annual fattening. In Ukraine, there is traditionally an industrial production of pork, which was carried out at enterprises with a capacity of 108, 54, 24, 12 thousand pigs per year [95].

The main design technical and economic indicators of the most common industrial pig farms are presented in table 2.1. [381].

In today's conditions, pork production in industrial complexes is carried out by single-phase, two-phase and three-phase technologies, the choice of which is determined by the number of livestock, production structure and investment [72, 73, 75, 95, 105, 193, 290, 291, 436].

In industrial pig breeding, preference is given to three-phase technology, in which piglets after suckling period from transfer machines are transferred to the rearing group in specialized premises, and when they reach a live weight of 25-30 kg they are transferred back to the fattening room [57, 58]. When using three-phase technology for the suckling period receive piglets with a live weight of 5-12 kg, on rearing 18-30 kg, on fattening - from 30-110 kg [291].

Table 2.1

The main design technical and economic indicators of pig farms

Indicator	108 thousand monoblock 3 phases	108 thousand 3 phases	54 thousand 3 phases	24 thousand 2 phases	12 thousand
№ project	819-169	819-216	819-217	802-147	802-144
Number of machine seats	71540	70424	36148	15800	8663
Annual production meat, t	12847	12590	6295	2683	145.8
Number of service personnel: - general	270	209	120	102	92
- key employees	130	141	71	42	35
Consumption of feed per 1 quintal of growth, quintal of feed units	4.1	4.1	4.1	5.8	5.9
Payback period, years	2.8	2.0	2.3	4.9	5.5
Labor costs of basic workers per 1 quintal of increments, man / hour.	2.0	2.2	2.2	3.1	4.8

Due to the flow technology it is possible to increase the level of productivity of animals, increase production, reduce its cost, increase the efficiency of use of premises, equipment, labor and material resources. With this technology at the state industrial complexes with a capacity of 24-108 thousand projected the following technical and economic indicators: the number of farrowings per year per sow - 2.0-2.2; average daily live weight gain during cultivation and fattening, g: up to 18 kg - 300-400; from 18 to 40 kg - 400-500; from 40 to 115 kg - 600-650; pork production per sow per year - 20-25; feed costs for the production of 1 quintal of pork, quintals of feed. from - 4.5-5.0; labor costs per 1 quintal of pork, man/hour - 3-4 [73, 105, 107, 188, 193, 207].

However, along with the positive characteristics of industrial complexes revealed a number of negative factors, such as: environmental pollution, dependence on the supply of feed and complete set of breeding stock pigs repair pigs not adapted to the conditions of industrial technology and, consequently, the emergence of various technological stress, reduced resistance and productivity, reduced shelf life, and deteriorating pork quality [23, 95, 143, 145, 188, 193, 332, 341, 417].

With three-phase technology, as established by studies [26, 173, 402, 347], early weaning of piglets from sows and transfer to new premises there

are stress factors that can cause disruption of vital functions of piglets and adversely affect their viability, health and body resistance, which reduces growth energy and impairs feed conversion. With this technology, the mortality of piglets in the first four months of life is 15-20%, which is twice as much as in the case of single-phase and 9-12% - with two-phase [531].

As for Ukraine, it should be noted that currently there are positive trends in the development of pig farming in Ukraine, and this situation has led to the revival of modern technologies of some large industrial enterprises, reconstruction and construction of new pig farms [75, 155, 342, 416].

Analyzing the single-phase technology of pork production, we report that due to this technology the rank stress is leveled and the animals grow more intensively and use food more efficiently [72, 523, 524]. It helps to improve the safety of piglets after weaning by 8% and increase their average weight when transferred for fattening by 6.5%, reducing the cost of disinfection of premises. However, single-phase technology irrationally uses master machines and expensive production areas are not exploited intensively enough, so it is the most capacious in terms of capital investment [143, 382, 407].

Russian scientists, taking into account the shortcomings of pig farms, which were built in the 70-80s of the twentieth century, for the period 2005-2012 developed projects for 12.5-20 thousand tons, which began construction of new modern enterprises that fully comply with international technological and veterinary standards and are the most effective in terms of product quality and financial performance. They use the latest technologies and equipment of the world's leading companies.

Given the shortcomings of single-phase and three-phase technology of pork production, scientists and practitioners have developed a two-phase, which involves keeping in the uterine machines of piglets until the end of rearing nests [547]. It allows to improve the conditions of piglets and reduce technological stresses caused by regrouping of pigs, increase their safety and productivity and get higher by 12-15% growth compared to three-phase and reduces the production area for fattening by 15-20% [105].

Today, this technology, with some improvements, has found application on modular farms in Ukraine and Russia [178, 360, 420].

Russia's scientific elite has created a 200-head pig farm with a closed production cycle and a two-phase system for keeping livestock in machines with a raised lattice floor.

In Ukraine, a light-type monoblock room with two-section machines

for two-phase nesting of pigs has been developed, which achieves more comfortable ethological conditions for its rearing and fattening, which increase the growth energy of young animals by 17.65% and reduce the duration of fattening by 27 days [75].

According to Belarusian scientists [531], single-phase or two-phase production should be used on complexes of up to 6 thousand heads, which increases the leveling of piglets' nests, their safety and increases their weight during transfer to fattening [532, 545].

In Canada, the United States, Australia and some European countries, an alternative method of keeping pigs during fattening is used [251, 294], which involves the use of a hangar system in deep litter [633, 632, 648]. In Ukraine, this system has become quite widespread due to less investment in fattening facilities [383].

Thus, in view of the above, we note that the formation of the pig industry and animal productivity due to the development of industrial technology occurred gradually and depended on the state of the industry and scientific and technological progress in each country. Therefore, in farms where intensive industrial technology with a completed production cycle is used, the level of animal productivity needs further research and study.

SECTION 3.
INTRODUCTION OF LEADING TECHNOLOGIES AND PRODUCTION OF PIG PRODUCTION

The main sex and age groups in pig breeding include: breeding boars; sows (single, conditionally pregnant, pregnant, suckling); repair young stock; suckling piglets; piglets on rearing; young animals for fattening.

Depending on the type of enterprise, boars are kept in individual machines. This method of restraint prevents fights between animals, they are easily expelled to exercise or to the arena to obtain sperm on an artificial vagina. In elevers, where boars are grown and evaluated for their own productivity, according to the norms of technological design, no more than three boars should be kept in one group machine. On commodity farms, the norm of easel area in group machines for breeding boars is 2.5 m^2/head, and on breeding farms - 6.0 m^2/ head. The machine is equipped with a feeder and a watering can. The floor in the machine is combined: 75% - expanded clay concrete and 25% - slotted. The front and side walls 1.4 m high are made solid and only in the area of defecation and from the sows for visual inspection - lattice. The slope of the floor is 0.03 towards the manure tray, the feeding front is 0.5 m [403].

It is well known that sows are the main means and object of pork production technology, so the efficiency of the pig farm depends on the conditions of their maintenance. According to the literature [607], about 25% of all costs for the maintenance of pigs relate to work with sows, while, for comparison, for the maintenance of pigs for fattening - 5%.

A number of scientists [53, 89, 94, 217, 272, 329, 363, 429, 451, 551, 553, 562-566, 576, 583, 590, 595, 612, 618, 630, 636, 638, 642, 644 , 645, 659, 661] devoted their research to the issue of keeping single and pregnant sows in a pig farm. Therefore, science has different views on the application of technology for keeping sows. As a rule, the issues for discussion in this aspect are the following:

- Which group or individual sow content is better?
- Is it better to keep sows with or without litter?
- Do sows need exercise or is it better without walking?
- To keep this technological group with artificial or natural microclimate [12, 162, 328, 371].

In the former Soviet Union, industrial sows were kept in group sows in groups, mostly 5-20 heads each [72, 91, 107, 134, 145, 161, 328, 373]. With the intensification of the pig industry in Ukraine and post-Soviet countries,

the maintenance of single and pregnant sows in individual machines has become widespread [12, 77, 282]. In the recent past in Europe, according to D. Hesse [603], 70% of pregnant sows were kept in individual machines, in Australia and New Zealand 63 and 50%, respectively [595, 647]. According to Barnett et al. [551] in the United States, approximately 60-70% of sows were in individual machines throughout the gestation period. In Great Britain, according to P. Brooks [53], such detention has been banned since January 1, 1999. In Denmark, as of 2007, the percentage of sows kept on individual machines has decreased to 25%, while in Ukraine this method is used by up to 30% of pork producers [350].

The main advantages of the individual method of maintenance include: individual feeding according to the physiological needs of the sow, low need for space, better opportunities for artificial insemination of queens, better hygiene compared to group machines, no struggle for rank in the group and, consequently, reduced injuries, time spent on cleaning the machine [53, 89, 495, 590, 634, 661].

According to the information [120, 601, 602, 669], pregnant sows during their individual keeping gained more weight in the group compared to those animals that were kept at this time in groups. So, summing up the above information, it should be generalized that the positive feature of individual maintenance of sows is that the machines allow easy access to the sow, herd management, individual feeding. In sows with this method of keeping there is almost no aggression and the animal cannot harm another, because it is limited by the cage, and this minimizes injury to animals. However, the downside is that the sow loses any ability to move actively. Such keeping is unnatural for sows and does not meet the needs of pig ethology. This interpretation is confirmed by stereotyped behaviors in sows [350, 363, 551, 564, 550, 555, 645].

Such negative consequences of individual keeping of sows have led to protests against such keeping of pigs by animal rights activists in both Europe and the United States. As a result of such protests, there was a complete ban on keeping pregnant sows for more than 35 days in all EU countries from January 1, 2013 [403, 646]. This fact has led scientists around the world to study the advantages and disadvantages of this method of keeping pregnant sows.

When comparing group and individual maintenance J. Marshant and D. Broom [639], L. Boyle [562] found that sows during group maintenance during pregnancy more often during childbirth change posture, turn over, rise, which negatively affects their well-being. Increased activity during

childbirth leads to squeezing of piglets [667] and causes aggression by the sow towards them [600].

Thus, according to A. Lawrence [635], first-calves, which are accustomed to free movement in a group machine, when placed in a cage for farrowing show more signs of fear and aggression compared to analogues, which were kept in individual machines. In turn, according to L. Boyle [563], V. Beattie [555], M. Harris and H. Gonyou [601], first-calves, which were kept in individual machines during pregnancy, feel a lot when they are transferred to the farrowing shop. greater stress than those maintained by groups during this period.

An alternative to individual maintenance is considered group maintenance of pregnant sows [551, 567, 609]. The main advantages of the group method include the following: a larger area of the machine per head, more space for the movement of the animal, greater opportunities to maintain a normal body temperature of the animal and create conditions for the detection of natural herd instincts [661].

However, there are disadvantages of the group method of keeping sows: aggression of sows, injury to animals, death of embryos during implantation, difficult detection of injured and sick animals, difficulties in organizing individual feeding, increased staff attention [566, 577, 614, 615]. The aggression of sows in a group is a natural phenomenon, to establish a hierarchical relationship, but often leads to serious injuries to animals, and sometimes to their death [638]. And in industrial pig farming, it is provoked by frequent regroupings of sows, which lead to stress and reduced productivity of pigs [566]. In this regard, one of the alternatives to group keeping is to keep sows in small groups of 4-12 heads [87]. The main advantages of small group maintenance are: relative stability of the group, which minimizes sow aggression, simultaneous individual feeding, ease of process control [73, 89, 105, 349, 373, 589, 659, 661, 674]. The proposed system of keeping pregnant sows is widely used in farms of different sizes and requires sufficient funds [73, 89, 105, 155, 184, 224, 349, 373, 589, 595, 605, 661, 674].

Due to the development of energy-saving technologies, a system of keeping sows in deep litter appeared [215, 217, 299, 553, 564, 599, 605, 618, 629, 645, 659, 661, 670]. Thus, when kept in large groups using straw for sows, there are more natural, more comfortable housing conditions. They have a large space for movement, which allows you to exercise. The presence of a large area of the machine, a sufficient amount of straw in the machine and an unlimited amount of feed in the feeder leads to a decrease

in aggression in sows and, consequently, reduce the level of their injuries [564, 566, 609, 614]. Herd control here is much worse than with the previously described housing systems [615, 636, 660]. According to V. Hetman [89], feed consumption in such a system exceeds 6 kg, which leads to a significant overuse of it almost twice, and as a result, the condition of sows with the second and third farrowing is excessive.

Scientists such as P. Lamers and M. Hanimen [217] compared the productivity of sows kept in large groups in deep litter with electronic feed dosing during pregnancy, with the productivity of their analogues kept in individual machines. These researchers found that sows kept in large groups in deep litter gave birth to significantly more than 8.1% of live piglets, 4.6% significantly more before weaning. Keeping pigs in large groups in deep litter increased by 1 day, or 18.5%, the duration of hunting after weaning and reduced their fertility by 2.2%. Given the simplicity, cheapness and positive aspects of keeping single sows in deep bedding, scientists and practitioners from different countries have implemented various improvements to this system of keeping.

Thus, in the Netherlands, a system of «voluntary» movement of sows in individual machines for the period of feeding was developed [53, 594, 674]. This system combines the benefits of individual feeding of pigs with their group keeping. It is used in combination with deep bedding and with a slotted floor [608]. As a variant of this system, there is a system developed in Germany such as «Hoermatik» [589, 590], which involves keeping sows in individual machines and their alternate exit into the passage between machines. The rear wall of the machine is unlocked only in the absence of animals in the aisle and the next pig can go into the aisle after returning the previous one to the machine.

Again, in the Netherlands, according to J. Höges [610], to combine the benefits of group keeping of pregnant sows on litter with individual feeding and free-range, a pigsty with division into three zones was developed. The recreation area has a solid concrete floor with bedding and is divided into sectors for animal recreation. The area for walking sows can have both a lattice floor and a solid floor with the possibility of using litter. In some farms, the sow rest area is located outside the premises and has only a cover. The sow feeding area is equipped with individual feeders with the possibility of fixing the animals during feeding and insemination. But with this system, the need for areas for sows to almost 5-6 m^2 per 1 head is almost doubled and labor costs for litter removal and renewal are increased.

Many farms in North America, Australia, the EU, Ukraine, Russia,

Kazakhstan, in order to reduce investment in the maintenance of pregnant sows use lightweight piggeries with a deep floor [329, 589, 632], in which the place of feeding (feeders) of sows is raised relative to floor level. 50-60 cm and equipped with steps. The place of rest and the territory for walking are determined by the sows themselves. This retention technology allows to reduce the area of retention per sow to 2.5-3.0 m^2, but increases the cost of litter to 3 kg per head per day and, accordingly, the cost of labor for its removal and spreading. It requires additional costs for manure storage and processing and impairs animal monitoring.

Due to the intensive development of the market of «organic» pork in many countries with developed economies, the process of returning to keeping sows in the wild has begun [611, 613]. The system of keeping sows «in nature» is twice cheaper than intensive, provides many benefits for the animal, but also creates certain inconveniences and is unproductive and extensive [566, 664].

Therefore, the group machine for keeping sows should have the following dimensions: length 4050 mm, width - 3150 mm, height - 1000 mm, area - 12.8 m^2, area of the machine per head - 2.1 m^2. Slotted floor made of reinforced concrete has the following dimensions: the width of the bar - 82 mm, the gaps between the bars -18 mm.

As for the systems of keeping suckling sows, it should be noted that currently in Ukraine and around the world introduced different technologies of pork production, with different ways of keeping suckling sows [20, 57, 72, 73, 75, 85, 87, 153, 184, 222, 287, 328, 330, 371, 431, 502, 523, 541, 583, 597, 603, 608, 612, 622, 667]. Usually, scientists and practitioners around the world are carrying out various developments of machines for farrowing sows, in which come to the fore designs that prevent squeezing piglets by sows and creating an optimal microclimate in the nest for piglets.

For the maintenance of suckling sows on pig farms for a long time in Ukraine and other post-Soviet countries, machines are used with a division into a zone for keeping a sow and a zone for feeding and resting piglets, ranging in size from 5 to 8 m^2 [73, 184, 207, 431]. In such machines, litter and local heating of piglets' lairs in their rest area were used. However, this design of the machines caused a large loss of piglets during the suckling period, and as a consequence, the low efficiency of the pig industry in these farms.

At the present stage at the pig enterprises of Ukraine for the maintenance of suckling sows use technological equipment both domestic (LLC «Agricon», LLC «Techna», «I-TEK Ukraine», LLC «Factory

Variant», «Bratslav»), and foreign companies («Big Duchment», «Haka», «Shauer», «Egeberg», «Funky», «Phi-CC», «Porcon»), etc. [403]. Narrow-sized machines for early weaning of piglets (21-28 days) have become widespread in the European Union [7, 219, 378, 570]. They are equipped with a lattice floor, elements of local heating of piglets, partitions from plastic panels, automated feeders with feed dispensers. Their dimensions: width 1800-2000 mm, length 2200-2400 mm, height 1000 mm, in which the fixing box for the sow is placed in the center of the machine. Some machines can be transformed to raise piglets in them.

Given the results of research by domestic authors, as well as the latest requirements of EU legislation for the fixed maintenance of sows, there is a need to develop machines for semi-fixed maintenance [532, 615]. In Denmark, machines are used to fix and disengage sows after the piglets acquire a guard reflex, where the floor is made of plastic gratings, where the size of the cells in the sow's area is 120 × 5 mm, and in the area of piglets - 50 × 5 mm [403].

Domestic serial machines such as SSI-2, CCD-2M, SOS-F-35 were used for three-phase keeping of piglets at industrial complexes [21, 22]. Each brand of machines has its own characteristics and is designed for farrowing sows and keeping piglets up to 26-45 days of age. The main disadvantage of machines of these brands is the hypodynamics of sows.

In the conditions of two-phase keeping of piglets serial machines like OSM-60 and OSM-120, SP-1, SOIL-2, S-966A, KSK-50 were used [13, 21, 22, 26, 207, 343, 382, 547]. In these machines, the sow was fixed for the first 7-10 days after farrowing, then kept free until weaning the piglets, after which it was transferred to another pigsty for insemination. Weaned piglets were kept in these machines until 3-4 months of age, depending on the technology adopted.

Considering the technological features of keeping piglets at weaning, rearing and fattening, we report that a two-phase system of pig breeding is suitable for industrial pork production. Wang is based on the calculation that rearing of pigs by weight of 25 to 30 kg sufficient area of the machine, where the litter. Under this system, when the piglets reach 21-60 days, the sow is removed from the machine, and the piglets are kept in it until they are handed over for fattening. With such a system of growing weaned young, the number of regroupings decreases compared to the three-phase system, which allows to increase the growth intensity of piglets by 7-21% [74, 120, 135, 252, 607]. However, it requires the use of special machines for farrowing sows, which must be transformed into machines for rearing, and

requires a third more area of pig farms for farrowing.

Most suited for intensive pig production appeared to be three-phase system of rearing pigs, piglets in which to hold the uterus weaning, then regroup and keep them in a pigsty for rearing until they reach the weight of 25-30 kg, then transfer to fattening. Weaning of piglets leads to stressful phenomena, which result in the loss of piglets and reduced growth intensity.

In European countries, the most common is cellular content. Piglets up to 20 kg require a machine area of 0.2 m^2, and up to 30 kg-0.3 m^2 per 1 head. It is believed that such a system is not only productive, but also reliable and hygienically favorable. However, it has a minimum of comfort for the animals. The Swiss Agricultural Association has proposed a pigsty for keeping large groups of animals. It is divided into two branches. Closer to the central aisle there are places for laying piglets with heated air. The compartment where the cages used to be has been turned into a place where the piglets can move and play.

Growing piglets on a partially slotted floor in machines of different designs is also quite widely practiced. In terms of cost and hygiene, they are inferior to cages with a completely slotted floor, but are more comfortable for animals.

German scientists have developed a pigsty with a semi-open facade with heated air in the boxes for raising piglets. Piglets lie tightly in closed beds next to each other at a temperature of 30 to 40 degrees. Near the sunbeds there is a walk with a plastic slotted floor, where there is a feeder, a drinking bowl and a place to play. At visual observation, animals feel normal, working conditions for humans are also quite satisfactory [493, 616].

The most important and profitable stage of pork production is fattening. Here, according to [73, 162, 184, 207, 371, 429, 537] more than half of the production facilities are used and about two thirds of all feed is consumed. In industrial pig breeding, different systems of keeping pigs are used for their nesting, small-group and large-group keeping. Nesting content is used mainly in single-phase and two-phase production technology and with inefficient use of the premises has not become widespread in industrial complexes [162, 296, 361].

Fattening in one machine of 20-25 heads is considered small group, and more than 25 - large group. The analysis of group keeping of fattening pigs showed that with the increase in the number of animals in one machine the labor costs for pork production decrease, but the increments decrease and the feed costs per unit of production increase due to its cost [363]. Thus,

in studies [371, 403] it was found that pigs with 100-120 heads in the machine spent 17-19% less time on rest, had a lower average daily gain of 37.5%, spent 10.7% more feed per 1 kg of live weight gain compared to analogues, which contained 20-25 heads. Therefore, small-group keeping of fattening pigs with the use of solid concrete, or partially or completely slotted floor is widely used on pig farms and complexes. However, this method of keeping does not meet the physiological needs of animals and is criticized by animal rights activists [94, 272, 330, 495, 633].

In the aspect of «organic» pig breeding in countries with developed economies, fattening pigs «in nature» is used. This method is possible in areas with warm climates. Pigs are provided with a large fenced area equipped with protective structures, where pigs hide from the heat in summer and from the cold in winter. Most pork producers believe that all the advantages of refusing to build a capital building nullify the difficulties associated with fattening pigs «in nature» [669].

Analysis of the materials in this section shows that there are many systems and ways to keep different sex and age groups of pigs. Thus, individual or group machines are used for breeding boars. For keeping single and pregnant sows, the most common are keeping in individual boxing machines, in small groups with normalized feeding and large groups with individual feeding. For suckling sows, farrowing is carried out in machines with fixation on the slotted floor. But this method of keeping has a negative effect on the health of pigs. The use of machines with a partially slotted floor improves the welfare of animals, but reduces their productivity. Keeping pigs in hangars and pastures reduces investment in pig farming and is part of «organic» pork production, improves the health of sows and their offspring, but worsens the economic performance of pork production.

SECTION 4.
FORMATION OF PRODUCTIVE QUALITIES OF PIGS IN THE CONDITIONS OF MODERN INDUSTRIAL TECHNOLOGY

All factors that can cause stress reactions can be divided into the following groups [486]:

1) physical (temperature, humidity, solar and ionizing radiation, noise, air movement);

2) chemical (increasing the concentration of ammonia, hydrogen sulfide, carbon dioxide, chemicals used in animal husbandry);

3) feed (insufficient and defective feeding, excessive consumption of animal feed, a sharp change in the nature of feed, the use of substandard feed and water);

4) transport (loading, unloading, transportation of animals by different modes of transport);

5) technological (weighing, weaning of young animals from mothers, dense keeping of animals, small front of feeding and water supply, increased noise from working mechanisms, abrupt change of keeping regime);

6) biological (pathogens of infectious and invasive diseases, vaccination of animals);

7) rank (stress in the struggle for leadership in a group of animals in group housing to establish a hierarchical order and determine leadership in the group).

In 1936, the Canadian scientist Hans Selye experimentally established a stereotypical set of simultaneous changes in the organs of laboratory animals exposed to completely different stimuli. This set included: increased and increased activity of the adrenal cortex, atrophy of the thymus and lymph nodes, gastrointestinal ulcers and was called by him a general adaptation syndrome, or syndrome of biological stress [658].

Currently, stress is defined as a general nonspecific neuro-hormonal response that occurs in animals in response to different in nature strong stimuli that lead to disruption of homeostasis [44, 160]. The possible occurrence of a stress response is determined not only by the action of stimuli, but also by the reactivity of the organism, which in turn depends on hereditary properties, physiological condition, sex, age, housing technology and other factors [90, 111, 112, 160, 293, 432].

Naturally, stresses that require significant costs on the part of animals to adapt will reduce productivity and deplete the protective mechanisms of pigs. Accordingly, stressful situations for animals must be avoided in order

to achieve high production rates. But to achieve this in practice is impossible. Necessary veterinary measures, early weaning of piglets, weighing, regrouping in the formation of groups of piglets at weaning, young animals for fattening and ewes, as well as a number of other technological operations are inevitable in industrial production [169, 194, 482, 535].

Studies by many authors confirm the strengthening of the stress response in pigs after the mandatory technological operations in industrial pig breeding [2, 78, 191, 258], found that after weaning from sows in piglets can develop various diseases of the gastrointestinal tract, respiratory tract, associated with the stress response of animals. In the first two weeks, the number of erythrocytes, hemoglobin, total protein decreases, live weight gain decreases.

Studies N.W. Chorny and etc. [522] there was an increase in the number of gastrointestinal diseases for 5-7 days after weaning in 3 times (12-17% of piglets after weaning), compared with the observation before weaning. Live weight gain decreased during the first 10 days by 12.8-21.3%, bactericidal activity of serum - by 20.5%, lysozyme - 19.5%. Immunobiological parameters remained low for 15 days after weaning.

In the industrial production of pork, situations have often arisen where some stressors are combined with others [488, 504, 521, 548]. Thus, A. Kuznetsov [210], studying the immune status, found that in 42% of 50-day-old piglets in the industrial pig complex, the ratio of lymphocytes and neutrophils corresponded to the stage of mobilization. 38% of young animals were in the phase of depletion as a result of the influence of technological stresses of weaning and transfer to the rearing room. His results explain the reason for the weak immune response of piglets to vaccination against classical swine fever. Only 20-40% of piglets had a normal antibody titer of 1:8 and above.The author considers it correct to postpone vaccinations due to low reactivity of piglets.

J. H. Lyakh, G. V. Maksimov, reported that such stress factors as unbalanced in digestible protein feeding is too low or high ambient temperature inhibit antibody formation and prevent the formation of immune stress in the body of pigs [258, 267].

S. A. Kerr and ets [580], reported a joint adverse effect of Actinobacillus pleuopneumoniae and changes in temperature in the pigsty on productivity, insulin-like growth factor and blood cortisol levels in fattening pigs. Significant negative impact on the health of animals and their

productivity of technological stresses are reported by other authors [2, 163, 117, 140, 312, 313, 666].

In the 70s of the last century in the former USSR consumer demand for pork grew, and the breeding of domestic meat breeds of pigs began. It soon became clear that the breeding and rearing of meat animals in industrial production is a more difficult task, compared with the traditional use of meat and fat pigs. Specialized meat breeds are more demanding to the conditions of feeding and keeping, many of them are hypersensitive to many technological stressors [259, 454, 470].

Increased stress sensitivity, associated with selection for meat, often leads to deterioration of meat quality [18, 163, 169]. Meat obtained from such animals has a pH of 5.5-5.9 45 minutes after slaughter. It becomes pale, watery and acquires a coarse-grained structure. The moisture holding capacity of such meat is low, as well as taste and technological qualities [302, 348]. This specific defect of pork is called in the world PSE- meat (pale- pale, soft - soft, exudative- exudative). In France, Holland, USA, England, up to 41% of carcasses from stress syndrome are missing from pigs [264, 265, 403, 435, 486].

A large number of studies in pig breeding have been conducted to develop methods for determining the stress sensitivity of animals and selection for reproduction of the most resistant to stress. Widespread in the 80s of last century was a method of testing piglets aged 5-12 weeks for susceptibility to stress using the anesthetic gas halothane, developed in the United States. In stress-resistant pigs under its influence there is a malignant hyperthermia, accompanied by muscle rigidity, the appearance of red spots on the skin, increased heart rate, shortness of breath and other signs characteristic of stress syndrome [302, 348, 398].

Subsequently, methods were used to determine the predisposition to stress syndrome by blood group systems, the activity of the enzyme creatine phosphokinase. However, DNA diagnostics by the RYR1 ryanodin receptor gene is currently used. Since it not only accurately identifies stress-sensitive animals homozygous for recessive mutation, but also allows to determine carriers - heterozygotes [455, 504, 515, 535]. According to V.I. Stepanov [435], heterozygous sows had lower fertility rates by 8.8%, the number of live-born piglets - 11.1%, nest weight at birth - by 11% compared to uteri without a recessive allele. However, according to the same data [435], the manifestation of *PSE* and *DFD defects,* although decreased by 30 and 10%, respectively, but also occurred in the offspring of parents free of mutations in the *RYR1* gene.

Thus, the stress response can be caused by a variety of stimuli that act for a long time or are inadequate for the animal's body.

Analysis and assessment of the significance of various factors influencing the final result in the production of livestock products is a fundamentally important and complex problem, which depends on the amount of effort, material and intellectual resources aimed at solving a specific production problem. So, D. N. Hodosovskyy [504] M. G. Povod [351], and etc. [470, 454], report that the productivity of animals by 40-60% depends on the quality and quantity of feed, 30-40% on compliance with regulatory parameters of the microclimate and 20-30% on hereditary factors. A. A. Starkov, V. K. Denisov [428] believe that the highest level among the factors that affect the health and productivity of pigs takes the level and adequacy of feeding (65-75%); second place - conditions of detention and technical means (15-20%); third place - animal breed, pedigree of crossbreeds, breeding system (0-16%); fourth - other factors (up to 4%).

One of the main problems of modern technologies is forced hypodynamia in industrial pig farms. Thus, I.V. Khrustaleva [508], notes: "The lack of the required dose of activity deprives the musculoskeletal system to perform important functions of the brain and" peripheral heart ", which is performed under the action of mechanical energy that occurs only during movement. It follows that without movement no mechanical energy is formed, without which there is no normal outflow of metabolic products from the organs.

Hypodynamia is also seen by other scientists as one of the leading causes of impaired health and productivity of pigs [398, 521]. G. S. Pokhodnya studying the effects without walking and fixed sows, found increasing the number of viable and dead piglets at birth, and also leads to deterioration of the physiological state of sows [359, 365, 369].

The positive effect of motor activity on the reproductive qualities of sows and the productivity obtained from their piglets were recorded [516, 521]. Fertilization of queens in the next mating period increased by 8.3%, the average daily gain of piglets - by 8.7%. On the contrary, piglets were kept less viable from queens kept without feeding, and this tendency intensified in subsequent farrowings. Exercise accelerates the onset of sexual hunting by an average of 3 days, fertility - by 12.3% and milk yield - by 23.6%. Similar data were obtained abroad [373, 394, 585, 653].

According to V.I. Bezzubov [35], it was found that the fertility of repair pigs during the development of production facilities of the pig farm

with a capacity of 108 thousand heads of annual fattening was 54.6-64.6%, which is lower than the production program. The fact that this problem remains relevant is evidenced by M.H. Povod [350], A.V. Chernenko [518], Y. V. Konopelko [191], who stated that the fertility of sows in most farms depends on way of keeping them.

In addition to fertility, a number of authors associate hypodynamics with an increase in culling due to limb diseases [35, 160, 163, 264, 267, 373, 398, 403, 454, 504]. For this reason, from 15.6 to 63.6% of breeding stock and repair young stock can be culled.

It is experimentally proved about the close connection of the sow MMA syndrome with the change of their housing conditions. N. Polyantsev, E. Ushakova [359], report that MMA (mastitis-metritis-agalactia) was first registered in the 1970s at large pig farms in the United States and Western Europe. The emergence and development of MMA syndrome is associated with the destruction of microbial biocenoses in the gastrointestinal tract of animals [86, 592].

Lack of movement, due to the peculiarities of industrial technology, causes, according to I.M. Nikitchenko, S.I. Plyashchenko, A.S. Zinkova, stress of considerable force [302]. Due to the long-term restriction of motor activity develops the so-called «chronic stress», which leads to metabolic disorders, impaired motor function, reproductive capacity, the duration of economic use of animals falls sharply.

One of the ways to combat the effects of hypodynamics and stimulate the body of pigs with favorable environmental factors, many authors suggest the use of different options for summer camp maintenance of pigs [366, 373, 403, 470, 516]. Although negative results can be obtained [517, 518].

Along with the problem of hypodynamics, it is necessary to highlight another integral factor of industrial production technology - the high concentration of livestock in a limited area, which increases the number of veterinary problems [117, 140, 312]. Therefore, industrial pork production provides a high level of veterinary services.

The next problem of industrial pig farming, as mentioned earlier, is stress. As a result of the intensification of animal husbandry, most livestock was closed for life in the four walls of the industrial complex, without sun, pastures and pastures. This has led to the emergence of new diseases, which in veterinary medicine have become known as «concentration diseases», «indoor diseases» or «adaptation diseases». The authors directly link the stress-genetics of the environment in industrial pig breeding with functional non-communicable diseases, which account for about 96% of total losses in

modern livestock complexes [44, 48, 191, 258, 312, 313, 398, 432, 504, 535].

Thus, in view of the above, we note that the existing problems in industrial pig farming are diverse and do not have a simple and easy solution. They require comprehensive research in many areas of zootechnical and veterinary sciences. Achieving high performance obviously requires both a revision of the technological requirements for livestock facilities and an appropriate system for selecting animals that are best suited to industrial housing technology.

A promising reserve to increase pork production is the use of enzymes and probiotics, feed additives that normalize the microbial composition of the gastrointestinal tract and have the ability to restore and improve digestion, absorption of nutrients, metabolic processes in the digestive tract, the body as a whole and increase it resistance [221, 275, 276, 376, 401]. In the production of feed, various feed additives are actively used, which significantly improve the consumption of basic rations, increase digestibility and nutrient use, purposefully change metabolic processes and prevent stress in animals [55, 497, 504, 525].

A special place is occupied by enzymes that promote maximum destruction of plant cell membranes and increase the availability of nutrients, when the production of their own enzymes in young animals is limited [52, 99, 100, 308, 309, 549, 559, 619].

The use of enzyme preparations allows to reduce the use of expensive and inaccessible to farms feed of animal origin and, in particular, soybean meal, fish and meat and bone meal by feeding feed of own production (peas, vetch, lupine, sunflower meal, etc.). Enzymes introduced with food selectively destroy D-glucan, pectin compounds and arabinoxylans, which, in turn, allows animals to more efficiently digest proteins, fats, starches and carbohydrates.

Enzymes are highly active biological catalysts that determine the direction and accelerate metabolism during the reaction [150, 308, 309]. The enzymes themselves are not part of the final products of the reactions, are not consumed in the process and after the end remain in the original amount. The mechanism of action of enzymes is explained by the fact that they enter into a temporary connection with the substrate and form a complex «enzyme-substrate». At the same time there is an activation of a substrate owing to polarization of electrons or deformation of the communications involved in reaction. The complex that is being created exists for a very short time. In the second stage, it decomposes, releasing the

enzyme, and the substrate breaks down into simpler compounds [221].

According by A.E. Braustein and others. [52], enzymes reduce the activation energy in chemical reactions, directing it through intermediate reactions, which proceed faster at lower energy. Enzymes act as specific biocatalysts that accelerate the course of biochemical reactions of the body.

The microbiological industry produces enzyme preparations of two groups for agriculture: fungal and bacterial. Fungal strains are more suitable for use. They have almost no unpleasant odor, contain a complex of enzymes required for hydrolysis of native substrates, fungal biomass is easier to separate during filtration and the drug is more concentrated, and the cultivation of fungi is carried out in an acidic environment, which prevents the development of foreign pathogenic bacteria.

Currently, in pig feeding and feed production are widespread enzyme preparations, which can significantly improve the digestibility and absorption of nutrients by the body, as well as accelerate digestion [198, 204, 205].

Of scientific and practical interest are studies related to the development and application of multienzyme compositions, which can be considered as a set of enzymes involved in one cycle of reactions designed to increase the productive action of feed with high content of barley, wheat, oats, bran and etc. [205, 309, 401, 445].

Thus, to study the action of the enzyme pectofoetidine in the diets of repair pigs with different levels of soy protein (15.25 and 35%) [111, 204], animals were fed daily per head of 2-3 g of enzyme. The highest rates of dry and organic digestibility, nitrogen deposition, calcium and phosphorus use were in the group receiving a diet with pectofoetidine, in which 35% of protein was represented by soybean meal. Animals in this group were superior to peers in the control group in terms of live weight gain by 5.9 kg or 8%, per 1 kg of growth spent feed units less by 9.1%, digestible protein by 6.8%.

The combined use of two enzyme preparations of pectofoetidine and celloveridine had a positive effect on live weight gain, metabolism and the balance of most amino acids in the body of pigs for fattening. When growing and fattening pigs from 31 to 120 kg of live weight, it is advisable to use pectofoedin 0.04 and celloveridine 0.02% in diets with a fiber level of 6.8 to 9.3% [308, 309, 376].

According to A.G. Marusich [276], enrichment of rations with 12,6-14,7% crude protein, 6,9-8,0% crude fiber, a complex of enzyme preparations of pectolytic (pectofoetidine) and cellulosolytic (celloterin)

action in doses of 0.04-0.06 and 0.01-0.03%, increases the efficiency of growth of fattening pigs by 4.3-7.3%, reduces feed costs per 1 kg of growth and its cost, respectively, 3, 9-8.1% and 3.0-7.3%, improves slaughter and meat quality of pigs.

A number of similar studies [99, 125, 308] have shown that not all enzymes that have cellulosolytic action hydrolyze fiber and non-starch polysaccharides contained in the grains of different cereals. This served as a basis for studying the effect of different combinations of enzymes on animal productivity, digestibility and absorption of nutrients in diets, including grain feeds of different species.

Thus, the effectiveness of enzymes increases if they are introduced into the diet not separately but in combination. This is due to the fact that in the process of metabolism is carried out simultaneously many enzymatic reactions, the products of which are substrates for others.

Currently, the industrial production of not only individual enzyme preparations, but also complexes of multienzyme compositions (IEC). V. A. Krohina, A.V. Karabanov, E.V. Udalova, T. M. Ryzhov [204, 205] believe that the enrichment of animal feed compositions multienzyme subject to the rules of administration and appointment increases the productivity of pigs. The rate of introduction of IEC in compound feeds does not depend on the activity of enzymes that are part of them and range from 0.05 to 0.1% or 0.5-1 kg per ton of feed.

In the experience of V. Krokhin, V. Fantin, N. Anisov, R. Fatrakhmanov and others. [204, 205, 454, 470] in the cultivation of piglets after weaning found that the addition of MEK in complete feed in the specified dose contributed to an increase in the weight of piglets by 25.2% due to better use of feed.

Fundamental research of modern biological and medical science has allowed to develop and implement a new class of drugs - probiotics. They have a wide range of positive pharmacological effects and, in addition, they are much more environmentally friendly than many other drugs [206, 271, 305, 340, 494, 530, 591, 592].

Experimental data and production observations show that in the conditions of intensive animal husbandry the addition of probiotics to the diet of animals increases their resistance to technological and biological stressors, normalizes metabolism and provides a fuller disclosure of genetically determined productivity [621, 637, 656, 671, 677].

Industrial technology of animal husbandry has led to the widespread spread of dysbacteriosis [59, 206, 677], quantitative and qualitative changes

in the normal microflora of the gastrointestinal tract, accompanied by the reproduction of opportunistic enterobacteria [587]. According to the authors, probiotics have a beneficial effect on the body under stress, which violates the homeostasis of the body, sharply reduces the number of lactic acid bacteria in the intestine [59, 587].

A large number of probiotics have been developed abroad, including both monoculture and associations of different strains [585, 587, 591, 637, 653]. In Sweden received a product that regulates the bacterial flora of the intestines of animals for the prevention of enteritis, in England developed a bacterial additive for silage, feed additives based on lactic acid cultures «Biomax», «Laktabak» and «Pronifer», in France - an immunological drug restores the intestinal flora in gastric diseases, in Japan – «Toyotserin», which contains viable spores of Bacillustoyoi, which get into the intestine, turn into bacteria that promote the development of lactobacilli, inhibiting the reproduction of bacteria such as *E. coli* , in Hungary – «Lacto allows» to reduce the incidence of young animals from 12.1 to 2.4% [376, 530, 591, 592, 621].

In our country, the development and testing of probiotic drugs in various fields of animal husbandry. According to H. Chomakov [525], the use of the drug "Anticolina" (combined prebiotic based on natural strains of bacteria *Lactobacil lusacidophilus* and *Streptococcus lactis*, reduced the negative effect of feed affected by micromycetes on the body of piglets 4-8 months of age.

In experiments conducted by O. Kryukov [206] on piglets during the first two months of life, it was found that the use of spore-forming probiotic additive can increase the percentage of preservation by 2.5%, feed consumption per 1 kg of live weight gain of suckling piglets is reduced by 1.7%, compared with animals of the control group.

Thus, probiotics are a powerful tool that can significantly improve the health status and production performance of pigs. An additional advantage of probiotics is the positive effect on the physiological state and productivity of animals, because probiotics are non-toxic and, unlike antibiotics, do not provoke the emergence of resistant bacteria. Thus, both producers of livestock products and consumers will benefit.

Given the above issues, we note that these functions of modern enzyme preparations and probiotics and their impact on improving production, economic and economic performance unequivocally prove the reasonable need for their use in the technology of feeding pigs.

SECTION 5.
BUSINESS - ASPECTS OF PIG PRODUCTION

The path of the agro-industrial complex to a market economy is accompanied by a change in forms of ownership, privatization of enterprises, privatization of property between specific owners. At the same time, new production relations are beginning within enterprises based on the personification of property and labor. However, at the initial stage the issues of ensuring parity of interests of all owners and subjects of production and economic units of the agro-industrial complex, in particular, in the meat subcomplex, were not given enough attention.

As a result of the decline in agricultural production, a significant number of processing enterprises declined. Hopes that the market will automatically adjust economic relations in the right direction, put everything in its proper place, proved futile. There is no doubt that society will have to pay dearly for such carelessness. To somehow improve the situation, it is necessary to strengthen the restructuring of industries and, above all, to overcome the local monopoly position of food and processing enterprises, to harmonize their activities with the interests of agricultural producers [6, 14, 15, 45, 454].

Issues of intersectoral relations in the agro-industrial complex have become extremely acute. There was an objective need for integration, in the creation of integrated production formations in the meat subcomplex on the basis of unification and mutual coordination of the interests of agricultural producers, processors and trade. The main goal of this process should be to overcome the downward trend in production and losses. The situation of rural producers and processing enterprises in the domestic market remains very tense. They are insufficiently protected in domestic markets.

There are a number of other factors that hinder the increase in the competitiveness of domestic products. Wholesalers reached for cheaper imported products and, as a result, processing companies began to overstock. Lack of normal sales, high costs for energy-intensive equipment, transport have led to the fact that manufacturers do not pay suppliers on time, delay the payment of wages and taxes. The study of the processes of corporatization and development of processing enterprises shows that in the situation that is characteristic of the agricultural economy, there are very few cases of improvement of their production and financial performance. In most processing enterprises, the transition to market relations tends to increase the consumption fund, reduce investment and increase prices. The

growth rate of prices for final products usually exceeds the growth rate of household income, which, along with a wide flow of imports, undermines the economic foundations of both agricultural enterprises and processing enterprises.

Thus, producers (agricultural enterprises and processing enterprises), whose ultimate goal is a certain product, seek to separate in the management of their economy in order to make a profit depending on the cost of their labor and resources. That is, there is a departure from the social division of labor, although it is known from economic theory that economic separation gives the exchange a new character. It is carried out, as a rule, on the basis of taking into account labor costs of producers. There is a commodity form of production, commodity relations between producers. It follows that in theoretical terms, production associations, as an integrative form of involvement of disparate producers in the manufacture of a particular end product, should be built on the basis;

- defined in the country division of labor;
- existing forms of ownership of the means of production;
- observance of socio-economic separation of producers;
- mutually agreed and mutually beneficial economic relations between separate producers by exchange;
- exclusion of elements of spontaneity and anarchic nature.

The purpose of such an integrated production association is to make a profit. In the conditions of integration, the profit is not individual, but general, but in each case it is distributed among the participants of integration on the basis of agreements and current legislation. A production association can be in the form of corporate, cooperative or joint-stock formations.

The primary link of associations are agricultural enterprises, organizations (sales or supply), processing enterprises, organizations and trade enterprises, research and production structures, financial and credit institutions, farmers, entrepreneurs, subsidiary farms, etc. Each of the members of the association acts as an independent producer and provides the process of reproduction on the basis of independence and self-sufficiency. The previously created forms of associations, which functioned within the planning and distribution system, did not withstand the new economic conditions and disintegrated mainly due to the disappearance of economic conditions, which were a unifying element.

On the one hand, three unrelated sectors have been formed in agriculture: collective agricultural enterprises (CAPs), created on the basis

of reorganized collective farms and privatized state farms, with partial restrictions on market turnover; peasant (farmer) farms; individual subsidiary farms of the population. All production entities, without experience, without market orientation and other economic conditions, did not maintain production at the appropriate level, especially in the collective sector. Although farming has some stability, the level of its production is insufficient. Households, unencumbered by various circumstances, which are inherent in the PCB are gradually expanding production

In theoretical terms, production associations, as an integration form of involvement of disparate producers in the manufacture of a particular end product, should be built on the basis of: defined in the country division of labor; existing forms of ownership of the means of production; observance of socio-economic separation of producers; mutually agreed and mutually beneficial economic relations between separate producers by exchange; exclusion of elements of spontaneity and anarchic nature. The purpose of such an integrated production association is to make a profit.

In terms of integration, the profit is not individual but general, but in each case is distributed among the participants in the integration on the basis of agreements and applicable law. In the conditions of economic liberalization, it was assumed that producers of primary raw materials, as well as processing enterprises, would switch to a direct contractual system (contracts). However, the contractual system of relations has not developed. Mainly due to non-fulfillment by processing enterprises, which at the same time perform the function of state procurers of agricultural products, of their obligations under the contracts. Such a negative phenomenon as untimely calculations has also spread. It is because of this that agricultural enterprises have begun to show a reluctance to cooperate with processors. And this under the conditions when processors had the opportunity to buy agricultural products at higher prices for livestock and poultry by an average of 14% against the actual price, which was formed during sales through other channels. In such circumstances, both sides lose. Agricultural enterprises, for which the livestock industries were the basis of their stability and contributed to a more or less uniform flow of money during the year, have practically lost money, and the livestock losses are constantly increasing. In part, they sell meat products to commercial entities at lower prices than those offered to them by meat processing plants, but the latter are paid immediately in cash. Therefore, the formation of a civilized food market did not take place. On the contrary, these relations have significantly increased the criminalization of the agricultural

market [6, 14, 15, 45, 454, 477].

The small intermediary structures that prevailed in the first stage of trade liberalization gradually began to unite and dominate the markets, displacing direct producers and maintaining high retail prices for meat and other food products. Agricultural producers, trying to adapt to market conditions on their own, began to create their own industrial base for processing products. According to our estimates, every fourth or fifth agricultural enterprise has one or another processing. However, two thirds of them, having the capacity to process livestock and poultry, milk, grain, sunflower seeds, due to lack of raw materials use them less than half. A significant part of other farms (about half) have resorted to long-term storage of their products, especially grain, sunflower seeds, and sell it in small batches throughout the year.

The other side of this process is that against this background, the economic situation of processing enterprises has significantly deteriorated. Due to the lack of raw materials, they reduced production volumes and, without exception, found themselves in a difficult financial situation. Their technical level decreases. The competitiveness of food products is lost. This was used by foreign companies and firms. They initiated the import of food meat products at lower prices than for similar domestic products.

Particularly in bricks imported meat was cheaper to domestic 10-15%. Imported pork came to Ukraine on average at 1.5-2 US dollars per 1 kg, although in the domestic market of importing countries it was sold at 4 dollars, and in the US selected pork - at 5 - 6 dollars. per kg. In practice, products were supplied at dumped prices, which harmed domestic production and subsequently led to higher prices. Practically there was a capture of the domestic market by all marketing laws: advertising, low prices, good quality, loans, reduction of domestic production and the tendency to a gradual increase in imports and prices [228, 253, 314, 454].

The state course taken at the previous stage to curtail domestic production can be attributed to strategic mistakes, the social consequences of which are still felt today. Under these circumstances, there was an internal need for professional associations in the production structures. For example, in districts (regions) of the state associations of farmers, joint-stock companies, various kinds of agricultural firms, or associations like Agroinkoma, «Land and People» and others are created. However, such associations cannot be attributed to production. Some of them have a socio-political nature, others perform the functions of agro-service for part of the

crop. There are very few professional associations that would be focused on the production of the final product, its implementation. It can be argued that at this stage the idea of the need to create them has matured, and it must be intensively implemented.

In the real economy, there are specific objective factors for the creation of production associations. According to the current regulations, joint-stock associations distribute profits on shares without taking into account the labor costs of agriculture. The share of rural producers in the price of the final product in 2000 compared to 1991 decreased by more than 2 times. Rural producers did not receive real rights to manage privatized enterprises when they received shares. The main obstacle to this is that the property of the enterprise, valued in shares, is the property of its staff. The path to the secondary issue leads to a violation of the legal rights of owners. There are also a number of other reasons that stand in the way of coherence between agricultural producers and processors.

Therefore, objectively, there is a need to return to the idea of forming closed-loop associations that would work for the end result, from production to implementation. It is not necessary to prove that such associations have significant advantages:

- reduction of trade margins (which reach 30-40% of the price of goods);
- production of more competitive products;
- distribution of profits in such associations throughout the chain - production-processing - sales, taking into account the contribution to the final result.

Thus, in the process of privatization, it is necessary that agriculture has its share in the property of processing enterprises, depending on their participation in the volume of work and services received from them. That is, agriculture should have a controlling stake in the property of processing enterprises, and economic relations should be built by distributing profits depending on the share of value in the selling price [14, 78, 114, 454, 479-481].

Assessment of reform processes allows us to draw certain conclusions. First: it is impossible to apply the standard criteria of reform to the whole set of enterprises.

Second: the reform of large-scale collective and state-owned enterprises is inevitable, because in the old forms they are mostly inefficient and unpromising.

Third: reform is a qualitative change in the system of economic

relations, which causes the growth of activity and interest of producers based on the transformation of previous impersonal and inert property into private (collective, group or personalized), able to significantly increase productivity and payback.

The implementation of this is aimed at organizational strengthening of the meat product subcomplex of Ukraine. In combination with state support, it is possible to quickly increase production capacity, help improve the supply of meat products to the population [6, 14, 15].

Forms of entrepreneurial activity. The main forms of entrepreneurial activity are: sole proprietorships, business associations, cooperatives, joint stock companies or corporations, joint ventures [6, 15, 454, 542].

Sole proprietorships are the property of one person or family, which is fully responsible for its obligations to all the capital of the enterprise and all its property. Sole proprietorships are the most common in market economies, their share in the total number of enterprises is 60 - 80%. In Germany, 90% of small and more than 50% of medium-sized enterprises are sole proprietorships. The share of small business in the GDP of developed countries is about 72%, and in Ukraine - 8%. Sole proprietorship has both advantages and disadvantages.

Advantages of sole proprietorship:

1. Sole proprietorships are relatively easy to form, because there is no bureaucratic red tape (in developed foreign countries) and costs for legal services. In Ukraine, in September 1994, the «Regulations» [138], were adopted, which provide for only three documents (previously up to 20 documents) for the right to open an enterprise. Thus, the registration body is obliged not later than in 5 days to register and hand over to the applicant the certificate of the state registration. However, few people follow this «Regulation». To open a small business in Ukraine, you need to invest more than $ 1,000; including In fact, in order to register a small business you need to give bribes 10 - 100 times more than the official price and spend a few months. Terrible bureaucracy, corruption, and difficult tax policies not only hinder the development of entrepreneurship, but drive it into the shadow economy. If in Poland there are 2.3 million small enterprises, in Italy - 3.5 million, in Ukraine - only 136 thousand.

2. In a sole proprietorship, the owner is his own master, the boss, who is free to act. The income of the enterprise depends first of all on its work. Here is a strong spirit of entrepreneurship, an incentive for production efficiency.

3. In small business a person tests himself, goes through a good school

for big business. By the way. Henry Ford began by making (riveting) two cars in 1903 , winning a race, selling them, and founding a small firm in a barn. The computer industry in the United States was started and developed in California's Silicon Valley in garages.

4. The advantage of sole proprietorships and small businesses is that here the organization of one job requires 7 - 10 times less money than a large one.

Disadvantages of sole proprietorships:

1. With some exceptions, the financial resources of a sole proprietor are insufficient for a firm to grow into a large enterprise. Here, financial resources are limited by the company's income and some credit, as banks are reluctant to give them loans, as they often go bankrupt.

2. The owner fully resolves all issues related to the operation of the enterprise. He buys the means of production, manufactures and sells products, advertises it, keeps records of costs and production results.

3. A significant disadvantage is that the sole owner is subject to unlimited liability. This means that such companies risk not only the assets of the company, but their personal property and their death or disability is d at eliminating or curtailing production.

Business associations (partnerships). Partnership - is a form of organization of production, when two or more persons agree among themselves about the joint venture management. To do this, they combine their funds, work, share risk, profits, losses.

Advantages of partnership:

1. Like sole proprietorship, a partnership is easy to organize by concluding a written agreement.

2. A large number of partners allows you to achieve high specialization in management.

3. It is possible to combine more funds, have more access to bank credit.

4. Companies are taxed less than corporations.

Disadvantages of the partnership:

1. Sometimes there is an incompatibility of interests, uncoordinated policies, inaction instead of decisive action.

2. The financial resources of partnerships are greater than sole proprietorships, but may be insufficient for profitable production.

3. The duration of the partnership is uncertain, unforeseen. Withdrawal from the partnership of even one participant can lead to its disintegration.

4. Unlimited liability threatens the partnership as sole proprietorship, because each partner is fully responsible for the results of the joint venture.

Partnerships have the following types: a) general partnership; b) a limited liability company; c) limited partnership.

Full society. The members of a general partnership personally take part in the affairs of the partnership and each of them bears full personal responsibility for the obligations of the partnership not only with the amount of invested capital, but also with all his property. Losses and profits are distributed among the participants in proportion to the share of each of them in the total assets of the firm. Each participant has the right to sign contracts on behalf of the company.

Limited Liability Company. This is a form of pooling of capital, where the participants are liable for the obligations of the firm only by their contribution. The capital of the company is divided into shares, which are distributed among the founders. The company does not issue shares, but gives the founder a document on his contribution. The highest body here is the meeting of shareholders. The board and its chairman (director) are elected for the current management. One of the forms of limited liability company is an additional liability company. Here, participants can be liable in 2 - 3 times the size of the share and their property.

Limited partnerships. This is a form in which some participants (full partners) are fully responsible for the company as their contribution and all their property, and others (commanders) are responsible only for their contribution.

Cooperative societies - these are associations where the size of the unit contributed the same for all participants and the number of members of the cooperative may vary. There are production, credit, sales, procurement, etc.

Joint-stock companies (corporations) are a legal form of business where ownership is joint, anonymous. The corporation, as well as other types of enterprises, can be engaged in any kind of activity: to buy, make and sell production, to take and give the credit, etc. The joint-stock company issues shares, which are a bearer document. Shares are of two types: a) preferred; b) ordinary, Preferred share - provides a guaranteed income, but does not give the right to vote at the meeting of shareholders. Ordinary share - gives the right to vote and dividends, the amount of which depends on the company's profits. Shares are listed on the Stock Exchange and can move freely from one person to another. The liability of depositors (shareholders) for the obligations of the firm is limited only by the amount paid per share. The income is paid to the shareholder for each share in the

form of a dividend. Its size depends on the company's profits. The supreme body of a joint-stock company is the meeting of shareholders. However, the Supervisory Board is also elected, the executive director, who is responsible for all his property for the company's losses. The director is hired on a competitive basis. He works under a contract and receives a salary that can be several times higher than the salary of the country's president. In addition to the salary, the president of the company must receive bonuses (part of the company's income). Corporations exist in all countries.

Advantages of the corporation:

1. Corporation - is the most effective form of raising capital. This is achieved through the securities market. The members of the corporation receive income even without participating in the management. They can be members of many corporations, which dispels risk. This is a profitable investment. The corporation has relatively easy access to credit. Banks are willing to cooperate with them because they receive income from them.

2. The second advantage of the corporation is limited liability: a member of the corporation risks only the amount paid for the shares. Creditors can only sue a corporation as a legal entity, but not individual partners.

3. Thanks to its privileges in raising funds, the corporation can easily expand production, introduce new technology. If in a sole proprietorship the owner is forced to deal with all issues related to the organization of production and sales, the corporation has the opportunity to hire professionals - professionals for each activity (accountants, engineers, technologists, etc.), which is the key to efficiency. production.

4. Since a corporation is a legal entity, it can exist independently of its owners. In a partnership, the exit or death of at least one partner leads to the termination of the partnership. In such cases, the corporation is retained because the shares may pass from the hands of some to the hands of other owners. In this regard, the corporation, if not eternal, then a long-term firm.

Thus, the advantages of the corporation are undeniable, although it has a number of disadvantages:

1. Registration of the corporation's charter requires some time and money for legal services.

2. There are opportunities for abuse, use of official position for useful purposes, issue and sale of securities that have no value. However, this is only an opportunity, not the nature of corporations.

3. The disadvantage of corporations is that there is a double taxation: profit and dividend.

4. In contrast to personal and partner property, where the owners themselves dispose of their property, exercise control, in corporations, participants are deprived of this opportunity. Most shareholders are deprived of the opportunity to vote in resolving certain issues, as they may be far from the corporation. Heads of corporations may be interested in one (increasing their salaries, most of the hit its profits to expand production), while shareholders - in big dividends.

5. Joint ventures (joint ventures) are created in the form of companies for the implementation of special projects and their activities are limited by the success or failure of this project [6, 14, 15, 138, 360, 393, 397, 414, 430, 454, 470, 542, 547].

SECTION 6.
MANAGEMENT AND MARKETING IN INDUSTRIAL PIG BREEDING

The concept of «management» and the need to manage organizations and pits. To define the activity of coordinating the work of people in practice, different concepts are used: management, administration, administration, etc.

Management is the most general concept. It applies to a wide range of various objects, phenomena and processes, such as: technical systems, economic systems, social systems, government systems and more.

Management is a concept that is used mainly to describe the management processes of business organizations (enterprises).

Administration - applies to the management of government agencies or to denote the management processes of the management of the enterprise.

Management - applies to the art of a person (manager) to influence the behavior and motives of subordinates in order to achieve the goals of the organization.

Therefore, to understand the essence of the category of "management", we must first find out that this is an organization that aims its activity and why any organization should operate.

By definition, Charles Bernard: «An Organization - a group of people whose activities are consciously coordinated to achieve a common goal or common goals».

All organizations have common characteristics for them.

All organizations use the four basic types of resources: human resources; financial resources; physical resources (raw materials, equipment, etc.); information resources.

Any organization with an open system. The resources that the organization uses to produce products (services), it takes away from the environment. In turn, the products produced by the body and the organization are also sold in the environment. Thus, the organization can exist only in interaction with the environment. This means that any real organization is an open system.

Division of labor in the organization. Even if two people work together to achieve a common goal, they must divide the work among themselves.

The division of general work in the organization into its constituent parts is called the horizontal division of labor. The result of the horizontal

division of labor is the formation of separate units of the organization (departments, shops, industries, sections, etc.).

Because the work in the organization is divided between individual departments and performers, someone has to coordinate their activities. As a result, there is an objective need for the so-called vertical division of labor, that is, for activities of coordinate the work of units and individual performers within the units.

Activities to coordinate the work of others in a broad sense and is the essence of managing the organization.

Thus, the need for management objectively arises due to the horizontal and vertical division of labor in the organization. Since the division of labor is a common characteristic of any organization, all organizations need management.

The global goal of any organization is to achieve success. What is success? An organization is considered successful when it achieves its goals. The components of success are:

a) survival, that is the possibility of living as long as possible;

b) effectiveness and efficiency.

To be successful in the long run, to survive and achieve its goals, an organization must be both effective and efficient.

According to P. Drucker, efficiency is a consequence of the right things being done; and efficiency is a consequence of the fact that these same things are created correctly. The first and second are equally important.

If the purpose of the organization is chosen correctly, it means that the organization satisfies certain important actually existing needs (things are created that are in demand). Effectiveness in this sense is something imperceptible (to the touch), invisible. Efficiency, on the other hand, can be measured and quantified. The relative efficiency of the organization is called productivity and is measured as the ratio of the cost of all exits from the organization and the cost of all inputs to the organization.

Management is an extremely broad and multidimensional concept. In order to better understand its essence, it is necessary to look at it from both sides.

Etymologically, management comes from the Latin word "manus" - hand. Originally, the word meant the ability to carefully maintain domestic households at households, skillfully own means of labor, deftly work. With the advent of many types of work, with the deepening of specialization, there was a need for activities that linked the work of many individual

performers. Accordingly, the transformed and the concept of «App same moment». This word has absorbed all the numerous requirements for management as a science, art of business and style of work.

Modern Oxford English Dictionary interprets pony t cha «management» is not clear, namely:

- management is a way, a manner of communication with people;
- management - it is the ability and administrative skills to organize the effective work of the organization;
- management is power and the art of management;
- management - is the governing bodies, administrative units, subdivisions and li.

In a broad sense, management is at the same time a system of scientific knowledge, art and experience embodied in the activities of professional managers to achieve the goals of the organization through the use of work, intelligence and motives of other people. All managers, regardless of the function they perform, the position they hold, the industry in which they work, have something in common. It is this common, common to the activities of all managers and is the foundation of the science of management, forms its foundations.

It should be noted that knowledge of the theoretical foundations of management is not enough to ensure the effective functioning of an organization. «Anyone who diagnoses from a book or tries to manage by memorizing the principles of management is seldom successful».

It is known that all other things being equal, the end result of different leaders is not the same. Attempts to explain this by scientific methods do not and cannot give results. There is always something in management that cannot be quantified and is called the art of management. However, this does not mean that management is carried out spontaneously, spontaneously, that the manager relies only on luck, intuition, personal experience. The art of management is the ability of the manager-practitioner to adapt the achievements of management science to the peculiarities of their own nature; features of subordinates: features of the relevant business area.

Thus, the science and art of management do not exclude, but complement each other. The art of management is always based on scientific knowledge, which is its basis.

In a narrow pragmatic sense, the essence of management is best perceived from the standpoint of a systems approach.

The job of managers is to combine and coordinate the use of these resources to achieve the goals (elements of the organization). How do

managers achieve this?

They do this in the process of performing four main management functions:

1) planning;
2) organizations;
3) management;
4) control.

Thus, in a narrow sense, management is the process of planning, organizing, managing and controlling organizational resources to effectively and efficiently achieve the goals of the organization.

These management functions are performed in a certain sequence, which forms the concept of management cycle.

It should be noted that this approach to understanding the management cycle does not mean that the management process is discrete (Monday - planning, Tuesday - organization, etc.). In reality, the manager's work constantly combines all these management functions.

Management as a type of professional activity. Management is often seen as a type of professional activity. Since u and tollgates perspective for understanding the essence of management is important to know who the managers and how their activities are different from the activities of other workers.

- Director, group leader, boss, manager - all these words denote positions. People who hold these positions can be united by the general concept of "manager", as it is possible to identify the following common features of their activities:
- the manager manages the work of one or more employees of the organization;
- the manager manages part or all of the organization in which he works;
- manager receives certain powers and takes within those full of at weighed decisions that will have consequences for other workers.

Any organization can be considered as a system, that is a set of interconnected elements. Any organization is also an open system. This means that it can only exist if it exchanges matter, energy and information with its external environment.

The main components of the internal environment of the organization include: production, research and development, technology, raw materials, materials, finance, employees and more.

The main components of the internal environment of the organization include: production, research and development, technology, raw materials,

materials, finance, employees and more.

The external environment of direct influence includes suppliers, consumers, competitors and other economic partners (for example a banks).

External environment for advocacy includes: eco including any social, political, legal, technological, environmental, and international and Mr. AI components.

All these are the components that the manager has to deal with. Accordingly, there are the following areas of management: production management, financial management, personnel management, research and development management, financial accounting, marketing, general administration.

The manager can: 1) manage any of them (or part of it); 2) manage several at once; 3) manage the entire organization as a whole. With a lying down on how many components (areas) organization manages manager, there are three levels of management: upper, middle, lower.

A small group of key executives of the organization belongs to the highest level. These are the president (director), vice presidents (deputies), the chief executive officer.

At the highest level of management, the mission is formulated and organizational goals are set, the overall corporate strategy and main tasks for its implementation are determined, decisions are made on entering new markets, launching new products, attracting investments, research and development, etc.

The middle level of management is responsible for the development and implementation of operational plans and procedures for the implementation of those decisions that were made by senior management of the organization. Middle managers have a fairly wide margin of appreciation for the implementation of plans. They, for example, independently determine: how many new employees need to be hired; what new equipment to buy; how to use the media for advertising, etc. This layer includes managers - heads of production and functional units of the organization.

Lower-level managers coordinate the activities of operational executors. This category includes, in particular, heads of sectors, groups, foremen, foremen, etc.

Senior managers of the organization develop a strategy, middle ones develop plans for its implementation, and lower - are responsible for the specific work performed in accordance with these plans.

The formal authority that managers receive in an organization

determines the appropriate status of the manager. This status, in turn, determines the nature of interpersonal relationships of the manager: with his superiors; with employees of different ranks; with subordinates. Such interpersonal relationships, on the other hand, provide the manager with the information he needs to make decisions.

For the successful functioning of the market of pig products it is necessary to draw the attention of managers and all employees of specialized enterprises in the field of pig production to meet the needs of consumers, make a profit, introduce new forms and methods of work in a competitive environment.

These requirements are met by the management in pig breeding, the main functions of which are:

- Strategic management and production planning and sale of pig products, increasing its competitiveness, studying market conditions and day-to-day management of specialized livestock enterprises.
- Marketing management, aimed at achieving the desired sales of pig products on the market and the impact on the level and nature of demand for livestock products, implementation of measures designed to establish, strengthen and maintain profitable relationships with customers in order to maximize profits, growth sales of pig products.
- The innovative function of management in pig breeding is to introduce advanced methods of reproduction of the herd, the use of the most effective methods of breeding (industrial crossing and hybridization), new schemes for feeding pigs. However, this management function involves the development and implementation of a new range of pig products.

The application of management in pig breeding provides:

- strengthening the company's position in the market;
- increasing labor productivity and on this basis the efficiency of pig production;
- avoidance of financial risks in market conditions. After all, in market competition it is not so important to make a profit, it is important to create the conditions necessary for the further successful operation of the enterprise;
- reducing the level of social tension in the enterprise.

Thus, properly established and effective management in pig breeding creates a holistic integrated management system that ensures the stability of development and high competitiveness of specialized livestock enterprises of various forms of ownership [360, 430, 454, 470, 542, 547].

The essence, concepts and causes of marketing. The transition of Ukraine's economy to market relations requires the most complete and active application of such a relatively new method for us as marketing.

Until recently, the word "marketing" could be heard only in a narrow circle of experts from foreign markets. Now it is increasingly heard in the discussions of businessmen, economists, business people who are engaged in entrepreneurial activities and who are looking for a way to make a profit based on market observation and forecasting, demand study, strategy development and tactics of the market. Some companies have already started to form special marketing services.

Consider first the meaning of the word «marketing». It is derived from the English word "market", which translated into Ukrainian means «market». In general, marketing covers everything related to working in the market.

In world practice, marketing did not appear immediately. It is the result of many years of evolution of entrepreneurs' views on their activities and the market, as well as the result of the scientific and technological revolution, which provided, on the one hand, the largest range of goods, and on the other - exceptionally high rate of recovery.

As a product of a market economy, marketing was formed at the turn of the XIX-XX centuries, first in the United States and then in England, France, Germany in response to consumer demand. During this period, production opportunities have expanded and the position of producers in the market has sharply deteriorated, competition has intensified.

As a result, there was a doctrine called marketing. Since its inception, it has undergone a great evolution in its development. This is due to the constant complexity of the market as a result of accelerating the pace of scientific and technological progress, as well as the successful development of communications, as they open up opportunities to respond flexibly to changing consumer demands and market fluctuations.

With these and many other reasons the concept of marketing fasting and pray changed. Currently, there are more than 2,000 interpretations of the concept of «marketing» in the world, each of which characterizes one or another of its aspects, or gives a comprehensive description.

In the traditional, classical concept, marketing refers to the entrepreneurial activity that controls the movement of goods and services from producer to consumer, or the social process by which demand for goods and services is projected, expanded, and met through their

development, receipt, and sale.

As you can see, the main thing in marketing is the movement of goods and services. This emphasizes the role of trade and sales channels, taking into account the importance of mutual benefit of buyers and sellers, as well as the role of government agencies and various social groups. In addition, this meaning clarifies the concept of marketing, reducing its role to the receipt of only goods and services, despite the fact that its objects may be ideas, people, organizations, individual territories, etc.

Therefore, the value formulated by the American Marketing Association (AMA) corresponds to a wider range. «Marketing is the process of planning and solving problems, pricing, obtaining and implementing ideas, goods and services through exchange that meets the goals of individuals and organizations».

J.E. Evans and B. Berman give a similar concept of marketing to the AMA, but shorter: «Marketing is the formation, management and satisfaction of demand for goods, services, organizations, people, territories and ideas through exchange». Currently, there are significant differences in approaches to the meaning of marketing.

The main in any sense of marketing should be consumer orientation, because in market conditions, any organization can only achieve its goals when consumer demand is best met. And for this it is necessary to anticipate, forecast demand, constantly studying the market, consumed products, manage this demand, including stimulating demand and regulation; to meet demand not only by improving the consumer properties of the product, but also to ensure its proper functioning throughout the period of consumption. In this regard, marketing can be considered in the full sense of the word as a philosophy of production, which is fully subject to market conditions and requirements, which are in constant dynamic development, taking into account a wide range of economic, political, scientific, technical and social factors. No wonder most foreign entrepreneurs understand marketing as a business philosophy.

Thus, the main thing in marketing is its target orientation to the consumer. Therefore, companies that work on the concept of marketing should be guided by the rule: to produce only what will be sold in the market, and not to impose on him non-performing products that do not use pop and volume.

Basic principles and methods of marketing. Marketing is an activity that is based on the implementation of objective laws. Marketing has its own basic laws and patterns. In addition to laws and patterns, marketing has basic

principles, mainly general rules and regulations that must be followed. They reflect the essence of marketing and are as follows:

• the need for complete and reliable information about the external conditions of the organization;

• adaptation of production to market conditions, requirements of potential buyers with simultaneous purposeful influence on them;

• production based on accurate knowledge of customer requirements, market situation and real capabilities of the enterprise;

• effective sale of products and services on the common market in the planned conditions and on time;

• ensuring the future effectiveness (profit) of production and commercial activities of the enterprise, it’s focus not on today's but on the long-term result of marketing activities of the enterprise, which involves a constant synthesis of scientific and technical ideas and developments to prepare products of market novelty;

• unity of strategy and tactics of active adaptation to the requirements of potential buyers with short-term purposeful influence on them, on demand and the market for control over the sphere of sales of products (services).

In accordance with the above principles of marketing activities is that:

- analysis of the external (in relation to the enterprise) state;
- consumer analysis;
- study of existing and planning of future goods;
- planning of turnover and sale of products (services);
- ensuring the formation of demand and sales promotion of products (services);
- ensuring pricing policy;
- accounting for technical and social standards of the importing country;
- management of marketing activities as a system.

The marketing processes. Marketing is not a simple process, but a complex complex activity carried out in this way. Marketing begins with the study of the market, as a result of which it is established which products are in demand, that is products the consumer would like to have, in what quantity and with what consumer qualities.

In the future, the work is transferred to the company, which explores the possibilities of production of such products, namely: the possibility of manufacturing these products, logistics system, the necessary financial resources, the conditions of their use, etc.

After establishing the possibility of manufacturing products at the enterprise begins the process of planning its production, which is carried out as a result of comprehensive targeted programs, called marketing programs. These programs reflect not only the type and volume of products produced, but also planned activities related to customer information about the products (advertising, distribution, sales, sales promotion, etc.).

Thus, the marketing process is that marketing activities begin with the market and end there. Moreover, the work on the market does not end after the sale of products, but continues in the period after sales service.

Types of marketing. As you can see, marketing focuses production on the maximum satisfaction of demand, and this actual market demand may be in many countries. The task of a marketing-oriented enterprise is to manage market demand and influence it.

Depending on the nature and characteristics of existing or desired demand, the following types of marketing are distinguished:

1. Demand is negative, it's for a number of reasons (propaganda, social idea, etc.) a number of buyers refuse to consume certain types of products. The task of marketing is to establish demand. This type of marketing is called conversion.

2. There is no demand, it's the buyer is indifferent to the product. The task of marketing - to stimulate demand, disseminate information about the product, update demand. Such marketing is called stimulating.

3. Potential demand, it's when the consumer has a demand for goods that are not for sale and in the project. The task of marketing is to turn potential demand into real, it's there is an evolving marketing.

4. Demand for products is there, but it is declining and if no action is taken, it will disappear. The task of marketing is to update the demand. This type of marketing is called remarketing.

5. Demand for goods and services is sufficient, but it fluctuates. The task of marketing - to stabilize, equalize demand, which can be achieved through prices, advertising, stocks. Such demand is called fluctuating demand, and marketing - synchromarketing.

6. The most successful case when demand meets supply. The task of marketing - in maintaining the achieved level of demand, in its stabilization. Such demand is called complete, and marketing - auxiliary.

7. Demand is excessive, it's when some products are very popular, and satisfaction with them is sharply insufficient. The task of marketing is to develop methods that reduce demand. This can be price regulation, cessation of sales incentives and more. Such demand is called extraordinary, and

marketing - where marketing.

8. Irrational demand was formed, ie the demand for irrational goods, ticklish from the point of view of the economy (vodka, tobacco, etc.). The task of marketing is to develop measures that eliminate or at least reduce demand. This type of market demand is called irrational, and marketing - anti-marketing.

Marketing system. In a consolidated form, the marketing system includes:

1. Enterprise-manufacturer of products, the function of which includes production.

2. Enterprise-supplier, whose function is to provide the necessary resources for production. It is better for the manufacturer, if there is an opportunity to use resources from different industries, then the supplier competes. If resources are scarce, then manufacturers have to compete.

3. The market. This is the place where supply and demand meet, the buyer and the seller, where goods are exchanged for money, where the end result of marketing is revealed.

4. Mediator. These are organizations or people involved in exchanging goods, providing communications, insurance, marking goods, identifying markets, etc. These include transport, warehouses, wholesalers and individual traders, and in foreign markets - sales agents, brokers, consignors, credit institutions and more.

5. Competitors. These are enterprises (associations) that produce similar products (services). Distinguish functional competition, when different products can perform the same function; species (for example, electric or mechanical feed cutter); intercompany, when products of the same type are produced, but at different enterprises. Competitors are usually associated with all of the above subsystems.

Finally, the marketing system includes an internal area, which means a clearly defined group of people who show real or potential interest in the company and can have a great influence on it.

Among them there are organizations or people:

- whose interests in principle coincide with the interests of the enterprise (banks, stock exchanges, financial departments, etc.);

- who may not show interest in the enterprise, but the enterprise is interested in their interest (mass media, information commercial publications, etc.);

- who are interested in the company, but in which the company is not very interested (consumer organizations, the mass buyer, the legislature,

etc.).

All this together, with all the mutual benefits, is called a marketing system.

Particular attention should be paid to marketing specialists engaged in the sale of pig products to ensure that pig products meet quality standards, according to which they are divided into six categories of fatness.

The division by categories is based on: live weight, fat thickness, age of pigs and more.

Meat and bacon pork is in a great demand.

You should also pay attention to the by-products of pork processing. Recently, widely used medical and biological drugs made from various organs and tissues of pigs.

In breeding farms (breeding plants, breeding breeders) it is advisable to create a marketing service, the main function of which is: analysis of opportunity costs for growing high-quality breeding young; market conditions.

The most effective selling price of breeding young is determined primarily by its quality (elite-record, elite), genotype and well-defined time and period of sale [157, 360, 404, 430, 454, 470, 529, 542, 547].

SECTION 7.
TECHNOLOGICAL SYSTEMS OF MANAGEMENT OF INNOVATIVE SOLUTIONS IN PRODUCTION SHOPS OF MODERN PIG COMPLEXES

7.1. Management of technological innovative solutions in the shop of reproduction and farrowing.

7.1.1. Development and implementation of technological innovative solutions in the reproduction shop. In solving the problem of raising livestock, the main role belongs to the rational system of keeping farm animals. We are talking about the use of a number of systems, methods and techniques of keeping, which would increase productivity, resistance of animals to various diseases and at the same time were the most cost-effective, means, use of land, equipment, premises, etc. [369, 372, 430, 518].

According to V.P. Rybalko (2006), the characteristic features of pig enterprises should be as follows: flow production, high technical security, full mechanization and automation of processes, keeping animals in conditions of limited movement, the formation of homogeneous, standardized sex and age groups, high requirements to the quality of rations and their completeness, the creation of optimal parameters of the microclimate for each production group, knowledge and strict adherence to production technology [390].

The most difficult and least solved issue in pork production is the organization of reproduction of the herd, namely the organization of technology for keeping sows. Opinions of many scientists about the methods and systems of keeping single and pregnant sows in the breeding area are very contradictory. The most controversial is the size of groups, the need for active exercise, the use of walking or non-walking content, group or individual, the choice of type of easel equipment, there is no consensus on the issue of keeping queens in different physiological periods [350, 373, 518].

Today, domestic and foreign industry produces a very wide range of easel equipment for individual keeping of sows in idle and pregnant periods. The presented equipment has certain design and ergonomic features, differs in cost and features of installation, etc. [350, 426, 427]. In the process of practical operation of this easel equipment on pork production complexes there were differences in the productivity of sows, which necessitates the study of the impact of different types of machines for keeping

single, conditionally pregnant and pregnant sows on their reproductive qualities.

Therefore, taking into account the above information, as well as based on the results of our previous studies, which established the advantage of the individual method of keeping sows on their reproductive qualities, there is a production need to study the impact of the type of machine for individual sows in the idle period. from the moment of steaming and within 30 days) on their reproductive qualities, in the context of two farms for the production of pork on an industrial basis.

Data of the results of research on the study of fertility and prolapse of sows of experimental groups under different breeding methods and conditions of use for their maintenance of different design of individual machines (Fig. 7.1, 7.2) in the «Agrofirm «Mig-Service-Agro» Of the Nikolaev region are given in table 7.1.

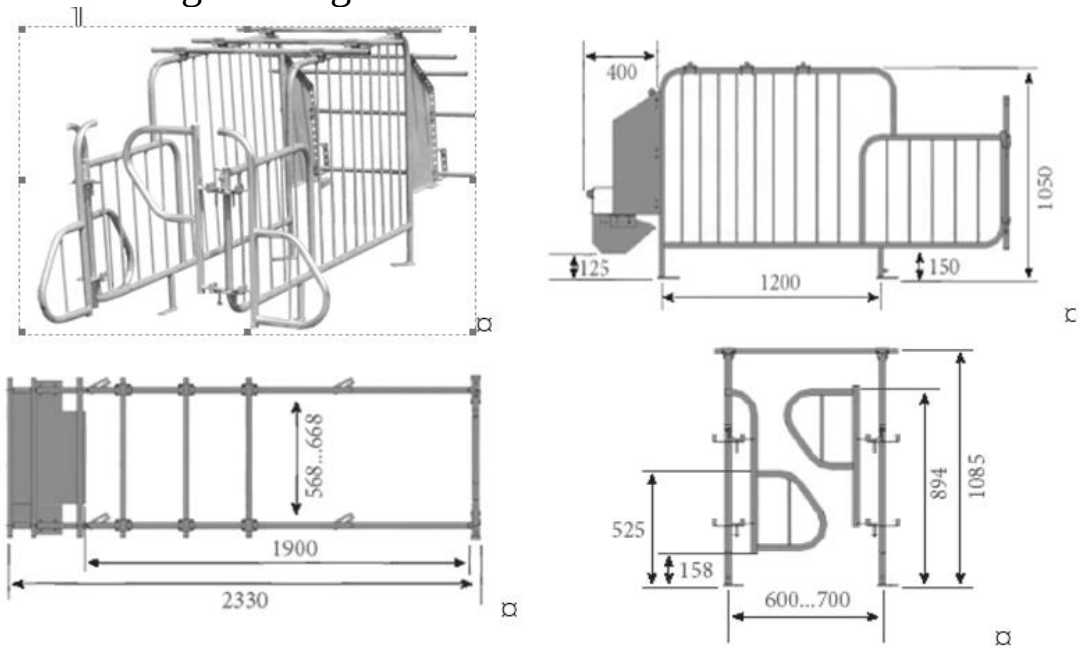

Fig. 7 .1. **Machine for keeping single and conditionally pregnant sows «type № 1»**

It is noted that animals of the same combinations, which were formed on the principle of analogues, differed in terms of fertility and emptiness. Sows of each of the presented breeds reacted differently to the content in machines of different design. Thus, observations showed that sows of large white breed mostly did not respond to keeping in different machines, in contrast to sows of intrabreed type of Duroc breed of Ukrainian selection «Stepovy», and sows of Landrace breed occupied an intermediate position. However, it was probably found that keeping sows in the idle period and the period of conditional gestation in machines «type № 1» had a worse effect on fertility and idleness.

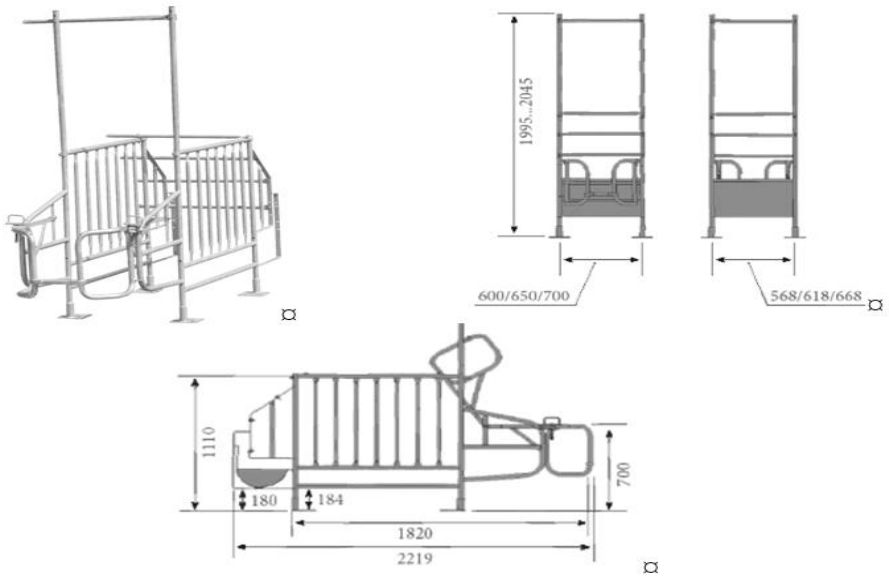

Fig. 7 .2. **The machine for the maintenance of single and conditionally pregnant sows «type 2»**

To study and confirm the strength of the influence of factors (type of machine design, genotype) on the studied trait (fertility and emptiness indicators) we conducted a two-factor analysis of variance (Table 7.2; 7.3; 7.5; 7.6) using G. Scheffe's model [536].

Table 7 .1

Indicators of fertility and thinness of sows depending on the type of machine for individual keeping and genotype in the conditions «Mig-Service-Agro» Agricultural Firm, $\overline{X} \pm S_{\overline{X}}$

A group of animals	Breed		Indicator fertility,%	Indoor rate,%
	sows	boar		
Control groups (machine №1), (*n* = 30)				
I	DUSS	DUSS	78.0 ± 2.10	22.0 ± 0.30
II	WB (ZS)	DUSS	76.6 ± 2.20	23.4 ± 0.32
III	DUSS	WB (ZS)	77.2 ± 3.14	22.8 ± 0.44
IV	L (FS)	DUSS	75.2 ± 3.30	24.8 ± 0.50
V	DUSS	L (FS)	76.1 ± 2.86	23.9 ± 0.32
On average by groups			76.6 ± 2.20	23.4 ± 0.44
Experimental groups (machine №2), (*n* = 30)				
VI	DUSS	DUSS	83.3 ± 2.68	16.7 ± 0.32***
VII	WB (ZS)	DUSS	81.6 ± 2.80	18.4 ± 0.20***
VIII	DUSS	WB (ZS)	84.1 ± 3.42	15.9 ± 0.30***
IX	L (FS)	DUSS	81.4 ± 3.00	18.6 ± 0.44***
X	DUSS	L (FS)	84.2 ± 3.60	15.8 ± 0.26***
On average by groups			82.9 ± 2.10 *	17.1 ± 0.30***

Analysis of the dependence of sow fertility on the studied type of

machine design and genotype shows that this trait has a dependence on the first factor at 3.77% (P> 0.95) and less on the genotype - 0.33%, while the interaction of both evaluated factors is much lower than the actual factors themselves - 0.12% (Table 7 .2).

Table 7.2

Influence of machine type for individual sow keeping and genotype on fertility rates

The strength of the influence of factors on the percentage of fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	2976,75	1	2976,75	11,42382	**0.001**	3.77
Genotype (B)	258,18	4	64,545	0.247703	0.911	0.33
A × B	94.5	4	23,625	0.090665	0.985	0.12
Residual	75566.46	290	260,574	-	-	4.22
General	78895,89	299	-	-	-	-

Therefore, we state that to increase the fertility of sows, not taking into account their pedigree, it is more appropriate to use machines «type № 2».

According to Table 7.3, the type of machine is likely to affect the rate of idleness and the strength of the influence of factor A is 67.63%, while the strength of the genotype and the interaction of both assessed factors is 5.87 and 2.15%, respectively.

Table 7.3

Influence of machine type for individual sows and genotype on idleness

The strength of the influence of factors on the percentage of idleness						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	2976,75	1	2976,75	805,3977	0.000	67.63
Genotype (B)	258,18	4	64,545	17.46347	0.000	5.87
A × B	94.5	4	23,625	6,392045	0.000	2.15
Residual	1071,84	290	3,696	-	-	75.65
General	4401,27	299	-	-	-	-

Given the probable influence of genotype on the rate of emptiness, it should be noted that in terms of experimental groups the least value of this indicator were sows of the eighth experimental group - 15.9% (maternal form - intrabreed type of Duroc breed «Stepovy», paternal form - large white breed of foreign selection) , and the greatest value of this indicator was characterized by the uterus of Landrace breed of French selection in combination with boars of intrabreed type «DUSS» - 18.6%.

Methodologically similar studies were conducted in the farm «Tavria

pigs» Skadovsk district of Kherson region using similar easel equipment for individual keeping sows in the idle period and gestation period, but other genotypes.

According to the analysis of table 7.4, a similar trend with previous similar studies, but in another farm, the advantage of the experimental groups of animals in terms of fertility when kept in machines №2. The average group fertility rate of the experimental groups was – 83.5%, which is 7.9% more than the analogues of the control groups (*P> 0.95*).

Table 7.4

Indicators of fertility and thinness of sows depending on the type of machine for individual keeping and genotype in the conditions LLC «Tavrian pigs», $\overline{X} \pm S_{\overline{x}}$

A group of animals	Breed		Indicator fertility, %	Indicator idleness, %
	sows	boar		
Control groups (machine № 1), (*n* =25)				
I	WL	WL	78.4 ± 2.15	21.6 ± 0.32
II	UM	UM	74.1 ± 2.54	25.9 ± 0.20
III	L	L	75.0 ± 1.92	25.0 ± 0.44
IV	DUSS	P	73.4 ± 2.17	26.6 ± 0.20
V	(WL × L)	P	77.6 ± 2.46	22.4 ± 0.22
VI	(UM × L)	P	75.3 ± 2.38	24.7 ± 0.30
On average by groups			75.6 ± 2.27	24.4 ± 0.50
Experimental groups (machine № 2), (*n* =25)				
VII	WL	WL	84.6 ± 1.80	15.4 ± 0.40 ***
VIII	UM	UM	80.5 ± 2.50	19.5 ± 0.26 ***
IX	L	L	84.8 ± 2.32 **	15.2 ± 0.48 **
X	DUSS	P	79.4 ± 2.10	20.6 ± 0.22 **
XI	(WL × L)	P	86.0 ± 1.80 *	14.0 ± 0.24 ***
XII	(UM × L)	P	85.7 ± 2.00 **	14.3 ± 0.28 ***
On average by groups			83.5 ± 2.62 *	16.5 ± 0.42 ***

The difference can be explained by the fact that when keeping sows in machines №2, it was more convenient to carry out insemination operations (created better conditions for stimulation of sows), vaccination and examination with ultrasound scanners. The absence of pipes above the sow, the design of the rear doors in the machines № 2, in contrast to the machines № 1, facilitated access to the sow, zootechnical and veterinary staff, respectively, they gave less stress to animals.

The design features of the machines № 2 (experimental group) allowed to spend less time and effort of the staff on setting and grazing sows. Thus, as according to design machines number 1 and number 2 in and out of sows going through the back door, then using machines number one animal over injured more exposed to physical impact staff, all of it, in turn, affected the performance of reproductive qualities of sows.

Also, due to the greater height from the floor to the edge of the machine № 2 (184 mm) sows were brought to their feet faster, without undue effort during feeding and exposure to various types of stimuli, in contrast to keeping in machines № 1.

It should be noted that there were quite high rates of fertility in the studied economy in two-breed queens of large white × landrace and Ukrainian meat × landrace in combination with pietren boars: 86.0 and 85.7%, respectively, which probably prevails analogues of control groups (*P> 0.95; 0.99*).

According to the results of research it is established that the dependence of the fertility rate of sows in the conditions of LLC «Tavria pigs» on the studied type of machine design, has a dependence on the first factor at 11.39% (*P> 0.95*) and less on the genotype - 3.05%, while the interaction of both estimated factors is much lower than the factors themselves - 0.58% (Table 7.5).

Table 7.5

Influence of machine type for individual sow keeping and genotype on fertility rates

The strength of the influence of factors on the percentage of fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2,%
Machine type (A)	4641.3	1	4641.3	38,606	**0**.0000	11.39
Genotype (B)	1243.7	5	248.73	2,069	0.0693	3.05
A × B	235.7	5	47,133	0.392	0.8541	0.58
Residual	34624.7	288	120.22	-	-	84.98
General	40745.3	299	-	-	-	-

The results of the research are presented in Table 7.6, proving that the type of machine, genotype and interaction of both evaluated factors probably affects the rate of idleness and the strength of the influence of the presented factors is 68.11%; 18.25 and 3.46%, respectively.

Table 7 .6

Influence of machine type for individual sows and genotype on idleness

The strength of the influence of factors on the percentage of idleness						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	4641.3	1	4641.3	1925,864	**0.0000**	68.11
Genotype (B)	1243.7	5	248.73	103,209	**0.0000**	18.25
A × B	235.7	5	47,133	19,557	**0.0000**	3.46
Residual	694.1	288	2.41	-	-	89.82
General	6814.7	299	-	-	-	-

Comparing the indicators of thinness of sows of different genotypes in terms of farms, we note that the impact of the type of machine was almost the same and was in terms of agricultural production cooperative Agrofirm «Mig-Service-Agro» - 67.63%, and in a limited liability company «Tavrian pigs»- 68.11%.

The presented genotypes of sows of the breeding farm «Mig-Service-Agro» had a greater effect on the rate of idleness (18.25%) than the genotype of sows of the breeding plant LLC «Tavria pigs» (5.87%), the combined influence of factors in terms of farms in which the study was conducted was - 2.15% and 3.46% respectively.

Given the above results, it can be reliably stated that at the same cost of the presented machines (1548 UAH, price in 2015) for individual maintenance of sows in the idle period and during the period of conditional gestation it is more appropriate to install machines of the second type (see Fig. 7.2), which was confirmed experimentally.

Data on the basis of research on reproductive qualities of sows of experimental groups under conditions of use for their maintenance (idle and conditional periods) of different design of individual machines in the conditions of LLC Agrofirm «Mig-Service-Agro» of the Nikolaev area are given in table 7.7.

The types of machines used to keep the sows of the experimental groups in the idle period and in the period of conditional gestation, probably did not affect the total number of piglets at birth. The birth of dead piglets took place in animals of both groups, but more of them were in sows, which in the idle period and in the period of conditional gestation were kept in machines № 1 (control group) and was - 7.3%, which is 1% more than the experimental groups kept in machines № 2. A lower percentage of stillborn piglets (6.3%) caused a higher value of fertility in sows of experimental groups - 10.7 goals, which is 7% more than analogues of control groups

(*P>0.95*), taking into account the average for the groups.

Table 7.7

Indicators of reproductive qualities of sows depending on the type of machine in the conditions of Agrofirm «Mig-Service-Agro», $\overline{X} \pm S_{\overline{X}}$

A group of animals	Breed		Birth of piglets, heads		Proportion of stillborn piglets, %	Fertility, kg	At the age of 28 days		Saving, %
	sows	boar	total	alive			number of piglets, heads	live weight of piglets, kg	
Control groups (machine №1), (*n* = 25)									
I	DUSS	DUSS	10.6 ±0.20	9.8 ±0.30	7.5± 3.40	1.44 ±0.02	8.4 ±0.20	8.14 ±0.28	85.7 ±2.20
II	WL	DUSS	11.0 ±0.24	10.1 ±0.22	8.2± 4.25	1.36 ±0.03	9.1 ±0.30	7.74 ±0.20	90.1 ±1.80
III	DUSS	WB	10.6 ±0.30	9.8 ±0.20	7.5± 3.62	1.40 ±0.03	9.0 ±0.28	8.20 ±0.26	91.8 ±1.60
IV	L	DUSS	11.2 ±0.32	10.7 ±0.24	4.1± 2.81	1.33 ±0.03	9.1 ±0.28	8.24 ±0.20	84.7 ±2.10
V	DUSS	L	10.8 ±0.28	9.8 ±0.32	9.3± 4.26	1.42 ±0.02	8.9 ±0.30	8.58 ±0.22	90.8 ±1.60
On average by groups			10.8 ±0.26	10.0 ±0.28	7.3± 3.33	1.39 ±0.02	8.88 ±0.24	8.18 ±0.22	88.6 ±2.00
Experimental groups (machine №2), (*n* = 25)									
VI	DUSS	DUSS	11.6 ±0.24 **	10.7 ±0.28 *	7.8± 3.41	1.40 ±0.02	10.1 ±0.22 ***	8.00 ±0.18	94.4 ±1.80 **
VII	WB	DUSS	11.8 ±0.30 **	11.0 ±0.20 **	6.8± 3.31	1.32 ±0.03	10.4 ±0.20 ***	7.86 ±0.20	94.5 ±1.40
VIII	DUSS	WB	11.0 ±0.33	10.3 ±0.28	6.4± 2.85	1.42 ±0.02	9.8 ±0.26 *	7.90 ±0.20	95.1 ±1.80
IX	L	DUSS	11.9 ±0.28	11.1 ±0.24	6.7± 3.31	1.28 ±0.02	10.2 ±0.20 **	8.32 ±0.22	91.9 ±2.00 *
X	DUSS	L	11.0 ±0.20	10.6 ±0.20 *	3.6± 3.32	1.44 ±0.03	9.6 ±0.20 **	8.10 ±0.18	90.6 ±2.10
On average by groups			11.5 ±0.24 *	10.7 ±0.22 *	6.3± 2.98	1.37 ±0.03	10.02 ±0.28 **	8.04 ±0.20	93.3 ±1.46

As a result of studies on the indicators of high fertility, live weight of piglets at weaning and preservation, no significant difference was found between the animals of the experimental groups, because different types of machines do not affect the studied indicators.

The probable influence of design features of the machine № 2 on the number of piglets at weaning was noted, sows of experimental groups were weaned by 11.3% more piglets (*P> 0.99*) in comparison with control analogues.

On the value of indicators: live weight of piglets at weaning and safety, no probable influence of the design features of the machines was found, but in terms of safety, it was higher in animals of experimental groups (93.3%).

Data on the basis of research on reproductive qualities of sows of experimental groups under the conditions of use for their maintenance (idle and conditional periods) of different design of individual machines in the conditions of LLC «Tavria pigs» of Kherson region are given in table 7.8.

It was found that the design features of machines for individual maintenance of single and conditionally pregnant sows did not affect the total number of piglets at birth.

The fertility indicators were influenced by the type of machine, so on average in groups the highest value of the fertility rate was observed in sows kept in machines «type № 2», and was equal to - 11.2 heads, which is 6.25% more than analogues kept in individual machines «type № 1» (*P>0.95*).

The birth of dead piglets took place in animals of both groups, but more of them were in sows, which in the idle period and in the period of conditional gestation were kept in machines №1 (control group) and amounted to - 8.1%, which is 2.7% more analogues of the experimental group, which were kept in machines № 2.

The value of the high fertility rate was quite high in the experimental groups, in the range of 1.30-1.60 kg, but a significant effect of the type of machine for individual sows during the idle period and the period of conditional gestation, was not established.

According to the research results, the probable influence of the design features of the machine № 2 on the indicator - the number of piglets at weaning was noted. Thus, sows of experimental groups were weaned by 7.5% more piglets (*P> 0.95*) compared with control analogues.

The value of the indicator live weight of piglets at weaning is not established the probable influence of the design features of the machines.

Analyzing the survival rate in terms of experimental groups, found a significant difference between the uteruses of IV-X and V-XI groups, a higher value of the indicator was found in sows of the experimental groups (96.1-95.7%).

Table 7.8

Indicators of reproductive qualities of sows depending on the type of machine in the conditions of LLC «Tavria pigs», $\overline{X} \pm S_{\overline{X}}$

A group of animals	Breed		Piglets born, heads		Proportion of stillborn piglets, %	Fertility, kg	At the age of 28 days		Saving, %
	sows	boar	total	alive			number of piglets, heads	live weight of piglets, kg	
Control groups (machine №1), (n = 22)									
I	WL	WL	11.7 ±0.30	10.9 ±0.21	6.8 ±3.22	1.30 ±0.01	10.0 ±0.20	7.65 ±0.22	91.7 ±1.50
II	UM	UM	10.8 ±0.28	10.0 ±0.18	7.4 ±4.08	1.54 ±0.02	9.6 ±0.22	8.28 ±0.26	96.0 ±1.66
III	L	L	11.5 ±0.30	10.7 ±0.24	7.0 ±4.00	1.40 ±0.02	10.1 ±0.30	7.62 ±0.18	94.4 ±1.44
IV	DUSS	P	10.7 ±0.33	9.8 ±0.22	8.4 ±4.62	1.60 ±0.02	9.0 ±0.30	7.80 ±0.28	91.8 ±1.82
V	(WB×L)	P	12.1 ±0.42	11.0 ±0.18	9.1 ±5.02	1.32 ±0.03	10.0 ±0.22	8.42 ±0.16	90.9 ±1.60
VI	(UM×L)	P	11.6 ±0.40	10.6 ±0.32	8.6 ±3.80	1.46 ±0.04	10.1 ±0.26	8.20 ±0.18	95.3 ±1.48
On average by groups			11.4 ±0.38	10.5 ±0.21	8.1 ±3.54	1.44 ±0.02	9.8 ±0.24	8.00 ±0.22	93.7 ±1.60
Experimental groups (machine №2), (n = 22)									
VII	WL	WL	12.1 ±0.28	11.4 ±0.28	5.8 ±2.84	1.38 ±0.02	10.7 ±0.30	7.56 ±0.20	93.9 ±1.40
VIII	UM	UM	11.6 ±0.30	11.0 ±0.20 **	5.2 ±2.70	1.46 ±0.02	10.2 ±0.28	8.17 ±0.16	92.7 ±1.28
IX	L	L	11.8 ±0.34	11.1 ±0.20	5.9 ±3.00	1.30 ±0.04	10.8 ±0.21	7.52 ±0.18	97.3 ±1.52
X	DUSS	P	11.0 ±0.20	10.2 ±0.18	7.3 ±4.20	1.58 ±0.01	9.8 ±0.24 *	7.86 ±0.22	96.1 ±1.60 *
XI	(WB×L)	P	12.2 ±0.18	11.7 ±0.23 *	4.1 ±1.85	1.32 ±0.03	11.2 ±0.20 **	8.31 ±0.24	95.7 ±1.48*
XII	(UM×L)	P	12.1 ±0.22	11.8 ±0.24 *	2.5 ±1.30	1.42 ±0.02	10.9 ±0.18 *	8.28 ±0.16	92.4 ±1.34
On average by groups			11.8 ±0.34	11.2 ±0.20 *	5.4 ±2.44	1.41 ±0.03	10.6 ±0.26 *	7.95 ±0.20	94.5 ±1.46

In order to confirm the strength of the influence of factors (type of

machine design, genotype) on the studied trait (indicators of reproductive qualities of sows) in the context of experimental farms, a two-factor analysis of variance was performed (Table 7.9-7.16).

Table 7.9

Influence of machine type for individual keeping of sows and genotype on the total number of piglets at birth in the conditions «Mig-Service-Agro» Agricultural Firm

The strength of the factors on the total number of piglets at birth						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	24.025	1	24.025	12.92883	0.000	4.85
Genotype (B)	20.5	4	5.125	2.757971	0.029	4.14
A × B	5.1	4	1.275	0.686129	0.602	1.03
Residual	445.98	240	1.85825	-	-	89.98
General	495.605	249	-	-	-	-

When analyzing the influence of the studied traits on the total number of piglets at birth in terms of farms in which the experiment was conducted, it was found that the force of the type of machine was greater in terms of agricultural cooperative Agrofirm «Mig-Service-Agro» - 4.85%.

However, in the farm of «Tavriya Pigs» LLC, a greater influence of the sow genotype on the total number of piglets at birth was found at the level of 8.99%. The probable influence of the studied traits on the total number of piglets at birth was not established.

Table 7.10

Influence of machine type for individual keeping of sows and genotype on the total number of piglets at birth in the conditions «Tavria Pigs» LLC

The strength of the factors on the total number of piglets at birth						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	10.6	1	10.56	5.196	0.0235	1.83
Genotype (B)	51.9	5	10.384	5.110	0.0002	8.99
A × B	3.1	5	0.616	0.303	0.9108	0.53
Residual	512.1	252	2.0323	-	-	88.65
General	577.7	263	-	-	-	-

Analysis of the dependence of the fertility of experimental sows on the studied type of machine and genotype showed that this figure is more likely to depend on the first factor in the agricultural production cooperative Agrofirm «Mig-Service-Agro», which was - 7.54% (Table 7.11), and the second factor in the conditions of the Limited Liability Company «Tavria pigs» - 13.43%.

Table 7.11

Influence of machine type for individual keeping of sows and genotype on fertility in the conditions of «Mig-Service-Agro» Agrofirm

The strength of the influence of factors on fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	30.625	1	30,625	19,35841	0.000	7.03
Genotype (B)	22.85	4	5.7125	3,610936	0.007	5.24
A × B	2.75	4	0.6875	0.434576	0.784	0.63
Residual	379.68	240	1.582	-	-	87.10
General	435.905	249	-	-	-	-

Given the above results, it can be argued that the combination and genotypes of sows bred in the farm LLC «Tavrian pigs» to a greater extent respond to the design features of the machine value of the fertility index (Table 7.12).

Table 7.12

Influence of machine type for individual keeping of sows and genotype on fertility in the conditions of «Tavria pigs» LLC

The strength of the influence of factors on fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	32.3	1	32.34	24.480	0.0000	7.54
Genotype (B)	57.6	5	11.528	8,726	0.0000	13.43
A × B	6.2	5	1,232	0.933	0.4604	1.44
Residual	332.9	252	1.3211	-	-	77.59
General	429.1	263	-	-	-	-

According to the results of the analysis of the studied factors, no probable influence of the type of machine, genotype, or the combination of both factors on the number of stillborn piglets was revealed. The results of the research are presented in table 7.13, 7.14 indicate that the indicator of high fertility of sows in terms of farms is significantly influenced by the second factor (B) - genotype and the combination of both factors (A × B).

Table 7 .13

Influence of machine type for individual keeping of sows and genotype on high-fertility of piglets in the conditions Agricultural firm of "Mig-Service-Agro"

The strength of the influence of factors on fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	0.02025	1	0.02025	1.246154	0.265	0.44
Genotype (B)	0.611	4	0.15275	9.4	**0.000**	13.31
A × B	0.061	4	0.01525	0.938462	0.442	1.33
Residual	3.9	240	0.01625	-	-	84.92
General	4.59225	249	-	-	-	-

Their strength of influence on the studied trait is at the level of

13.31%; 39.83% and 1.33%; 3.59% respectively.

Table 7.14

Influence of the type of machine for individual keeping of sows and genotype on high-fertility of piglets in the conditions of LLC «Tavria pigs»

The strength of the influence of factors on fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	0.0	1	0.0469	3.368	0.0676	0.75
Genotype (B)	2.5	5	0.501	35.958	0.0000	39.83
A × B	0.2	5	0.0452	3.242	0.0074	3.59
Residual	3.5	252	0.0139	-	-	55.83
General	6.3	263	-	-	-	-

Thus, studies have shown that the choice of easel equipment for keeping sows in the idle period and during the period of conditional gestation probably affects the number of piglets at weaning, the higher value of this indicator was observed in sows kept in machines «type № 2» (table 7.15; 7.16).

Table 7.15

Influence of machine type for individual keeping of sows and genotype on number of piglets at weaning in the conditions «Mig-Service-Agro» Agricultural Firm

The strength of the factors on the number of piglets at weaning						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	78.4	1	78.4	51.17493	**0.000**	16.87
Genotype (B)	10.6	4	2.65	1.729765	0.144	2.28
A × B	8.1	4	2.025	1.321802	0.262	1.74
Residual	367.68	240	1,532	-	-	79.11
General	464.78	249	-	-	-	-

Table 7 .16

Influence of the type of machine for individual keeping of sows and genotype on the number of piglets at weaning in the conditions of LLC «Tavria pigs»

The strength of the factors on the number of piglets at weaning						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Machine type (A)	42.2	1	42.24	31,696	0.0000	9.88
Genotype (B)	46.9	5	9.372	7.033	0.0000	10.97
A × B	2.4	5	0.484	0.363	0.8734	0.57
Residual	335.8	252	1.3327	-	-	78.58
General	427.3	263	-	-	-	-

The indicator of the strength of the type of machine on the number of piglets at weaning, which is considered one of the main production indicators, was in terms of farms - 16.87 and 9.88%, respectively.

The probable influence of the sow genotype on the studied indicator was found only in sows belonging to «Tavria pigs» LLC.

According to the results of studies in two farms and the analysis of the studied factors, no probable influence of either the type of machine, genotype, or the combination of both factors on the live weight of piglets at weaning and safety.

Experimental studies to study the impact of the type of machine for individual sows in the idle period, the period of conditional gestation (from the moment of mating and for 30 days) on their reproductive qualities in terms of two farms for industrial pork production, concluded that the machines for keeping single sows and conditionally pregnant sows «№ 2» - provide convenience during insemination, increase fertility of sows and fetal safety, as well as create optimal conditions for observation and control of each animal. It can be argued that «type 2» machines are anatomically more suitable for sows during their insemination and the period of conditional gestation.

Influence of sows' age on their reproductive qualities. One of the important technological methods of increasing the efficiency of livestock production is to ensure the maximum duration of economic use of animals [61, 124, 136, 202, 254, 455].

According to most researchers, both in our country and abroad, long-term use of animals on farms is one of the main indicators of a high management culture. However, despite the urgency of the problem of increasing the life of animals, systematic and in-depth development to address it has not been carried out.

The duration of economic use of farm animals depends on several factors. These include: biological life expectancy, the length of the period during which the animal retains the ability to show its productive qualities; conditions for feeding and keeping animals; resistance to diseases; individual hereditary conditionality of productive longevity, etc.

The importance of the problem is more durable highly stressed animals founders of the national zootechnics M.F. Ivanov, E.F. Lyskun, E. A. Bogdanov [47] each in its time, livestock advised: «To most productive uterus and boars used to breed ' I'm as long as possible and wouldn't get under the knife too early». The question of determining the optimal duration of economic use of pigs has not lost its relevance today.

Intensive exploitation of pigs in the conditions of year-round free-range keeping indoors proved to be effective only if the farms are equipped with constitutionally strong animals with high natural resistance and hereditary stability. And this, in turn, has led to the need to use more intensive traditional and new more effective methods of selection work, providing high productivity of animals for a long time.

Thus, the manifestation of reproductive qualities of sows depends on many factors. Therefore, in practice it is necessary to clearly understand the strength and direction of each of these factors, which will control the process of reproduction of the herd and, thus, will obtain the maximum possible number of products [33, 174, 175].

The aim and task of the research was to analyze and study the features of the age dynamics of reproductive qualities of two-breed sows and to identify a more productive maternal form.

An important factor that must be taken into account in the technological process of pork production is the nature of changes in the level of reproductive qualities of sows with age. These are the results of research of the N. Baranova [33], V. Kononov [190], G. Hiking [365, 366, 369] and others.

As a result of our researches in the conditions of economy on cultivation of pigs of the Ukrainian meat and big white breeds on a purebred basis, and also reception of two-breed pigs (UM × L and WL × L) for industrial production of pork LLC «Tavriya pigs» of the Skadovsk district of the Kherson region is established that the indicator «total number of piglets at birth» in sows UM × L and WL × L was the highest on the fourth and fifth farrowings, respectively (Table 7.17; 7.18).

The lowest value of this indicator was characterized by sows at the first farrowing - in both combinations of 10.38 and 10.75 goals. in accordance.

Regarding the fertility rate, it should be noted that in sows of both combinations the lowest value was recorded during the first farrowing (9.32; 9.58 goals), and the most - according to the results of the fourth farrowing (11.62; 11.04 goals, respectively).

It should also be noted that sows of the combination UM × L on the fifth and sixth farrowing, had a fairly high rate of fertility and did not significantly yield to the peak value at the fourth farrowing in contrast to sows WB × L, which sharply decreased the value of fertility.

Table 7.17

Reproductive qualities of two-breed sows of a combination of UM × L of different age, $\overline{X} \pm S_{\overline{X}}$

Indicator	Farrowing number						
	I (*n*=79)	II (*n*=55)	III (*n*=44)	IV (*n*=29)	V (*n*=24)	VI (*n*=13)	VII (*n*=10)
The total number of piglets at birth, heads	10.38 ±0.216	10.95 ±0.304	11.39 ±0.321	12.96 ±0.448	12.42 ±0.580	12.85 ±0.741	12.40 ±0.653
Multiplicity, heads	9.32 ±0.235	10.16 ±0.273	10.14 ±0.312	11.62 ±0.366	11.20 ±0.423	11.39 ±0.828	10.60 ±0.561
Proportion of stillborn piglets, %	10.36 ±1,222	6.69 ±1,228	10.77 ±1,826	8.25 ±1,447	10.29 ±2,400	11.79 ±3,065	14.05 ±3,064
Number of piglets at weaning at 28 days, h	8.51 ±0.206	9.33 ±0.219	9.32 ±0.210	9.79 ±0.207	9.29 ±0.359	10.00 ±0.320	9.30 ±0.300
Weight of piglets at weaning, kg	5.67 ±0.107	5.92 ±0.139	6.08 ±0.151	5.77 ±0.188	6.28 ±0.242	5.52 ±0.261	5.88 ±0.199
Preservation of piglets, %	95.32 ±3,350	93.62 ±2,213	95.33 ±3,514	86.30 ±2,850	94.06 ±3,009	92.74 ±6,609	87.74 ±5,864

If we consider the dynamics of changes in the values of traits that characterize the reproductive qualities of two-breed sows of both combinations, we can note the following trends: indicators of the total number of piglets at birth, fertility, number of piglets at weaning at 28 days of age tend to increase from the first to sixth slight fluctuations, but in older animals (seventh farrowing) the value of these traits decreases sharply.

Table 7.18

Reproductive qualities of two-breed sows of the UM × L combination of different ages, $\overline{X} \pm S_{\overline{X}}$

Indicator	Farrowing number						
	I (*n*= 60)	II (*n*= 43)	III (*n*= 37)	IV (*n*= 28)	V (*n*= 21)	VI (*n*= 14)	VII (*n*= 9)
The total number of piglets at birth, heads	10.75 ±0.298	11.86 ±0.377	11.89 ±0.357	12.39 ±0.464	12.76 ±0.487	12.36 ±0.589	12.22 ±0.662
Multiplicity, heads	9.58 ±0.250	10.86 ±0.364	10.91 ±0.362	11.04 ±0.423	10.71 ±0.464	10.21 ±0.613	10.00 ±0.687
Proportion of stillborn piglets, %	9.63 ±1,657	7.46 ±1,889	8.16 ±1,277	10.49 ±1,689	15.93 ±2,027	16.66 ±4,538	18.08 ±4,579
Number of piglets at weaning at 28 days, heads	8.81 ±0.220	9.62 ±0.218	10.03 ±0.199	10.21 ±0.259	9.57 ±0.235	9.42 ±0.402	8.11 ±0.539
Weight of piglets at weaning, kg	5.63 ±0.126	5.62 ±0.117	5.94 ±0.167	5.61 ±0.191	5.95 ±0.224	5.77 ±0.210	6.30 ±0.225
Preservation of piglets, %	95.65 ±3,530	92.12 ±3,240	94.99 ±3,375	94.52 ±2,801	91.87 ±3,605	95.31 ±4,906	84.11 ±7,313

The results also indicate a significant increase in the proportion of

stillborn piglets in nests as the age of sows increases. Especially significant increase is observed after the fourth farrowing in sows of the combination WB × L, and in sows of the combination UM × L increase in this indicator was observed after the fifth farrowing.

Many scientists have studied the causes of this phenomenon. For example, according to G. Vanroose et al [673], about 30% of stillbirths cause pathogenic agents. The other 70% of stillbirths are related to other factors, the main of which scientists call the age and condition of the sow, the duration of farrowing, nest size and live weight of piglets [582, 649].

According to H. Zaleski and R. Hacker [678], many of these parameters correlate with each other. For example, the duration of farrowing increases with increasing nest size.

Thus, the increase in the number of stillborn fetuses detected by us with increasing age of sows is consistent with the literature data [561, 573]. One of the main reasons for this trend, we tend to consider perinatal suffocation, which occurs due to the prolongation of the duration of the birth process due to age-related decrease in muscle tone of the uterus.

The tendency to increase the frequency of stillbirths in the first farrowing, compared with the second, is also consistent with the results of other researchers [557, 572], and may be associated with insufficient size of the birth canal in young pigs [572]. Also, there is every reason to believe that along with anatomical and physiological factors, one of the main causes of high stillbirth may be incomplete or poor performance of technological and veterinary measures during farrowing.

According to the results of a study by Y. Le Cozler and co-authors [586, 678], with full control of farrowing, the proportion of nests without stillborn piglets is 65.7%, and in the absence of human control - only 45.6%.

Estimates of survival of suckling piglets show almost no age dynamics and vary almost at the same level for animals of different ages and different breed combinations.

The age dynamics of the mass of one piglet at weaning and the weight of the whole nest at weaning has a constant tendency in terms of farrowing number and breed of sows. Thus, these indicators reach their first maximum in sows of both combinations at the third farrowing, but then decrease again at the fourth farrowing, and in older animals (fifth and seventh farrowing) reach the second maximum weight of piglets at weaning.

Thus, high reproductive qualities of sows, both combinations, are inherent in animals up to the fourth or fifth farrowing.

In the future, the total number of piglets at birth remains almost

constant, but the proportion of stillborn piglets increases, thereby reducing the fertility rate. In addition, after the fourth farrowing there were fluctuations in the safety of piglets during the suckling period and the weight of both one piglet and the nest as a whole at weaning. Obviously, this is due to the milking of sows.

Reproductive qualities of two-breed sows in the conditions of the presented economy are at rather high level.

High indicators of reproductive qualities of sows of both combinations are inherent in animals up to the fourth-fifth farrowing. Thus, it is necessary to have the largest number of sows of this age in the herd. Comparing the reproductive qualities of sows of the two combinations, it is necessary to note the advantage of animals UM × L in terms of basic indicators, as well as their ability to maintain high performance at later age periods.

One of the current problems of the pig industry is to develop techniques to improve reproductive qualities, including the total number of piglets at birth, fertility, number of piglets at weaning, nest weight and piglets at weaning, which significantly affects the economic efficiency of the industry. Based on these assumptions, it should be determined that the reproductive qualities of pigs largely determine the technology of pork production.

Purposeful selection in breeding herds with the selection of boars and ewes with high fertility potential and their use gives a significant effect in improving the reproductive qualities of pigs [259, 463].

The possibility of using entropy-information analysis (*EIA*) in various fields of biological science was noted earlier [86, 149, 196]. Most of these works demonstrated examples of the use of *EIA* in the study of discrete (qualitative) features.

Modification of *EIA* for quantitative traits, using integrated estimates of the density of distribution of standardized values [43, 196], made it possible to expand the application of this method for estimating various quantitative indicators of productivity of farm animals. Using this technique, the researchers estimated the level of entropy of age dynamics of live weight of different species of poultry, shell thickness and egg shape index, system characteristics of the frequency of alleles of protein loci in meat and egg hens, milk productivity of cattle. This method was also used to assess the reproductive qualities of purebred sows [196].

It should be noted that in the vast majority of industrial pig farms in the south of Ukraine the production of fattening young is carried out on the basis of the use of local maternal forms - large white × landrace and

Ukrainian meat × landrace. In this regard, the objectives of our research were to study the characteristics of the age dynamics of their reproductive qualities using EIA in a limited liability company LLC «Tavria pigs» Skadovsk, Kherson region. Indicators of reproductive qualities of local sows large white (WB) × landrace (L) and Ukrainian meat (UM) × landrace (L) were used for research. Data on the results of the first seven farrowings of 80 sows of each genotype were used for the research.

Reproductive qualities of sows were assessed by the following indicators: total number of piglets at birth (*TNB*), number of live piglets at birth (*NBA*) and number of piglets at weaning (*NW*).

Age dynamics of reproductive qualities of sows of different genotypes has some characteristic features.

In particular, the TNB index in WB × L sows reached its maximum on the V farrow - 12.76 goals. after which its steady decrease is noted.

At the same time, in sows UM × L this figure reaches a maximum value of 12.96 goals., On IV farrowing and further (the next three farrowings) is almost at the same level - 12.40-12.85 goals.

In addition, there are differences in the age dynamics of the *NBA* (fertility). Its significant decrease in sows WB × L is observed after IV farrowing.

In UM × L sows, this indicator also reaches its maximum value before IV farrowing, but later, according to the results of V and VI farrowing, its stabilization was noted at the level of 11.39-11.20 goals, which is only 0.42-0.23 goals, less than the maximum value.

Even more significant differences between the studied groups of sows were noted on the basis of *NW*. Thus, in sows WB × L to reach four farrowings there is a steady increase in performance. However, in the future there was a sharp decline. In sows UM × L, on the contrary, from the second to the seventh farrowing studied indicators of this trait were in the range of 9.29-10.0 goals.

Thus, the identified trends indicate that UM × L sows are more adapted to long-term economic use. Obviously, this is due to the good adaptation of their maternal basis (Ukrainian meat breed) to the conditions of southern Ukraine.

In addition, there was a significant difference between the studied groups of sows in terms of the difference between the values of *TNB* and *NBA* (number of stillborn piglets) after IV farrowing. Thus, in sows WB × L according to the results of V, VI, VII farrowing, the number of stillborn piglets and their proportion in the nest was constantly increasing

and amounted to 2.05; 2.15; 2.22 goals, or 15.9; 16.7; 18.1% respectively.

In UM × L sows, this trend also manifested itself, but in a less pronounced form. The proportion of stillborn piglets according to the results of V, VI, VII farrowing was 10.3; 11.8 and 14.1%, respectively.

An increase in the probability of stillbirths in sows with a large number of farrowings has previously been noted by other researchers [561, 623]. It is believed that this increase may be due to excessive fat in old sows, or aging of the uterus, reduced muscle tone which becomes less able to ensure the process of farrowing, or both [561]. Thus, we can assume that in sows WL × L all of the above processes in the body occur much earlier than in sows UM × L.

The age dynamics of the *NW* index among sows of both studied groups is almost completely identical to the dynamics of the *NBA* indicator, which indicates a very weak influence of sow age on the survival of piglets in the suckling period.

The TNB system was characterized by the lowest order in both WL × L and UM × L sows. The average entropy of this system for seven farrowings was 2.7375 and 2.6851 bits, respectively.

A common characteristic for both studied groups of sows is the highest degree of ordering of the *NW* system, compared to other studied systems.

However, between the studied groups of sows there were significant differences in the level of order of this system. In particular, in sows (WL × L) there was a steady decrease in entropy to V farrowing. However, at VI and VII farrowings the level of entropy sharply increased and made 2,4067-2,4194 bits that testifies to sharply increased influence on the given indicator of various casual factors.

At the same time, in sows of UM × L the entropy of this system steadily decreased to VI farrowing and only on VII farrowing its insignificant increase was noted. On average, for all seven piglets analyzed, the entropy of this system was 2.3369 bits for WB × L sows and 2.0607 bits for UM × L sows. A higher level of orderliness of this system was also previously noted by S.S. Kramarenko, S.I. Lugov [257] and for purebred sows of the Ukrainian meat breed, compared with sows of large white breed.

According to the classification of S. Beer [43], a system for which the value of the relative organization of the system $R \leq 0.1$ is probabilistic (stochastic); if $R > 0.3$, then such a system is considered deterministic. Finally, a system for which $0.1 < R \leq 0.3$ is quasi-deterministic (probability-deterministic).

The relative organization of the *TNB* system on average for all considered farrowings in sows of both studied groups was 0.1760-0.1917 (Table 7 .19), which allows to classify this system as quasi-deterministic (probabilistic-determined).

Table 7.19

Evaluation of absolute (*O*) and relative (*R*) organization of the system of reproductive qualities of sows

Number farrowing	Pedigree of sows			
	WL × L		UM × L	
	AT	*R*	*AT*	*R*
The total number of piglets at birth				
1	0.3961	0.1192	0.6143	0.1849
2	0.4261	0.1283	0.5716	0.1721
3	0.5662	0.1704	0.5430	0.1635
4	0.5830	0.1755	0.3815	0.1148
5	0.5972	0.1798	0.4298	0.1294
6	0.6224	0.1874	0.7565	0.2277
7	0.9025	0.2717	1.1610	0.3495
Number of live piglets at birth				
1	0.6529	0.1965	0.5914	0.1780
2	0.4788	0.1441	0.6122	0.1843
3	0.5341	0.1608	0.6791	0.2044
4	0.6938	0.2089	0.5446	0.1639
5	0.4834	0.1455	0.9886	0.2976
6	0.9081	0.2734	0.6607	0.1989
7	1.6462	0.5010	0.8000	0.2408
Number of piglets at weaning				
1	0.8081	0.2432	0.8928	0.2688
2	0.9235	0.2780	0.9131	0.2749
3	1.1546	0.3476	1.0764	0.3240
4	1.4025	0.4222	1.3338	0.4015
5	1.4891	0.4483	0.8151	0.2454
6	0.9153	0.2755	1.6215	0.4881
7	0.9025	0.2717	1.4755	0.4442

Common to both groups of animals is the tendency to increase this figure with age. Thus, the average relative organization of the *TNB* system for 1-3 farrowings of sows WL × L was 0.1393, and for 4-7 farrowings - 0.2036. For sows UM × L, these figures were 0.1735 and 0.2054, respectively.

There is also a system quasi-deterministic *NBA*. Moreover, this

system, as well as the *TNB* system , has a tendency to increase the degree of relative organization with increasing age of sows. *NW* systems are deterministic, regardless of the breed of sows. On average, for the seven weaned pigs among animals of both groups, this figure varied in the range of 0.3266-0.3496.

According to the results of the conducted researches it is established that the degree of determinism of reproductive qualities, including in age dynamics, is influenced by the breed of sows.

The highest level of order is characterized by the number of piglets at weaning (*NW*). Therefore, this indicator should be used as the main in assessing the reproductive qualities of sows.

Influence of keeping technology on reproductive qualities of breeding boars. Reproduction of pigs is a key stage of pork production, so the task of increasing the level of fertility of ewes is always relevant for pig farms. Further selection progress and increase of productive qualities of pig population in breeding and commodity farms is impossible without introduction of artificial insemination with use of genetic resources of the best producers [132, 316, 489, 496, 533].

As a result of the introduction of artificial insemination methods in pig breeding, the requirements for breeding qualities of breeding boars have significantly increased. The technology of their cultivation should guarantee high sexual activity, the maximum duration of their exploitation, create conditions for the fullest realization of genetic potential [132, 189, 368, 487].

It is well known that modern intensive technology of pork production uses the latest advances in science and technology. Favorable conditions for feeding and keeping are created for animals, selection is carried out to increase productivity and the strength of the constitution [333, 366, 370, 371]. However, the enterprises still have reserves to increase the productivity of animals of the breeding herd.

It is proved that the conditions of their keeping are of great importance in the operation of breeding boars. Movement, fresh air, sunlight, bathing increase their sexual activity and sperm quality.

The positive effect of exercise on the potency and quality of sperm was noted by I.I. Ivanov (1907) and S.I. Urusov (1911). These authors, and later other researchers have shown that systematic exercise prevents obesity in males and thus improves their sexual activity, males retain high reproductive qualities for a long time [56, 364, 489].

However, from studies of other authors found that pigs, especially

boars, do not tolerate forced exercise, the use of which causes a decrease in semen of boars and sexual activity [297, 298, 364, 373, 476].

The level of productivity of boars depends on many factors - breed, feeding, keeping, care, age, mode of sexual use and so on. Each of them is interconnected mainly with the quantity and quality of sperm production in boars. In practice, various indicators are used to assess boar semen - physiological, biochemical, morphological, etc., but ultimately take into account the level of fertility of sows. In the process of sperm testing, morphological parameters of sperm are detected, as well as their motility, concentration and survival [132, 496].

Based on the above, the task of scientific work was to assess the reproductive qualities of adult boars-breeding breeds: Large White, Landrace, Ukrainian meat, intrabreed type of pigs of the breed Duroc Ukrainian selection «Stepnoy» and breed Pietren depending on housing conditions and the presence of exercise in conditions of LLC «Tavria pigs» of the Kherson region.

Boars of the control group were kept individually, with a floor area per head of 7m^2. Throughout the study period, the boars were kept without giving them exercise. Boars of the experimental group were also kept individually, with a floor area per head of 7m^2. Throughout the research period, the boars had the opportunity to freely enter the covered walking area (floor area per head 9 m^2, floor with a solid concrete floor) through a manhole in the wall of the building.

Quantitative and qualitative indicators of sperm production of breeding boars of different breeds, depending on the conditions of detention and the presence of exercise are presented in table 7.20.

As a result of research, it was found that boars-breeders of control groups, which were kept year-round without walking, were significantly inferior to analogues of experimental groups, which were provided with free-walking exercise in most quantitative and qualitative indicators of sperm production.

Note that the presence of exercise did not significantly affect the volume of ejaculate in boars of large white breed, but it was found that boars breeds: Landrace, Ukrainian meat and Duroc (experimental groups) according to this indicator exceeded their counterparts by 6.5% ($P>0.99$); 2.4% ($P> 0.95$) and 4.1% ($P> 0.99$), respectively.

Table 7.20

Indicators of sperm production of breeding boars, $\overline{X} \pm S_{\overline{X}}$

Breed	Researched		Volume Ejaculate, ml.	Sperm concentration, mln/ml.	Rectilinear mobility, %	Sperm survival, hours.	Fertilizing ability, %
	boars	ejaculate					
Control groups (without exercise)							
WL	3	60	256.4 ±2.79	281.3 ±3.78	95.5 ±0.63	47 ±0.80	72.7
L	3	60	290.3 ±2.94	276.3 ±3.41	96.3 ±0.48	51 ±1.60	74.0
UM	4	80	288.4 ±2.70	281.3 ±2.60	96.2 ±0.32	52 ±1.40	75.1
DUSS	2	40	215.0 ±2.51	310.8 ±2.52	96.0 ±0.38	54 ±1.50	74.3
P	3	60	231.0 ±3.36	240.6 ±2.33	97.0 ±0.20	48 ±1.50	68.2
Experimental groups (free-walking exercise)							
WL	3	60	260.2 ±2.20	288.8 ±3.30	96.0 ±0.52	63 ±0.74 ***	77.4
L	3	60	310.6 ±2.60 **	285.2 ±2.64 *	96.7 ±0.40	70 ±1.00 ***	78.0
UM	4	80	295.3 ±3.60 *	290.4 ±3.00 *	95.7 ±0.56	68 ±1.20 ***	80.5
DUSS	2	40	224.2 ±2.20 **	305.4 ±3.20	96.4 ±0.30	60 ±1.34 ***	82.2
P	3	60	218.8 ±3.10 **	252.3 ±2.82 **	97.3 ±0.44	50 ±1.20	72.4

The concentration of sperm in the ejaculate of boars of large white breed and breed Duroc remained unchanged, depending on the conditions of detention and the presence of exercise, but boars breeds: Landrace, Ukrainian meat and Pietren (experimental groups) according to this indicator exceeded their counterparts at 3.1% (*P> 0.95*); 3.1% (*P> 0.95*) and 4.6% (*P> 0.99*), respectively.

During the study period, the indicator of rectilinear-translational movement of sperm in boars of the experimental groups did not change significantly, a slight increase in this indicator was found in boars, which were given free-walking exercise.

An important indicator in determining the quality of sperm is the survival of sperm outside the body. This indicator characterizes the degree of preservation of biological value and more than others reflects their ability to fertilize [154, 160]. It was found that free-walking exercise of breeding boars: Large White, Landrace, Ukrainian meat and Duroc significantly increased sperm survival (*P> 0.999*), only in pietren boars this figure did not change significantly.

The main assessment of sperm is its fertilizing ability. It has been experimentally established that on average, 5.24% more farrowings were obtained from uteruses of boars fertilized with sperm, which used free-walking exercise, than on queens, which were fertilized with sperm of holders kept year-round without walking.

Summarizing the data on the effect of free-walking exercise and its absence on the quantitative and qualitative indicators of sperm production, we can conclude that giving boars free choice of exercise helps to increase the overall indicators of sperm production, while increasing the ability to fertilize.

During the observation of the behavior of boars in different ways of keeping and the presence of exercise in the conditions of LLC «Tavrian pigs» also studied their sexual activity. The strength of sexual reflexes was determined by the time of their manifestation in minutes. The sexual behavior of boars in the arena for collecting sperm on an artificial vagina was studied by the method of visual and chronometric observations by V.I. Velikzhanin and others. [60]. The time of manifestation of sexual reflexes from the moment of the boar's detachment to the arena to the beginning of ejaculation are given in table 7.21.

Table 7.21

The duration of the period from the detachment of the boar in the arena to the manifestation ejaculation reflex (min.), $\overline{X} \pm S_{\overline{X}}$

Method of retention	*n*	Breed				
		WL	L	UM	DUSS	P
Control groups (without exercise)	15	5.3±0.05	5.2±0.04	4.8±0.08	6.1±0.05	5.8±0.04
Experimental groups (free-walking)	15	4.8±0.07 **	5.0±0.05 **	4.9±0.05	5.7±0.08 **	6.0±0.07 *

As a result of observations of the boars of the experimental groups, it was noted that the boars spent most of the day without movement - lying in

the machine and only a short time in motion during feeding and watering, as well as responding to staff.

Boars with free-walking content, even at optimal microclimate in the room, spent most of the day on indoor walking areas.

During the observations it was noted that the boars often changed their place of rest between the room and the playgrounds. It was also noted that the animals of this group, regardless of breed, were more vigorous and more active in sexual reflexes.

The duration of the period of sexual activity of boars with free-range keeping in boars of breeds: Large White, Landrace, Ukrainian meat and Durok significantly decreased by an average of 0.3 minutes (*P> 0.99*), and for boars of the Pietren breed the presence exercise increased the duration of the period of sexual activity by 0.2 minutes (*P> 0.95*), they reacted worse to the change of premises: the machine for holding-walking area-arena to obtain ejaculate.

According to the results of research, it can be stated that free-walking exercise of boars, solar insolation cause, a positive effect on the qualitative and quantitative indicators of sperm, while increasing the ability to fertilize. The presence of exercise has a positive effect on the manifestation of erection and mating reflexes.

As a result of introduction of own developments (the machine for accustoming of boars to a garden on an artificial vagina and the mobile stuffed animal for receiving sperm from boars) in production (SVC «Agrofirm «Mig-Service-Agro», PE «Dumitrash», POP «Victoria» of the Nikolaev region, Open Company «Tavriya pigs» of Kherson region, PJSC «Stepnoy» Breeding Plant of Zaporizhia region, «Novoselivske» LLC of Odessa region allowed to reduce the training period of young boars for obtaining sperm by manual method and to facilitate the work of specialists working in the reproduction shop, which, in turn, , affected the reduction of expenditures on the salary fund.

According to the results of the industrial use of the above developments on the training of boars in the garden for stuffed animals, the results were obtained, which are presented in table 7.22. It was found that when accustoming boars to the garden for a stuffed animal using an ordinary metal phantom, it took an average of 8.08 days to develop and consolidate the reflex. When used for training machine, was reduced by 2.19 days, the duration of training compared to the control (*P>0.99*), and the use of a mobile stuffed animal to obtain sperm in boars made it possible to reduce the duration of training by 3.48 days (*P>0.999*) relative to the control group.

Table 7.22

Duration of training of boars to a garden on a stuffed animal, $\overline{X} \pm S_{\overline{X}}$

Assignment of groups	Number of boars, Goal.	Type of training equipment	Number of trained		Term of training, days
			heads	%	
1-control	25	The usual phantom of industrial production	13	52	8.08 ± 0.537
2-experimental	25	The machine for accustoming of boars to a garden on an artificial vagina	18	72	5.89 ± 0.395 **
3-experimental	25	Mobile stuffed animal for sperm in boars	20	80	4.60 ± 0.253 ***

The difference in the duration of acclimation to the stuffed animal garden can be explained by the fact that when using the phantom boars decreased sexual activity, and when using our developments, it was possible due to stimuli to keep sexual activity at a high level and in a shorter time to develop and consolidate reflex in boars.

Influence of feed additives on productive qualities of sows and breeding boars. In the conditions of intensive animal husbandry, achieving a high level of productivity and obtaining high-quality livestock products is possible only if animals are provided at all ages and physiological periods with full and balanced feeding [8, 110, 176].

The most important factor in balancing diets on a complex of nutrients and biologically active substances is the use of micronutrients, among which a special place is occupied by trace elements. Minerals (*Ca, P, K, Na, Mg, S, I, Fe, F, Cl, Co, Mn, Se*) are very important in animal nutrition, as they are involved in many physiological processes: reproduction, growth and development of animals , immunity, digestion, homeostasis, conduction of nerve impulses and many others. [192, 306, 376].

In our country, the problem of mineral nutrition of animals is relevant, because part of the territory is deficient in a number of trace elements.

A special place among the substances characterized by both antioxidant and adaptogenic properties is selenium and its compounds, the deficiency or excess of which directly affects the health and productivity of

animals [98, 119, 186]. Deep deficiency of selenium in the food chain causes the development of specific endemic diseases: cardiomyopathy (Kesh's disease) and osteoarthropathy (Kashin-Bek's disease) in humans, white muscle disease in cattle and pigs, exudative diathesis in poultry and agricultural meat. dystrophy in almost all species of animals. This, in turn, leads to a decrease in product quality, increase its cost, which prevents the realization of genetic potential [48, 101, 212, 214].

The content of selenium in the soil, feed and tissues of animals is characterized by great variability depending on natural and climatic zones, growing conditions, harvesting, storage and use of feed, type of selenium source, dose and methods of administration. To solve the problem of selenium deficiency in animal husbandry, inorganic sources of selenium have traditionally been used for many years: selenites or selenates. In recent years, studies by many scientists have described the benefits of using organic sources of selenium, which are characterized by a large inclusion of selenium in metabolic processes and less toxicity [212, 214, 300, 301, 375, 503, 478].

Of particular interest in this regard is the drug "Sel-Plex" manufactured by «*Alltech»*, which contains at least 50% selenium in the form of selenomethionine, ie biologically active forms of this trace element, and the other 50% are selenocysteine, selenocystation and other selenoamino acids. They have a higher availability, especially under stress, and are not an oxidant unlike selenite. From the above it follows that with unsatisfactory supply of animals in selenium, there is a shortage of it in the feed, and hence in their diets, so the use of «Sel-Plex» is quite justified and necessary.

In this regard, we implemented the task in the conditions of LLC «Tavria pigs» of Kherson region on the population of purebred boars, sows and repair pigs to study the effect of feed additive «Sel-Plex» on their productive qualities. Quantitative and qualitative indicators of sperm production of breeding boars of the Ukrainian meat breed depending on feeding them the feed additive «Sel-Plex» are presented in table 7.23.

Feeding the feed additive (organic form of selenium) «Sel-Plex» boars made it possible to obtain a larger volume of ejaculate by 14.5 ml (*P> 0.95*) and a higher concentration of sperm by 10.9 million/ml 0.95) compared to the control, despite the negative correlation between these indicators, which in turn led to an increase in diluted semen, and accordingly to an increase in the number of sperm doses received from a single semen collection manually.

There was no statistically significant difference between the rate of rectilinear motility of sperm in the context of the control and experimental groups, but this difference was higher in boars that received the supplement «Sel-Plex».

Table 7.23

Quantitative and qualitative indicators of sperm production breeding boars, $\overline{X} \pm S_{\overline{X}}$

Breed	Researched		Volume ejaculate, ml	Sperm concentration, mln/ml	Rectilinear mobility, %	Sperm survival, hours	Fertilizing ability, %
	boars	Ejaculate					
Control group (basic diet)							
UM	5	80	283.3 ±2.56	280.7 ±2.61	96.0 ±0.30	52 ±1.40	77.3
Experimental group (basic diet + 0.3 kg/t «Sel-Plex»)							
UM	5	80	297.8 ±3.20 *	291.6 ±2.86 *	96.6 ±0.56	68 ±1.20 ***	80.5

An important indicator in determining the quality of sperm is the survival of sperm outside the body. This indicator characterizes the degree of preservation of biological value and more than others reflects its ability to fertilize. According to the obtained data, this indicator was probably higher in the boars of the experimental group and was - 68 hours, which is 16 hours higher than the control (*P> 0.999*).

It should be noted that as a result of our research it was found an increase in the proportion of fertilized sows who received a feed additive (organic form of selenium) «Sel-Plex» boar semen, which also received this additive by 3.2%. The obtained data suggest a positive effect of organic selenium on the reproductive qualities of both boars and sows. A similar trend was found in repair pigs and sows transferred to insemination. During the experimental studies and the introduction of the main diet of breeding boars and repair pigs feed additive «Sel-Plex» increased the number of pigs that came to hunt (Table 7.24).

It was found that when using a feed additive (organic form of selenium) «Sel-Plex» in the experimental group there is a positive indicator compared to the control group. Namely, the number of females who came to hunt on 4,0-6,2% higher fertilization rate keeps increasing and tended to

prevail co ntrolnu group on 4,9-8,6%.

Table 7.24

Reproductive capacity of repair pigs and sows

Appointment of the group	*n*	Came to hunt		Pereguliv		Fertilized	
		heads	%	heads	%	heads	%
repair pigs (average age - 234.2 ± 4.82 days)							
1-control	60	52	87.7	12	23.1	40	76.9
2-experimental	60	55	91.7	8	14.5	47	85.5
+/- to control	-	+3	+4	-4	-8.6	+7	+8.6
adult sows (mean age - 2.8 ± 0.40 farrowing)							
1-control	32	26	81.3	5	19.2	21	80.8
2-experimental	32	28	87.5	4	14.3	24	85.7
+/- to control	-	+2	+6.2	-1	-4.9	+3	+4.9

Thus, taking into account the results of the research, it is possible to offer as an additional reserve to increase the reproductive functions of pigs to use organic compounds of selenium, in our case feed additive (organic form of selenium) «Sel-Plex». In addition to the peculiarities of the impact on the body of animals, feed additive «Sel-Plex» has an advantage over inorganic drugs that must be administered as injections to each animal, while the introduction of feed additives occurs immediately in the manufacture of feed, which, in turn , reduces the cost of manual labor for the production of pig products.

7.1.2. Development and implementation of technological innovative solutions in the farrowing shop. Today, some pig farms are created on the basis of reconstruction of different livestock facilities, which in turn determines the peculiarities of the organization and design of individual shops and units of pork production [75, 182, 430].

The farrowing unit is not only the most expensive structure in the sow unit, but also very important. It must provide comfort for the sow and for the newborn piglets and at the same time be comfortable for the staff during the maintenance and care procedures. The purpose of the farrowing unit is to produce as many piglets as possible with a high weight at weaning. Of course, technology is only one part of this task, and temperature regime and care, directly the genotype of animals also play an important role [75, 350].

Compliance with the biological needs of piglets and sows is fundamental when designing a farrowing unit. All over the world, farrowing boxing is the most common solution to this problem. Quality, durability,

price and efficiency are the main components of farrowing machines.

For a long time, and even in today's conditions, there are discussions about the type of location of the fixing machine for the sow in the farrowing box: straight or diagonal (Fig. 7.3; 7.4).

Fig. 7.3. **Direct location of the locking machine (author's photo)**

Fig. 7.4. **Diagonal location of the locking machine (author's photo)**

But both the direct location of the cell and the diagonal have, according to research, their advantages and disadvantages [75, 366, 371]. To date, boxes with a length of 2.4 to 2.5 m and a width of 1.7-1.9 m are considered optimal. At a diagonal arrangement of a sow in a pen its length

can be reduced by 10 - 20 cm. Given this fact and the constant high cost of building materials, we set a task to analyze the impact of the location of the fixing machines for suckling sows in the farrowing box (diagonal or straight) on their reproductive qualities.

Indicators of reproductive qualities of sows of the experimental groups depending on the location of the fixing machine in the box for farrowing and breed of queens are presented in table 7.25.

Table 7.25

Reproductive qualities of sows depending on the location of the fixing machine in the box for farrowing and genotype, $\overline{X} \pm S_{\overline{X}}$

A group of animals		Multiplicity, heads	Large-fruited, kg	Milk yield, kg	Number of piglets at weaning at 28 days, heads	Live weight of piglets at weaning, kg	Saving, %	Nest alignment during weaning, points
Control groups (direct locking machine), (n = 16)								
I	♀L×♂L	12.1 ±0.30	1.40 ±0.02	64.6 ±2.80	11.5 ±0.24	8.0 ±0.22	94.2 ±1.62	66.9 ±3.00
II	♀DUSS ×♂DUS S	10.6 ±0.24	1.41 ±0.02	54.8 ±3.20	10.1 ±0.30	8.1 ±0.18	94.6 ±2.00	48.4 ±2.44
Experimental groups (diagonal fixing machine), (n = 16)								
III	♀L×♂L	12.0 ±0.48	1.38 ±0.04	60.3 ±3.60	10.8 ±0.28 *	7.4 ±0.20 *	90.0 ±1.40 *	54.2 ±2.84 **
IV	♀DUSS ×♂DUS S	10.7 ±0.26	1.40 ±0.03	51.8 ±2.24	9.2 ±0.26 *	7.5 ±0.20 *	88.6 ±1.80 **	33.3 ±2.26 ***

Analyzing the reproductive qualities of sows of Landrace breed and intrabreed type of Duroc pigs of Ukrainian selection «Stepovy», which during the suckling period were kept in farrowing pens with different location of the fixing machine, we note that the indicator of fertility, infertility and fertility.

During the studies, observing the animals, it was noted that when cleaning the boxes for farrowing with a diagonal location of the locking machine there were difficulties with cleaning the far zone. The operator of the farrowing shop often had to go into the box for thorough cleaning, such situations almost did not occur with the direct location of the locking machine.

In addition, in the case of sowing piglets with structural elements of

the machine, the operators were more convenient to «rescue» the piglets in the direct location of the machine, there is access to the animal was greater. These facts to some extent affected the safety and growth energy of piglets.

The number of piglets at weaning in Landrace sows, which were kept in diagonal locking machines was 10.8 heads, which is 6.5% less than analogues kept in direct locking machines, where for sows of intrabreed type the difference in this indicator was 9,8% in favor of the control group (*P>0.95*).

During the research it was also observed that in direct fixing machines sows were «more conveniently» placed in terms of accessibility of teats for piglets during feeding, without resting on the structural elements of the machine, in contrast to the diagonal location of the fixing machine. Live weight of piglets at weaning was higher in piglets of control groups, and probably exceeded the experimental groups by 0.6 kg (*P> 0.95*).

The direct location of the fixing machine for farrowing led to a higher value of the conservation rate in sows of Landrace breed - 94.2%, in sows of intrabreed type of pigs of Ukrainian breed Duroc breed «Stepovy» - 94.6%, which is 4.2% and 6%, respectively. more than analogues, which were kept in machines with a diagonal arrangement (*P> 0.95; P> 0.99*, respectively).

An important requirement for weaning piglets is to obtain aligned nests, because piglets that differ sharply in development from the average nest in the future in the process of rearing will be worse fattened and pay for feed in increments. The alignment of the nest at weaning was calculated by the Klemin-Pavlov formula [174, 180, 220].

Instead, the nests of piglets of the I and II control groups (direct location of the fixing machine), which probably outperformed the analogues of the III and IV experimental groups (diagonal location of the fixing machine) by 18.9% and 31%, respectively, were more aligned during weaning. 99; *P> 0.999*).

In order to confirm the strength of the influence of factors (location of the fixing machine for farrowing, genotype) on the studied trait (indicators of reproductive qualities of sows) in the context of experimental farms, a two-factor analysis of variance was performed. The influence of the location of the fixing machine in the farrowing box and the genotype of the sow on fertility is shown in table 7.26.

According to the results of research it is established that the dependence of the indicator of fertility of sows, in the conditions of SVC

Agrofirm «Mig-Service-Agro» of the Nikolaev region from the studied factors, has probability from the second factor (genotype of sow) at 22,65% and in general there is no influence of fixing location. machine for this indicator, while the interaction of both estimated factors is much lower than the actual factors themselves - 0.12%.

Table 7.26

Influence of the location of the fixing machine in the farrowing box and sow genotype on fertility

The strength of the influence of factors on fertility						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Location of the machine (A)	0.00	1	0	0.000	1.0000	0.00
Genotype (B)	31.36	1	31.36	17.594	0.0001	22.65
A × B	0.16	1	0.16	0.090	0.7655	0.12
Residual	106.94	60	1.7824	-	-	77.23
General	138.46	63	-	-	-	-

According to the results of the analysis of the studied factors, no probable influence was found on the type of machine location, genotype of sows, or the combination of both factors on the fertility rate of piglets.

The results of the studies are presented in table 7.27 indicate that the milk yield of sows in terms of experimental groups, probably influenced by the second factor (B) - genotype (13.12%).

When analyzing the results of research, it was found that the number of piglets at weaning is more influenced by the genotype of the sow (landrace or intra-breed type of pigs of the Duroc breed of Ukrainian selection «Stepovy») - 30.81%.

Table 7.27

Influence of the location of the fixing machine in the farrowing box and sow genotype on milk yield

The strength of the influence of factors on milk yield						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Location of the machine (A)	213.2	1	213.16	1.478	0.2289	2.09
Genotype (B)	1339.6	1	1339.6	9.288	**0.0034**	13.12
A × B	6.8	1	6.76	0.047	0.8293	0.07
Residual	8653.8	60	144.23	-	-	84.72
General	10213.3	63	-	-	-	-

Also, it should be noted that the uterus Landrace breeds had higher reproductive performance qualities compared to similar intra-breed type (tab.7.28).

There is also a probable influence of the location of the machine on the studied indicator - 8.76%, with no significant combined effect - 0.14%.

Table 7.28

Influence of the location of the fixing machine in the farrowing box and sow genotype on the number of piglets at weaning

The strength of the factors on the number of piglets at weaning						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Location of the machine (A)	10.2	1	10.24	8.719	0.0045	8.76
Genotype (B)	36.0	1	36	30.654	0.0000	30.81
A × B	0.2	1	0.16	0.136	0.7133	0.14
Residual	70.5	60	1,174	-	-	39.71
General	116.9	63	-	-	-	-

To a greater extent on the indicator of live weight of piglets at weaning has the effect of the location of the locking machine in the farrowing box - 12.94%. There was no probable effect of genotype (factor B) on the weight of piglets at weaning. Also, do not co-found influence subjects factors (tab.7.29). The direct location of the locking machine in the farrowing box creates more optimal conditions for the growth of piglets.

Table 7.29

Influence of the location of the fixing machine in the farrowing box and sow genotype on the weight of piglets at weaning

The strength of the influence of factors on the weight of piglets at weaning						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Location of the machine (A)	5.8	1	5.76	8.955	0.0040	12.94
Genotype (B)	0.2	1	0.16	0.249	0.6198	0.36
A × B	0.0	1	0	0.000	1.0000	0.00
Residual	38.6	60	0.6432	-	-	86.70
General	44.5	63	-	-	-	-

In the experimental groups there is a lower value of the safety index - 88.6-90.0%, compared with control analogues, they were inferior by 6.0-4.2%, respectively.

To increase the safety rate, regardless of the genotype of the sow, it is advisable to use the direct location of the locking machine in the farrowing box. Thus, the strength of the impact of this factor on the rate of preservation - 12.72%, in the absence of force likely influence of genotype and joint influence factors (tab. 7. 30).

According to the results of research, due to the increase in the weight of the sows of piglets at weaning, the number of piglets at weaning and the reduced number of lagging piglets made it possible to obtain higher values of the alignment of the nest of piglets at weaning. farrowing.

Table 7.30

Influence of the location of the locking machine in the farrowing box and sow genotype on the safety of piglets

The strength of the influence of factors on the safety of piglets						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2,%
Location of the machine (A)	416.2	1	416.2	8,799	0.0043	12.72
Genotype (B)	4.0	1	4	0.085	0.7722	0.12
A × B	13.0	1	12.96	0.274	0.6026	0.40
Residual	2837.9	60	47.3	-	-	13.24
General	3271.0	63	-	-	-	-

Thus, the force of influence of the location of the machine on the alignment of the nest at weaning is equal to - 19.23%, the force of influence of the genotype of sows on the studied indicator is - 38.63% (Table 7.31).

Table 7.31

Influence of the location of the fixing machine in the farrowing box and sow genotype on the alignment of the nest at weaning

The strength of the influence of factors on the alignment of the nest during weaning						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Location of the machine (A)	3091.4	1	3091.4	27.477	0.0000	19.23
Genotype (B)	6209.4	1	6209.4	55.191	0.0000	38.63
A × B	23.0	1	23.04	0.205	0.6525	0.14
Residual	6750.4	60	112.51	-	-	42.00
General	16074.3	63	-	-	-	-

Studies have shown that the direct location of the locking machine for sows in the farrowing box, in contrast to the diagonal location, helps to increase the number and weight of piglets at weaning, safety and,

consequently, the alignment of the nest at weaning by creating more optimal conditions for suckling. sows and suckling piglets.

Using an advanced feeder for piglets. At present, there is a constant improvement of self-feeders for piglets in order to feed the cost of super stater feed in the period from birth to transfer to rearing (35th day of life of piglets) [263, 383].

Using the relevance of this issue and the interest of producers, the study aimed to investigate the impact of the type of self-feeding for piglets in the period from the beginning of training (5th day of life of piglets) to superstarter feed before transfer to rearing (35th day of life of piglets) on productive qualities (live weight, average daily gains, safety index).

The results of growing piglets from the beginning of accustoming to superstarter compound feeds (5th day of piglet life) to their transfer to rearing (35th day of piglet life) were used for the study. The duration of the suckling period was 28 days, after weaning the piglets remained for another 7 days in farrowing machines in order to minimize stress.

The scientific and economic experiment was conducted in the conditions of «Tavriya Pigs» LLC, Skadovsk, Kherson Region. Young animals for the experiment were obtained according to the scheme, combining the maternal form (Ukrainian meat × landrace) with the paternal form - pietren and dyurok. Superstarter compound feed produced by Tekro LLC (Ukraine) was used for feeding suckling piglets and feeding weaned piglets.

Young subjects were divided into two groups: I group - for feeding superstarter compound feed type of fodder used №1 (Fig. 7.5); Second group - for feeding compound feed type of fodder used №2, own development (Fig.7.6).

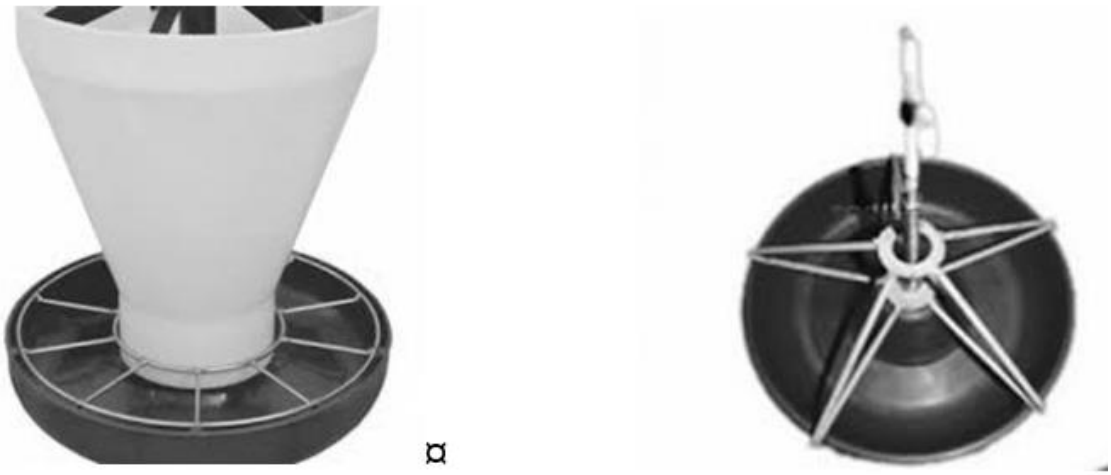

Fig.7.5. **Self-feeding for piglets «type №1»**

The research was performed by conventional zootechnical methods [443]. To study and confirm the strength of the influence of factors on the studied traits, a two-factor analysis of variance was performed using a model with random factors A and B according to G. Scheffe (1963) [536].

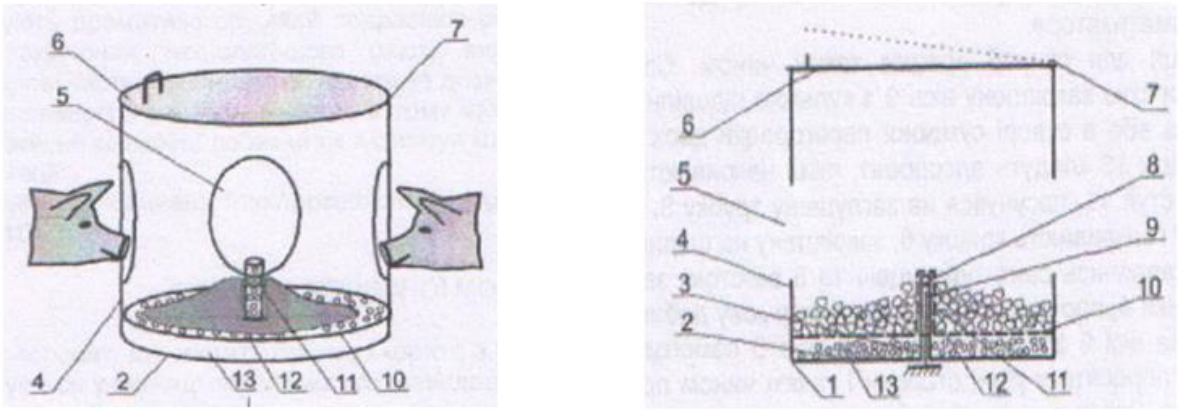

Fig.7.6. **Self-feeding for piglets «type №2»**

1 - bunker; 2 - bottom; 3 - tube (plug); 4 - cylindrical wall; 5 - aft openings; 6 - cover; 7 - hinges; 8 - bearing; 9 - axis; 10 - round plate; 11 - cylindrical protrusion; 12 - perforations; 13 - compartment for adsorbent, flavor.

In the farrowing shop, the use of self-feeders for suckling piglets, in contrast to conventional troughs, helps to maintain the proper level of sanitation in the feeding area of piglets, reduce feed costs and more.

This reduces the cost of expensive «starter» feed, also continues to maintain the energy potential of the body, which contributes to the rational use of feed nutrients and provides a high growth rate of young pigs.

But it is necessary to further study the comparison between self-feeders of different designs and the influence of design features of feeders on the productive qualities of young pigs.

In the domestic market there are self-feeders for feeding dry feed, which contain a hopper and a trough with distributors [263, 383]. These feeders feed the piglets at will during the day and perform the functions of accustoming to concentrated feed (see Fig.7.5). However, this device has several disadvantages: it does not protect the feed from getting into the trough of excrement and moisture, which leads to its deterioration; it does not attract piglets to consume pre-starter feed.

The feeder of own development (see fig.7.6) is executed in the form of the hollow cylinder in the lower part of which the compartment for sorbent or flavoring closed by the perforated round plate with a cylindrical ledge is placed, in the middle - forage cells, the size sufficient for

advancement in a piglet's head. top - cover. Moreover, the amount of perforation is such that it prevents spillage into the feed compartment.

As a result of introduction into production of the elements of improvement of a feeding trough for piglets offered by us, allowed to increase productive indicators of young pigs. The results of growing piglets depending on the type of feeder are shown in table 7.32.

During the scientific and economic experiment, it was found that the piglets are constantly interested in the feeder (type №2) and its contents, push their heads into the feed holes (5) of the cylindrical wall (4) and accordingly begin to consume superstarter feed. Due to the fact that the bottom (2) of the hopper (1) is mounted on the axis (9) with a ball bearing (8), the self-feeder (type №2) easily rotates when pressing the piglet's snout in different directions and thus attracts animals to feed.

Thanks to the walls (4) of the hopper (1), excrement will not get into the superstarter feed, and the presence of perforation (12) and mycotoxin sorbent in the compartment (13) eliminates its wetting and caking. To further stimulate the piglets' appetite, a round plate (10) was removed and a flavoring was added, which irritates the olfactory receptors and activates the feeding behavior of the experimental piglets.

Table 7.32

The results of growing piglets depending on the type of feeder, $\overline{X} \pm S_{\overline{X}}$

Indicator	A group of animals			
	I (UM×L)×P	II (UM×L)×D	III (UM×L)×P	IV (UM×L)×D
Assignment of groups	control (regular bunker feeder)		research (advanced feeder)	
Number of heads at the beginning of accustoming to superstarter feed (5 days), heads.	135	135	135	135
Live weight of piglets at the beginning of accustoming to superstarter feed (5 days), kg	2.65 ± 0.10	2.71 ± 0.20	2.62 ± 0.24	2.68 ± 0.22
Number of heads at the age of 35 days when transferred to rearing, heads.	127	126	130	131
Live weight of piglets at the age of 35 days, kg	8.05 ± 0.22	8.20 ± 0.20	8.92 ± 0.14 **	9.61 ± 0.12 ***
Average daily gain, g	180 ± 2.8	183 ± 2.6	210 ± 3.5 ***	231 ± 4.40 ***
Saving, %	94.1 ± 1.84	93.3 ± 1.86	96.3 ± 1.60	97.0 ± 1.80

In order to confirm the strength of the influence of factors (type of feeder, genotype) on the studied trait (live weight, average daily gain, safety), a two-factor analysis of variance was performed. The influence of feeder type and genotype of piglets on their live weight at the age of 35 days are presented in table 7.33.

Table 7.33

Influence of feeder type and genotype on live weight of piglets at the age of 35 days

The strength of the influence of factors on the live weight of piglets at the age of 35 days						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Feeder type (A)	167.4	1	167.43	26.743	0.0000	7.69
Genotype (B)	23.6	1	23,609	3.771	0.0530	1.08
A × B	8.9	1	8.8788	1.418	0.2346	0.41
Residual	1978.4	316	6.2608	-	-	90.82
General	2178.3	513	-	-	-	-

The live weight of piglets at the age of 35 days, when transferred to rearing, was probably influenced by the use of an improved feeder for feeding superstarter feed for young pigs during the suckling period. Thus, the force of influence of the type of feeder (A) was 7.69%, the force of influence of genotype (B) of experimental young animals on the studied indicator was - 1.08% and not significant force of influence was the combined influence of factors (A×B).

The significant influence of the type of feeder on the live weight of piglets can be explained by the fact that the proposed feeder due to its design features stimulated the feeding behavior of the experimental young pigs. Animals consumed better feed, there was less scattering and wrapping of feed, in contrast to the usual feeder.

According to the results of the research, we note that the combination of two-breed sows Ukrainian beef Landrace with pietren and duroc boars had a significant effect on the average daily gain in the suckling period. Thus, the strength of the influence of genotype (B) on the studied trait was - 1.96% (Table 7.34).

Table 7.34

Influence of feeder type and genotype on average daily growth of young animals

The strength of the influence of factors on the average daily gain						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Feeder type (A)	195864.0	1	195864	80.689	0.0000	19.74
Genotype (B)	19414.9	1	19415	7.998	0.0050	1.96
A × B	9929.1	1	9929.1	4.090	0.0440	1.00
Residual	767059.0	316	2427.4	-	-	77.3
General	992267.0	513	-	-	-	-

Regarding the type of feeder, we note that the strength of this factor (A) was the highest and amounted to 19.74%, also noted the probable influence of both factors (A × B) on the average daily gain in the suckling period - 1.00%.

Neither the type of feeder nor the genotype was found to be likely to be affected by the study.

Thus, due to the design features of the proposed device, which prevent spoilage of feed additives (superstarter feed) by excrement and moisture and improve conditions for its active consumption, as well as the implementation of feed behavior of piglets, it is possible to increase live weight of piglets and their average daily gain in suckling period.

The use of the first proposed advanced self-feeding for feeding young pigs during the suckling period and the first stage of rearing provided the opportunity to obtain live weight at the age of 35 days (III and IV experimental groups) by 10.8% and 17.2% higher than analogues of I and II groups, who consumed feed from a conventional bunker self-feeder, this led to higher average daily gains - by 16.7-26.2%. Local animals with the blood of boars of the Duroc breed were characterized by higher growth energy. During the two-factor analysis of variance, the probable influence of the improved self-feeder and genotype on the studied traits was established.

Patent 118,470 Ukraine, IPC A01K5 / 00 (2017.01). Self-feeding for piglets / Ivanov V.O., Zasukha L.V. , Lykhach A.V.; applicant and patent owner Institute of Pig Breeding and APV NAAS. - № u 201701929; declared 28.02.2017; public. 10.08.2017, Bull. № 15.

Influence of feed additives on productive qualities of suckling sows. The new century is a fundamental study in the field of physiology and biochemistry of nutrition. Advances in genetics and breeding have

significantly increased the growth rate of farm animals and poultry and improved feed conversion. However, new problems have arisen that raise many questions about the technology of feeding farm animals and poultry. Highly productive animals are more sensitive to stress, and low immunocompetence often leads to disease outbreaks [109, 192, 306].

One of the methods of increasing productivity is the use of stimulants of productivity and safety, while the focus remains on their safety. In this regard, the search for biologically active feed additives (BAA) instead of antibiotics is of scientific and practical interest today [109, 571, 657, 663].

The foundation for successful pork production is laid immediately after the birth of piglets. The main role here is played by the weight of the newborn piglet (>1.3 kg) and early intake of colostrum. Colostrum contains protective substances (immunoglobulins) that protect young animals from dangerous diseases - digestive disorders, respiratory diseases, etc. [110, 437, 519].

Given this information, the aim of our study was to study the effect of adding the product «Actigen» to the main diet of deep-fed and suckling sows on the content of immunoglobulins in colostrum. The research was carried out in the conditions of SVC Agrofirm «Mig-Service-Agro» of the Novoodesky district of the Nikolaev region on a population of purebred sows of intrabreed type of pigs of breed of Durok of the Ukrainian selection «Stepovy». Experimental group (II) for 30 days (before farrowing) and during the suckling period to the main diet was injected supplement «Actigen» at a dose of 400 g/ton of feed, sows of control group (I) received a normal basic diet, and other technological factors of feeding and maintenance were identical.

The product «Actigen» manufactured by the company «*Alltech»* - is a new generation of prebiotics and an alternative stimulant of productivity and safety, helps animals on the first line of defense, supporting intestinal function and maximum absorption of nutrients. This product is the result of the latest advances in the science of nutrigenomics, a preparation of yeast mannan oligosaccharides (MOS), obtained from the outer, mannose-rich wall of a yeast cell and additionally phosphorylated.

The level of immunoglobulins and related specific antibodies is the most important mechanism of protection of the animal throughout the individual development [318].

The content of immunoglobulins in the colostrum of sows of the experimental groups is shown in table 7.35.

According to the results of research, we note that in the colostrum of

sows who consumed the usual basic diet (group I), the content of immunoglobulins (their sum) was lower than the physiological norm by 36%, which, in turn, will cause low immunity in piglets. It should be noted imbalances immunoglobulin *G*, females in the control group (*I*), at 38.9%, which will cause a lack of antibodies in newborn piglets needed to create of maternal immunity similar situation is observed with immunoglobulin *M*.

When the product «Actigen» is added to the main diet, the level of immunoglobulins (their amount) in the colostrum of experimental sows is observed by 39.7% in relation to the control. There is also an increase compared to the control concentration of immunoglobulin *A* in the colostrum of experimental sows by 0.1 mg/ml (*P>0.99*), immunoglobulin *M* by 3.1 mg/ml (*P>0.99*) and immunoglobulin *G* by 13.9 mg/ml (*P>0.999*).

Table 7.35

The content of immunoglobulins in the colostrum of sows, $\overline{X} \pm S_{\overline{X}}$

Group	The concentration of immunoglobulins, mg/ml			The number of immunoglobulins, mg/ml	The ratio of immunoglobulins, %		
	Ig A	*Ig M*	*Ig G*		*Ig A*	*Ig M*	*Ig G*
Norm	2.7	10.0	57.0	69.7	3.9	14.3	81.8
I	2.1 ±0.07	7.7 ±0.81	34.8 ±4.22	44.6	4.7	17.3	78.0
II	2.8 ±0.15 **	10.8 ±0.86 **	48.7 ±2.54 ***	62.3	4.5	17.3	78.2

An important fact is that after feeding the test drug in colostrum, the concentration of immunoglobulins *M* and *G* increased to a greater extent, because colostral immunity is due to the presence of these immunoglobulins in colostrum.

Table 7.36 presents indicators of reproductive qualities of sows depending on the presence or absence of feed additive «Actigen» in the diet.

It should be noted that the use of feed additive «Actigen» had a positive effect on the content of immunoglobulins in the colostrum of sows, which also likely increased the reproductive quality of sows.

The use of the presented drug did not affect the indicators of sow fertility and high fertility. But the following indicators show a probable advantage of the experimental group (II) over the control group (I). Thus, 9.8% more piglets were weaned from the sows of the experimental group compared to the control (*P> 0.95*), the piglets were also larger in weight at weaning by 8.8% (*P> 0.95*).

Table 7.36

The effect of feed additive «Actigen» on the reproductive qualities of sows, $\overline{X} \pm S_{\overline{X}}$

Indicator	Group	
	I (n = 24)	II (n = 24)
Multiplicity, heads	10.8 ± 0.21	10.7 ± 0.20
Large-fruited, kg	1.39 ± 0.02	1.40 ± 0.02
Number of piglets at weaning, heads	9.2 ± 0.28	10.1 ± 0.26 *
Live weight of piglets at weaning at 28 days, kg	8.0 ± 0.20	8.7 ± 0.24 *
Saving, %	85.2 ± 2.00	94.4 ± 1.80 **
Nest alignment during weaning, points	34.3 ± 2.40	52.2 ± 3.32 ***
The average daily gain on the suspension, g	236 ± 3.64	261 ± 4.00 ***

More complete colostrum in terms of immunoglobulin content, due to the use of feed additive «Actigen», led to higher values of the preservation of piglets in sows of the experimental group at the level of 94.4%, which is 9.2% more than control analogues (*P> 0.99*).

The experimental nests of piglets were more aligned at the time of weaning, as evidenced by the value of the index of alignment of the nest - 52.2 points, in contrast to the control group - 34.3 points. Piglets that received more complete colostrum were also characterized by higher average daily gains - 261 g, which is 25 g superior to control (*P> 0.999*).

Thus, studies have shown that the use of feed additive «Actigen» (mannan oligosaccharides) promotes the production of sows full colostrum, which improves the viability of piglets, increases growth energy and protects them from digestive disorders and life-threatening diseases.

7.2. Management of technological innovative solutions in the plant of rearing and fattening.

7.2.1. Development and implementation of technological innovative solutions in the growing shop. At the present stage of development of pig breeding in the world there are many options for effective technology for raising piglets from birth to transfer for fattening. The developers of these technologies are scientists, specialists of companies producing feed and equipment of domestic and foreign origin,

these technologies are implemented in farms of different sizes, methods of conducting the pig industry, etc. [263]. However, there are currently no agreed recommendations on the timing of transferring weaned piglets to the rearing area - on the day of weaning or, given the seven-day rhythm step, to perform this operation seven days after weaning.

Using the relevance of this issue and the interest of producers, as a result of research, the task was to investigate the impact of technological features of growing piglets during rearing on their productive qualities (live weight, average daily gain, safety), taking into account the factor - the time of transfer to rearing.

The experimental young were divided into two groups as follows: Group I - on the day of weaning sows are transferred to the area of single sows, and piglets on the same day were transferred to the area of rearing; Group II - weaned sows were transferred to the breeding area, but the piglets remained in the farrowing machines for another 7 days (according to the accepted rhythm step in the farms), and then transferred to the rearing area.

Weaning is a serious stress for piglets and one of the main critical periods of their lives, when the foundations are laid for future growth and development. Today it is well known that the weight of piglets at weaning and growth rates in the first 7-10 days after it significantly affect the efficiency of feeding throughout life until slaughter. Therefore, during this period it is necessary to ensure the highest average daily gain and good health of piglets.

The results of growing experimental piglets from weaning to 90 days of age are presented in table 7.37. It should be noted that at weaning the live weight of piglets in the experimental groups was almost the same, the difference in favor of piglets of group II was only 0.06 g (the difference is not statistically significant).

However, during the period of stay of experimental piglets on rearing we note a probable decrease in live weight in animals of group I by 4.86 kg compared with experimental youngs of group II ($P > 0.999$).

When studying this issue and observing the behavior and condition of piglets in both experimental groups, it should be noted that piglets that on the day of weaning fell on the rearing area (group I) for a longer time established a hierarchical relationship with each other, in contrast to those piglets that remained for another week in their farrowing machines (group II). Based on this, we state that the animals of the second group are better at merging nests in the rearing area.

Table 7.37

The results of growing experimental piglets (on average by farms), $\overline{X} \pm S_{\overline{X}}$

Indicator	Group		± II to I
	I	II	
Number of goals at weaning (28 days), goal.	1790	1790	-
Live weight of piglets at weaning, kg	8.01 ± 0.30	7.95 ± 0.28	-0.06
Number of goals at the age of 90 days, goals.	1672	1751	+79
Live weight of piglets at the age of 90 days, kg	33.41 ± 0.22	38.27 ± 0.14	+4.86 ***
Average daily gain, g	416 ± 6.8	497 ± 3.5	+81 ***
Saving, %	93.40 ± 1.85	97.82 ± 1.60	+4.42

Studies have shown that the animals of the first experimental group decreased feed consumption during the first days after transfer to the rearing area, in contrast to their counterparts in the second group, which after a week of adaptation in farrowing machines consumed much better feed in the rearing area. This fact was observed in the reduction of the average daily gain in piglets of group I, which was equal to 416 g, which is 81 g less than in young pigs of group II (*P> 0.999*).

According to the indicator of preservation of young animals in the period of rearing, a probable difference in terms of experimental groups was not established, but it was higher by 4.42% in young animals, which were weaned for another 7 days after weaning.

On the basis of the conducted researches in four farms with similar technology of conducting the pig industry («Mig-Service-Agro» agricultural firm, Dumitrash private enterprise, Mykolaiv region; «Tavriya pigs» of Kherson region and Novoselivske of Odessa region), that piglets, which after weaning remain for 7 days in their farrowing machines (group II), are likely to predominate in live weight and average daily gain, young animals that immediately after weaning enters the rearing area (group I).

In the rearing shop, the use of bunker feeders and feed machines, in contrast to conventional troughs, helps to maintain the proper level of sanitation in the piglet feeding area, reduce feed costs, etc. This reduces the cost of expensive "starter" feed, and continues to maintain the energy potential of the body, which contributes to the rational use of feed nutrients and provides a high growth rate of young pigs. But it is necessary to further

study the comparison between self-feeders of different designs and the influence of design features of feeders on the productive qualities of young pigs.

In the domestic market, there are self-feeders for feeding dry feed, which contain a hopper and a trough with distributors [413]. These feeders provide free feeding of pigs for a day or more. This device has several disadvantages:

- first, it does not regulate the height of the front wall of the trough, which leads to turning the feed piglets;
- secondly, in the case of the use of finely ground feed, they can be compressed and hang in the narrowed part of the hopper, resulting in a violation of the process of their uniform consumption by animals;
- thirdly, the device does not sufficiently stimulate the forage activity of pigs;
- fourth, rigidly fixed distributors create inconvenience when cleaning the trough from feed residues.

The aim of the research was to improve the feeder, taking into account - to prevent sticking and freezing of feed in the hopper of the feeder and to improve the conditions for maintenance and implementation of feed behavior of piglets.

The problem is solved by the fact that the feeder is movable in a horizontal position, contains brackets for adjusting and fixing its height, L-shaped sides and trough lattice to prevent foraging, lattice distributors with hinged shaped brackets with scrapers to prevent friction and prevent behavior of piglets. For convenient cleaning of a trough from the forage rests the lattice is hinged over a trough.

The essence of the utility model is illustrated by the drawing, where in Fig.7.7 and 7.8 show a general view of the feeder for pigs in axonometric projection; in fig. 7.9 is a horizontal section of the position of the device; in fig.7.10 - vertical section of the feeder for pigs.

Device containing hopper «1» with axes «2» hinged to the fence (not shown), trough «3», gate valve «4», with the mechanism «5» mounted on the upper edges of the front «6» and rear «7» walls, hinged to the front wall «6» lattice «8», which is formed by distributors «9» with hinged shaped brackets «10» with scrapers «11», brackets «12» and «13» and G -shaped sides «14» and «15», connected to the ends of the trough «3».

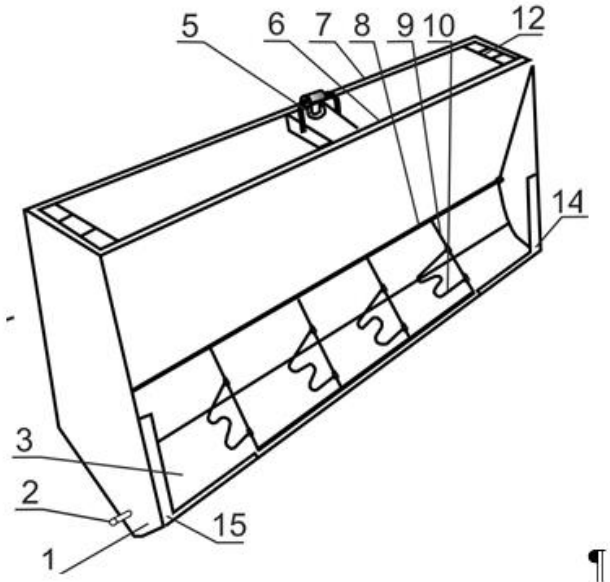

Fig.7.7. **General view of the self-feeder for pigs in oxonometric projection (option 1)**

1 - bunker; 2 - axes; 3 - trough; 4 - sliding gate; 5 - mechanism; 6 - front wall; 7 - rear wall; 8 - lattice; 9 - distributors; 10 - figured consoles; 11 - scrapers; 12; 13 - brackets; 14; 15 – «L-shaped» sides.

Self-feeding for pigs works this way. At the beginning of rearing or fattening hopper «1» with axes «2», hinged to the fence is filled with feed, which is poured into the trough «3» due to the raised gate valve «4».

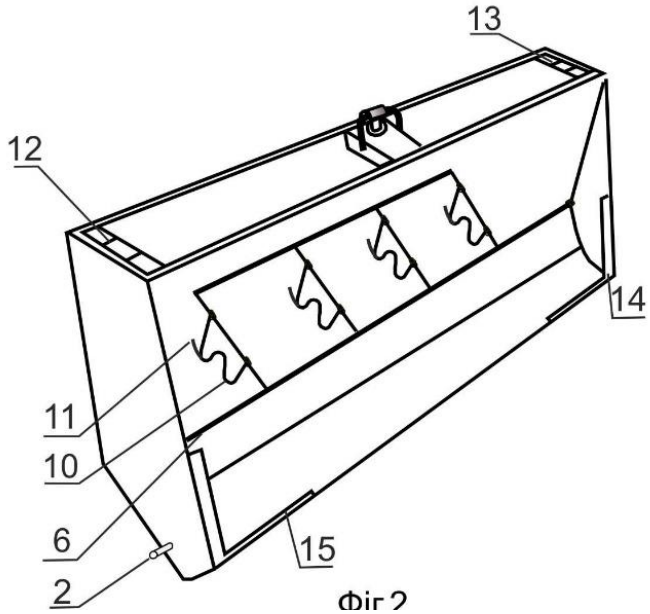

Fig. 7.8. **General view of the self-feeder for pigs in oxonometric projection (option 2)**

1 - bunker; 2 - axes; 3 - trough; 4 - sliding gate; 5 - mechanism; 6 - front wall; 7 - rear wall; 8 - lattice; 9 - distributors; 10 - figured consoles; 11 - scrapers; 12; 13 - brackets; 14; 15 – «L-shaped» sides.

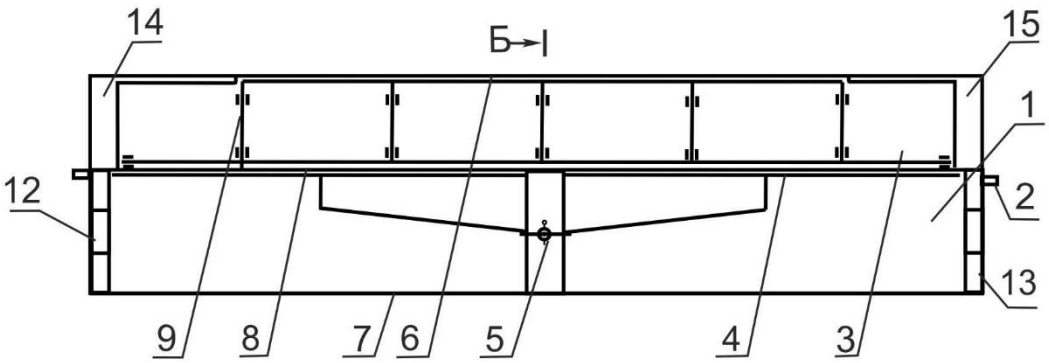

Fig. 7.9. **Horizontal section of the feeder for pigs**

Adjusting the feed to the trough «3» is by means of the mechanism «5», which is installed on the upper edges of the front «6» and rear «7» walls. Lattice «8» in the lowered state thanks to distributors «9» provides a feeding front of six animals. It also in a lowered state forms a kind of extension of the L-shaped sides «14» and «15» and prevents them from turning the feed out of the trough «3» piglets. If it is necessary to conveniently clean the trough from the remains of feed, the lattice «8» is raised to the stop in the front wall «6». Figured consoles «10», deviating to the sides under the pressure of the snout of one individual stimulate the consumption of food by neighboring individuals and thanks to scrapers «11» loosen the compacted feed in the lower narrowed part of the hopper «1» and promote its entry into the trough «3».

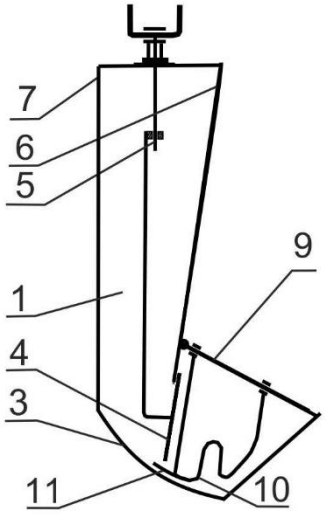

Fig. 7.10. **Vertical section of the feeder for pigs**

To adjust the height of the trough «3» at the end of the first or second third of rearing (fattening) to prevent raking of feed, the feeder is deflected in the opposite direction from the piglets and with brackets «12» and «13»

fixed to the adjacent fence (not shown).). The height of the trough «3», which allows you to easily consume and not rake the feed is determined by the average size of the piglets. The L-shaped sides «14» and «15» lattice which are fixed on end faces of a trough «3» also promote prevention of raking of a forage by piglets from a self-feeder.

The advantage of the proposed device is that it prevents the adhesion and freezing of feed in the hopper «1», and thanks to the lattice «8» facilitates the cleaning of the trough «3» from feed residues and improves conditions for maintenance and implementation of feed behavior of piglets.

As a result of the introduction into production of our proposed elements of improving the feeder for piglets for rearing, allowed to increase the fattening qualities of young pigs. The results of growing piglets on rearing depending on the type of feeder and genotype are shown in table 7.38.

Table 7.38

The results of growing piglets on rearing depending on the type of feeder, $\overline{X} \pm S_{\overline{X}}$

Indicator	A group of animals			
	I (WB×L)×P	II (WB×L)×D	III (WB×L)×P	IV (WB×L)×D
Assignment of groups	control (regular bunker)		research (advanced)	
Number of heads when staging (35 days), heads.	80	80	80	80
Live weight of piglets when placed for rearing, kg	10.1 ± 0.30	10.8 ± 0.32	9.8 ± 0.24	11.0±0.28
Number of goals at the age of 90 days, goals.	76	75	77	77
Live weight of piglets at the age of 90 days, kg	35.2 ± 0.32	36.5 ± 0.40	37.8±0.34 ***	38.2±0.52 **
Average daily increase, g	465 ± 6.8	476 ± 5.00	519 ± 3.5 ***	503±4.40 ***
Daily addition of compound feed per head, kg / day	1.5	1.5	1.5	1.5
Feed conversion, kg	3.23	3.15	2.89	2.98
Saving, %	95.0 ± 1.64	93.8 ± 2.00	96.3 ± 1.80	96.3 ± 1.86

The live weight of piglets at the age of 90 days was probably influenced by the use of an improved feeder for feeding compound feed for young pigs during the rearing period. Thus, the force of impact-type feeders

(A) was 8.52%, the strength of influence of genotype (B) experimental study on calves' index was - 1.33% and a large force of impact was marked joint influence factors (A × B) (tab. 7.39).

Table 7.39

Influence of feeder type and genotype on live weight of piglets at the age of 90 days

The strength of the influence of factors on the live weight of piglets at the age of 90 days						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2,%
Feeder type (A)	353.8	1	353.84	29.973	0.0000	8.52
Genotype (B)	55.4	1	55.439	4.696	0.0310	1.33
A × B	14.5	1	14.516	1,230	0.2683	0.35
Residual	3730.6	316	11.806	-	-	89.80
General	4154.4	304	-	-	-	-

The significant influence of the type of feeder on the live weight of piglets can be explained by the fact that the proposed feeder due to its design features stimulated the feeding behavior of the experimental young pigs.

Animals consumed better feed, there was less scattering and wrapping of feed, in contrast to the usual bunker feeder.

According to the results of the research, we note that the combination of two-breed sows large white × landrace with boars Pietren and Duroc had no significant effect on the average daily gain during the rearing period. Thus, the strength of the influence of genotype (B) on the studied trait was only - 0.07% (Table 7.40).

Table 7.40

Influence of feeder type and genotype on average daily growth of young animals

The strength of the influence of factors on the average daily gain						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Feeder type (A)	125282.0	1	125282	67,409	0.0000	17.23
Genotype (B)	476.1	1	476.11	0.256	0.6131	0.07
A × B	13947.4	1	13947	7,504	0.0065	1.92
Residual	587299.7	316	1858.5	-	-	80.78
General	727005.3	304	-		-	-

Regarding the type of feeder, we note that the strength of the influence of this factor (A) was 17.23%, also noted the probable influence of both factors (A × B) on the average daily gain on rearing - 1.92%.

Neither the type of feeder nor the genotype was found to be likely to

be affected by the study.

Thus, due to the design features of the proposed device, which prevents sticking and freezing of feed in the hopper, and due to the lattice facilitates cleaning of the trough from feed residues and improves conditions for maintenance and implementation of feed behavior of piglets, it is possible to increase live weight of piglets and their average daily gain rearing.

The method of increasing the productivity and safety of piglets. Nowadays, there is a significant loss of young animals in farms due to dyspepsia, cholesterol toxemia, salmonellosis. A large percentage of these diseases account for cholesterol toxemia [20, 263]. Thus, the disease becomes relevant due to its frequent occurrence.

Cholesterol toxemia (edema) is an acute infectious disease of piglets, mostly of weaned age, characterized by dysfunction of the central nervous system, enterotoxemia, edema in various organs and tissues. This disease usually affects piglets with better fattening after weaning from sows. This occurs in weaned piglets with excessive and greedy consumption of a large part of the feed, mostly unusual, difficult to digest. Lustful consumption of food often leads to overflow and overload of the stomach, and thus - to severe indigestion. Treatment of edema is effective only at the beginning of the disease. The main measure should be prevention [294, 372, 373, 522].

Researchers offer different ways to solve this problem. In particular, B.L. Belkin, V.S. Prudnikov, A.M. Malakhov and others believe that all suspected piglets for this disease should be immediately given orally 10% calcium chloride and sodium chloride 5 ml three times a day. Next, to accelerate the evacuation of the contents of the gastrointestinal tract and reduce the absorption of toxins in the feeders of piglets need to pour 5% solution of Glauber's salt. According to S. Bobruyko, the method of dosed suckling should be used to prevent edema in piglets. It was used in the two-phase method of raising piglets: with the help of special shields with a manhole, piglets were denied access to sows, kept in "dining rooms" for piglets from two to three hours to three to five days, there is gradually weaned from sows.

According to M. Burlaka, for the prevention of edema in piglets for four days before and after weaning per 100 kg of feed should be given: 50 g of chlortetracycline, 200 g of sulfadimesine, 60 g of copper sulfate, 40 g of furazolidone, 50 g of pharmazine. Within 10 days after weaning, the author recommends reducing the amount of total feed by 20% [44, 48].

Good results in the prevention of edema of piglets provides a Polish

product «*Bioveta»*, which contains sulfadimethoxine and zinc oxide.

According to V.P. Urban, I.L. Naimanov, the most effective and cheapest method of prevention and treatment of the disease is feeding weaned piglets within the zoohygienic norms of table salt.

In connection with the above, it should be noted that in today's pig farming practice there is no clear opinion on the term of use of salt to prevent edema of weaned piglets. Therefore, the main purpose of the study was to study the use of table salt of weaned piglets for the prevention of edema (cholesterol toxemia).

In connection with the above, we set a task to determine the optimal period of free access of weaned piglets to table salt in feeders. For this purpose we carried out scientific and practical experiment in the conditions of Agrofirm «Mig-Service-Agro» of the Novoodesky region of the Nikolaev area, having formed 5 experimental groups of weaned piglets with live weight of 8 kg by the principle of analogs: I control group which piglets did not have free access to cooked salts; Experimental group II - animals whose animals had access to table salt 10 days before and 10 days after weaning; Experimental group III - 7 days before and 7 days after weaning; IV experimental group - 4 days before and 4 days after weaning; V experimental group - 1 day before and 1 day after weaning. The total number of pigs in each group was 180.

In addition, we studied the motor behavior of piglets in the experimental groups in the form of the number of approaches to the feeder with salt. Motor behavior was studied by visual observation from 6 am to 6 pm. Performance indicators of piglets during the rearing period according to the experiment are shown in table 7.41.

As a result of our study, we found that the rate of high fertility in all experimental groups was in the range of 1.41-1.44 kg. The duration of the sucking period was 30 days. The largest number of piglets at the age of 90 days was found in the IV experimental group, which exceeded I, II, III, V groups by 5.6%, 2.2%, 3.4%, 2.8%, respectively.

Thus, the largest live weight was recorded in piglets of the IV experimental group, which had free access to salt 4 days before and 4 days after weaning - 37.8 kg and probably exceeded the animals of I, II, III, V experimental groups by 7.4 kg, 1.8 kg, 2.0 kg, 2.1 kg, respectively. However, it should be noted that according to this indicator, the piglets of all experimental groups probably exceeded the control peers by 5.3-5.6 kg.

Table 7.41

Productivity of piglets during rearing, $\overline{X} \pm S_{\overline{X}}$

Indicator	Time of free access to table salt, days				
	without salt	10 days before and 10 days after weaning	7 days before and 7 days after weaning	4 days before and 4 days after weaning	1 day before and 1 day after weaning
A group of animals	I	II	III	IV	V
Number of animals in the group, heads	180	180	180	180	180
Large-fruited, kg	1.44 ± 0.04	1.43 ± 0.03	1.41 ± 0.02	1.42 ± 0.02	1.42 ± 0.03
Duration of the sucking period, days	30	30	30	30	30
Number of piglets at the age of 90 days, heads	168	174	172	178	173
Saving, %	93.3 ± 2.20	96.7 ± 2.20	95.6 ± 2.10	98.8 ± 1.80 a, b, c, e	96.1 ± 2.14
Live weight at the age of 90 days, kg	30.4 ± 0.56	36.0 ± 0.40 a	35.8 ± 0.32 a	37.8 ± 0.42 a , b, c, e	35.7 ± 0.32 a
The average daily increase in rearing, g (90 days)	321.8 ± 6.83	384.1 ± 6.00	382.1 ± 5.70	404.2 ± 5.56 a, b, c, e	380.9 ± 5.75

Notes: *a - probable excess of indicators of the I control group; b - probable excess of indicators of the II experimental group; c - probable excess of indicators of the III experimental group; e - probable excess of the V of the experimental group.*

This fact contributed to the increase in the average daily growth of piglets of group IV on rearing - 404.2 g , in contrast to peers of groups I-III - 321.8-384.1 g.

Thus, the highest survival of piglets was also recorded in piglets of the IV experimental group - 98.8%.

These calculations indicate that the best option for the prevention of edema in piglets is the use of salt in free access to it 4 days before and 4 days after weaning.

In our opinion, the physiological effect of table salt for the prevention of edema in piglets is the existence of a "potassium-sodium pump". Nutrients from food in the intestines enter the bloodstream through the mucous membrane, which then delivers them to the tissues. Through the

thinnest capillaries (blood vessels) they get into the extracellular fluid, the surrounding cells. From here they are pumped to the cells of the body.

The movement of fluid inside the cell is due to miniature "pumps" that are located on the inner shell of the cell. First, they pump sodium out of the cell through the smallest pores. As a result, the concentration of sodium in the intracellular fluid decreases in the presence of salt in the diet. Other sodium ions penetrate through the protective membrane into the cell. There is a constant exchange of fluids between the outer and inner space of the cell. Otherwise, there is an accumulation of fluid near the meninges, which provokes edematous, and then the nervous form of edema.

Such "gateways", which organize the inflow of nutrients into the cell, work only in the presence of large amounts of potassium. Potassium-carrying particles then enter the cell, while sodium is pumped out and enters the extracellular fluid. Therefore, at the first symptoms of edema of piglets, practitioners recommend forcibly giving suspicious piglets a teaspoon of common salt at once, and then make it free access to the piglet feeder. If you take such actions immediately, the symptoms of this dangerous disease will disappear later.

Thus, in the course of the study we find that in order to prevent cholesterol toxemia of piglets on rearing, the cheapest method is the use of salt 4 days before and 4 days after weaning from the sow.

As a result of research on the use of salt for the prevention of edema in piglets, the amount of salt eaten by piglets in the experimental groups was investigated. During the experiment it was found that the piglets of the experimental group II during free access to salt (10 days before and 10 days after weaning) the first 3 days did not consume salt, and approaches to the feeder were solely out of interest, then the piglets tried to taste interested object (salt), sniffed it, etc. The same trend of limited salt consumption was observed in the last three days, where the piglets lost interest in this feeding, and physiologically did not need this element, and therefore feeding was trampled, contaminated, etc. During the experimental period, the piglets of the II experimental group ate 5.92 g of table salt.

As for the III experimental group, we note that the piglets of this group during free access to salt (7 days before and 7 days after weaning) for the first 2 days did not consume salt, but only first sniffed it, and then tried to eat, and the last two days also lost interest in table salt due to the physiological saturation of these trace elements. During the experiment, piglets in this group ate 6.58 g of salt.

Young animals of the IV experimental group during the time of free

access to table salt (4 days before and 4 days after weaning) almost from the first day consumed table salt and showed great interest in mineral fertilization. During the experiment, the piglets consumed 8.14 g of salt.

Of course, piglets of the V experimental group, the time of free access to salt (1 day before and 1 day after weaning) is insufficient for the prevention of edema, and therefore the amount of mineral fertilizer consumed is 3.82 g.

Subsequently, during the observations it was found that piglets of II, III experimental groups during the observations made an average of 12 approaches to the feeder with table salt, and piglets of IV, V experimental groups during the observations made an average of 16 approaches to the feeder with mineral salt. top dressing.

As a result of research conducted in the conditions of Agrofirm «Mig-Service-Agro» of the Novoodesky district of the Nikolaev area it is established that the most optimum and cheapest way of prevention of an edematous disease of piglets is use of table salt 4 days before and 4 days after weaning. In addition, it was found that piglets (IV, V experimental groups) made an average of 16 approaches to the feeder with salt.

Patent 117,639 Ukraine, IPC A01K67 / 02 (2017.01). The method of increasing the productivity and safety of piglets / Borodaenko F.A., Lykhach V. Y., Lykhach A.V., Ivanov V.O., Zasukha L.V. ; applicant and patent owner Institute of Pig Breeding and APV NAAS. - № u201701612 ; declared 28.02.2017 ; public. 26.06.2017, Bull. № 12.

The method of growing weaned piglets. Raising young animals is the most important stage in pig breeding, the results of which determine the final zootechnical and economic indicators of the industry. Therefore, the issue of growing young animals, especially the organization of its full feeding, should be given maximum attention [250, 372, 470]. Biological features of newborn animals are anatomically and functionally underdeveloped digestive system in comparison with adult animals. Up to 3 weeks of age, the stomach of piglets does not produce hydrochloric acid, without which gastric juice enzymes that digest proteins, lipase, which breaks down fats, cannot function properly. Gastric juice of young animals is devoid of bactericidal properties, as a result of which they are prone to gastrointestinal diseases [48, 154].

In this regard, to ensure profitable pork production, one of the defining links in the technology of growing young pigs is to increase the efficiency of feed use.

Modern compound feed enterprises, shops for feeding pigs produce

both loose and granulated compound feeds.

In the production of feed in bulk grain and non-grain components are cleaned, crushed, dosed according to the recipe, mixed. Compound feed made by this technology has a low enough digestibility of nutrients. The starch of the grain components, which occupy the largest part of the feed, is in a form inconvenient for assimilation by the body of animals, especially for young pigs. The use of such feed has a number of disadvantages: self-sorting of feed during transportation and storage, selective consumption of components by animals. The presence of fine fractions in placer feed leads to feed loss during transportation and feeding, to irritation of the mucous membranes of the respiratory tract and eyes, stressful condition of animals during feeding, low sanitary quality and feeding efficiency. This method requires a large number of technological and transport equipment and is characterized by high specific costs of electricity for feed production. Changes in the raw material base, in particular, the tendency to reduce the amount of cereals in the diet, contamination of grain with mycotoxins, global shortage of fishmeal, ban on the use of meat and bone meal, and in Ukraine in addition, falsification and low quality of this group of feeds , require the use of another physical form of feed [17, 167, 306]. In addition, most pig farms in Ukraine consider it appropriate to use feed in bulk, as energy costs for pelleting are not paid by the growth of pigs.

Granulated feed is most acceptable for young pigs. In the process of granulation, up to 95% of colonies of molds that produce toxins are destroyed. Heat treatment inactivates specific inhibitory factors that limit or disable the physiological functions of animals.

During granulation, the biopolymers that make up the main part of organic matter change significantly. Moisture heat treatment causes denaturation of the protein, affects the solubility of its fractions and their ratios. Starch is 16% gelatinized and converted into a form more accessible to enzymes, which is very important for young pigs. The positive effect of the granulation process on the quality of feed is largely due to changes in the physicochemical properties of plant fibers, which leads to the formation of low molecular weight carbohydrates. As a result, the amount of crude fiber and lignin in the feed is reduced by 1.2-1.3 times. In the process of granulation, fat is released from the fat cells of the components (meal, cake, etc.), reducing its viscosity, the fat is more evenly distributed on the surface of the feed, which contributes to better digestibility. Digestibility of protein in such feeds increases by 1.6%, fat - by 4.6-9.7, fiber - by 3.8%. However, various technological factors (heat, moisture, mechanical pressure) lead to

some changes in low molecular weight components: amino acids, vitamins and other substances. Some scientists believe that the most destroyed is vitamin A. The loss of vitamins E and K reaches 12-15% during granulation, and vitamin C is destroyed by 25%. Water-soluble vitamins (choline, choline chloride, niacin and its amides) are quite stable under normal production conditions, the loss of vitamins B_1, B_2 *and* B_{12} *is* insignificant [309].

Heat treatment has almost no effect on the content of mineral components in the feed, but sometimes changes in their digestibility by animals are possible.

It can be concluded that in the process of granulation physicochemical transformations of the main biopolymers of feed (proteins, starch, fiber), which increase the nutritional value of the product, significantly exceed the changes in low molecular weight components (vitamins, amino acids, enzymes) and contribute to better 22%) feed sales and intensity (by 6.7-23.7%) growth of pigs.

Given the above, the technology of production of finished products should include stages of preparation of components in accordance with the physiological characteristics of animals and heat treatment of both raw materials and finished products.

Summarizing the data from various sources, it should be noted that the feasibility of using granular feed in the diets of piglets, of course, proven, but not widely used (as pre-starter feed). In addition, there is no exact data on what should be the length of the granules, because in most cases, granules with a diameter of 0.5 cm are used.

Therefore, based on the task invention to provide a method of growing weaners, including feeding granular feed using granules, whose diameter varies between 2-4 mm (Patient number 118222).

The essence of the method is as follows: for the experiment were formed five groups of piglets-analogues at the age of 35 days, 160 heads each. Young animals throughout the experiment (from 35 to 90 days of life) were fed daily the same nutrient feed according to the accepted technology. But the physical form of feed was different. Piglets of the first group consumed feed in the form of crumbs, the second, third, fourth and fifth - in the form of granules with a diameter of 2, 3, 4 mm, respectively

Taking into account the conditions of keeping on the farm, five groups of piglets were determined to be equal in number (160 heads), of which the first - control, and II, III, IV, V - experimental. Rhythm step on the farm 7 days. Therefore, we compared 5 groups that settled in separate boxes of the

growing shop in equal groups with an interval of a week. In addition, we calculated and analyzed the index of forage activity at the end of the rearing period. The results of the experiment on the effect of feed on the productivity of piglets on rearing are shown in table 7.42.

Table 7.42

Influence of physical condition of compound feed on productivity of piglets on rearing, $\overline{X} \pm S_{\overline{X}}$

№ s/n	Sign	Physical condition of compound feed				
		loose	crumb	granular, diameter, mm		
				2	3	4
1	A group of animals	I	II	III	IV	V
2	Number of animals when placed for rearing, heads.	160	160	160	160	160
3	Age of piglets when placed for rearing, days	35	35	35	35	35
4	Live table at staging on rearing, kg	10.1 ± 0.30	10.4 ± 0.32	9.8 ± 0.24	10.6 ± 0.40	10.3 ± 0.28
5	Live weight of animals when transferred from prestarter (granules) to starter compound feed (45 days), kg	12.0 ± 0.48	11.8 ± 0.30	12.1 ± 0.40	12.2 ± 0.60	11.8 ± 0.44
6	Live weight of piglets when transferred to fattening (90 days), kg	29.7 ± 0.50	30.6 ± 0.28	32.4 ± 0.36	36.8 ±0.36 [a, b, c, e]	31.8 ± 0.48
7	Average daily increase in rearing, g	356.4 ± 10.12	367.3 ± 8.30	410.9 ± 6.24	476.4 ± 7.20 [a, b, c, e]	390.9 ± 8.80
8	Number of piglets when transferring to fattening, heads.	150	153	156	158	156
9	Saving, %	93.8 ± 1.96	95.6 ± 2.40	97.5 ± 2.00	98.8±2.00 [a]	97.5 ± 1.96
10	Index of forage activity (on average) at the end of the growing season	0.183 the most common	0.153 the most common	0.210	0.256	0.215

Notes: *a - probable excess of indicators of the I control group; b - probable excess of indicators of the II experimental group; c - probable excess of indicators of the III experimental group, .e - probable excess of indicators of the V experimental group.*

These tables convincingly show that the feeding of granular feed with a granule diameter of 3 mm in comparison with loose and crumb contributed to an increase in live weight gain by 33.67% and 29.7%, respectively, during the experiment, or 7.8% for the whole growing season.

A similar result was obtained when comparing the method of feeding piglets when feeding compound feed, the size of the granules of which was 2, 3, 4 mm.

Thus, the feeding of granular feed with a granule diameter of 3 mm compared with 2.4 mm contributed to an increase in live weight gain by 15.94, 21.87 and 22.46%, respectively, during the experiment. The survival of piglets during the rearing period was also the highest in the IV experimental group, where pigs consumed granular feed 3 mm long, and amounted to 98.8%.

This indicates that this physical state of the feed has a positive effect on the digestive processes in the gastrointestinal tract of piglets.

As for feed costs, we note that they were approximately the same in all groups. Regarding the index of feed activity, we note that piglets (group IV) that consumed granular feed with a granule diameter of 3 mm had the highest index - 0.256, and animals of this group spent more time on the number of approaches and stays near feeders, interest in the feed object (compound feed) in piglets was higher because it was more often sniffed and tasted, less contaminated and scattered compared to analogues of I, II, III and V experimental groups, where the index of their feed activity was slightly lower, in particular 0.183, 0.153, 0.210, 0.215 in accordance.

Therefore, the data of this experiment showed that on granular feed with a granule diameter of 3 mm piglets not only grew more intensively, but also the group before transfer to fattening was more homogeneous in live weight compared to control, which reduced the intragroup hierarchy between animals when transferring them for fattening. .

Thus, in comparison with the prototype, the proposed utility model has the following advantages: piglets spent more time on the number of approaches and stay near the feeders, had a higher interest in feed, sniffed and tasted more often and less polluted and scattered it; increased weight gain of piglets per day by 12%; feed costs per unit weight gain decreased by 9.8%, feed digestibility and safety of pigs increased due to the exclusion of disorders of the gastrointestinal tract.

Patient 118,222 Ukraine, IPC A01K67 / 02 (2017.01). The method of growing pigs weaned / Lykhach A.V., Lykhach V. Y., Borodayenko F. A., Ivanova L. A.; applicant and owner of the Institute of Pig Breeding and APV NAAS. № u201701923 ; declared 28.02.2017 ; public. 25.07.2017; Bull.№ 14.

7.2.2. Development and implementation of technological innovative solutions in the fattening shop. *Fattening and meat qualities of young pigs with different sensitivity and housing conditions.* Farm animals are characterized by a high degree of herd organization. Herd instinct leads to their rapprochement, and antagonism - to separation. Therefore, to obtain good results with a group method of detention, it is necessary to strive for maximum consistency of group composition. However, this usually contradicts other technological requirements. In particular, the decisive factor is to provide animals with a level of feeding according to their age, physiological condition and productivity.

The process of forming groups causes a strong stress response in animals, associated with the need to establish a certain rank in the group. When forming a group or with the appearance of a «newcomer» there is significant excitement, anxiety, clashes, fights, until a certain hierarchical order is established. The position of the animal in the group is closely related to its weight and aggression.

The higher the animals are on the hierarchical step, the more persistent the struggle for supremacy between them. In this regard, the more frequent regrouping and recruitment of new groups, the stronger and longer the stress reactions, the more pronounced their negative effects, which are manifested in reduced growth energy, increased morbidity, etc. Highly productive animals react especially strongly to regrouping. [399, 433].

According to the research of many scientists and practitioners, it is noted that one of the stressors that negatively affects the body of animals is their content in large groups, which is provided by the technology of industrial pork production. In these cases, aggression increases, the normal organization of the herd is disrupted, because the animals of the lowest rank cannot avoid meeting with aggressive animals, which leads to frequent fights. In conditions of fierce competition, weak, timid animals are not able to fully meet their needs, are in constant anxiety and excitement. The consequence of stress in them is reduced productivity and other disorders [261, 483, 510].

Based on the above, it is of considerable interest to study the peculiarities of growth rate, metabolism, fattening and meat qualities of piglets with different stress sensitivity in different growing conditions.

Analysis and study of the peculiarities of growth in the dynamics allows to more objectively assess the intimate processes that underlie the development of stress in sensitive animals and purposefully determine the

search for ways to prevent it. To this end, the following studies were conducted. At the end of the suckling period in piglets was determined by the degree of stress sensitivity. To do this, on the first day after weaning, the piglets were injected subcutaneously behind the auricle with 40% formaldehyde solution, and on the second day, their immunological response was assessed by the size of the swollen spot. To stress-resistant, stress - prone and stress-doubtful were young animals, in which the size of the swollen spot ranged from 1.1 to 1.5, respectively; 2.1-2.5 and 1.6-2.0 cm. After selection, three groups of piglets were formed, in each of 40 animals, the breed of experimental piglets was the same ♀ (WL × L) × ♂P. Observations were performed for 180 days. The research results are presented in table 7.43.

Table 7.43

Dynamics of live weight of young pigs with different sensitivity and rearing conditions (kg), (*n* =40), $\overline{X} \pm S_{\overline{X}}$

Age, miss.	Group		
	I stress resistant	II stress-sensitive	III mixed (50% - stress - resistant; 50% - stress - sensitive)
1	7.3 ± 0.20	7.8 ± 0.24	7.5 ± 0.18
2	20.2 ± 0.28	20.3 ± 0.26	19.1 ± 0.28 **
3	32.1 ± 0.26	30.4 ± 0.26 **	29.3 ± 0.24 ***
4	56.1 ± 0.28	53.6 ± 0.24 ***	51.8 ± 0.22 ***
5	82.2 ± 0.26	80.3 ± 0.21 ***	78.1 ± 0.24 ***
6	106.5 ± 0.28	100.3 ± 0.18 ***	97.8 ± 0.19 ***

According to the results of the research, it was established that stress-resistant and stress - sensitive animals raised in different conditions had different values of live weight. Thus, at the age of 30 days, piglets of all groups had almost the same live weight, no probable difference between the groups was found.

At the age of two months in the groups of stress-resistant animals and stress - sensitive animals that were raised separately, the live weight was also the same, there is they responded equally to the stress factor - weaning and kept the same growth energy. In the group of animals that were mixed (group III), live weight at this age was lower than stress-

resistant and stress - sensitive animals that were bred separately.

From the age of three months, there is a clear trend of the predominance of stress-resistant animals in terms of live weight over analogues of stress-sensitive animals and the mixed group (50% - stress - resistant; 50% - stress - sensitive). The live weight of young pigs depended on the conditions of their rearing.

Differences in changes in live weight were confirmed by the level of absolute, average daily and relative increments (Table 7.44 -7.46), as live weight is directly proportional to them.

The value of absolute growth in young pigs of the experimental groups tended to increase with age. A slight decrease was observed at the age of 2-3 months.

Table 7.44

Dynamics of absolute growth of young pigs with different sensitivity and rearing conditions (kg), (*n* =40),

Age periods, months	Group		
	I stress resistant	II stress-sensitive	III mixed (50% - stress - resistant ; 50% - stress - sensitive)
1-2	12.9 ± 0.36	12.5 ± 0.40	11.6 ± 0.54 *
2-3	11.9 ± 0.50	10.1 ± 0.56 **	10.2 ± 0.65 *
3-4	24.0 ± 0.52	23.2 ± 0.50	22.5 ± 0.60 *
4-5	26.1 ± 0.32	26.7 ± 0.41	26.3 ± 0.64
5-6	24.3 ± 0.32	20.0 ± 0.46 ***	19.7 ± 0.82 ***

The absolute growth rates in young pigs, which were defined as stress-sensitive, were higher in contrast to the absolute growth rates in young piglets reared with stress-resistant pigs.

According to the results of the analysis of the average daily gain, a similar trend was noted, stress-resistant animals (group I) probably outperformed the analogues of groups II and III, in all age periods.

The absolute growth rates in young pigs, which were defined as stress-sensitive, were higher in contrast to the absolute growth rates in young piglets reared with stress-resistant pigs.

Table 7.45

Dynamics of average daily growth of young pigs with different sensitivity and rearing conditions (g), (*n* =40),

Age periods, months	Group		
	I stress resistant	II stress-sensitive	III mixed (50% - stress - resistant; 50% - stress - sensitive)
1-2	424 ± 8.51	411 ± 9.10	382 ± 8.74 **
2-3	391 ± 8.40	332 ± 10.00 **	356 ± 9.04 **
3-4	790 ± 8.48	763 ± 9.84 *	740 ± 10.32 **
4-5	859 ± 8.60	878 ± 9.20	865 ± 12.00
5-6	799 ± 8.20	658 ± 8.44 ***	648 ± 11.80 ***

According to the results of the analysis of the average daily gain, a similar trend was noted, stress-resistant animals (group I) probably outperformed the analogues of groups II and III, in all age periods. Stress-sensitive animals that were with stress-resistant animals grew less intensively than stress-resistant and stress - sensitive animals that were raised separately.

A significant increase in growth rate in the experimental groups was observed after 90 days of age and reached its peak value at the age of 4-5 months. It was during this period that the separate cultivation of stress-sensitive animals made it possible to obtain the highest values of the average daily gain - 878 g.

Table 7.46

Dynamics of relative growth of young pigs with different sensitivity and rearing conditions (%), (*n* =40), $\overline{X} \pm S_{\overline{X}}$

Age periods, months	Group		
	I stress resistant	II stress-sensitive	III mixed (50% - stress - resistant; 50% - stress - sensitive)
1-2	104.9	99.6	98.4
2-3	45.5	39.8	42.1
3-4	54.4	55.2	55.5
4-5	37.7	39.9	40.5
5-6	25.8	22.1	22.4

During this period, the indicators of average daily gains in terms of groups probably did not differ, which can probably be explained as a manifestation of the compensatory response. In the age period of 5-6 months, only young animals that were separated as stress-resistant maintained a fairly high level of average daily growth, the growth energy decreased less compared to the previous period.

Evaluating the experimental groups in relation to the indicator of relative growth, which characterizes the intensity of growth of the organism, it was found that for all groups the value of relative growth was the highest in the period of 1-2 months and ranged from 98.4 to 104.9%. The highest value of this indicator was characterized by animals of group I - stress - resistant.

With age, the value of relative growth in young animals of all groups decreased, a more intense decrease was observed in young animals of group III, where stress-sensitive animals were with stress-resistant.

Thus, based on the above, we can conclude that piglets with different stress sensitivity in intensive technology are growing at different speeds.

It is known that the growth rate of pigs at an early age affects their meat and fattening qualities [211, 485]. In this regard, in terms of studying the physiological characteristics of piglets with different stress sensitivity, it was appropriate to determine the age at which they reach a live weight of 100 kg, features of protein and carbohydrate-lipid metabolism, slaughter and meat qualities. The results of studies on the fattening qualities of young pigs with different sensitivity, which are raised in different conditions are presented in table 7.47.

Table 7.47

Feeding qualities of young pigs with different sensitivity and rearing conditions (*n* =40), $\overline{X} \pm S_{\overline{X}}$

Group	Age of reaching live weight 100 kg, days	The average daily increase in fattening, g	Feed costs per 1 kg of growth, feed. from
I	174.3 ± 2.46	801.6 ± 6.25	3.25
II	182.5 ± 2.52	769.9 ± 7.96	3.46
III	185.3 ± 2.93	744.2 ± 5.36	3.52
+/- II to I	+8.2 **	-31.7 ***	+0.21
+/- III to I	+11 **	-57.4 ***	+0.27
+/- III to II	+2.8	-25.7 ***	+0.06

According to the results of research, it was found that stress-resistant animals of group I had the youngest age of 100 kg live weight - 174.3 days, which is 8.2 days (*P> 0.99*) and 11 days (*P> 0.99*) less than II (stress-sensitive) and III (mixed) groups. A significant difference in this indicator between young animals, which were defined as stress-sensitive and mixed group was not found, but stress-sensitive animals that were raised separately reached a live weight of 100 kg faster.

The rate of average daily gain was higher in stress-resistant animals - 801.6 g and probably outperformed peers in this indicator from the second and third groups. Stress-sensitive young animals fed in a separate group had a better result in terms of average daily gains in contrast to stress-sensitive young animals reared with stress-resistant animals, where the difference was 25.7 g (*P> 0.999*).

Higher rates of precocity and average daily gains led to lower feed costs. We indicate that the lowest feed costs were characterized by stress-resistant animals - 3.25 feed. from one kilogram of gain, in turn, 3.46 feed. one per kilogram of gain was spent on sensitive animals, which were raised separately and the highest feed costs were observed in animals of the mixed group - 3.52 feed. from

Thus, a comparative analysis of the obtained data allows us to conclude that stress-resistant young animals have better fattening qualities than stress-sensitive animals. They are more precocious and consume less feed per unit of growth. Growing separately stress-sensitive animals can increase their fattening qualities.

One of the most pressing problems of modern animal husbandry is the study of the impact of stress factors of industrial technology on the body of animals, of particular interest is the study of biochemical properties of their blood, because in zootechnics interior research aimed at finding and understanding stable internal systems of animals. which make it possible to analyze the level of viability of the organism in harsh conditions, to assess the physiological state and intensity of intermediate metabolism in animals [319, 348].

During the action of stress in the body of animals changes the activity of the endocrine glands and the course of metabolic processes, which causes changes in all types of metabolism. The study of indicators of protein metabolism in the body of pigs carried out by analyzing the levels of total protein (biuret reaction), urea (diacetylmonooxime method) and creatinine (by color reaction Jaffe) (tab. 7.48).

Table 7.48

Indicators of protein metabolism of young pigs with different sensitivity and rearing conditions, (*n* =10), $\overline{X} \pm S_{\overline{X}}$

Group	Total protein, g/l	Urea, mmol/l	Creatinine, kmol/l
I - stress - resistant	91.6 ± 1.96	2.77 ± 0.58	148.7 ± 14.22
II - stress - sensitive	84.5 ± 2.22	2.28 ± 0.30	168.4 ± 13.24
III - mixed (50% - stress - resistant ; 50% - stress - sensitive)	81.7 ± 3.12	1.50 ± 0.24	211.3 ± 14.80
+/- II to I	-7.1 **	-0.49	+19.7
+/- III to I	-9.9 ***	-1.27 *	+62.6 **
+/- III to II	-2.8	-0.78 *	+42.9 *

The amount of protein in the blood of animals can be judged on the intensity of metabolism in the body. They maintain blood viscosity, regulate *pH,* colloidal - osmotic pressure, provide transport of many substances.

It was found that animals of group I (stress-resistant) prevailed in the content of protein in the blood in comparison with animals of group II (stress-sensitive) and group III (mixed group: 50% - stress - resistant; 50% - stress - sensitive) by 7.1% (*P> 0,99*) and 9.9% (*P> 0.999*). This suggests that anabolic processes in stress-resistant animals are more focused on protein deposition and increased muscle tissue.

The end product of protein metabolism is urea, the main component of residual nitrogen in the blood of mammals [108, 304]. The concentration of urea depends on the intensity of its synthesis and excretion, so determining its content is an important test to assess both the function of the liver where it is synthesized and the kidneys through which it is excreted.

The level of urea, as the end product of protein metabolism, was probably lower in stress-sensitive animals (group II) by 17.7% (difference is not probable) and in animals of mixed group by 45.8% (*P> 0.95*). There is a probable difference in the level of urea between animals of groups II and III. This may be due to the development of the resistance stage. During the development of the stage of anxiety and stress resistance there is a hormonal adjustment of the body, which results in the mobilization of deposited carbohydrates, increased lipolytic processes with the development of lipomobilization syndrome and reduced breakdown of structural proteins. The decrease in serum urea is also observed in alimentary depletion.

The level of creatinine and the rate of glomerular filtration in the blood is accepted by the main laboratory criteria in the characterization of chronic renal failure and helps to confirm the violation of nitrogen metabolism in the body. Steady increase in creatinine in the blood of stress-sensitive pigs of group II and to a greater extent in pigs of group III (mixed group: 50% - stress - resistant; 50% - stress - sensitive) indicates a violation of the renal filter.

According to the research carbohydrate-lipid metabolism in the body of local pigs with different stress sensitive grown under different conditions found that glucose (glucose oxidase method) was in the normal range in the blood of animals of all experimental groups (tab. 7.49).

However, in animals of group III it tends to decrease in comparison with stress-sensitive, bred separately and stress-resistant by 16.5 and 30.3%, respectively (*P> 0.95*), which indicates its intensive use to ensure an increased level of metabolic processes and development stages of stress resistance, as well as depletion of stored glycogen.

Table 7.49

Indicators of carbohydrate-lipid metabolism in young pigs with different sensitivity and rearing conditions (*n* =10), $\overline{X} \pm S_{\overline{X}}$

Group	Glucose, mmol/l	Cholesterol, mmol/l	Triacylglycerols, kmol/l
I - stress - resistant	2.61 ± 0.24	4.34 ± 0.30	3.48 ± 0.28
II - stress - sensitive	2.18 ± 0.42	3.35 ± 0.21	3.05 ± 0.18
III - mixed (50% - stress - resistant; 50% - stress - sensitive)	1.82 ± 0.30	2.90 ± 0.20	2.48 ± 0.42
+/- II to I	-0.43	-0.99 **	-0.43
+/- III to I	-0.79 *	-1.44 ***	-0.6 *
+/- III to II	-0.36	-0.45 *	-0.27

The level of cholesterol (enzymatic method) in the blood of animals with different sensitivity varied in the range of 2.90-4.34 mmol/liter. The lowest level of cholesterol in the blood of animals of the mixed group, which was 13.4% (*P> 0.95*) less than this figure compared with stress-sensitive animals raised in a separate group, and 33.2% (*P> 0.999*) less than stress-resistant animals. The reduction of this indicator causes the use of cholesterol for the synthesis of hormones of the adrenal cortex during stress.

Under the action of stress factors in the serum of animals of groups II and III decreases the content of triacylglycerols (enzymatic colorimetric method) [281] compared with analogues of group I (*P> 0.95*), which indicates increased lipolysis to ensure energy homeostasis of their body in fattening process.

Due to the relatively low glucose level with a high level of triacylglycerols, we can assume that the animals of the experimental groups were characterized by intense energy metabolism. As a result, glucose concentrations decreased, and lipids in the form of triacylglycerols were mobilized to meet the growing demand for energy materials.

As a result of experimental studies, we note that the mechanisms of stress development in pigs are very complex. It is established that in young pigs with different sensitivity, reared in different conditions, all links of metabolic processes are involved, which are closely related to their productivity, morbidity and safety. This is confirmed by the data of production experiments to study the growth rates, fattening qualities of young pigs with different sensitivity.

The efficiency of pig production, along with reproductive and fattening characteristics, largely depends on the level of slaughter and meat qualities. The general indicator of slaughter qualities of animals is slaughter yield, the value of which is influenced by many factors: breed, breed of animals, direction of productivity, sensitivity to stress factors and more.

When the piglets reached a live weight of 100 kg was carried out a control slaughter of animals, the value of the slaughter yield in terms of groups are shown in table 7.50. The study of fattening, slaughter and meat and fat qualities of experimental animals was carried out according to the relevant guidelines of the Institute of Pig Breeding and APV NAAS (Modern methods of research in pig breeding, Poltava, 2005) [443].

After slaughter of young pigs with different sensitivity , different data were obtained on slaughter yield in terms of groups. It was found that the highest value of this indicator was characterized by stress-resistant animals - 75.1%, which is 0.27 and 3.9% (*P> 0.999*) higher than analogues of groups II and III.

Stress-sensitive young animals kept together with stress-resistant young ones had a lower slaughter yield compared to stress-sensitive young animals kept during fattening separately, the difference was 3.63% (*P> 0.99*). An important indicator of the meat quality of pigs is the length of the chilled half-carcass, but in our studies, we have not found a probable effect of stress sensitivity of animals on this indicator.

Table 7.50

Slaughter qualities of young pigs with different sensitivity and rearing conditions, $\overline{X} \pm S_{\overline{X}}$

Group	Slaughterhouse, %	Half carcass length, see	Fat thickness, mm	The area of the «muscle eye», cm ^{2}	Weight of the rear third of the carcass, kg
Pre-slaughter weight of 100 kg, (n = 10)					
I	75.10 ± 0.69	96.77 ± 0.46	16.30 ± 0.46	39.10 ± 0.28	11.35 ± 0.11
II	74.83 ± 0.71	96.24 ± 0.66	19.20 ± 0.63	38.60 ± 0.34	10.98 ± 0.18
III	71.20 ± 0.77	95.61 ± 0.68	20.80 ± 0.88	37.30 ± 0.37	10.81 ± 0.22
+/- II to I	-0.27	-0.53	+2.9 **	-0.5	-0.37
+/- III to I	-3.9 ***	-1.16	+4.5 ***	-1.8 ***	-0.54 *
+/- III to II	-3.63 **	-0.63	+1.6	-1.3 **	-0.17

During fattening of experimental young animals, it was noted that young animals of group III were more salted and had a fat thickness at the level of 6-7 thoracic vertebrae - 20.8 mm, which is 4.5 mm higher than stress-resistant animals of group I (*P> 0.999*).

Stress-sensitive animals that were kept in a separate group during fattening (group II) had a fat thickness lower than stress-sensitive counterparts kept with stress-resistant animals (group III) by 1.6 mm, but still had a higher fat thickness value of 2.9 mm (*P> 0.999*) compared with stress-resistant animals.

Absolute and relative changes in muscle and adipose tissue are reflected in changes in the area of the «muscle cell», which is a reliable criterion for assessing the meat content of carcasses. According to numerous studies, the area of the «muscle eye» is positively correlated with the yield of meat in pig carcasses [163, 259].

The development of the longest back muscle was higher in stress-resistant animals (group I), which affected the value of the area of the «muscle eye» and was - 39.1 cm^2 at a pre-slaughter weight of 100 kg , which is 0.5 and 1, 8 cm ^{2} higher than animals of II and III groups (*P>0.999*; *P>*

0.99), respectively.

Regarding mass index posterior third corps between stress resistant animals and stress sensitive animals are reared in isolation does not have reliable difference, but showed a trend toward greater weight in ham stress resistant animals, indicating a change in the intensity of the body, his precocity. Animals of group III were probably inferior in this indicator to analogues of group I, the difference was - 0.54 kg (*P> 0.95*).

In the study of fattening and meat qualities of young pigs with different sensitivity, which are grown in different conditions, used the evaluation index for the integrated assessment of fattening and meat qualities (Table 7.51).

We state that the greatest value of the complex index of fattening and meat qualities had stress-resistant animals of group I, which were fattened in a separate group - 193.9 points, which was higher than the same indicator of stress-sensitive animals of group II, which were also kept separately by 7.6 points (*P> 0.95*). In comparison with animals of the first group with analogues of group III, the advantage was on the side of stress-resistant animals and amounted to 13.8 points (*P> 0.999*). The lowest value of this indicator was characterized by stress-sensitive animals that were raised together with stress-resistant (group III) - 180.1 points.

Table 7.51

Comprehensive index of fattening and meat qualities of young pigs with different sensitivity and rearing conditions, $\overline{X} \pm S_{\overline{X}}$

The value of the index	Group			Difference		
	I	II	III	+/- II to I	+/- III to I	+/- III to II
Pre-slaughter weight of 100 kg						
I	193.9 ± 3.20	186.3 ± 2.10	180.1 ± 1.23	-7.6 *	-13.8 ***	-6.2 **

A more accurate conclusion about the productivity of pigs can be made on the basis of data on the quantity and quality of meat products obtained from them. The criterion for assessing the quality of pork includes a number of indicators, such as: the quality of the carcass, its morphological and chemical composition, physical properties, etc. [187, 259, 470, 475]. A more objective indicator of meat productivity is the morphological composition of pig carcasses. The collapse of carcasses showed that the carcasses of pigs with different sensitivity, which were grown in different conditions, differed in morphological composition (Table 7.52).

Carcasses obtained from stress-resistant young pigs were

characterized by a higher content of muscle tissue - 64.18%, which is higher than animals of groups II and III by 0.98 and 1.08% (*P>0.99*), respectively. But it should be noted that the carcasses of all experimental groups were characterized by a sufficiently high content of muscle tissue, the value of this indicator was in the range - 63.10-64.18%. More meat carcasses were characterized by a higher yield of bones - 12.82%, but no significant difference between the groups was found.

In carcasses where high values of fat thickness at the level of 6-7 thoracic vertebrae were noted, a higher fat content was also established. It should be noted that the highest fat content in the carcass was characterized by stress-sensitive animals, which were kept together with stress-resistant (group III) - 24.59%, they probably exceeded this indicator stress-resistant (group I) and stress-sensitive animals (group II), which were raised separately groups by 1.32% (*P> 0.999*) and 0.27%, respectively.

Table 7.52

Morphological composition of the carcass of experimental piglets with different sensitivity and rearing conditions, $\overline{X} \pm S_{\overline{X}}$

Group	Content in mascara, %			The ratio of meat: lard
	meat	fat	bones	
Pre-slaughter weight of 100 kg, (*n* = 10)				
I	64.18 ± 0.30	23.00 ± 0.24	12.82 ± 0.38	1: 0.36
II	63.20 ± 0.28	24.32 ± 0.34	12.48 ± 0.25	1: 0.38
III	63.10 ± 0.21	24.59 ± 0.30	12.31 ± 0.20	1: 0.39
+/- II to I	-0.98 **	+1.32 ***	+0.34	+0.02
+/- III to I	-1.08 **	+1.59 ***	-0.51	+0.03
+/- III to II	+0.10	+0.27	-1.17	+0.01

Differences in the intensity of growth of muscle tissue in relation to fat are clearly expressed in animals of group III, the ratio of meat: fat was 1: 0.39.

Today, the main trend in the development of pig farming is not only a further increase in meat, but also a simultaneous improvement in the quality of pork produced. In most animals with a high yield of meat there is an increase in water content, flabbyness, decreased intensity of color. Such deterioration in the quality of meat causes significant damage to farms. Significant economic losses were observed in the production of bacon and canning meat with high humidity [259, 509, 532].

Estimated slaughter products were determined by the methods of

A. M. Polivoda, R. W. Strobykinoyi, M. D. Lyubetskii (1977) and the guidelines of Agricultural Sciences (1978). Samples of the longest back muscle (400 g), lard (200 g) were taken between 9-12 thoracic vertebrae [354-357, 441]. From the data of table 7.53 it is seen that in animals with different sensitivity, fattened in different conditions of intensive technology, the chemical properties of meat are different. Analysis of the data shows that the experimental groups differed in the content of total moisture in the longest muscle of the back.

Thus, the meat of stress-sensitive pigs fed a separate group had the highest total moisture content - 75.24%, which is 2.82% higher than this indicator of stress-resistant animals (*P>0.999*). Increased total moisture content was characterized by meat obtained from stress-sensitive animals, which were kept together with stress-resistant. In this regard, the value of the indicator was at the level of 74.89%, which is 2.47% higher than the rate of stress-resistant animals (*P> 0.99*).

Table 7.53

Chemical properties of pig meat with different sensitivity and rearing conditions, $\overline{X} \pm S_{\overline{X}}$

Group	Total moisture, %	Dry matter, %	Fat, %	Protein, %	Ash, %
Pre-slaughter weight of 100 kg, (*n* = 10)					
I	72.42 ± 0.42	27.58 ± 0.35	2.54 ± 0.31	23.18 ± 0.38	1.86 ± 0.05
II	75.24 ± 0.41	24.76 ± 0.51	2.83 ± 0.27	20.35 ± 0.82	1.58 ± 0.10
III	74.89 ± 0.68	25.11 ± 0.45	2.50 ± 0.19	20.78 ± 0.41	1.83 ± 0.04
+/- II to I	+2.82 ***	-2.82 ***	+0.29	-2.83 **	-0.28 **
+/- III to I	+2.47 **	-2.47 **	-0.04	-2.4 ***	-0.03
+/- III to II	-0.35	+0.35	-0.33	+0.43	+0.25 **

More watery meat had a lower dry matter content, meat obtained from animals of groups II and III was inferior to this indicator of meat obtained from animals of group I by 2.82 and 2.47% (*P>0.999; P>0.99*) respectively.

There was no significant and statistically significant difference in the fat content in the meat of the experimental groups, but the highest fat content was characterized by meat obtained from animals of group II. However, we note that the meat of all groups belongs to the category of lean, not fatty.

When slaughtering animals with a live weight of 100 kg, the highest protein content was observed in the meat of stress-resistant animals (group I) - 23.18%, which probably exceeded similar indicators of groups II and III.

Under the condition of increased moisture content and lower percentage of dry matter in meat obtained from animals of the II experimental group, a lower ash content was noted - 1.58%.

The determining condition for the formation of biochemical processes of meat and its quality is the level and nature of the development of autolytic changes in tissues. As a result of keeping for some time at low positive temperatures, the meat matures and has high consumer properties. Ripe meat is characterized by a delicate texture, juiciness, pleasant taste and aroma. Qualitative changes in meat in the process of its maturation are due to a complex set of enzymatic, autolytic transformations in muscle and connective tissues. However, it is known that the quality of meat and the nature of the autolytic processes after slaughter of the animal depend on the conditions of feeding and rearing, pre-slaughter content and the degree of stress sensitivity of pigs. Of all these factors, the most influential is the level of stress sensitivity of pigs [81, 151, 261, 288, 456, 484].

Given the widespread prevalence of high stress sensitivity among pigs of specialized meat breeds, in industrial pork production enterprises the task was to determine the peculiarities of autolytic processes in pig meat obtained from animals with different stress sensitivity, reared in different conditions, as well as to conduct a comparative assessment of organoleptic characteristics of meat.

In meat samples were determined *pH*, glycogen, glucose, lactic acid. The research results are presented in tables 7.54-7.56.

To study the effect of stress sensitivity of pigs raised in different conditions of intensive technology on the biochemical maturation processes and organoleptic indicators of meat quality, the *pH*, glycogen, glucose and lactic acid content, which were expressed in mg%, were studied. *pH* (active acidity) of meat - determined to extract hydrogen of 1: 4 to pH-meters- MPI-0.1 (P.A. Krylov, T. M. Lyaskovskiy, 1957).

Quantitative determination of glucose from muscle tissue extract was performed by the Bertrand method, glycogen - by color reaction with anthrone, lactic acid - by color reaction with veratrol [277, 355, 356].

Table 7.54

Dynamics of carbohydrate content in the process of maturation of pig meat with different sensitivity and growing conditions (*n* =10), $\overline{X} \pm S_{\overline{X}}$

Duration of autolysis	Group	Contents	
		glycogen, mg%	glucose, mg%
45 min	I	1834.6 ± 3.58	103.8 ± 1.02
	II	1540.6 ± 4.66 ***	118.0 ± 1.34 ***
	III	1130.2 ± 2.60 ***	137.9 ± 1.00 ***
12 years	I	818.6 ± 4.00	363.7 ± 1.58
	II	718.2 ± 2.40 ***	394.4 ± 2.00 ***
	III	609.4 ± 3.22 ***	498.2 ± 1.80 ***
24 years	I	660.8 ± 2.10	408.6 ± 2.12
	II	578.3 ± 3.15 ***	364.8 ± 2.18 ***
	III	543.7 ± 3.11 ***	341.0 ± 1.88 ***
48 years	I	490.6 ± 2.44	450.8 ± 2.62
	II	456.2 ± 1.65 ***	400.8 ± 1.80 ***
	III	426.8 ± 1.90 ***	377.5 ± 1.62 ***

From the given data it is seen that the values of the studied indicators that characterize the degree of maturation of meat obtained from stress-resistant and stress - sensitive animals are different and change in the process of autolysis in different ways. The most positive changes were observed in meat obtained from stress-resistant pigs. After slaughter, in the first 45 minutes, the glycogen content in the studied meat samples was - 1834.6 mg%; glucose - 103.8 mg%; lactic acid - 266.8 mg%; the *pH* was at the level of 7.14.

After 12 hours as a result of hydrolysis, the amount of glycogen decreased by 55.4% and amounted to 818.6 mg%. As a result, the glucose content increased by 3.5; lactic acid - 2.41 times, which caused the *pH* to drop to 6.03. In the following hours of observations, the monitored indicators continued to change sharply. Thus, after 24 hours the glycogen level decreased to 660.8 mg%; glucose increased to 408.6 mg%; lactic acid - 950.6 mg%, which reduced the *pH* to 5.61. The established nature of the changes persisted in the following hours of research.

Two days later, the amount of glycogen was in the range of 490.6; the amount of glucose increased to 450.8; lactic acid - 914.6 mg%; the *pH*

decreased to 5.61 (Table 7.55).

As a result of organoleptic evaluation of meat obtained from stress-resistant pigs, it was found that it has a drying crust of pale pink color. The muscles in the section are slightly moist, do not leave a wet spot on the filter paper, light pink, dense, elastic, when pressed with a finger, the resulting hole is quickly leveled. The smell is specific to this type of fresh meat. The fat is pale pink, soft, elastic, has no odor of rancidity.

Cooked meat has an excellent appearance, a very pleasant and strong smell, the taste is very tasty, with a delicate texture and very juicy (GOST 9959-91) [45].

Table 7.55

Dynamics of lactic acid content and *pH* during the maturation of pig meat with different sensitivity and rearing conditions (*n* =10), $\overline{X} \pm S_{\overline{X}}$

Duration of autolysis	Group	Indicator	
		The content of lactic acid, mg%	*pH*
45 min	I	266.8 ± 2.11	7.14 ± 0.035
	II	298.0 ± 1.74 ***	6.40 ± 0.054 **
	III	338.8 ± 3.60 ***	5.60 ± 0.044 ***
12 years	I	642.3 ± 3.20	6.03 ± 0.026
	II	739.5 ± 4.42 ***	5.82 ± 0.025 **
	III	858.2 ± 2.72 ***	5.40 ± 0.020 ***
24 years	I	950.6 ± 1.82	5.61 ± 0.014
	II	870.8 ± 2.80 ***	5.71 ± 0.042 **
	III	762.8 ± 2.34 ***	5.90 ± 0.018 ***
48 years	I	914.6 ± 1.46	5.61 ± 0.020
	II	798.2 ± 2.20 ***	5.70 ± 0.028 **
	III	735.6 ± 2.00 ***	5.81 ± 0.022 ***

The overall assessment of the quality of cooked meat is quite high and is 7.9 points out of 9 possible (Table 7.56). Evaluation of the organoleptic characteristics of meat broth showed that it has an excellent appearance, a very pleasant and strong aroma, has a high richness, which determines its taste - it is very tasty. The overall assessment of the quality of the broth is also quite high and is 7.9 points out of 9 possible (Table 7.56).

In meat obtained from stress-sensitive pigs fed in separate groups, the rates of autolytic changes were lower. Yes, after slaughter, in the first 45 minutes. the glycogen content was - 1540.6; glucose - 103.8; lactic acid 298.0 mg%; *pH* 6.40.

After 12 hours, the amount of glycogen decreased to

718.2; glucose rose to 394.4; lactic acid - 739.5 mg%; *pH* 5.82. Compared with the values of the same indicators obtained from stress-resistant animals, the glycogen content was lower by 12.3% (*P>0.999*); glucose more by 8.4% (*P>0.999*); lactic acid by 15.1% (*P>0.999*); *pH* less than 3.5% (*P> 0.99*).

After 24 hours, the glycogen level was set within 578.3; glucose - 364.8; lactic acid - 870.8 mg%; *pH* 5.71.

In the following days of observations in pork meat continued to decrease the glycogen content, increase the amount of glucose and lactic acid. However, the *pH* remained stable. It should be noted that the studied values were significantly lower than in meat obtained from stress-resistant animals.

Table 7.56

Tasting evaluation of boiled meat and broth of pigs with different sensitivity and rearing conditions, $\overline{X} \pm S_{\overline{X}}$

Indicator	Groups		
	I stress resistant	II stress-sensitive	III mixed (50% - stress - resistant; 50% - stress - sensitive)
Tasting evaluation of meat (points)			
Appearance, color in section	8.1 ± 0.30	7.5 ± 0.37	5.0 ± 0.22 ***
Aroma	8.0 ± 0.32	7.2 ± 0.24 *	4.2 ± 0.24 **
Taste	8.2 ± 0.31	7.8 ± 0.38	5.0 ± 0.37 ***
Consistence	7.6 ± 0.28	7.4 ± 0.26	5.2 ± 0.30 ***
Succulence	7.8 ± 0.26	7.3 ± 0.25	6.0 ± 0.30 **
Overall rating	7.9 ± 0.23	7.4 ± 0.30	5.1 ± 0.31 **
Tasting evaluation of broth (points)			
Appearance, color	7.7 ± 0.24	7.8 ± 0.33	5.0 ± 0.37 ***
Aroma	8.0 ± 0.22	7.7 ± 0.35	4.6 ± 0.26 ***
Taste	8.2 ± 0.30	7.7 ± 0.35	4.8 ± 0.40 ***
Richness	7.6 ± 0.37	7.8 ± 0.26	4.8 ± 0.36 ***
Overall rating	7.8 ± 0.20	7.7 ± 0.24	4.8 ± 0.40 ***

Organoleptic evaluation of mature pork obtained from stress-sensitive animals (group II) grown in separate groups showed that the carcass surface has a dry crust, pale pink color, muscles in the section of

moisture, leaving wet spots on the filter paper. The meat in the cut is less dense and less elastic, when pressed with a finger, the hole is aligned slowly, has a slightly sour smell. The fat has a grayish-matte hue.

According to the results of organoleptic evaluation of cooked meat, it was found that it has a good appearance, pleasant, but not sufficiently pronounced aroma, quite tasty, quite tender texture, juicy. The overall assessment of meat quality is good and is 7.4 points.

In the process of sensory analysis of meat broth, it was found that it has a good appearance, a pleasant but not strong enough aroma, but tasty and rich broth. The overall assessment of the quality of the broth is good and is 7.7 points.

In pork obtained from stress-sensitive pigs, which were fattened together with stress-resistant values of the studied indicators in the process of meat maturation were the lowest. Thus, in the first 45 minutes after slaughter in pork, the glycogen content was 1130.2; glucose - 137.9; lactic acid 338.8 mg%; the *pH* was the lowest - 5.60. The level of these indicators in relation to stress-resistant was, respectively: 61.6; 132.9; 126.9; 78.4%, in relation to the stress-sensitive, who were fattened in a separate group: 73.4; 116.9; 113.7; 87.5%.

In the following days of observations, the controlled parameters continued to change, but their changes were less significant than in pork obtained from animals of the first and second groups.

During the first 12 hours, the glycogen content decreased to 609.4; glucose rose to 498.2; lactic acid - 858.2 mg%; the *pH* decreased to 5.40.

After 48 hours, the glycogen content decreased to 426.8 mg%, resulting in an increase in glucose concentration to 377.5; lactic acid - 735.6 mg%; the *pH* decreased to 5.81. Regarding the values of similar indicators from stress-resistant pigs, they were, respectively: 87; 83.7; 80.4; 103.6%, stress-sensitive second group: 93.6; 94.2; 92.2; 101.9% (see Table 7.54; 7.55).

Organoleptic evaluation of mature pork obtained from stress-sensitive pigs that were fattened together with stress-resistant pigs in one group showed that the surface of the carcass is slightly moistened and has a darkened appearance. Muscles in the section are moist, red, leave spots on the filter paper, slightly sticky. Consistency: in the cut the meat is less dense and less elastic, the hole formed by pressing with a finger is leveled for more than 1 minute, the fat is soft, the smell is sour. The fat has a grayish-matte hue, slightly sticky to the fingers.

Cooked meat has a slightly unattractive appearance, without a clear aroma, tasteless, hard, dry. The overall assessment of meat quality is slightly above average and is - 5.1 points.

The broth made from the studied meat has a slightly unpleasant appearance, without a pronounced aroma and taste, slightly rich. The overall assessment of the quality of the broth is within the average and is 4.8 points (see table.7.56).

Thus, the analysis of the obtained data allows us to conclude that the meat obtained from pigs with different stress sensitivity and those fattened in different conditions of intensive technology during maturation and storage has a different nature of biochemical changes that determine its different quality.

In meat obtained from stress-resistant animals, the most intense changes occur in the first 24 hours after slaughter. After 45 minutes of storage in pork is determined by the high content of glycogen, low concentration of glucose and lactic acid, a high level of *pH*. Subsequently, a gradual decrease in the amount of glycogen continues; increasing the content of glucose and lactic acid, the *pH* of the medium is stabilized within 5.6. Due to this nature of biochemical changes, the meat matures on the second third day and has high consumer properties. Cooked meat and broth have an excellent rating.

In meat obtained from stress-sensitive animals that were fattened together with stress-resistant animals after 45 minutes after slaughter and in the following days of observations autolytic processes proceeded less intensively. As a result of such changes, pork on the second or third day had low consumer properties, cooked meat and broth were rated within the average.

The susceptibility of pigs to stress has a genetic nature, which affects a set of genes that encode information about proteins and enzymes that are synthesized in the pig's body in response to various stressors. With the help of DNA diagnostics, it became possible to detect a mutation in one of the genes - *RYR-1* (rianodine -receptor gene), which is the cause of excessively acute reaction of pigs to stress - malignant hyperthermic syndrome. There is a deterioration in the quality of meat with the appearance of defects such as *PSE* - pale, soft, watery meat and *DFD* - dry, dark, dense meat [3, 126, 127, 141, 152, 339, 358, 406, 409].

In order to confirm the effectiveness and accuracy of the method of distribution of young pigs to stress-resistant and stress - sensitive (the size of the swollen spot behind the auricle one day after weaning), due to the

immunological reaction of piglets to subcutaneous injection of 40% formaldehyde solution was DNA testing for the locus of the ryanodine receptor gene (*RYR-1*). Analysis of the polymorphism of the studied gene was performed by PCR-RFLP (polymerase chain reaction, restriction fragment length polymorphism) according to the methods of T. H. Short et al. and C. Drogemuller et al. [29, 575, 579].

Polymorphism of stress sensitivity genes (*RYR-1*) was studied in local animals of the combination - ♀ (WL×L)×♂P. Based on the genotyping of pigs belonging to three groups: group I - stress - resistant , group II - stress - sensitive , group III - mixed (50% - stress - resistant and 50% - stress - sensitive) revealed polymorphism of the *RYR-1* gene (Table 7.57).

Table 7.57

Frequency of genotypes and alleles of the *RYR-1* gene, (*n* =40)

Group	Frequency of genotypes			Frequency of alleles	
	NN	*Nn*	*nn*	*N*	*n*
I - stress - resistant	35	5	-	0.938	0.062
II - stress - sensitive	17	23	-	0.712	0.288
III - mixed (50% - stress - resistant and 50% - stress - sensitive)	21	19	-	0.763	0.237

From the results of genotyping, we can conclude that the method by which animals were divided into stress-resistant and stress - sensitive is effective, as of the 40 piglets that were classified as stress-resistant (group I) 35 animals were homozygous for the *N* allele ; of the 40 animals that were classified as stress-sensitive (group II), 23 animals were heterozygous, and of the 40 animals that were selected to co-maintain stress-resistant and stress - sensitive (group III), 21 animals were homozygous for the *N* allele and 19 animals were heterozygous. Carriers of the homozygous recessive genotype *nn* were not detected.

Studies on the prevalence of high stress sensitivity of piglets, the impact of separate breeding of stress-sensitive piglets on growth, fattening, meat quality of pigs, nutritional value and consumer properties of pork, revealed that high stress sensitivity of piglets is widespread in pig farms and is high biological and economic problem. It is established that the number of animals with high stress sensitivity in terms of industrial technology is from 27.0 to 40.0%.

The mass spread of stress-sensitive piglets among fattening young is

due to the high percentage of transmission of this trait to offspring, which ranges from 50-60%, and the lack of targeted selection of repair pigs and boars according to their level of stress sensitivity [3].

At the same time, our data allow us to conclude that animals with different stress sensitivity are characterized by different adaptive properties, which determine the peculiarities of their growth, fattening and meat qualities, nutritional value of pork and its consumer properties.

The method used by us in the research is easy to perform, cheap, technological, allows you to detect the sensitivity of animals to weak negative stimuli and quickly distribute the piglets according to the level of stress sensitivity. Formation of technological groups of animals taking into account their stress sensitivity allows to reduce undesirable influence of negative technological factors without additional expenses, to increase growth rate of young pigs, to improve fattening, meat qualities of pigs, nutritional value and consumer properties of pork.

Ways to increase the production of meat and bacon pork. In today's conditions in the consumer meat market there is an intensively growing demand for high quality pork, in particular bacon, which can be met only by pigs of specialized meat breeds. Today, the number of purebred livestock of the main breed used for the production of bacon - landrace, in Ukraine is insufficient to fully meet the needs of the market. This encourages producers to look for alternative ways to increase the production of pigs of the first-extra category at the expense of young animals of local origin, to meet the needs of the processing industry and the growing demands of consumers [187].

In terms of enterprises producing pork on an industrial basis company’s "Breed-Stock Plant «Stepnoy» Zaporozhye region addressing this problem is the use internally pedigree type pig breeds Duroc Ukrainian selection «Steppe» and the Large White breed in direct and reciprocal crossbred Landrace breed animals. To improve bacon qualities in terms of company’s Breed-Stock Plant «Stepnoy» fatten manor young purebred and combinations of specialized meat breeds: I group (control) - ♀L × ♂L; II group (experimental) - ♀L×♂WL; III group (experimental) - ♀WL×♂L; IV group (experimental) - ♀L×♂DUSS; V group (experimental) - ♀DUSS × ♂L.

To study the bacon qualities of the experimental animals took into account: the weight of chilled carcass, the thickness of the fat on the withers, over 6-7 thoracic vertebrae, three measurements at the buttocks, middle on the back, chest, abdomen, groin, half carcass and bacon half, width of the

front and the back of the bacon half, the mass of bacon cuts for retail trade (DSTU 7158: 2010), the morphological composition of the cuts (meat, lard, bones), the area of the «muscle cell», the mass of bacon halves. The quality of carcasses of slaughtered pigs was assessed according to DSTU 4718: 2007 «Pigs for slaughter» [260, 404].

The study of fattening, slaughter and meat and fat qualities of experimental animals was carried out according to the relevant guidelines of the Institute of Pig Breeding and APV NAAS [443].

The most valuable parts of the bacon half are on the back. Therefore, in a long carcass, other things being equal, there are more high-value parts than in a short one [187, 464, 513].

Half - carcasses with the highest value of the length of the cooled half-carcass at a pre-slaughter weight of 100 kg were obtained from young animals of V and I experimental groups - 96.12 and 96.06 cm (Table 7.58).

Slightly lower half- carcass length at slaughter with this weight condition was characterized by animals of the II and III experimental groups, which were obtained as a result of reciprocal combination of breeds Great White and Landrace. Juveniles above groups inferior counterparts controls the length of the chilled carcasses at 1,94-2,06 cm respectively ($P>0.95$). The length of the bacon half characterizes the development of the most valuable fillet part of the carcass.

Table 7.58

Measurements on carcasses of young ante weight of 100 kg in conditions of JSC Breed-Stock Plant «Stepnoy», (*n* =5), $\overline{X} \pm S_{\overline{X}}$

Indicator	Group				
	I	II	III	IV	V
Half carcass length, cm	96.06 ± 0.53	94.00 ± 0.58 *	94.12 ± 0.60 *	95.50 ± 0.51	96.12 ± 0.60
The length of the bacon half, cm	78.43 ± 0.39	76.50 ± 0.68 *	77.56 ± 0.56	77.75 ± 0.40	78.25 ± 0.53
Width of the front part of the bacon half, see	36.50 ± 0.49	35.25 ± 0.77	35.87 ± 0.68	35.28 ± 0.53	35.50 ± 0.37
The width of the back of the bacon half, cm	29.94 ± 0.51	29.62 ± 0.69	31.00 ± 0.83	29.50 ± 0.45	29.00 ± 0.62
The area of the «muscle eye», cm ^{2}	39.25 ± 0.74	36.42 ± 0.63 *	35.50 ±0.75 **	38.00 ± 0.73	39.95 ± 0.69

Carcasses of experimental groups are marked by a high level of this

indicator, which exceeds the established normative value - 75 cm. The longest bacon halves were in local animals of the combination ♀DUSS ×♂L - 78.25 cm and purebred landrace animals - 78.43 cm.

Simultaneously with the indicator, the length of the cooled half-carcass takes into account the width of the front and back of the bacon half. More valuable are those bacon halves in which the width of the front part does not exceed 40% of the length [171, 187]. At a pre-slaughter weight of 100 kg, the carcasses of piglets of the fourth and fifth experimental groups were better, although in all groups this ratio exceeded 40% and ranged from 45.3 to 46.5%. There is no probable difference between the groups in the width of the back part of the bacon half.

The longest corps when achieved live weight of 120 kg and was obtained from V and calves and research groups - 101.21 and 101.75 cm, respectively (Table. 7.59). Analysis of the results allowed us to draw the following conclusion: the length of the carcass and the length of the bacon halves at different weight conditions almost equally reflect the length of the carcass when comparing animals of different groups and, therefore, in subsequent studies to characterize the meat qualities of pigs can use one of these indicators.

Table 7.59

Measurements on carcasses of young ante weight of 120 kg in conditions of company's Breed-Stock Plant «Stepnoy», (*n* =5) $\overline{X} \pm S_{\overline{X}}$

Indicator	Group				
	I	II	III	IV	V
Half carcass length, cm	101.75 ± 1.55	98.00 ± 1.03	98.52 ± 0.84	100.98 ± 1.54	101.21 ± 0.96
The length of the bacon half, cm	81.51 ± 1.25	80.52 ± 0.86	81.03 ± 1.31	82.56 ± 1.71	82.98 ± 1.64
Width of the front part of the bacon half, see	38.00 ± 0.50	38.50 ± 1.86	38.26 ± 0.74	38.24 ± 0.75	38.03 ± 1.32
The width of the back of the bacon half, cm	33.06 ± 0.71	33.02 ± 2.31	32.21 ± 1.28	32.81 ± 1.26	32.17 ± 0.73
The area of the «muscle eye», cm ^{2}	41.75 ± 1.03	39.32 ± 1.13	39.20 ± 2.44	40.56 ± 0.43	41.15 ± 1.21

Studies have shown that the area of the «muscle cell» is positively correlated with the yield of meat in pig carcasses. Common to pigs of all

experimental groups was a pattern, which is that as the growth and increase in live weight of animals, the area of the «muscle eye» increases. It should be noted that the growth rate of this trait remains at a high level when the animals reach a live weight of 120 kg.

At a live weight of 100 kg, the highest value of the «muscle eye» area was characterized by animals of the V experimental group (maternal form - intrabreed type of pigs of the Duroc breed of Ukrainian selection «Stepovy», parent form - Landrace breed) - 39.95 cm^2, lower values had animals of the II and III experimental groups, which were 2.83 (*P> 0.95*) and 3.75 cm^2 (*P> 0.99*), respectively, inferior to analogues of the control group. When reaching a live weight of 120 kg, no significant and probable difference between the groups was detected.

To study and confirm the strength of the influence of factors (breed of boar and sows) on the studied trait (measurements of bacon carcasses) we conducted a two-factor analysis of variance.

Analysis of the dependence of the genotype of the sow and the boar on the length of the cooled half-carcass shows that this trait depends on the second factor (B) - the breed of the boar at 38.1% (*P>0.99*) and insignificant on the genotype of the uterus - 0.7% (Table 7.60). The combined effect of the studied factors on the rate of chilled carcass is only 0.9%.

The genotype of the father (Landrace breed) probably also affects the length of the bacon half (Table 7.61). The strength of the influence of this factor is 23.3% (*P> 0.95*).

Table 7.60

Influence of sow and boar genotype on half-carcass length

The strength of the influence of factors on the length of the cooled carcass						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Breed of sow (A)	0.46	1	0.46	0.29	0.594	0.7
Boar breed (B)	23.75	2	11.88	7.59	**0.003**	38.1
Combined exposure (A × B)	0.54	2	0.27	0.17	0.842	0.9
Residual variability	37.57	24	1.57	-	-	60.3
General variability	62.31	29	-	-	-	-

The strength of the influence of factor A (breed of sow) on the length of the bacon half is 4.6%, the combined effect of the genotype of the sow and the boar on the studied trait is 3.2%.

With regard to the indicator of the area of the «muscle eye» (Table 7.62), it should be noted that there is a probable effect on the studied indicator of the genotype of the boar, which, accordingly, has a force of

47.8% (*P>0.999*).

Table 7.61

Influence of sow and boar genotype on the length of the bacon half

The strength of the influence of factors on the length of the bacon half						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2,%
Breed of sow (A)	2.03	1	2.03	1.60	0.218	4.6
Boar breed (B)	10.29	2	5.14	4.06	**0.030**	23.3
Combined exposure (A × B)	1.41	2	0.70	0.55	0.581	3.2
Residual variability	30.42	24	1.27	-	-	68.9
General variability	44.14	29	-	-	-	-

Table 7.62

Influence of sow and boar genotype on area «Muscle eye»

The strength of the influence of factors on the indicator of the area of the «muscle eye»						
Factor	*SS*	*df*	*MS*	*F*	*p*	η^2, %
Breed of sow (A)	0.88	1	0.88	0.35	0.562	0.6
Boar breed (B)	66.63	2	33.32	13.05	0.000	47.8
Combined exposure (A × B)	10.74	2	5.37	2.10	0.144	7.7
Residual variability	61.27	24	2.55	-	-	43.9
General variability	139.53	29	-	-	-	-

The conducted research allows us to conclude that such bacon qualities as: the length of the half-carcass , the length of the bacon half, the area of the «muscle eye» - probably influenced by the genotype of the boar; the probable strength of the influence of the studied factors was not revealed on the indicator of the width of the bacon half.

The main indicator of slaughter qualities of animals is the slaughter yield, the value of which is influenced by many factors: breed, breed of animals, direction of productivity and more. When slaughtering pigs receive the highest slaughter yield, on average more than 25% compared to other farm animals. The highest slaughter yield, which is noted in the special literature, is 88-90%. The number of bones in pig carcasses is 2.5 times smaller, so when slaughtering pigs get the highest yield of edible products [163, 470].

When reaching a live weight of 100 kg, the slaughter yield in terms of control and experimental groups was 68.62-71.08%, when reaching 120 kg – 68.51-72.68%. Purebred young Landrace breed and crossbreeds of IV, V experimental groups were characterized by the highest value of slaughter

yield, and piglets of II, III experimental groups in all weight categories had a lower slaughter yield – 68.51-68.62%, but no significant difference was found. Given the reorientation of the consumer market to meat and bacon pork, a very important feature that characterizes the quality of carcasses and their meat is the thickness of the lard. Data on fat thickness measurements in the appropriate topographic locations of the carcasses when the animals reach a live weight of 100 kg are given in table 7.63, which shows that there is a slight difference between the groups between the indicators.

Table 7.63

Fat deposits on topographic parts of carcasses of calves in experimental conditions company's Breed-Stock Plant«Stepnoy», (*n*= 5)

Group	Fat thickness, mm							
	on the withers	at the level of 6-7 thoracic vertebrae	on the waist	on the crosses	average value	in the chest	on the abdomen	in the groin
when reaching a live weight of 100 kg								
I	24.0 ±0.67	17.6 ±0.76	9.0 ±1.12	11.8 ±0.86	15.6 ±1.11	9.4 ±1.22	11.8 ±0.86	13.6 ±0.66
II	28.2 ±1.22 *	19.8 ±1.00	10.6 ±0.86	13.8 ±1.22	18.1 ±1.32	8.6 ±1.28	9.8 ±1.00	12.8 ±1.26
III	27.6 ±1.04 *	20.0 ±1.28	10.4 ±1.44	13.8 ±1.32	18.0 ±1.20	8.6 ±1.10	9.6 ±1.24	12.4 ±0.90
IV	22.4 ±1.43	17.2 ±1.17	8.2 ±0.96	10.6 ±1.02	14.6 ±1.32	6.8 ±1.40	7.4 ±1.24	11.0 ±0.88 *
V	24.2 ±1.12	17.4 ±0.88	9.4 ±1.24	11.4 ±0.82	15.6 ±1.00	7.8 ±0.96	9.0 ± 0.84	12.0 ± 1.16
when reaching a live weight of 120 kg								
I	31.2 ± 0.95	22.8 ± 0.64	11.6 ±1.32	15.4 ±1.57	20.2 ±1.00	12.0 ±1.20	15.2 ±1.84	17.6 ±1.30
II	35.6 ±1.54 *	25.0 ±0.63 *	13.8 ±0.83	17.6 ±1.59	23.0 ±0.67 *	11.0 ±1.45	12.6 ±1.43	16.4 ±0.77
III	33.0 ±1.31	24.0 ±1.21	13.4 ±1.22	16.8 ±1.42	21.8 ±0.96	11.2 ±0.86	12.4 ±0.69	16.0 ±1.21
IV	29.2 ±1.53	22.4 ±0.82	10.6 ±1.70	13.6 ±0.84	19.0 ±0.88	9.0 ±0.67 *	10.6 ±0.88 *	14.2 ±0.76 *
V	31.8 ±1.20	22.8 ±0.64	12.2 ±0.76	14.8 ±0.96	20.4 ±0.87	10.0 ±0.86	11.6 ±0.76	15.4 ±0.86

This can be explained by the fact that the studies used specialized meat genotypes of pigs and their combinations. According to the state standard DSTU 4718: 2007 «Pigs for slaughter» [404] the thickness of lard over 6-7 thoracic vertebrae for pigs of the first category should be in the range of 1.0-2.0 cm. The lowest value of the thickness of lard at the level of 6-7 thoracic vertebrae were observed in animals of the IV experimental group – 17.2 mm, the highest value of this indicator was found in animals of the III group - 20.0 mm.

It was found that animals of all experimental groups according to this indicator met the standard of the first-extra category. For the qualitative assessment of carcasses of great importance is the degree of evenness of the spine, which is determined by the difference in the thickness of the fat on the withers (thickest) and back (thinnest), this difference should not exceed 15 mm [25, 171, 187, 513].

According to the results of the assessment of the difference in the thickness of the fat on the withers and back, the following results were established: Group I - 15 mm, Group II – 17.6; III – 17.2; IV – 14.2; V – 14.8 mm. The best in alignment were the carcasses obtained from purebred landrace animals and local genotypes of IV and V experimental groups.

In determining the commercial value of carcasses, great importance is attached to the absolute and relative weight of their parts. As a result of the analysis of literature sources, it is established that in bacon and meat fattening it is necessary to strive for breeding pigs, first – with the longest possible middle part of the body; secondly – with the best developed hams; thirdly – with a minimally light front part and fourthly – with the maximum amount of meat with a limited and proportional amount of fat.

For retail trade, carcasses of bacon pigs are developed into separate varietal parts in accordance with DSTU 7158: 2010 [260]. The results of the assessment of the mass of cuts in the carcasses of experimental animals at different weight conditions are presented in table 7.64.

No statistically significant difference between the weights of most similar cuts in pig carcasses of different experimental groups was found. With a pre-slaughter weight of 100 kg, the exception was the weight of the hind leg. Animals of the II experimental group were probably inferior to this control indicator by 0.59 kg ($P> 0.95$). A similar trend was observed for the pre-slaughter mass of 120 kg – 0.56 kg ($P> 0.95$).

The above research results give reason to believe that direct

and reciprocal crossing of Landrace pig breeds and intrabreed type pig breeds Duroc Ukrainian selection makes it possible to obtain hybrids that for bacon is almost not inferior qualities purebred Landrace breed animals.

Fattening of young animals to a live weight of 120 kg to some extent deepened the difference between the experimental groups in terms of mass of individual cuts. Thus, animals of group III were probably inferior to analogues of the control group by weight of the scapular and lumbar parts by 1.13 and 0.58 kg, respectively (*P> 0.95*).

Table 7.64

Weight cuts carcasses of young pigs under conditions of company's Breed-Stock Plant «Stepnoy», (*n* =5), $\overline{X} \pm S_{\overline{X}}$

Group	Cutting, kg				
	scapular part	loin	brisket	lumbar part	hind leg
Upon reaching a live weight of 100 kg					
I	10.21 ± 0.16	4.48 ± 0.22	3.64 ± 0.14	4.31 ± 0.25	10.56 ± 0.16
II	10.61 ± 0.22	4.08 ± 0.35	3.58 ± 0.21	4.20 ± 0.31	9.97 ± 0.18 *
III	10.60 ± 0.23	4.13 ± 0.28	3.54 ± 0.15	4.17 ± 0.24	10.05 ± 0.20
IV	10.29 ± 0.18	4.48 ± 0.16	3.68 ± 0.16	4.22 ± 0.26	10.88 ± 0.23
V	10.14 ± 0.30	4.47 ± 0.32	3.68 ± 0.14	4.23 ± 0.20	10.83 ± 0.22
Upon reaching a live weight of 120 kg					
I	13.11 ± 0.21	5.42 ± 0.18	4.73 ± 0.22	5.45 ± 0.25	12.74 ± 0.18
II	12.13 ± 0.22	5.15 ± 0.23	4.71 ± 0.25	5.02 ± 0.22	12.18 ± 0.16 *
III	11.98 ± 0.32 *	5.23 ± 0.30	4.39 ± 0.21	4.87 ± 0.14 *	12.26 ± 0.17
IV	12.55 ± 0.25	5.38 ± 0.21	4.38 ± 0.14	5.25 ± 0.26	12.79 ± 0.24
V	12.42 ± 0.26	5.37 ± 0.16	4.15 ± 0.21	5.36 ± 0.21	12.42 ± 0.20

More valuable bacon carcasses are those carcasses where the middle part (loin, brisket, lumbar part) and back part are most developed, with the front (shoulder) part being as light as possible. The results of the obtained data on the index of the mass of the cooled half- carcass, confirms the ratio of the experimental genotypes to the category of pig carcasses of the first-extra category (Table 7.65).

According to the results of the evaluation of the ratio of the mass of different cuts of half – carcasses of purebred and local young pigs when reaching a live weight of 100 kg, it was found that the yield of the most valuable cuts of half-carcasses was in animals of I and V experimental groups. Out of scapular in purebred Landrace breed animals (group I) was 29.93%, the average of 36.44% and 30.96% of the back, the calves V landed

experimental group where the parent form sows were v internally pedigree type pig breeds Duroc Ukrainian selection «Stepovy», and the parent breed Landrace – respectively 29.55%; 36.04% and 31.56%. Animals of the III experimental group (♀WL (FS)×♂L) were characterized by less valuable yield of cuts from half-carcasses.

Table 7.65

Varietal cutting carcasses of young pigs under conditions of company's Breed-Stock Plant «Stepnoy», (*n* =5), $\overline{X} \pm S_{\overline{X}}$

Group	Weight of the cooled half-carcass, kg	Specific weight by weight of chilled carcass, %				
		scapular part	loin	brisket	lumbar part	hind leg
Upon reaching a live weight of 100 kg						
I	34.11 ±0.19	29.93 ±0.54	13.12 ±0.21	10.67 ±0.17	12.65 ±0.27	30.96 ±0.22
II	33.41 ±0.36	31.76 ±0.58 *	12.21 ±0.32 *	10.72 ±0.21	12.58 ±0.31	29.84 ±0.36 *
III	33.49 ±0.17 *	31.66 ±0.52 *	12.34 ±0.26 *	10.57 ±0.16	12.46 ±0.26	30.01 ±0.33 *
IV	34.55 ±0.20	29.77 ±0.55	12.96 ±0.18	10.66 ±0.22	12.21 ±0.24	31.48 ±0.20
V	34.32 ±0.13	29.55 ±0.58	13.01 ± 0.19	10.71 ±0.23	12.32 ±0.22	31.56 ±0.13 *
Upon reaching a live weight of 120 kg						
I	42.77 ±0.78	30.66 ±0.56	12.68 ±0.64	11.05 ±0.51	12.75 ±0.12	29.79 ±0.47
II	40.32 ±0.83	30.08 ±0.67	12.77 ±0.15	11.68 ±0.10	12.44 ±0.15	30.20 ±0.20
III	40.15 ±0.91 *	29.84 ±0.67	13.02 ±0.38	10.94 ±0.40	12.12 ±0.14	30.54 ±0.39
IV	41.62 ±0.79	30.16 ±0.85	12.92 ±0.43	10.52 ±0.20	12.62 ±0.42	30.72 ±0.80
V	41.30 ±0.83	30.07 ±0.56	13.00 ±0.21	10.05 ±0.11	12.99 ±0.44	30.07 ±0.69

At a pre-slaughter weight of 120 kg, no statistically significant difference between the specific gravity of the mass of different cuts in animals of different experimental groups was found. It can be noted that the increase in pre-slaughter mass does not have a probable effect on the structure of young carcasses, regardless of its origin.

The value of bacon is determined by the amount and ratio of tissues in

the bacon half. The higher the content of muscle tissue, the more valuable is the carcass. A significant amount of fat and bone tissue in the carcass is undesirable.

In a quality bacon half carcass, a small amount of adipose tissue should be identified, taking into account that heavier conditions lead to a change in the ratio of tissues in the carcass in the direction of reducing the proportion of muscle tissue and increasing adipose tissue.

In improving the range of pork, the meat of individual cuts is of paramount importance. The results of the assessment of the morphological composition of individual cuts of half-carcasses gave grounds to establish that at a pre-slaughter weight of 100 kg the maximum meat content is characterized by the scapular part and hind leg (Table 7.66; 7.67).

Table 7.66

Morphological composition of carcasses of young pig carcasses Ante weight of 100 kg in conditions of company's Breed-Stock Plant «Stepnoy», (*n* =5)

Part of the carcass	Contents, %	Group				
		I	II	III	IV	V
Scapular part	meat	68.54	58.97	60.10	61.55	66.00
	fat	20.40	29.74	28.07	26.35	22.61
	bones	11.06	11.29	11.83	12.10	11.39
Korean	meat	54.73	45.60	46.12	46.98	52.49
	fat	34.08	43.20	41.26	40.05	36.20
	bones	11.19	11.20	12.32	12.97	11.31
Brisket	meat	52.74	46.93	48.45	47.91	50.68
	fat	40.63	46.32	44.51	45.28	42.47
	bones	6.63	6.75	7.04	6.81	6.85
Lumbar part	meat	51.65	48.69	49.87	50.00	50.00
	fat	43.01	46.05	44.48	44.13	44.65
	bones	5.34	5.26	5.65	5.87	5.35
Rear ham	meat	66.08	60.85	61.71	64.85	64.43
	fat	23.92	28.72	27.61	24.17	25.29
	bones	10.00	10.43	10.68	10.98	10.28

It was found that such cuts as the loin, brisket and lumbar region were characterized by the highest content of adipose tissue. The highest meat content in the scapular part was observed in carcasses of pigs of I and V experimental groups – 68.54 and 66.0%. The same animals were characterized by the lowest fat content in this cut – 20.40-22.61%.

A similar trend was observed in the proportion of meat and lard in cuts

such as brisket, loin and lumbar, both when reaching a live weight of 100 kg and 120 kg.

In our studies, there was a pattern of changes in the ratio of tissues with age, a decrease in meat yield and an increase in fat, but different genotypes have a specific intensity of change in this ratio.

Purebred animals of Landrace breed (Group I – control) and local genotypes obtained from a reciprocal combination of pigs of Duroc and Landrace breeds (IV, V experimental groups) at a live weight of 120 kg retained a high intensity of muscle tissue formation. It is noted that the yield of meat with increasing weight conditions increased slightly.

The results of the research, it should be noted that to increase the production of pork meat and bacon, along with purebred Landrace breed animals appropriate to use the Local youngsters received from reciprocal crossing Landrace pigs breed and internally pedigree type pig breeds Duroc Ukrainian selection «Stepovy».

The use of local young animals obtained on the basis of large white and landrace breeds does not increase the production of high-quality bacon pork.

Table 7.67

Morphological composition of carcasses of young pig carcasses ante weight of 120 kg in conditions of company's Breed-Stock Plant «Stepnoy», (*n* =5)

Part of the carcass	Contents, %	Group				
		I	II	III	IV	V
Scapular part	meat	69.15	57.36	59.87	64.30	66.38
	fat	20.13	30.12	28.15	23.45	22.44
	bones	10.72	12.52	11.98	12.25	11.18
Korean	meat	55.12	45.40	46.33	47.87	51.98
	fat	33.12	43.55	42.30	39.17	35.98
	bones	11.76	11.05	11.37	12.96	12.04
Brisket	meat	51.12	46.54	47.45	47.87	50.77
	fat	42.21	46.56	46.01	45.65	43.00
	bones	6.67	6.90	6.54	6.48	6.23
Lumbar part	meat	51.20	48.98	49.87	49.73	50.11
	fat	43.44	46.14	44.52	45.32	44.78
	bones	5.36	4.88	5.61	4.95	5.11
Rear ham	meat	67.15	61.00	61.44	64.92	65.65
	fat	24.10	28.33	27.54	25.62	25.32
	bones	8.75	10.67	11.02	9.46	9.03

Influence of functional feeds on productivity of fattening young pigs. Of all the possible toxic contaminants in pig feed, mycotoxins are the most dangerous. Mycotoxins are known to be toxic substances of microscopic fungi that contaminate feed and cause intoxication in farm animals (mycotoxicosis) [17].

Annual contamination of pig feed with mycotoxins leads to huge losses in pig farming due to reduced productivity, feed conversion, increased mortality and reduced immunity and reproductive function, increasing the cost of treating animals. In most countries of the world, the content of mycotoxins in pig feed is strictly regulated. The use of feed in which the concentration of at least one of the mycotoxins exceeds the maximum allowable level (MRL) is prohibited. But now it is no longer official bans, but a conscious attitude to the problem and understanding of its relevance by producers of pig products is the main factor limiting the use of toxic feed. Mandatory inclusion in the diet of pigs of veterinary drugs and feed additives with antitoxic properties has long been the norm [526].

Mycotoxins are formed in the grain affected by fungi at all stages of its production and processing. When growing cereals and legumes, mycotoxins accumulate due to the defeat of plants by fusarium wilt. Therefore, fungi of the genus *Fusarium* and the mycotoxins formed by them are called, respectively, «field mold» and «field mycotoxins». Field mycotoxins include T-2 toxin, deoxynivalenol, zearalenone and fumonisins. In the process of storing grain, wild mushrooms are at rest. In the conditions of warehouses on grain and plant forages «mold colonies» develop – fungi *Aspergillus flavus* and *Aspergillus ochraceus,* which produce aflatoxins and ochratoxins [317, 449, 650].

It should be noted that some types of mycotoxins are carcinogenic and accumulate in livestock products – eggs, meat, milk, which is a great danger not only for animals but also humans. Therefore, control over the content of mycotoxins in feed and timely elimination of their negative impact – necessary measures to ensure the safety of animal health and especially consumers of livestock products [391].

The main way to remove mycotoxins from feed is neutralization with sorbents. Its effectiveness differs significantly due to the variety of chemical structures and properties of mycotoxins and sorbents. Methods of control of mycotoxins are currently undergoing a significant evolution, which resulted in the path from the use of bentonites and aluminosilicates, active against only one or two mycotoxins, to the use of modified glucomannans, strongly and rapidly adsorbing almost all currently known mycotoxins [63, 167]. Due

to the urgency of the problem, we determined the effectiveness of the drug «Mikosorb» manufactured by «*Alltech»* in compound feeds contaminated with mycotoxins.

Researches were carried out in the conditions of the Agrofirm «Mig-Service-Agro» of the Novoodesky district of the Nikolaev area on a stock of local young growth of pigs. The experimental groups were formed as follows: I (control group) during the fattening period consumed the basic diet (OR); II (experimental group) to the main diet was introduced mycotoxin sorbent «Mikosorb» at a dose of 500 g/ton of feed; III (experimental group) Mycotoxin sorbent «Mycosorb» was introduced into the main diet at a dose of 1000 g/ton of feed, and other technological factors of feeding and maintenance were identical. The main feed used for feeding pigs of the experimental groups according to laboratory studies was recognized as low-toxic. In the experiment, fattening indicators were studied according to generally accepted methods [443].

The results of fattening of local young pigs of the experimental groups under the use of mycotoxin sorbent «Mycosorb» are presented in table 7.68. Young animals of all groups at fattening, after the equalization period had almost the same live weight in the range of 33.6-34.6 kg at the age of 90 days.

During the period of fattening, young animals of the experimental groups that consumed compound feed contaminated with mycotoxins, which included or was absent sorbent of mycotoxins differed in the length of stay for fattening.

Young pigs of group I, which consumed the main feed, were fattened for a longer time – 97.6 days, and thus probably inferior to this indicator in the experimental groups: animals of group II for 9 days (*P> 0.99*) and group III for 12.3 days (*P> 0.99*). This difference affected the total age of reaching a live weight of 100 kg, so the young of the II and III experimental groups, which were fed with sorbent «Mikosorb» at a dose of 0.5 and 1.0% reached a live weight of 100 kg at 178.6; 175.3 days, respectively.

The presence of sorbents in the compound feed used for fattening young animals caused higher average daily gains, respectively, the animals of the second group had the value of this indicator at the level of 749.4 g, which was 11% higher than the control group (*P> 0.999*) and animals of the third group – 766, 7 g, which is 13.6% higher than the control indicator. Higher average daily gains led to a decrease in feed costs per unit of growth in the young of the experimental groups.

Table 7.68

The results of fattening young pigs, $\overline{X} \pm S_{\overline{X}}$

Indicator	A group of animals		
	I	II	III
Assignment of groups	control	experimental	experimental
The percentage of drug administration per 1 ton of feed, %	-	0.5	1.0
Number of heads at fattening (90 days), heads	40	40	40
Live weight of piglets at fattening, kg	34.1 ± 0.45	33.6 ± 0.50	34.6 ± 0.44
Number of heads when reaching a live weight of 100 kg, goal.	37	39	38
Duration of fattening, days	97.6 ± 1.85	88.6 ± 1.60 **	85.3 ± 1.71 **
Age of reaching live weight 100 kg, days	187.6 ± 3.22	178.6 ± 1.90 *	175.3 ± 2.00 **
Absolute increase in fattening, kg	65.9 ± 1.22	66.4 ± 1.89	65.4 ± 1.92
The average daily increase in fattening, g	675.2 ± 8.92	749.4 ± 5.88 ***	766.7 ± 6.15 ***
Feed costs per 1 kg of growth, f. f.	3.43	3.25	3.12
Saving on fattening, %	92.5 ± 1.00	97.5 ± 0.89	95.0 ± 0.88

Thus, «Mycosorb», which was introduced into the feed (contaminated with mycotoxins) for fattening young animals helps to improve fattening qualities. Higher rates of average daily gain were obtained in pigs, to which compound feed was introduced 1 kg per ton of sorbent «Mikosorb». However, if the level of contamination of feed is not higher than in this case, it is possible to introduce a smaller dose of the drug – 500 g per ton of feed.

The method of increasing the productivity of young pigs in the complex use of drugs «Pro-Mac» and «Ultimate Acid». Stress load, embedded in the very essence of modern technology of productive livestock, leads to lower profitability, increased unit costs, increased costs and causes significant economic losses. Prevention and elimination of the negative effects of stress on the body is an urgent task of animal husbandry. A set of zootechnical and pharmacological measures aimed at solving this problem helps to increase the safety of livestock and reduce morbidity by increasing the overall nonspecific resistance of the organism, which ultimately leads to increased productivity of farm animals [409, 433, 484].

Using the urgency of this issue and interest of practitioners was set goal – to investigate the impact of technological features of growing pigs during rearing as their productive (live weight, average daily gain, safety), including the use of complex factors in their drinking drug «On Mac» and «Ultimate Acid» (manufacturer «*Kanters Special Products BV «*Netherlands»), which are introduced into the water supply system for suckling piglets, with the help of a medicator every other day, four days before weaning and seven days after weaning piglets (rearing plant).

The object of the research was improved performance of young pigs using drugs «Pro-Mac» (complex vitamins, amino acids, minerals, herbal supplements and essential oils) in conjunction with the «Ultimate Acid» (complex organic acids, formic, propionic, lactic, acetic, sorbion). The components that are part of the drug «Pro-Mac» have a multifaceted effect on almost all body systems, stimulating their activity. «Pro-Poppy» provides a good start for young pigs, helping to effectively «start» the digestive, immune, hormonal and nervous systems.

The main function of «Ultimate Acid» is to reduce the *pH* of the stomach, stimulation enzyme formation, prevention of reproduction of *E. coli* and *Salmonella*, antifungal and antimycotoxic effects activation of growth and development of villi small intestine.

In order to verify the integrated use of heterogeneous drugs, a scientific and economic experiment was conducted on suckling piglets and piglets at the first stage of rearing in a limited liability company (LLC) «Tavria pigs» Skadovsk, Kherson region.

The results of growing piglets from weaning (28 days) and reaching the age of 90 days were used for the study. The total number of heads for the study was 1780 heads. The research scheme provided for the assessment of the productive action of the drugs «Pro-Mac» and «Ultimate Acid» both independently and in combination.

Test youngsters were divided into two groups: a control group – pigs reared baseline technology use water-soluble additives «On Mac» and «Ultimate Acid» during weaning and during transfer to rearing, namely four days before weaning through watering was administered the drug «Pro-Mac» and within seven days after weaning the piglets through the watering system was administered the drug «Ultimate Acid»; Experimental group II – piglets were raised according to the basic technology, but for young animals at the same time used drugs «Pro-Mac» and «Ultimate Acid», which are introduced into the water supply system for piglets (farrowing shop) with the help of a medicator every other day for four days before weaning and

seven days after weaning piglets (rearing plant).

The drugs were introduced into the watering system using the drug «*Dozatron»* at a dose of 100 ml per 100 liters of water. For feeding pigs and lactating balancing rations for rearing calves used superstarterni feed and protein-vitamin-mineral supplements company «AgroVetkorm» (c. Dnipro). Keeping animals in the suckling period and during the rearing period, in terms of control and experimental group, had no significant design and technological features.

Evaluation of pig productivity was carried out according to general methods [443].

Weaning is a serious stress for piglets and one of the main critical periods of their lives, when the foundations are laid for future growth and development. Today it is well known that the weight of piglets at weaning and growth rates in the first 7-10 days after it have a significant impact on the efficiency of lifelong feeding before slaughter. Therefore, during this period it is necessary to ensure high average daily gains and health of piglets.

The results of growing experimental piglets from weaning to 90 days of age using the drugs «Pro-Mac» and «Ultimate Acid» are presented in table 7.69.

Table 7.69

The results of growing guinea pigs, $\overline{X} \pm S_{\overline{X}}$

Indicator	Group		± II to I
	I	II	
Number of goals at weaning (28 days), goal	890	890	-
Live weight of piglets at weaning, kg	8.12 ± 0.32	8.08 ± 0.30	-0.04
Number of goals at the age of 90 days, goals	823	858	+35
Live weight of piglets at the age of 90 days, kg	32.81 ± 0.20	37.88 ± 0.24	+5.07 ***
Average daily gain, g	405 ± 5.3	489 ± 4.5	+84 ***
Saving, %	92.47 ± 1.60	96.40 ± 1.80	+3.93 *

At weaning, the live weight of piglets in the experimental groups was almost the same, the difference in favor of piglets of group II was only 0.04 g (the difference is not statistically significant).

When studying this issue and observing the behavior and condition of piglets in both experimental groups, it should be noted that piglets of group

I for a longer time established a hierarchical relationship with each other, in contrast to piglets of group II. Based on this, we state that the animals of the second group are better at merging nests in the rearing area.

During the period of stay of experimental piglets on rearing we note a probable decrease in live weight in animals of group I by 5.07 kg in comparison with experimental young of group II (*P> 0.999*).

We note that the animals of the first experimental group decreased feed consumption during the first days after their transfer to the rearing area, in contrast to their counterparts in the second group, which consumed feed much better. This fact was also observed in the increase in the average daily gain in piglets of group II, which was equal to 489 g, which is 84 g more than in young pigs of group I (*P> 0.999*).

According to the indicator of preservation of young animals in the period of rearing, the highest preservation was established in group II – 96.40%, which is 3.93% more than the analogues of group I (*P> 0.95*).

Thus, the studies confirmed the feasibility of comprehensive use of drugs «Pro-Mac» and «Ultimate Acid» for suckling piglets (farrowing shop) four days before weaning and seven days after weaning piglets (rearing shop) at intervals of 24 hours in a row. It is proved that the combined use of both drugs is more effective.

The economic efficiency of using this method of complex use of drugs «Pro-Mac» and «Ultimate Acid» is 12.05 UAH per head.

Patent 129,160 Ukraine, IPC G01N 33/48 (2006.01). The method of increasing the productivity of young pigs in the complex use of drugs «Pro-Mac» and «Ultimate Acid» / Lykhach V. Y., Lykhach A.V., Faustov R.V., Lenkov L.G., Zadorozhniy V.V.; applicant and patent owner Mykolayiv National Agrarian University. – № u2018 03780; appl. 04/10/2018; public. 10/25/2018, Bull. № 20.

The use of feed additive «Perfectin» and its effect on pig productivity. The intensity of pig farming largely depends on the complete feeding of animals. Various feed additives are used to supplement nutrient deficiencies in pig diets. According to the literature, high results in the production of livestock products are achieved by farms that use feed additives, resulting in increased by 30-40% average daily gain of pigs, feed consumption is reduced by 15-20%, and the preservation of young animals increases by 40-60% [370, 376].

Interest in natural feeding of animals indicates that domestic producers are increasingly thinking about the quality of products they produce. The

quality and safety of the final products depends on a number of factors: animal health, housing conditions, feeding, vaccination programs, and so on. These factors are interrelated, and each is important in its own way. Feeding is one of the most important and, at the same time, costly factors of influence, because usually the cost of feeding is 60-70% of the total. Therefore, analyzing the effectiveness of feeding, first of all, pay attention to the conversion rate of feed. In order to improve feed conversion and productivity, the use of phytogenic products has recently become quite popular in feeding. They are also used as a natural alternative to antibiotic growth stimulants, especially by specialists of full-cycle companies, for which both animal growth rates and the quality of the final product are important [176, 309, 376].

Today, as natural stimulators of animal growth, more and more attention is paid to plant components [110, 186, 192, 308, 340]. According to L. N. Barbosa, V. L. Rall (2009), many plants have useful multifunctional properties due to the content of certain biologically active components. They are mainly secondary metabolites, in particular: terpenoids (mono – and sesquiterpenes, steroids, etc.), phenolic substances (tannins), glycosides and alkaloids (alcohols, aldehydes, ketones, esters, ethers, lactones, etc.).

There are many variants of their compositions, depending on biological factors (plant species, place where they grow, and harvesting conditions), production methods (extraction, distillation, stabilization), storage conditions (light, temperature, storage duration, etc.). However, if phytogenic substances are included in the diet of animals in the right combination and dosage, the producer of livestock products receives significant benefits. First of all, phytogens control the state of the intestinal microflora, preventing the occurrence of gastrointestinal disorders, which, in turn, alleviates immune stress in animals. In addition, phytogenic substances, due to their physical and chemical properties, can significantly change the sensory and olfactory characteristics of animal feed.

This necessitates the search for optimal, natural growth stimulants for fattening pigs. Taking into account the above data, the aim was to study the productivity of young pigs during the fattening period depending on the feeding of the feed additive «Perfectin».

Research and production studies were performed in the conditions of the limited liability company (LLC) «Tavria pigs» of Kherson region, Skadovsk, which specializes in breeding pigs of large white, Ukrainian meat, pietren, landrace and terminal line «Maxter». The scientific and economic experiment consisted in studying the productive qualities of

fattening pigs of the combination ♀ (WL × L) × ♂ Maxter depending on the feeding of the feed additive «Perfectin» (manufacturer «Vetpharm», Ukraine) and its impact on their productivity. According to the registration certificate, the feed additive «Perfectin» stimulates the growth of muscle tissue, improves the conversion rate of feed in pigs, promotes the preservation of livestock and more. This feed additive is fed to young pigs in the form of powder in the amount of 2 kg per 1 ton of feed, basic ration (OR). The study of fattening, slaughter and meat and fat qualities of experimental animals was carried out according to the relevant guidelines of the Institute of Pig Breeding and APV NAAS of Ukraine and others [357, 443, 439].

Studies have shown (Table 7.70) that the use of feed additive «Perfectin», in these quantities by the manufacturer LLC «Vetpharm» promotes better growth of experimental pigs in terms of age. According to the results of studies that when fattening the live weight in young pigs of the two experimental groups almost did not differ, the advantage in favor of the second experimental group was 0.7 kg, where the difference is not statistically significant.

Table 7.70

The growth of experimental young pigs for fattening, depending from feeding feed additive «Perfectin» (*n* = 40), $\overline{X} \pm S_{\overline{X}}$

Group	Live weight at age (months), kg			
	3	4	5	6
I	30.4 ± 0.24	53.6 ± 0.24	80.3 ± 0.21	100.3 ± 0.18
II	31.1 ± 0.36	56.1 ± 0.28	84.2 ± 0.26	107.5 ± 0.28
+/- II to I	+0.7	+2.5 ***	+3.9 ***	+7.2 ***

At the age of 4 months, the preference for live weight had pigs of the II experimental group – 56.1 ± 0.28 kg and prevailed on this indicator of peers of the control group by 2.5 kg, at *P> 0.999*.

A similar trend is observed at the age of 5 months, where a statistically significant difference in live weight in favor of pigs of the second experimental group was 3.9 kg (*P>0.999*) compared with analogues of the first control group.

Regarding the six-month age period, we state that the animals of the II experimental group by live weight probably exceeded the control piglets by 7.2 kg (*P> 0.999*).

The presented data of the conducted researches allow to state that at

feeding of a feed additive «Perfectin» the fattening young growth of pigs which spent more time for rest and reception of a forage and water had probably higher indicators of live weight at the age of 4, 5, 6 months.

It is known that the growth rate of pigs at an early age affects their fattening and meat qualities [31, 57, 259]. In this regard, we studied the effectiveness of the use of feed additives «Perfectin» to improve the fattening qualities of young pigs (Table 7.71).

The results of studies on the fattening qualities of young pigs of the experimental groups, depending on the presence in their diet of feed additive «Perfectin» convincingly shows that the animals of the experimental group 9.3 days earlier reach a live weight of 100 kg compared with peers of the first control group, *P> 0.99*.

Table 7.71

Feeding qualities of young pigs depending from feeding feed additive «Perfectin» (*n* = 40), $\overline{X} \pm S_{\overline{X}}$

Group	Age of reaching live weight 100 kg, days	The average daily increase in fattening, g	Feed costs per 1 kg of gain, feed units.
I	179.6 ± 2.46	776.7 ± 7.96	3.32
II	170.3 ± 2.93	826.7 ± 6.25	3.16
+/- II to I	+9.3 **	+50.0 ***	+0.16

Regarding the average daily increase in fattening, we note that the animals of the second experimental group probably exceeded the analogues of the first control – by 50 g, where the difference is statistically significant (P> 0.999).

In terms of feed consumption per 1 kg of growth, the advantage belongs to the animals of the II experimental group – 3.16 feed from against 3.32 feed from young pigs of the I control group. Thus, fattening young animals of the II experimental group for 0.16 feed from spent less feed per 1 kg of gain compared to control animals.

The efficiency of pork meat production, along with reproductive and fattening characteristics, largely depends on the indicator of slaughter and meat qualities. This issue is especially important when using specialized meat breeds of foreign selection in order to improve the meat qualities of domestic pig breeds in the derivation of new intra-breed types and lines, or in obtaining hybrid commercial young [163, 165, 245, 259].

Animals selected for slaughter to assess slaughter qualities were selected from groups of fattening young. When the piglets reached a live

weight of 100 kg in the conditions of LLC «Tavria pigs» of Kherson region, a control slaughter of animals and determination of slaughter qualities of animals of the control and experimental groups was carried out. The study of fattening, slaughter and meat and fat qualities of experimental animals was carried out according to the relevant guidelines [443].

Assessing the slaughter qualities of the experimental groups of pigs (Table 7.72) it was found that the highest value of the slaughter yield was characterized by pigs of the II experimental group – 75.0 ± 0.62% and outperformed their peers of the I control group by 3.9%, where the difference is statistically significant (*P> 0.99*).

Table 7.72

Slaughter qualities of young pigs depending from feeding feed additive «Perfectin» (*n* = 40), $\overline{X} \pm S_{\overline{X}}$

Group	Slaughter yield, %	Half carcass length, cm	Fat thickness, mm	The area of the «muscle eye», cm^2	Weight of the rear third of the carcass, kg
I	71.1 ± 0.76	94.6 ± 0.58	18.2 ± 0.89	36.8 ± 0.34	10.9 ± 0.32
II	75.0 ± 0.62	96.7 ± 0.69	14.6 ± 0.51	39.2 ± 0.29	11.4 ± 0.17
+/- II to I	+3.9 **	+2.1 *	-3.6 **	+2.4 ***	+0.5

No less important indicator of the meat qualities of pigs is the length of the carcass. In our studies, at the pre-slaughter live weight of young pigs, 100 kg of animals of the II experimental group had the highest value of this indicator – 96.7 cm, which is 2.1 cm more than that of animals of the I control group (*P>0.95*). Experimental animals of group II were characterized by a thinner fat, compared with animals of group I by 3.6% (*P>0.99*).

It should be noted that the absolute and relative changes in muscle and adipose tissue are reflected in the change in the area of the «muscle cell», which is an important criterion for assessing the meat content of carcasses. According to the results of numerous studies, it was found that the area of the «muscle cell» is positively correlated with the yield of meat in pig carcasses. In the course of research, it was found that when reaching a live weight of 100 kg in terms of groups, the area of the «muscle eye» ranged from 36.8 to 39.2 cm^2. Young animals of the II experimental group probably outperformed the animals of the I control on the value of this indicator by 2.4 cm^2, at *P>0.999*.

Regarding the weight of the posterior third of the carcass, no

significant difference was found in the experimental groups, but there was a tendency to a greater weight of ham in animals of the experimental group II, which during fattening consumed feed additive «Perfectin».

Thus, on the basis of the above material, we note that the use of feed additive «Perfectin» in the diet of young pigs of the experimental group II led to its better growth, fattening and slaughter qualities. However, it should be noted no less interesting fact that the feeding of feed additive «Perfectin» piglets of the experimental group II increases the time for rest and consumption of feed and water, as a consequence, reducing the aggression and fights of young pigs.

The results of our research are consistent with the data of other authors on the effectiveness of feed additives and premixes. Thus, a number of scientists [167, 186, 276, 376, 403, 525] note that the fattening of piglets, as well as those lagging behind in the conditions of pig enterprises received an average daily increase of 700 g or more for the use of natural growth stimulants.

In today's conditions, the predominant trend in the development of the pig industry is, along with the increase in meat, a simultaneous improvement in the quality of pork produced. It is worth remembering that most animals with a high yield of meat have an increased moisture content, which causes sagging and reduced color intensity. Undoubtedly, the deteriorating indicators of meat products cause damage to farms and the meat processing industry [209, 284, 403].

From the data of table 7.73 it is seen that in animals the chemical properties of meat depend on the feeding of the feed additive «Perfectin».

Table 7.73

Chemical properties of pork at ante-mortem weight of 100 kg depending on the feeding of feed additive «Perfectin» (*n* = 40), $\overline{X} \pm S_{\overline{X}}$

Group	Total moisture, %	Dry matter, %	Fat, %	Protein, %	Ash, %
I	74.6 ± 0.42	25.4 ± 0.32	2.2 ± 0.24	21.7 ± 0.49	1.5 ± 0.04
II	73.2 ± 0.38	26.8 ± 0.45	2.0 ± 0.19	23.1 ± 0.36	1.7 ± 0.10
+/- II to I	-1.4 **	+1.4 **	-0.2	+1.4 *	+0.2

According to the calculations, it was found that the animals of the second experimental group had a significantly lower moisture content in meat – 73.2% than young pigs of the first control group – 74.6%, where the difference is statistically significant (*P> 0.99*).

As expected, the waterier meat of pigs of the I control group had a

lower dry matter content, and therefore the meat obtained from animals of the I group was probably inferior to this meat, which was obtained from analogues of the II experimental group by 1.4% (*P> 0.99*).

There was no statistically significant difference in the fat content in the meat of the experimental groups of pigs, but it should be noted that a higher percentage of fat was characterized by meat obtained from animals of the control group I. Next, it should be noted that the meat of the experimental groups of pigs belongs to the category of lean or lean.

At slaughter of animals with a live weight of 100 kg, a higher protein content was observed in young pigs of the experimental group – 23.1 ± 0.36%, which probably exceeded the same indicator of animals of the control group.

Under the condition of increased moisture content and lower percentage of dry matter in meat obtained from pigs of the I control group; a lower ash content was noted – 1.5 ± 0.04%.

Thus, the results of research suggest that with the introduction of the main diet of young animals for fattening, 2 kg of «Perfectin» per 1 ton of feed, it is possible to increase the average daily gain by 6.43%, reduce feed costs by 5.06% resulting in live weight of 100 kg is reached 9.3 days earlier. Also, with the use of feed additive «Perfectin», due to the better synthesis of muscle tissue may increase meat qualities: slaughter yield by 3.9%, carcass length by 2.1 cm, muscle eye area by 2.4 cm^2. Meat obtained from animals of the experimental groups (OR + «Perfectin») was marked by the best quality indicators and is characterized as lean.

7.3. Evaluation of the effectiveness of information technology in pig breeding.

Information is the most important resource of society, the same factor of its development as, for example, raw materials or energy. In breeding pigs, information comes from various sources related to animal breeding. In our time, the speed of change of phenomena, the complexity of the set of tasks came into conflict with the existing limited capabilities of processing such information.

Therefore, the means of work of a zootechnician-breeder is increasingly becoming a personal computer, which allows a fundamentally new way to solve problems of scientifically sound improvement of the herd [527].

In countries with developed infrastructure of breeding and breeding work (USA, Canada, Germany, Sweden, etc.) the main impetus is made to

the introduction of the latest advances in population genetics and biotechnology in the practice of creating genotypes with desirable characteristics and properties [146, 311, 506, 527].

At the same time, it should be recognized that in Ukraine, due to the traditional views, economic conditions and principles of economic activity of tribal organizations, the system of selection and breeding work is a decentralized scheme, differentiated into regions, areas of farms and more. In this regard, there is a need to create a tool that would integrate separate information blocks related to productive and genetic qualities of animals in a single information-compatible network, which allows to form generalized data banks on breeding animals and unify the implementation of population data in in the form of solving various selection problems.

In Ukraine, breeding records in pig breeding are regulated by the «Instruction on breeding records in pig breeding» developed by the Law of Ukraine «On Breeding in Animal Husbandry» [157], approved by the order of the Ministry of Agrarian Policy of Ukraine from 396 of 17.12.2002.

One of the most common software products in Ukraine, which is used to provide automated breeding records in pig breeding, is «Accent – breeding records in pig breeding».

The main functionality of this software product is to ensure the possibility of automated maintenance of all major forms of breeding records in pig breeding, including the formation of the «Report on the results of grading pigs of the breed» (form 7-sv). The architecture of all forms of breeding records fully meets the requirements of the «Instructions for keeping breeding records in pig breeding», which makes it possible to print them and, if necessary, present them in paper form.

The analysis of the possibilities of this program to create different forms of reporting deserves special attention. The capabilities of the software product «Accent - breeding records in pig breeding» allow you to generate more than 30 different reports that allow you to assess the effectiveness of the use of animals of different sexes. In addition, it is possible to integrate the results of the generated reports in Microsoft Excel for further in-depth processing by methods of variation statistics. Genetic improvement of populations involves the assessment of genotype and intensive selection of animals in breeding herds in order to further their reproduction and optimal use of breeding animals in breeding systems.

However, it should be recognized that in breeding pig breeding mathematical methods have not become widespread in practice, as a result of which the objectivity, accuracy of assessment and prediction of certain

aspects of selection are insignificant. In this regard, at this stage the tasks of developing ways to use the existing databases to solve genetic selection problems become especially relevant.

In the program «Accent - breeding accounting in pig breeding» the opportunity to evaluate animals using selection indices (assessment of maternal qualities of sows based on the calculation of the assessment index for a limited number of traits in the modification of the M. D. Berezovsky, index of nest alignment, assessment of animals by reproduction) and calculated some other important indices [88, 420].

Today, this software product is supplemented by the ability to enter in the breeding cards of animal's data on their genotypes by genes-markers of productive qualities («genetic passport»). An important function of the block «Genetic Passport» is the ability to calculate the genotypes of offspring based on data on the genotypes of their parents.

The new module of the program «Accent - breeding accounting in pig breeding» – «Genetic Passport» is an effective tool that greatly simplifies the accounting of genetic data, as well as their use in the conduct of marker-dependent selection in pig breeding.

The latest additions to the program are the «meat definition» functionality. The thickness of the fat is measured at two points at the level of the last rib: P_2 – three centimeters away from the middle line of the back and P_4 – eight centimeters away from the middle line of the back. The thickness of the longest back muscle is measured only at the point P_4. All measurements are adjusted to a live weight of 110 kg.

The ultimate goal of creating a database of breeding animals in the program «Accent – breeding accounting in pig breeding» is the implementation on its basis of the transition to the evaluation of animals by BLUP. The program «Accent - breeding accounting in pig breeding» provides an opportunity for specialists-accountants and technologists in breeding in an automated mode to carry out in full breeding accounting, the formation of various types of reporting, as well as to plan the schedule of certain technological operations.

The introduction of this software product into production will significantly increase the efficiency of the pig farm by providing the necessary information support to the breeding service of the farm, as well as provide multiple acceleration of information processing and analysis.

But today on the Ukrainian market there are many software products with similar functional features. More common are: «Agrosoft» (Netherlands), «Farm» (Netherlands), «Boar» (Ukraine), «Accent»

(Ukraine) and «PlemOffice» (Ukraine). Taking in to account the features of these software products, we conducted a comparative description of these programs of zootechnical accounting in pig farming (user ergonomics) table. 7.74.

Table 7.74

Comparative characteristics of zootechnical accounting programs in pig breeding (user ergonomics)

Summary of product and options	Software products				
	«*Agrosoft*» (Netherlands)	«*Farm*» (Netherlands)	«Boar» (Ukraine)	«Accent» (Ukraine)	« *PlemOffice* » (Ukraine)
1	2	3	4	5	6
Software installation («+» without the participation of a specialist, «-» with the participation of a specialist).	-	-	-	+	-
Installation of software updates («+» without the participation of a specialist, «-«with the participation of a specialist).	+	+	+	+	+
Visibility of documents "as is" ("+" input is performed in a document as close as possible to the type of real document, "-" input is performed in a dialog box).	-	-	-	+	-
Ability to print a document without forming a "print view" of the document ("+" what we see, we print, "-" you need to form a printed view of the document.	-	-	-	+	-
Ability to work without office applications, the availability of their own means of forming printed documents and reports ("+" Yes, "-" No).	-	-	-	+	-
Individual accounting of animals.	+/-	+/-	+/-	+	+/-
Support for the functionality of breeding sow and breeding boar cards (1-2-St) pedigree + development, evaluation and averages.	-	-	-	+	+
Possibility of formation of a card of the account of productivity of a boar (3-Cv).	-	-	-	+	+
Ability to keep an electronic Journal of mating (4-St).	-	-	-	+	+
Ability to keep an electronic log of sows and piglets (5-St).	-	-	-	+	+
Possibility to keep an electronic log of growing young pigs (6-St).	-	-	-	+	+
Ability to generate a report on the results of grading pigs of a certain breed (7-St).	-	-	-	+	+
Forming a description of pig grading.	-	-	-	+	-
Formation of breeding certificate	-	-	+	+	+
Existence of functionality of planning of selection of pairs with an exception of inbreeding on Shaporuzh .	-	-	-	+	-
Possibility of culling pigs (Act of disposal).	+	+	+	+	+
Ability to run multiple businesses on a single physical database.	-	-	-	+	-
Possibility to keep both breeding records and records of sows and boars that are not part of the breeding group in one database.	-	-	+	+	+
Ability to maintain multiple breeds on a single physical database.	+	+	+	+	+
There are restrictions on the number of livestock that is recorded in the database.	+	+	+	-	-
Automatic birth of piglets in a computer with the construction of a pedigree for each born piglet.	-	-	-	+	-
Automatic calculation of breed, interbreed (breed) and intrabreed (selection) coefficients.	-	-	-	+	-
Ability to carry out personal weaning of piglets from one sow to another.	-	-	-	+	-
Control ultrasound.	+	+	+	+	+
Control of finding pigs in enclosures, boxes, machines.	+	+	+	+	+
Existence of system of import-export of pedigrees, for purchase and sale of animals from other enterprises which have a similar computer program.	+	+	+	+	+
Compliance of accounting forms with Ukrainian legislation.	-	-	-	+	+
Support for breeding records (Ukraine).	-	-	-	+	-
Work of several users in a local computer network.	+	+	+	+	+
Availability of index assessment.	+	+	+	+	+
Ability to work remotely using the Internet and a dedicated server.	+	+	+	+	+
Ability to use PDAs and tablets.	+	+	+	+	+
Finalization of those , task of users.	-	-	-	+	-
Availability of work planning system.	+	+	+	+	+
Data exchange with a breeding company.	+	+	+	+	+

We emphasize that the vast majority of functional features of the presented software products coincide. But we note that the program

«Accent» has an advantage over other software products from the standpoint of printing documents. Given the fact that in Ukraine breeding records in pig breeding are regulated by the «Instruction on breeding records in pig breeding» developed in pursuance of the Law of Ukraine «On Breeding in Animal Husbandry» and farms with breeding status are reported and kept records according to these instructions, the program «Accent» corresponds to the forms of the current law.

Also, a great advantage of this program is the presence of the functionality of planning the selection of pairs with the exception of inbreeding by Shaporuzh and automatic calculation of breed, interbreed and intrabreed coefficients.

In production conditions in the farrowing shop there are frequent cases of planting and weaning piglets from sows, depending on its productivity. In this regard, the program «Accent» has an option: personal weaning-transplantation of piglets from one sow to another.

Thus, the above information indicates that the vast majority of software products for zootechnical accounting in pig farming are not subject to change at the request of the user, and the program «Accent» can be adapted to the individual characteristics of the producer.

7.4. Economic efficiency of introduction of technological innovative decisions in pig breeding.

The level of efficiency in the use of sows depends, first of all, on the duration of their operation and obtaining the maximum number of piglets from them. To determine the most optimal design of the machine for individual maintenance of single and conditionally pregnant sows and its impact on their reproductive qualities, the calculation was performed based on the data obtained during the experiment (Table 7.75).

Estimation of economic efficiency of reproductive qualities of sows depending on design features of the easel equipment for individual maintenance was carried out according to average data of productivity of queens of two farms (Agrofirm «Mig -Service-Agro» of the Nikolaev region and LLC «Tavriya pigs» of the Kherson region). The results of economic efficiency show that with individual keeping of sows in machines «type № 2» the number of farrowings from 100 paired sows was 7.1% higher compared to keeping in machines «type № 1».

Higher fertility rates and more comfortable conditions for keeping sows in «type № 2» machines contributed to obtaining more piglets per 1

farrowing (10.4%), which is 131 heads, additionally obtained piglets. These indicators subsequently led to higher indicators of the number of piglets at weaning and their gross growth during the suckling period.

Table 7.75

Economic efficiency of reproductive qualities of sows depending on the type of machine (per 100 sows)

Indicator	Machine type		+/- №2 to №1
	№ 1	№ 2	
Number of farrowings from 100 paired sows	76.1	83.2	+7.1
Multiplicity (for 1 sow), ch.	10.25	10.95	+0.7
Received piglets per 1 farrowing, naked.	780,03	911,04	+131.02
Number of piglets at weaning at 28 days (per sow), ch.	9.34	10.31	+0.97
Number of piglets at weaning at 28 days, ch.	710,77	857,79	+147.02
Absolute growth of piglets during the suckling period, kg	6.68	6.61	-0.07
Obtained live weight gain of piglets, c	47.48	56.70	+9.22
The cost of 1 quintal of live weight gain, UAH	5747.8	5207.1	-540.7
The average selling price of 1 quintal of live weight gain*, UAH	6000.0	6000.0	0
The cost of the obtained increase in live weight of piglets, thousand UAH	272.90	295.24	+22.34
Revenue from sales of live weight gain of piglets, thousand UAH	284,88	340.2	+55.32
Net profit on sales, thousand UAH	11.97	44.96	+32.98
Profitability level, %	4.39	15.23	+10.84

Note. * - at average market prices in 2015.

Given the above results, it can be reliably stated that at the same cost of the presented machines (1548 UAH) for individual keeping of sows in the idle period and in the period of conditional gestation it is more expedient to install machines of the second type (see Fig. 7.2). not only to increase the reproductive qualities of animals from a technological point of view, but also to obtain a net profit and level of profitability in the sale of piglets, respectively, by 32.98 thousand UAH and 10.84% more. Estimation of economic efficiency of reproductive qualities of sows (on average on breeds) depending on an arrangement of the fixing machine in a box for farrowing is presented in table 7.76.

From sows that were kept in direct fixing machines during the suckling period, 7.5% more business piglets were obtained than in the diagonal location of the machine. Also, piglets from these nests at the time of weaning

had a higher live weight gain of 580 g.

Table 7.76

Economic efficiency of reproductive qualities of sows depending on the location of the fixing machine in the farrowing box (per nest)

Indicator	Location of the machine		+/- diagonal to the direct
	straight	diagonal	
Multiplicity, ch.	11.30	11.35	+0.05
Number of piglets at weaning at 28 days, ch.	10.8	10.0	-0.8
Absolute gain of one piglet during the suckling period, kg	6.64	6.06	-0.58
Obtained live weight gain of piglets, c	0.72	0.61	-0.11
The cost of 1 quintal of live weight gain, UAH	5000.7	5517.7	+517.0
The average selling price of 1 quintal of live weight gain, UAH	6000.0	6000.0	0
The cost of the obtained increase in live weight of piglets, UAH	3586,10	3343,73	-242.38
Revenue from sales of live weight gain of piglets, UAH	4302,72	3636.0	-666.72
Net profit on sales, UAH	716,62	292,27	-424.34
Profitability level, %	19.98	8.74	-11.24

This formed a lower cost per quintal of live weight gain of piglets obtained from sows that were kept in direct fixing machines during the suckling period – UAH 5,000.7 per nest.

Thus, taking into account the cost and selling price per quintal of live weight gain, we note that the use of a direct fixing machine in the farrowing box is more economically feasible than diagonal, as net profit and profitability per nest are higher by UAH 424.34 and 11.24% respectively.

Table 7.77 presents the cost-effectiveness of the use of advanced self-feeding for piglets on rearing.

Under the condition of using an improved self-feeder for feeding compound feed to young animals for rearing, heavier piglets were obtained, because at the end of this period their live weight was 38.0 kg, which is 2.15 kg higher than analogues consuming feed from conventional feeders.

We note that the design features of the advanced feeder affected the growth energy of pigs. Thus, from the number of pigs in the machines in which these feeders were installed received a higher rate of live weight gain – 44.16 quintals at a lower cost – 2615.0 UAH. During the rearing period, which lasted 54 days, provided the sale of 160 young animals, it is possible to get 36.87 thousand UAH of net profit, which is 9.35 thousand UAH

higher than analogues, while the level of profitability increases by 7.5% and is – 31,93%.

Table 7.77

Cost-effectiveness of using an advanced feeder for young pigs

Indicator	Type of feeder		+/- advanced to the usual
	ordinary	improved	
Number of piglets, ch.	160	160	-
Live weight of piglets when placed for rearing, kg	10.45	10.40	-0.05
Live weight of piglets at the age of 90 days, kg	35.85	38.00	+2.15
Absolute gain of one piglet during the rearing period, kg	25.4	27.6	+2.2
Obtained live weight gain of piglets, c	40.64	44.16	+3.52
The cost of 1 quintal of live weight gain, UAH	2772.7	2615.0	-157.7
The average selling price of 1 quintal of live weight gain*, UAH	3450.0	3450.0	0
The cost of the obtained increase in live weight of piglets, thousand UAH	112.68	115.48	+2.80
Revenue from sales of live weight gain of piglets, thousand UAH	140.21	152.35	+12.14
Net profit on sales, thousand UAH	27.53	36.87	+9.35
Profitability level, %	24.43	31.93	+7.50

Note. * - at average market prices in 2015.

In table 7.78 shows the indicators of economic efficiency of meat productivity of pigs with different sensitivity, which were raised in different conditions. It was found that from stress-resistant animals received a higher yield of meat – 57.2 kg, taking into account the price of meat on the bone, the total cost of meat will be – 2860.0 UAH, which is 80 and 215 UAH more than analogues II and III groups.

According to the results of the analysis of economic efficiency of meat productivity of pigs it is proved that joint cultivation of stress-resistant and stress - sensitive animals together is not expedient as the net profit from sale of meat and fat products in this group is the smallest and makes – 756,1 UAH that on 110 , UAH 8 and 153.9 less than the analogues of the II and I groups, respectively.

Taking into account the indicators of net profit and cost, the level of profitability in terms of experimental groups was group I (stress-resistant , which were grown separately) – 47.55%; Group II (stress-sensitive, which

were grown separately) – 41.64% and Group III (50% – stress – resistant and 50% – stress - sensitive, which were grown together) – 34.39%.

Table 7.78

Economic efficiency of meat productivity of pigs with different sensitivity and rearing conditions

Indicator	A group of animals		
	I - stress - resistant	II- stress - sensitive	III - mixed (50% - stress - resistant; 50% - stress - sensitive)
Weight of chilled carcass, kg	74.3	73.3	70.1
The output of meat from the carcass, * kg	57.2	55.5	52.9
Fat yield from carcasses, kg	17.1	17.8	17.2
The cost of meat from the carcass, ** UAH	2860.0	2775.0	2645.0
The cost of lard from the carcass, *** UAH	307.8	320.4	309.6
The cost of mascara, UAH	3167.8	3095.4	2954.6
The cost of carcass, UAH	2147.0	2185.4	2198.5
Net profit from the sale of meat and fat products from 1 goal, UAH	1020.8	910.0	756.1
The level of profitability when selling meat and fat products, %	47.55	41.64	34.39

Notes: * - meat on the bones; ** - at average market prices in 2015, the selling price of 1 kg of meat on the bones - UAH 50.00; *** - sales price of 1 kg of lard - UAH 18.00.

The experience of other countries shows that with increasing purchasing power of the population of Ukraine, there will be a question of reducing the energy and increasing the biological value of basic food products. And on these grounds, lard is significantly inferior to meat. The results of the evaluation of the economic efficiency of the results of research on the improvement of bacon qualities due to pigs of specialized meat breeds are shown in table 7.79.

Table 7.79

Indicators of economic efficiency of use of specialized breeds of pigs to improve bacon qualities

Group	Cutting															Price of half carcass, UAH
	scapular part			loin			brisket			lumbar part			hind leg			
	mass, kg	price 1 kg, UAH	cost of cutting, UAH	mass, kg	price 1 kg, UAH	cost of cutting, UAH	mass, kg	price 1 kg, UAH	cost of cutting, UAH	mass, kg	price 1 kg, UAH	cost of cutting, UAH	mass, kg	price 1 kg, UAH	cost of cutting, UAH	
AND	10.21	67.00 *	684,01	4.48	60.00 *	268.51	3.64	65.00 *	236.57	4.31	78.00 *	336,56	10.56	75.00 *	792,03	2317,69
II	10.61	67.00	710,94	4.08	60.00	244.76	3.58	65.00	232.80	4.20	78.00	327,83	9.97	75.00	747,72	2264,05
III	10.60	67.00	710.40	4.13	60.00	247.96	3.54	65.00	230.09	4.17	78.00	325.48	10.05	75.00	753,78	2267,71
IV	10.29	67.00	689,13	4.48	60.00	268.66	3.68	65.00	239.40	4.22	78.00	329.05	10.88	75.00	815,73	2341,96
V	10.14	67.00	679,48	4.47	60.00	267.90	3.68	65.00	238.92	4.23	78.00	329.80	10.83	75.00	812,35	2328,46

Note: * - at average market retail prices in 2015.

The main assessment of bacon carcass is to establish its price. Clear methodical selection work to improve the quality of meat while reinforcing it by constant control slaughter, increases the value of bacon carcasses and, consequently, increase the economic efficiency of commercial pork production.

It should be borne in mind that the individual cuts in the bacon half-carcass have different value and, accordingly, different cost. The most valuable in the bacon half are the edge of the ham and the lumbar part. The edge of the ham contains muscles and a small number of bones. The lumbar part of the bones does not contain at all. According to the results of research it is established that the local genotypes of Duroc and Landrace breeds are practically not inferior to purebred Landrace animals in terms of bacon qualities. Peculiarities of the morphological composition of carcasses of local young animals of IV and V experimental groups cause an increase in their total value by UAH 24.27 and 10.77, respectively, due to an increase in the proportion of more valuable cuts.

REFERENCES

1. Абзаев И. А., Кудрявцев В. Н. Определение оптимальних размеров животноводческих комплексов и их размещение в экономическом районе, области (крае) : методические рекомендации. Новосибирск, 1981. 56 с.
2. Абузяров А. А., Джамалдинов А. Ч. Снятие стрессовых состояний у свиноматок при искусственном осеменении. *Пути интенсификации отрасли свиноводства в странах СНГ* : тез. докл. XIII междунар. науч.-практ. конф., г. Жодино, 14-15 сент. 2006 г. Жодино, 2006. С. 9–10.
3. Авилов Ч. Влияние стресс-факторов на резистентность организма свиней. *Свиноводство*. 2001. № 1. С. 21–22.
4. Автанзимов Г. Г. Морфометрия в патологии. М. : Медицина, 1973. 248 с.
5. Автоматизована інформаційна система «Акцент – племінний облік у свинарстві» в селекції тварин [С. І. Луговий, В. Я. Лихач, А. В. Лихач, М. М. Сердюк, Ю. М. Сердюк]. *Міжвідом. темат. наук. зб. Свинарство*. Полтава, 2015. Вип. 67. С. 90–95.
6. Аграрний сектор економіки України (стан і перспективи розвитку) / [Присяжнюк М. В., Зубець М. В., Саблук П. Т. та ін.] ; за ред. М. В. Присяжнюка, М. В. Зубця, П. Т. Саблука, В. Я. Месель-Веселяка, М. М. Федорова. К. : ННЦ ІАЕ, 2011. 1008 с.
7. Агриван для опороса и 28 дней лактации [Электронный ресурс]. – Режим доступа: www/agrico.cz.
8. Айтпаев А. Кормопроизводство – главный цех животноводства. *Кормопроизводство*. 2004. № 2. С. 2–4.
9. Акімов С. В., Фесенко О. Г., Оніщенко А. О. Державна книга племінних тварин української м’ясної породи свиней. К. : Арістей, 2008. Т.1. 240 с.
10. Акімов С. В., Фесенко О. Г., Оніщенко А. О. Історія створення української м’ясної породи свиней, розміщення племінної бази та показники продуктивних якостей тварин. Державна книга племінних тварин української м’ясної породи свиней. К. : Арістей, 2008. Т.1. С. 6–20.
11. Акімов С. В., Ревенко О. І., Оніщенко А. О. Створення нових ліній і родин в центральному типі української м’ясної породи свиней. *Ефективне тваринництво*. 2008. № 3(27). С. 47–49.
12. Александров С. Н., Прокопенко Е. В. Промышленное содержание свиней. М. : Издательство : АСТ, Сталкер, 2007. 79 с.
13. Альбом станков для содержания свиней : довідник. М. : Гипронисельхоз, 1990. 26 с.
14. Аналіз і прогноз кон’юнктури світових ринків продукції тваринництва [Шпичак О. М., Лупенко Ю. О., Присяжнюк М. В. та ін.] ; за ред. О. М. Шпичака. К. : ННЦ ІАЕ, 2012. 250 с.
15. Андрійчук В. Г. Ефективність діяльності аграрних підприємств : теорія, методика, аналіз : монографія. Вид. 2-ге, без змін. К. : КНЕУ, 2006. С. 46–50.
16. Анкер А. Задачи и проблемы селекции и гибридизации свиней. Актуальные

вопросы прикладной генетики в животноводстве. М. : Колос, 1982. С. 216-253.
17. Антипов В. А. Микотоксикозы – важная проблема животноводства. *Ветеринария*. 2009. № 11. С. 7–9.
18. Антипова Л. В., Жеребцов Н. А. Биохимия мяса и мясных продуктов : учеб. Пособие. Воронеж : Изд-во ВГУ, 1991. С. 31–48.
19. Антипова Л. В., Зубаирова Л. А., Данылив М. М. Оценка качества и безопасности мясных продуктов. *Все о мясе*. 2006. №1. С. 8–9.
20. Аришин А. А. Совершенствование промышленной технологи производства свинины : дисс. ... докт. с.-х. наук : 06.02.10. Барнаул, 2011. 234 с.
21. Арнаутов В. И., Иванов В. А. Станки в свинарниках-маточниках. *Механизация сельского хозяйства*. 1979. №2. С. 22.
22. Арнаутов В. И. Технология механизированых работ на репродуктивных свинофермах. М. : Колос, 1976. 207 с.
23. Астахова О. Удосконалення техніко-технологічних основ промислового свинарства. *Тваринництво України*. 1996. № 2. С. 5–6.
24. Бабань О. А. Ефективність застосування препарату дінолітик для привчання кнурів до садки на чучело. *Міжвідомчий тематичний науковий збірник*. Полтава, 2013. Вип. 63. С. 42–45.
25. Бабушкин В., Негреева А., Чивилева А. Жироотложение у свиней. *Животноводство России*. 2006. № 6. С. 39.
26. Бажов Г. М., Комлацкий В. И. Биотехнология интенсивного. М. : Росагропромиздат, 1989. 269 с.
27. Бажов Г. М., Бахирева Л. А. Качественная характеристика мяса гибридных свиней. *Актуальные проблемы производства свинины* : мат. 7-го зас. межвуз. корд, совета Свинина и республик. научн.-производ. конф., п. Персиановский, май 1997 г. п. Персиановский, 1997. С. 11–12.
28. Базонов В. Н. О влиянии некоторых технологических факторов на продуктивность свиней в хозяйствах по производству поросят. *Сельское хозяйство за рубежом*. 1978. № 10. С. 60–63.
29. Балацкий В. Н., Метлицкая Е. Н. ДНК-диагностика стресс-синдрома свиней и ассоциация RYR1-генотипов с жизнеспособностью поросят раннего возраста. *Цитология и генетика*. 2001. № 3. С. 43–49.
30. Баньковська І. Б., Волощук В. М. Вплив факторів генотипу та способу утримання на морфологічний склад туш свиней. *Вісник аграрної науки Причорномор'я*. Миколаїв : МНАУ, 2015. Вип. 2(84). Т (2). С. 91–99.
31. Баранов В. Откормочные и мясные качества породно-линейных гибридов. *Свиноводство*. 1995. № 4. С. 10–11.
32. Баранов В. И. Мясные качества чистопородных и гибридных свиней. *Зоотехния*. 1998. № 3. С. 21–24.
33. Баранова Н., Дунаева М., Митрофанов Р. Сроки использования маток. *Свиноводство*. 1995. № 5. С. 11.
34. Баротфи И., Рафаи П. Энергосберегающие технологии и агрегаты на животноводческих фермах. М. : ВО «Агропромиздат», 1988. 232 с.

35. Беззубов В. И. Зоотехнические и биологические методы регуляции процессов воспроизводства в свиноводческих хозяйствах : автореф. дисс. … д-ра с.-х. наук : 06.02.04. Жодино, 1992. 48 с.
36. Беконні якості свиней породи ландрас / [В. С. Топіха, В. Я. Лихач, С. І. Луговий, І. В. Коновалов]. *Таврійський науковий вісник*. Херсон : Грінь Д. С., 2012. Вип. 78. Ч.2. Т.1. С. 200–205.
37. Беликов А. А. Методические рекомендации по организации и технике искусственного осеменения свиней на промышленных свиноводческих комплексах. Днепропетровск, 1988. 38 с.
38. Белоусов В. И., Матрешин А. В. Определение прогестерона в мясе с использованием ИФА. *Ветеренария*. 2000. №5. С. 55–57.
39. Березовский Н. Д., Гетя А. А., Ващенко П. А. Селекционная работа с крупной белой породой свиней в Украине. *Современные проблемы интенсификации производства свинины*: мат. межд. конф., Ульяновск, 2007. Т.1. С. 29–33.
40. Березовский Н. Д. Специализация селекции крупной белой породы свиней в Украине. *Аграрний Вісник Причорномор'я*: зб. наук. пр.. Одеса, 2006. Вип. 32. С. 29–30.
41. Березовський М. Д. Особливості вітчизняної та зарубіжної селекції з лінійного розведення свиней. *Свинарство*. 2008. Вип. 56. С. 6–10.
42. Березовський М. Д., Оніщенко А. О. Українська м'ясна порода свиней в умовах сьогодення. *Тваринництво України*. 2010. № 7. С. 35–38.
43. Бир С. Кибернетика и управление. М. : ИЛ, 1963. 168 с.
44. Біндюг О. А. Фізіологічний стан та продуктивність свиней різного рівня стрессхильності : автореф. дис. … канд. с.-г. наук : 03.00.13. Полтава, 2004. 20 с.
45. Бірта Г. О. Товарознавча характеристика продукції свинарства : навч. посіб. К. : Центр учбової літератури, 2011. 144 с.
46. Бірта Г. О. Морфологічний склад туш помісних свиней. *Вісник Полтавської державної аграрної академії*. 2011. № 4. С. 72–74.
47. Богданов Е. А. Происхождение домашних животных. М. : Сельхозгиз, 1937. 387 с.
48. Болезни свиней / [Грисслер А., Фогльмайр Т., Хольцхой М. и др.]. К. : Аграр Медиен Украина, 2010. 238 с.
49. Большаков О. В., Татулов Ю. А., Гареава Г. И. Европейская экономическая организация ООН по разработке стандартов на м'ясо. *Мясная индустрия*. 1998. № 5. С. 30–32.
50. Большаков О. В., Татулов Ю. А., Гараев Я. Г. Принимаем стандарты ЕЭК ООН на мясо. *Стандарты и качество*. 1990. № 3. С. 48–50.
51. Бондарська О. Глобальний ринок свинини. *Прибуткове свинарство*. 2015. № 4(28). С. 26–30.
52. Браунштейн А. Е., Капейская М. Я., Хомутов Р. М. Ферменты. М. : Наука. 1964. С. 37–267.
53. Брукс П. Групповое содержание свиноматок с использованием электронной

системы кормления: Сб. докл. межд. конф. Днепропетровск, 2006. С. 21– 38.
54. Бугаєвський В. М. Червоно-поясні м'ясні свині в умовах півдня України. *Вісник аграрної науки Причорномор'я*. 2006. Вип. 32. С. 33–38.
55. Бузлама Т. М. Научные основы витаминного питания сельскохозяйственных животных: Тез. докл. 2-го Всесоюзного симпоз. Юрмала, 1987. С. 47–49.
56. Варян Р. А. Моцион и воспроизводительная способность хряков. *Свиноводство*. 2004. № 5. С. 24–27.
57. Василенко В. Н., Третьякова О. Л., Михайлов Н. В. Технология производства свинины : учебное пособие. Новочеркасск : РИПКА, 2003. 96 с.
58. Василенко Д. Я., Зеленчук О. Й. Свинарство і технологія виробництва свинини : підруч. К. : Вища шк., 1996. 271 с.
59. Васин А. Д., Невзгодина М. В., Щукина Л. В. Надежные средства: Ацидофильные бактерии для лечения с.-х. животных. *Ветеринария*. 1987. № 10. С. 15–17.
60. Великжанин В. И., Васильева Е. Н., Куликов В. Б. Азбука элементов и актов поведения. Методические рекомендации по изучению поведения сельскохозяйственных животных. П., 1975. № 1. С. 10–15.
61. Використання та удосконалення генофонду свиней в умовах ТОВ «Таврійські свині» / [В. С. Топіха, В. Я. Лихач, С. І. Луговий, О. І. Загайкан]. *Науково-теоретичний фаховий журнал Науковий вісник «Асканія-Нова»*, 2012. Вип. 5. С. 283–289.
62. Відгодівельні якості помісного молодняку свиней / [В. Я. Лихач, А. В. Лихач, В. В. Лагодієнко, М. А. Коваль]. *Вісник аграрної науки Причорномор'я*. Миколаїв : МНАУ, 2015. Вип. 2(85), Т.1. С. 124–129.
63. Освальд И. Влияние микотоксинов на иммунную систему свиней. *Европейский семинар по микотоксинам «Оценка воздействия микотоксинов в Европе»*. 2005. С. 69–78.
64. Вовк В. О., Ващенко П. А., Скрипка С. М. Вплив комбінаційної здатності на репродуктивні якості свиней при чистопородному розведенні і схрещуванні. *Свинарство*. 2012. Вип. 60. С. 46–49.
65. Вовк В. О., Ващенко П. А., Скрипка С. М. Комбінаційна поєднуваність свиней різних генотипів. *Свинарство*. 2012. Вип. 61. С. 28–32.
66. Войтенко С. Л., Вишневський Л. В. Генофонд порід тварин Полтавщини та ризики втрати місцевих популяцій. *Вісник Полтавської ДАА*. 2015. №1-2. С. 60–64.
67. Войтенко С. Л., Вишневський Л. В. Контролювання генетичної ситуації миргородської породи свиней. *Науковий вісник «Асканія Нова»*. 2012. Вип. 5. Ч. 2. С. 199–200.
68. Войтенко С. Л., Петренко С. М., Цибенко В. Г. Миргородська порода свиней : шляхи створення та сучасний стан. Полтава : Оріяна, 2005. 196 с.
69. Войтенко С. Л., Овчаренко І. М. Провідний племзавод миргородської породи свиней. *Тваринництво України*. 2000. № 7-8. С. 3–4.

70. Войтенко С. Л. Чи доцільно зберігати локальні породи сільськогосподарських тварин? *Науковий вісник НУБіПУ*. 2011. № 10. С. 19–22.
71. Волков А. Разведение свиней породы дюрок. *Свиноводство*. 2000. № 4. С. 3–5.
72. Волощик П. Д., Пушкарський В. Г. Интенсификация репродуктивного свиноводства. М. : Россельхозиздат, 1982. 181 с.
73. Волощик П. Д., Бабенко Г. Ф. Поточная система производства свинины на реконструируемых фермах. *Теория и методы индустриального производства свинины* : сб. науч. тр. ВАСХНИЛ. Л., 1985. С. 183–188.
74. Волощик П. Д., Юсупов Х. Ф., Бабенко Г. Ф.Сравнение одно- и двухфазного методов выращивания поросят от рождения до передачи на откорм. М. : Агропромиздат, 1987. С. 188–195.
75. Волощук В. М. Теоретичне обгрунтування і створення конкурентоспроможних технологій виробництва свинини: дис. ... докт. с.-г. наук : 06.02.04. Херсон, 2009. 477 с.
76. Волощук В. М., Повод М. Г. Вплив умов утримання на репродуктивні якості свиноматок. *Свинарство* : міжвід. темат. наук. зб. Інституту свинарства і АПВ НААН України. Полтава, 2013. Вип. 62. С. 27–32.
77. Волощук В. М., Иванова Л. А. Современные технологии в свиноводстве : материалы XI междунар. науч.-практ. конф., г. Гродно, 2008. С. 154.
78. Воскресенский С. Б., Татулов Ю. В. , Сусь И. В., Миттелынтейн Т. М., Быканов А. В. Пути повышения эффективности свинины и производства высококачественного мяса. *Все о мясе*. 2006. № 4. С. 25–28.
79. Вплив умов годівлі на забійні та м’ясо-сальні якості молодняку свиней [В. М. Волощук, І. Б. Баньковська, С. М. Грищенко, Н. П. Грищенко] // *Свинарство*. Міжвід. темат. наук. зб. Полтава, 2015. Вип. 67. С. 185–190.
80. Выращивание поросят на промышленных комплексах / за ред. В. Т. Сидоров. Минск : Ураджай, 1976. 96 с.
81. Габдракипов Р. Р. Физиологические и продуктивные особенности свиноматок второго поколения, полученных от родителей с разной стрессовой чувствительностью при гомогенном типе их осеменения : автореф. дис. … канд. биол. наук : 03.00.01. Троицк, 2010. 27 с.
82. Гамалицкий В. А. Автоматизация выращивания и откорма свиней. М. : Россельхозиздат, 1982. 62 с.
83. Генофонд национальных пород свиней Украины, их создатели и современные координаторы / Под редакцией В. П. Рыбалко, А. А. Гетя, В. И. Герасимова. Полтава : Полтавський літератор, 2011. 156 с.
84. Герасимов В., Пронь Е. Хозяйственно-полезные качества трехпородных примесей. *Свиноводство*. 2000. № 3. С. 6.
85. Герасимов В. Эффективный обогрев в свиноводческих хазяйствах / В. Герасимов, Е. Пронь // Свиноводство. – 2005. – № 5. – С. 34.
86. Герасимов И. Г., Пронь Е. Энтропия биологических систем. *Проблемы старения и долголетия.* 1998. № 2. Т.7. С. 119–126.

87. Гессе А. Оценка различных способов содержания подсосных свиноматок. Техника и строительство в сельском хозяйстве. Дермштадт, 1991. С. 351–1991.
88. Гетя А. А. Організація селекційного прогресу в сучасному свинарстві : монографія. Полтава : Полтавський літератор, 2009. 192 с.
89. Гетьман В. В. Менше праці, менше кормів – більше кращих поросят! *Информационный вестник «ПромАгроКомбината».* Жовті Води, 2007. 17 с.
90. Гизатуллин А. Н. Иммунная реактивность супоросных и холостых маток с различной устойчивостью к стрессу. *Зоотехния*. 2008. № 9. С. 26–27.
91. Гильман З. Д. Повышение продуктивности свиней. Минск : Ураджай, 1982. 283 с.
92. Гильман З. Д. Механизированная технология промышленного производства свинины на местных кормах. Минск : ЦНИИМЭСХ, 1982. 80 с.
93. Глобальный план действий в области генетических ресурсов животных и Интерлакенская Декларация о генетических ресурсах животных / Комиссия по генетическим ресурсам в сфере продовольствия и сел. хоз-ва. Рим : ФАО, 2008. 37 с.
94. Гнатюк С. Применение новых систем содержания в свиноводстве. *Свиноводство*. 2003. № 3. С. 17–18.
95. Гнатюк С. Проблеми реконструкції і технічного переоснащення свинокомплексів. *Тваринництво України*. 2004. № 11. С. 2–4.
96. Гнатюк С. А. Дюрок і червоні білопоясі свині в Україні. *Свинарство*. 2008. № 5-6. С. 11–15.
97. Гнатюк С. А. Результати і перспективи роботи господарств корпорації «Тваринпром». *Вісник аграрної науки Причорномор'я*. Миколаїв, 2015. Вип. 2(84). С. 15–22.
98. Голубкина Н. А., Папазян Т. Т Селен в питании : растения, животные, человек. М. : Печатный двор, 2006. С. 95–96.
99. Голушко В. М., Колесень В. П. , Линкевич С. А. Влияние ферментных препаратов на рост свиней. *Зоотехническая наука Белоруссии*. 2007. № 33. С. 180–185.
100. Голушко В. М., Колесень В. П. , Линкевич С. А. Использование ферментов в кормлении подсосных свиноматок. *Зоотехническая наука Белоруссии*. 2007. № 33. С. 185–190.
101. Горбунова А. В., Сычева Л. В. Влияние «Сел-Плекса» на продуктивные и воспроизводительные качества свиноматок. *Научное наследие П. Н. Кулешова и современное развитие зоотехнической науки и практики животноводства* : сб. мат. междунар. науч.-практ. конф., посвященной 150-летию со дня рождения профессора П. Н. Кулешова. М., 2006. С. 403–408.
102. Горошко Г. П., Козина З. А. К вопросу обоснования точек контроля показателей качества мясных продуктов. *Мясная индустрия*. 2002. № 4. С. 44–47.
103. Гришина Л. П. Рівень фенотипової консолідації свиней великої білої

породи. *Розведення і генетика тварин*. 2005. Вип. 39. С. 88–91.
104. Гришина Л. П. Совершенствование методов селекционно-племенной работы с внутрипородным типом свиней крупной белой породы УКБ-1. Вісник аграрної науки Причорномор'я. 2002. Вип. 3(17). С. 32–37.
105. Гродский Е. Я., Павлова О. А., Родина О. С. Особенности новых проектов комплексов на 27, 54 и 108 тыс. свиней в год в унифицированных зданиях с законченным циклом производства. *Теория и методы индустриального производства свинины : сб. науч. тр. ВАСХНИЛ*. Л., 1985. С. 209–212.
106. Гузев І. В. Методологія збереження біорізноманіття генетичних ресурсів тваринництва України : дис. … доктора с.-г. наук : 06.02.01. Чубинське. 2012. 628 с.
107. Гучь Ф. А., Гуменный М. Ф. Организация производства свинины в Молдавской ССР. *Теория и методы индустриального производства свинины* : сб. науч. тр. ВАСХНИЛ. Л., 1985. С. 165–169.
108. Двовимірна карта мембранних білків еритроцитів людини / [П. С. Громов, С. Ф. Захаров, С. С. Шишина, Р. В. Іллінський]. Біохімія. 1988. Вип. 8. Т.53. С. 1316–1326.
109. Дворская Ю. Маннанолигосахариды – альтернатива ростостимулирующим антибиотикам для свиней. *Тваринництво сьогодні*. 2013. № 5. С. 38–42.
110. Дворська Ю. Висока продуктивність свиней без антибіотиків-стимуляторів росту. *Прибуткове свинарство*. 2012. № 5(11). С. 76–78.
111. Дедкова А. И., Сергеева Н. Н. Влияние отъемного стресса на показатели крови поросят. *Свиноферма*. 2006. № 11. С. 30–31.
112. Дедкова А. И., Сергеева Н. Н. Реакция откормочного поголовья свиней на уплотненное содержание. *Зоотехния*. 2009. № 6. С. 14–15.
113. Демин О. Б., Ельчищева Т. Ф Проектирование агропромышленных комплексов : учебное пособие. Тамбов : Издательство ТГТУ, 2005. 128 с.
114. Демчак І. М. Моніторинг стану галузі тваринництва та ринків м'ясо-молочної продукції за січень-березень 2013 року в цифрах, графіках, діаграмах / [І. М. Демчак, О. В. Сеннь, Д. М. Микитюк, О. Л. Чижевський]. К. : НДІ «Украгропрпомпродуктивність», 2013. 47 с.
115. Державна служба статистики України [Електронний ресурс]. – Режим доступу: http://www.ukrstat.gov.ua/
116. Джамалдинов А. Приучение хряков к садке на чучело с помощью феромонного препарата пасо. *Свиноводство*. 2006. № 3. С. 23–25.
117. Джупина С. И. Факторные инфекционные болезни животных. *Ветеринария*. 2001. № 3. С. 6–9.
118. Дикие и домашние свиньи : монографія / [Герасимов В. И., Барановский Д. И. Хохлов А. М. и др.], под. ред. В. И. Герасимова, Д. И. Барановского. Х. : Еспада, 2009. 240 с.
119. Дойлидов В. А., Каспирович Д. А. Эффективность использования кормовой добавки «Сел-плекс» для повышения воспроизводительных качеств свиней. *Современные тенденции и технологические инновации в свиноводстве* : матер. XIX междунар. науч.–практ. конф., 4–6 октября 2012 г. Горки :

БГСХА, 2012. С. 188–193.
120. Донцул Н., Балабан А. Зависимость продуктивности свиней от способов содержания и выращивания. *Основы повышения продуктивности свиней в Молдавии*. Кишинёв, 1979. С. 131–136.
121. Дудка О. І. Взаємозв'язок репродуктивних ознак свиноматок асканійського типу української м'ясної породи. *Вісник Полтавського державного с.-г. інституту*: зб. наук. пр. Полтава. 2001. № 2-3. С. 57–59.
122. Дудка О. І. Особливості успадкування продуктивних ознак свиней української м'ясної породи. *Науковий вісник «Асканія Нова».* 2012. Вип. 5 (Ч.ІІ). С. 222–229.
123. Дудка О. І. Селекційні досягнення при розведенні української степової рябої породи свиней. *Таврійський науковий вісник*. 2008. Вип. 58. Ч.2. С. 163–169.
124. Дудка О. І. Селекційно-генетичні аспекти оцінки продуктивних якостей свиней асканійського м'ясного типу : автореф. дис. … канд. с-г. наук : 06.02.01. Херсон, 2005. 20 с.
125. Енальева М. А., Руденко В. В. Физико-химические свойства и качества свинины. *Актуальные проблемы производства свинины* : мат. 6-го заседания межвуз. коорд. совета свинина и респуб. науч.-производ., конфер. Краснодар, 1996. С. 18–21.
126. Епишко Т. И. Влияние полиморфизма гена RYR1 на механизмы физиологической реактивности организма свиней. *Эпизоотология, иммунобиология, фармакология, санитария*. 2005. № 1. С. 49–54.
127. Епишко Т. И. Генетические основы породообразования. *Зоотехническая наука Беларуси*: сб. науч. тр. Жодино, 2007. Т.42. С. 57–66.
128. Еріксон Д. Американська технологія утримання свиней (від відлучення до забою). *Прибуткове свинарство*. 2015. № 3(27). С. 64–67.
129. Ефективність вирощування та відгодівлі свиней за різних умов їх утримання / [Ю. В. Засуха, В. М. Туринський, Н. В. Лук'янчук та ін.]. *Зб. наук. пр. Подільського ДАТУ*. Кам'янець-Подільський, 2012. Вип. 20. С. 92–94.
130. Жерноклеев Н. Н., Донских Т. В. , Хохлов А. М. и др. Зависимость убойных качеств свиней от генотипа и конечной массы при откорме [Электронный ресурс]. *Зооинженерия*. – Режим доступа к журналу: http:// www.rusnauka.com/15_APSN_2011/2_79878.doc.htm
131. Жиркова Р. М. Відгодівельні та м'ясні якості підсвинків ліній асканійського типу. *Шляхи підвищення виробництва та поліпшення якості свинини* : міжн. наук.-практ. конф. тези доп. Х., 1995. С. 47.
132. Журавель П. М., Давиденко В. М. Технологія відтворення сільськогосподарських тварин. К. : Слово, 2005. С. 67–84.
133. Журавская Н. К., Алехина Л. Т., Отряшенкова Л. М. Исследование и контроль качества мяса и мясопродуктов. М. : Агропромиздат, 1985. 87 с.
134. Заболотний І. І. Летне-лагерное содержание свиней. М. : Агропромиздат, 1985. 32 с.
135. Заболотный И. И. Организация поточного производства свинины в спецхозах. Поточно-цеховая система производства свинины. К. : Урожай.

1990. С. 8–29.
136. Задирко В. И. Усовершенствование и разработка методов племенной работы на крупных промышленных свиноводческих комплексах: дис. … кандидата с.-х. наук : 06.02.04. Х., 1988. 132 с.
137. Зайцева Е. А., Федянина Л. Н. , Коленченко Г. Н. *Listeria monocytogenes* новый микробиологический показатель безопасности пищевых продуктов. *Мясная индустрия*. 2006. № 4. С. 30–32.
138. Законодавство України [Електроний ресурс] – режим доступу : http://www.kmu.gov.ua
139. Заяс Ю. Ф. Качество мяса и мясопродуктов. М. : Легкая и пищевая промышленность, 1981. 480 с.
140. Зеленуха Е. А., Гречухин А. Н. Мероприятия при респираторных болезнях свиней в промышленных комплексах. *Ветеринария*. 2007. № 12. С. 13–14.
141. Зиновьева Н. А. Введение в молекулярную генную диагностику. ВИЖ. Дубровицы, 2002. 112 с.
142. Зубець М. В., Буркат В. П., Мельник Ю. Ф. Методологічні аспекти збереження генофонду сільськогосподарських тварин. К. : Аграрна наука, 2007. 120 с.
143. Зыкина Е. А. Анализ средств механизации содержания подсосных свиноматок. *Молодой ученый*. 2011. № 1. С. 296–298.
144. Иванкин А. Н., Гузнецова Т. Г. Современные методы оценки качества и безопасности сырья и мясопродуктов. *Все о мясе*. 2005. № 4. С. 26–30.
145. Иванов В. А. Повышение продуктивности свиней путем регуляции их двигательной активности в условиях промышленных комплексов : автореф. на соиск. уч. степени д-ра с.-х. наук : 06.02.04. Краснодар, 1991. 45 с.
146. Иванов Ю. А. Система селекции молочного скота в Российской Федерации на базе компьютерных технологий: дис. … доктора с.-х. наук : 06.02.01. Лесные Поляны, 2005. 300 с.
147. Ивашев В. Д., Захаров А. Оценка качества мяса. *Мясная промышленность*. 1995. № 3. С. 12–14.
148. Ильин И. В. Новые технологии в проектах реконструкции и строительства свиноводческих ферм и комплексов, задачи научных исследований. *Эффективное животноводство*. 2008. № 4(29). С. 50–52.
149. Информационно-статистический анализ менделирующих и полигенных признаков в популяциях сельскохозяйственных птиц: методические рекомендации / Ю. А. Рябоконь, Н. И. Сахацкий, П. И. Кутнюк. Харьков, 1996. 40 с.
150. Иоцюс Г. Л. Механизм действия ферментов на их активность. Справочник по кормовым добавкам. Минск : Урожай. 2008. С. 200–213.
151. Исаев Ю. Г., Кузнецов А. И. Возрастные закономерности изменений содержания энерго-пластических веществ в крови у высокопродуктивных свиноматок в состоянии лактации в условиях интенсивной их эксплуатации. *БИО*. 2004. № 5(44). С. 37.
152. Использование ДНК-технологий при определении стрессовой

чувствительности и продуктивности свиней. Под ред. И. П. Шейко. *Вести НАН Беларуси.* 2005. № 3. С. 76–78.
153. Іванов В. О., Волощук В. М. Альтернативна технологія виробництва свинини. Таврійський науковий вісник. Херсон, 2005. Вип. 39/1. С.101–106.
154. Іванов В. О., Волощук В. М. Біологія свиней : навч. посіб. К. : ЗАТ «НІЧЛАВА», 2009. 304 с.
155. Іванов В. О., Волощук В. М. Сучасна технологія виробництва свинини в Україні та перспективи її удосконалення. *Таврійський науковий вісник*. Херсон, 2006. Вип. 43. С. 75–79.
156. Іванов В. О., Торська С. М., Дашко І. П. Сучасна технологія утримання й використання кнурів. *Тваринництво України*. 1997. № 5. С.10.
157. Інструкція з бонітування свиней, інструкція з ведення племінного обліку у свинарстві. К. : Видавничо-поліграфічний центр «Київський університет», 2003. 64 с.
158. Інструкція із штучного осіменіння свиней. К. : Аграрна наука, 2003. 56 с.
159. Інтенсивна технологія виробництва свинини [Рибалко В. П., Баньковський Б. В., Коваленко В. П. та ін.]. К. : Урожай, 1991. 176 с.
160. Інтер'єр сільськогосподарських тварин : навч. посіб. [Й. З. Сірацький, Є. І. Федорович, Б. П. Гопка, В. С. Федорович, В. Є. Скоцик та ін.]. К. : Вища освіта, 2009. 280 с.
161. Кабанов В. Д. Повышение продуктивности свиней. М. : Колос, 1983. 256 с.
162. Кабанов В. Интенсивное производство свинины. М. : Колос, 2003. 400 с.
163. Кабанов В. Д., Гупалов Н. В., Епишин В. А. Теория и методы выведения скороспелой мясной породы свиней. М. : Изд-во ВНИИплем, 1998. 380 с.
164. Кабанов В. Д., Елишин В. А., Вохмякова А. С. Физико-химические свойства и жирнокислотный состав отечественного и импортного свиного жира. *Вестник РАСХН*. 2002. № 3. С. 67–69.
165. Кабанов В. Д. *Свиноводство*. М. : Колос, 2001. 431 с.
166. Казанцева Н. П., Маринина Е. С. Контрольное выращивание и оценка хряков на элевере. *Современны проблемы интенсификации производства свинины в странах СНГ* : сб. научн. тр. XVII Международной науч.-практ. конф. по свиноводству. Ульяновск, 2010. Т.2. С. 175–180.
167. Каиров В. Р., Газзаева М. С., Дзанагова З. Т. Ферменты и сорбенты в рационах ремонтных свинок. *Комбикорма*. 2009. № 8. С. 67.
168. Капелист И. В., Тариченко А. И. Продуктивность и качество мяса в связи со стрессор-активностью свиней. *Актуальные проблемы производства свинины в Российской Федерации* : мат. 11-го зас. межвуз. корд, совета, по свиноводству и республик. науч.-производ. конф. 28-29 мая 2002 г. п. Персиановский, 2002. С. 40–41.
169. Капелист И. В., Тариченко А. И. Стрессореактивность и воспроизводительная продуктивность свиноматок. *Актуальные проблемы производства свинины в Российской Федерации* : мат. 11-го зас. межвуз. корд. совета по свиноводству и республик. науч.-производ. конф. 28-29 мая 2002 г. п. Персиановский, 2002. С. 39–40.

170. Каратунов Г. А. Качественные показатели мяса свиней специализированных типов. *Актуальные проблемы развития животноводства на Дону* : сб. науч. труд. п. Персиановский, 1998. С. 136–138.
171. Каргаполова Л. И. Беконные качества чистопородних и помесных свиней : дис. … канд. с.-х. наук : 06.02.01. Полтава, 1983. 156 с.
172. Квасницкий А. В. Искусственное осеменение свиней. К. : Урожай, 1983. 185 с.
173. Керснаускас А. Реакция помесных свиней на стрессы, вызываемые перегруппировкой. *Повышение эффективности методов генетики и селекции в животноводстве* : сб. науч. тр. Байсогала, 1978. Ч. I. С. 38.
174. Клемин В. П., Павлова С. Ф. Оценка свиноматок по выравненности гнезда при отъеме. Бюллетень ВНИИ разведения и генетики с.- х. животных. 1984. С. 5–7.
175. Коваленко В. П., Рябко В. М. , Пелых В. Г. Перспективы свиноводства. Херсон : Айлант, 2000. 84 с.
176. Коваленко В. Ф., Зінов'єв С. Г. Кормові добавки у свинарстві. *Свинарство.* Міжвід. темат. наук. зб. Полтава, 2007. Вип. 55. С. 53–55.
177. Коваленко В. Ф. Методика прискореного привчання кнурів до садки на чучело. *Сучасні методи досліджень у свинарстві*. 2005. № 1. С. 111–113.
178. Коваленко В. Ф., Фоломеев В. З., Смыслов С. Ю. Свиноферма модульного типа. Зоотехния. 1998. № 12. С. 18–19.
179. Коваленко Л. А., Максимова В. М., Каратунов Г. А. Гистоструктура мышечной ткани новых специализированных линий степного типа и взаимосвязь ее с продуктивными качествами. *Генетика, разведение и селекция свиней.* М., 1988. С. 65–73.
180. Коваленко Т. С. Розробка селекційного індексу для оцінки відтворювальних якостей свиноматок. *Таврійський науковий вісник*. Херсон : Айлант, 2009. Вип. 64. С. 128–131.
181. Ковач Ю. Є., Ільїна Г. В. Ефективність свинарства в умовах сьогодення. Ефективність використання трудових і матеріальних ресурсів у сучасних умовах у свинарстві. *Продуктивність агропромислового виробництва* (економічні науки) : наук.-практ. зб. Українського науково-дослідного інституту. К. : НДІ «Украгропромпродуктивність», 2011. № 19. С. 55–57.
182. Ковригин А. В. Некоторые аспекты разработки инновационных технологий производства свинины в средних и малых сельскохозяйственных предприятиях России. Сб. науч. тр. научной школы професора Г. С. Походни «Свиноводство и технология производства свинины». Белгород : Изд.-во БелГСХА, 2011. Вып. 4. С.48–49.
183. Козир В. С. Технологія повинна динамічно удосконалюватись. *Новітні технології в тваринництві*. Дніпропетровськ, 2004. С. 4–6.
184. Козловский В. Г. Технология промышленного свиноводства. М. : Россельхозиздат, 1984. 334 с.
185. Козловский В. Г., Лебедев Ю. В., Тонышев И. И. Гибридизация в промышленном свиноводстве. М. : Россельхозиздат, 1987. 272 с.

186. Комбикорма, премиксы, БВМД для животных и птицы : справочник / Свеженцов А. И., Горлач С. А., Мартиняк С. В.. Днепропетровск : АРТ-ПРЕСС, 2008. 412 с.
187. Коновалов І. В. Адаптаційні та продуктивні якості свиней породи ландрас в умовах промислової технології : дис. … канд. с.-г. наук : 06.02.04. Миколаїв, 2011. 148 с.
188. Кононов В. Состояние и перспективы развития свиноводства в XXI столетии. *Свиноводство*. 2000. № 3. С. 20–23.
189. Кононов В. П., Зыкунов Н. П.. Рекомендации по интенсивному использованию хряков на станциях искусственного осеменения. Быково, 2002. 15 с.
190. Кононов В., Улиханова Г. Репродуктивный потенциал свиноматок. *Свиноводство*. 1990. № 4. С. 12–14.
191. Конопелько Ю. В. Некоторые аспекты оздоровления основного стада свиней. *Промышленное и племенное свиноводство*. 2006. № 1. С. 41–44.
192. Кормові натуральні стимулятори продуктивності свиней : практичний порадник / Висланько О. О., Семенов С.О., Марченков Ф.С. Полтава : ТОВ «Фірма Техсервіс», 2009. 59 с.
193. Коряжнов Е. В. Справочник по промышленному свиноводству свинины. М. : Россельхозиздат, 1980. 270 с.
194. Костенко С. Вместо трех фаз – две. *Животноводство России*. 2006. № 3. С. 7–28
195. Кравченко О. О. Породні особливості сперматогенезу та спермопродукції кнурів-плідників. *Вісник аграрної науки Причорномор'я*. 2005. Вип. 31. С. 60–61.
196. Крамаренко С. С. Особенности использования энтропийно-информационного анализа для количественных признаков биологических объектов. *Известия Самарского научного центра Российской академии наук.* 2005. № 1. Т.7. С. 242–247.
197. Красуля О. Н., Краснова Н. А., Иглицкий А. М. Новый подход к обработке результатов органолептической оценки мясных продуктов. *Мясная индустрия*. 2006. № 5. С. 52–55.
198. Кретович В. Л. Принципы классификации ферментов. Некоторые представители отдельных классов. Введение в энзимологию. М. : Наука, 1967. С. 199–253.
199. Крилов М. М. Інтенсивність росту та формування м'ясних якостей породи дюрок : автореф. дис. … канд. с.-г. наук : 06.02.01. Полтава, 1993. 23 с.
200. Крилова Л. Ф. Поглиблення та розширення консолідації відгодівельних і м'ясних якостей свиней. *Розведення і генетика тварин*. Вип. 31-32. К. : Аграрна наука, 1999. № 5. С. 10–12.
201. Крилова Л. Ф. Результаты селекционно-племенной работы. *Свиноводство.* 1997. № 5. С. 18–21.
202. Кристиансен Й. П. Основы свиноводства. Odder : Zeuner Grafisk, 2006. 216 с.
203. Криштафович В. И., Колобов С. В. Программа «Российское качество» – путь

к повышению конкурентоспособности мясных продуктов. *Мясная индустрия*. 2005. № 6. С. 30–33.
204. Крохина В. Ферментные препараты в свиноводстве. *Комбикорма*. 2001. № 2. С. 46–47.
205. Крохина В. А. Откорм свиней на комбикормах с новой ферментной добавкой [В. А. Крохина, А. В. Карабанов, Э. В. Удалова, Т. М. Рыжова]. *Зоотехния*. 2006. № 10. С. 19–21.
206. Крюков О. Спорообразующий пробиотик при выращивании свиней. *Комбикорма*. 2006. № 1. С. 75–77.
207. Крючковский А. Г. Организация производства свинины в Сибири. *Теория и методы индустриального производства свинины* : сб. науч. тр. ВАСХНИЛ. Л. : Агропромиздат, 1985. С. 159–165.
208. Крюшинський Л. В. Генетика и феногенетика поведения животных. *Актуальные вопросы современной генетики*. М. : Изд.во МГУ, 1996. С. 281–301.
209. Кудряшов Л. С., Гуремович Г. В. Цветометрический контроль качества мяса и мясных продуктов. *Мясная индустрия*. 1998. № 5. С. 35–36.
210. Кузнецов А. Решение проблемы стресса у поросят. *Свиноферма*. 2007. № 7. С. 57–58.
211. Кузнецов А. И., Мазгаров И. Р., Усова Н. Е. Динамика изменений живой массы свиноматок в связи с их физиологическим состоянием, стрессовой чувствительностью в условиях интенсивного использования. *Современные тенденции развития агропромышленного комплекса* : мат. междунар. науч.-прат. конф., 31 января-3 февраля 2006 г. : сб. науч. тр. п. Персиановский : Донской ГАУ, 2006. Т.1. С. 116–118.
212. Кузнецова Т. С., Галочкин В. А. Влияние селена на гематологические показатели и продуктивность свиней. *Зоотехния*. 2000. № 5. С. 18–22.
213. Кузьмичева М. Е. Государственное регулирование поставок мяса. *Мясная индустрия*. 2006. № 3. С. 18–22.
214. Кулешов В. Е., Кистина А. А., Прытков Ю. Н. Влияние «Сел-Плекс» в рационах на переваримость питательных веществ, гематологические показатели и продуктивность помесных бычков. *Достижения науки и техники АПК*. 2010. № 10. С. 37–38.
215. Кунз А., Мадсен В., Шоуман Г. , Тилсра Ф., Гуд Т., Нейфред К. Постройки на дугообразных опорах. Мат. конф. Варианты систем содержания свиней для штата Айова. Айова, Государственный университет штата Айова, 1996. С. 77–91.
216. Курбанов Ю. Ф., Хруцкой С. Ф., Ляпин О. А. Оценка мясной продуктивности и определение качества мяса убойного скота. Методические рекомендации. Оренбург, 1984. С. 40–41.
217. Ламмерс П., Ханимен М. Выращивание свиней в арочных конструкциях : взгляд из Айовы. Сборник докладов международной конференции : *Возможности и перспективы альтернативного свиноводства*. Днепропетровск, 2005. С. 79–90.

218. Лебедев Ю. В. Методы разведения свиней и использование эффекта скрещивания. Племенное дело в свиноводстве. М., 1982. С. 134–177.
219. Левентуль Л. Х. Бесподстилочное содержание в свинарниках-маточниках. М. : Колос, 1981. 252 с.
220. Левченко М. В. Объективная индексная оценка репродуктивных качеств свиноматок украинской мясной породы. *Научный журнал КубГАУ*. 2013. № 94(10). С. 20–31.
221. Ленинджер А. Основы биохимии в 3-х томах. М. : Мир. 1995. 380 с.
222. Леонтьев В. В. Відтворювальні якості свиноматок української м'ясної породи залежно від сезону року. *Таврійський науковий вісник*. 2008. Вип. 58. Ч. ІІ. С. 236–238.
223. Леонтьєв В. В. Обґрунтування використання свиней української м'ясної породи за різних поєднань та вагових кондицій: дис. … канд. с.-г. наук : 06.02.04. Миколаїв, 2011. 158 с.
224. Липатников В. Ф., Степанов В. П. Совершенствование способов содержания различных производственных групп свиней. Сб. науч. тр. ВНИИТИМЖ. Подольск, 2004. Т.14. С. 151–167.
225. Липатников В. Ф. Влияние технологических факторов на эффективность производства свинины. Сборник научных трудов, Всероссийский научно-исследовательский институт механизации животноводства. 2001. Т. 10., Ч.2. С. 14–21.
226. Липатов Н. Н., Лисицын А. Б. , Юдина С. Б. Совершенствование методики проектирования биологической ценности пищевых продуктов. *Хранение и переработка сельскохозяйственного сырья.* 1996. № 2. С. 24–25.
227. Лисицын А. Внедрение системы объективной оценки качества туш свиней [А. Лисицын, Ю. Татулов, Т. Миттелынтейн, А. Миззоян]. *Свиноводство*. 1999. № 5. С. 22–24.
228. Лисицын А., Татулов Ю. Международная оценка качества мясного сырья. *Свиноводство*. 2002. № 2. С. 10–12.
229. Лисицын А. Б., Татулов Ю. В., Чернуха И. М. Мировая практика формирования качества мясного сырья и требования к нему перерабатывающей промышленности. *Мясная индустрия*. 2001. № 9. С. 6–9.
230. Лисицын А. Б., Татулов Ю. В. Пути повышения эффективности переработки свинины. *Все о мясе*. 2007. № 4. С. 34–41.
231. Лисицын А. Б., Леонова Т. Н., Симакова Л. В. Современное состояние и тенденции развития мирового производства мяса. *Все о мясе*. 2005. № 3. С. 12–14.
232. Лихач В. Я., Черненко А. В. Аналіз морфологічного складу туш піддослідного молодняку свиней. *Науковий вісник Львівського національного університету ветеринарної медицини та біотехнології ім. С. З. Гжицького*. 2009. Т. 11. № 2(41). Ч.2. С. 322–326.
233. Лихач В. Я., Черненко А. В. Відгодівельні якості внутріпородного типу свиней породи дюрок української селекції «Степовий». *Новітні технології*

у свинарстві – сучасний стан і перспективи: зб. наук. праць Харк. держ. зоовет. акад. Харків, 2007. Вип. 15(40), Ч.1. С. 175–179.
234. Лихач В. Я., Черненко А. В. Відгодівля свиней м'ясних генотипів до різних вагових кондицій. *Таврійський науковий вісник* : зб. наук. праць ХДАУ. Херсон : Айлант, 2008. Вип. 58. С. 285–289.
235. Лихач В. Я. Відтворювальні якості свиноматок породи дюрок української селекції і великої білої породи імпортної селекції при чистопородному розведенні та схрещуванні. *Вісник аграрної науки Причорномор'я*. Миколаїв : МДАУ, 2006. Вип. (3)35. С. 54–59.
236. Лихач В. Я., Лихач А. В., Куліш А. І. Відтворювальні якості свиноматок при різних методах розведення. *Проблеми зооінженерії та ветеринарної медицини* : зб. наук. праць Харк. держ. зоовет. акад. Х. : РВВ ХДЗВА., 2011. Вип. 22, Ч. 1. Т.1. С. 142–146.
237. Лихач В. Я. Лихач А. В. Гематологічні показники внутрішньопорідного типу свиней породи дюрок української селекції «Степовий» при чистопородному розведенні та схрещуванні. *Вісник аграрної науки Причорномор'я.* Миколаїв : МДАУ, 2010. Вип. 3(56). Т.2 (Ч.3). С. 81–86.
238. Лихач В. Я., Луговий С. І. , Коновалов І. В. Гістологічна будова м'язової тканини свиней. *Таврійський науковий вісник*. Херсон : Грінь Д. С., 2011. Вип. 76. Ч. 2. С. 282–286.
239. Лихач В. Я., Галімов С. М. Ефективне ведення галузі свинарства в умовах СГПП «Техмет-ЮГ». *Таврійський науковий вісник* : збірник наукових праць ХДАУ. Херсон : Айлант, 2009. Вип. 64. С. 166–170.
240. Лихач В. Я., Загайкан О. І. Забезпечення високої продуктивності свиней в умовах ТОВ «Таврійські свині». *Таврійський науковий вісник*. Херсон : Грінь Д. С., 2011. Вип. 76. Ч. 2. С. 194–197.
241. Лихач В. Я. Морфологічний склад туш молодняку свиней спеціалізованих м'ясних генотипів. *Таврійський науковий вісник* : збірник наукових праць ХДАУ. Херсон : Айлант, 2007. Вип. 53. С. 134–138.
242. Лихач В. Я., Лихач А. В. Продуктивні якості свиней великої білої породи при різних методах розведення. *Таврійський науковий вісник*. Херсон : Грінь Д. С., 2011. Вип. 76. Ч. 2. С. 116–118.
243. Лихач В. Я., Романова О. М. Продуктивні якості свиней внутрішньопорідного типу породи дюрок української селекції «Степовий». *Технологія виробництва і переробки продукції тваринництва* : зб. наук. праць Білоцерк. держ. аграр. ун-т. Біла церква, 2010. Вип. 3(72). С. 21–22.
244. Лихач В. Я., Лихач А. В., Толмачова А. Ю. Продуктивні якості свиноматок великої білої породи залежно від лінійного складу кнурів-плідників в умовах ДП «Племрепродуктор «Степове» Миколаївського району. *Зоотехнічна наука поділля: історія, проблеми, перспективи* : зб. наук. праць. Кам'янець-Подільський, 2010. Вип. 16. С. 74–76.
245. Лихач В. Я. Формування м'ясних якостей у чистопородного та помісного молодняку свиней. *Вісник аграрної науки Причорномор'я*. Миколаїв : МДАУ, 2007. Вип. 1(39). С. 177–183.

246. Лихач В. Я., Крамаренко С. С., Шебанін П. О. Використання ентропійно-інформаційного аналізу для оцінки відтворювальних якостей помісних свиноматок. *Вісник аграрної науки Причорномор'я*. Миколаїв : МНАУ, 2015. Вип. 1(82). С. 187–194.
247. Лихач В. Я. Відтворювальні якості свиноматок залежно від конструктивних особливостей станкового обладнання. *Тваринництво України*. 2015. № 8. С. 34–37.
248. Лихач В. Я. Влияние технологии содержания на воспроизводительные качества хряков-производителей разных пород. *Инновации и продовольственная безопасность.* 2015. № 2(8). С. 30–35.
249. Лихач В. Я., Лихач А. В., Шебанин П. О. Гистологическое строение мышечной ткани свиней различных пород и сочетаний в условиях промышленной технологии. *Инновации и продовольственная безопасность*. 2015. № 5. С. 31–37.
250. Лихач В. Я. Технологічні особливості вирощування поросят. *Тваринництво України*. 2015. № 6. С. 11–13.
251. Лоза А. А. Сало на роздоріжжі. Бізнес. Київ, 2005. С. 22–28.
252. Лоза А. Тенденции развития свиноводства в Украине. Сборник Докладов Международной конференции «Возможности и перспективы альтернативного свиноводства». К., 2005. С. 24–29.
253. Лоза А. А. Слагаемые успеха отечественного свиноводства. *Тваринництво сьогодні*. 2010. № 2. С. 18–20.
254. Ломако Д. В. Вивчення ознак відтворювальної здатності свиноматок при чистопородному розведені : дис. ... канд. с.-г. наук : 06.02.01. Полтава, 2000. 155 с.
255. Ломако Д. В., Скрипка С. М. Поєднуваність свиней великої чорної породи новостворюваного заводського типу з покращеними відгодівельними якостями зі свинями великої білої породи в ТОВ «Маяк» Полтавської області. *Таврійський науковий вісник*. 2008. Вип. 58. Ч.2. С. 183–186.
256. Луганцев А. Е. Продуктивность и некоторые биологические особенности свиней различного направления продуктивности : дисс. … канд. с.-х. наук : 06.02.01. Персиановский, 2000. 133 с.
257. Луговий С. І., Лихач В. Я. Влияние возраста двухпородных свиноматок на их воспроизводительные качества. *Технологія виробництва і переробки продукції тваринництва* : зб. наук. праць Білоцерк. національний аграр. ун-т. Біла церква, 2015. Вип. 1(116). С. 45–49.
258. Лях Ю. Г. Промышленное свиноводство и стресс-факторы. *Севершенствование технологии производства свинины на комплексах и фермах промышленного типа Минской области* : материалы науч.-практ. конф., Минск, 23-24 дек. 2003 г. Минск, 2003. С. 81–84.
259. М'ясні генотипи свиней південного регіону України : монографія / [В. С. Топіха, Р. О. Трибрат, С. І. Луговий, В. Я. Лихач та ін.]. Миколаїв : МДАУ, 2008. 350 с.
260. М'ясо. Свинина в тушах і півтушах. Технічні умови : ДСТУ 7158:2010. –

[Чинний від 2011-01-01]. К. : Держспоживстандарт України, 2010. 11 с. (Національний стандарт України).
261. Мазгаров И. Р., Усова Н. Е. Влияние стрессовой чувствительности свиноматок на живую массу в связи с их возрастом. *Ученые записки Казанской государственной академии ветеринарной медицины им. Баумана* : «Особенности физиологических функций животных в связи с их возрастом, составом рациона, продуктивностью, экологией и этологией». Казань, 2006. Т.185. С. 192–201.
262. Мазгаров И. Р., Усова Н. Е. Сравнительная характеристика продуктивного потенциала стресс-устойчивых свиноматок подготовленных и неподготовленных к осуществлению репродуктивной функции в условиях интенсивной технологии. *Эколого-биологические проблемы повышения продуктивности долголетия животных* : материалы междунар. научн.-практ. конф. Екатеринбург : Уральский науч. исследов. ветер, ин-тут, 2006. С. 105–108.
263. Майструк С. Технологія вирощування поросят до чотиримісячного віку. *Тваринництво України*. 2005. № 9. С. 9-11.
264. Максимов Г. В. Биологические аспекты продуктивности свиней интенсивных пород и типов : автореф. дисс. … докт. с.-х. наук : 06.02.01. п. Персиановский, 1995. 50 с.
265. Максимов Г. В. Взаимосвязь интерьерных показателей с откормочными и мясными качествами подсвинков. *Новые направления породообразования и породоулучшения в свиноводстве* : сб. науч. труд. п. Персиановский, 1992. С. 38–43.
266. Максимов Г. В. Качество мяса у пород, типов и гибридов свиней в современных экологических условиях. *Биотехнология и производство экологически чистой продукции сельского хозяйства* : Тезисы доклад. регион. науч.-практич. конф. п. Персиановский, 1999. С. 97–98.
267. Максимов Г. В. Особенности интерьера свиней в зависимости от их мясной продуктивности. *Интенсификация селекционного процесса в свиноводстве* : межвуз. сб. науч. тр. п. Персиановский, 1989. С. 29–37.
268. Максимов Г. В. Проблемы качества продукции при селекции свиней по мясности. *Актуальные проблемы производства свинины* : мат. 6-го заседания межвуз. коорд. совета «Свинина» и респуб. науч.-производ. конфер. Краснодар, 1996. С. 29–31.
269. Максимов Г. В. Проблемы повышения качества мяса у свиней. Тезисы докладов конференции по итогам научно-исследовательской работы ДонГАУ в 1991-1995 гг. январь 1996 г. п. Персиановский, 1996. С. 93–95.
270. Максимов Г. В. Корреляция между уровнем и качеством мясной продуктивности свиней. *Новые направления породообразования и породоулучшения в свиноводстве* : сб. науч. труд. п. Персиановский, 1992. С. 43–55.
271. Малик Н. И., Сканчев А. И. Пробиотики и их влияние на рост и сохранность поросят. *Биология*. 2002. № 3(18). С. 137–139.

272. Малтмен Д. Основные управленческие факторы успешного выращивания свиней в арочных конструкциях. Сборник Докладов Международной конференции «Возможности и перспективы альтернативного свиноводства». К., 2005. С. 30–36.
273. Маменко О. М. Наукове супроводження інноваційних технологій розвитку тваринництва. *Проблеми зооінженерії та ветеринарної медицини* : зб. наук. праць Харк. держ. зоовет. акад. Х. : РВВ ХДЗВА, 2014. Вип. 28. Ч.1. С. 54–63.
274. Мангура Л. П. Відгодівельні та м'ясо-сальні якості чистопородних і помісних свиней. *Таврійський науковий вісник*. 2008. Вип. 58. Ч.2. С. 186–191.
275. Марков Ю. О роли ферментов в свиноводстве. *Свиноводство*. 2000. № 4. С. 15–16.
276. Марусич А. Г. Влияние ферментных препаратов на эффективность использования кормов и продуктивные качества молодняка при откорме на рационах с различным уровнем протеина и клетчатки. *Вестник акад. аграр. наук Белоруссии*. 2006. № 1. С. 67–70.
277. Международный стандарт ИСО 2917-74 «Мясо и мясные продукты. Контрольный метод определения концентрации водородных ионов (pH)».
278. Международный стандарт ИСО 936-1978 (Е) «Мясо и мясные продукты. Определение содержания золы».
279. Мельник В. О., Кравченко О. О. Технологія привчання та одержання сперми від кнурів-плідників на фантом. *Вісник аграрної науки Причорномор'я.* Миколаїв : МДАУ, 2005. Вип. 2. С. 208–212.
280. Методологія створення спеціалізованого типу свиней : монографія [Гришина Л. П., Волощук В. М., Акнєвський Ю. П.]. Полтава, 2015. 239 с.
281. Методы ветеринарной клинической лабораторной диагностики : справочник / [Кондрахин И. П., Архипов А. В., Левченко В. И. и др.] ; под. ред. И. П. Кондрахина. М. : Колос, 2004. 520 с.
282. Микитюк Д., Лоза А., Геймор М. Промислова технологія свинарства. *Пропозиція*. 2008. №5. С. 32–33.
283. Микроклимат в животноводческих помещениях [Электронный ресурс]. – Режим доступа: http://arx.novosibdom.ru/node/62 .
284. Мирзоян А. Совершенствование качества и классификации туш свиней. *Свиноводство*. 2001. № 6. С. 17–19.
285. Михайлова М., Явищенко В., Новіков В., Голуп'як Л. Племзавод свиней української степової рябої породи. *Тваринництво України*. 1998. № 12. С. 19–20.
286. Михайлова М. Селекция на мясные качества свиней. *Свиноводство*. 2002. №1. С. 8.
287. Моисеев П. И., Елисеев М. Н., Крячко В. Г. Производство свинины на промышленной основе. Л. : Лениздат, 1983. 136 с.
288. Молоканова И. В. Влияние стрессовой чувствительности на собственную продуктивность и репродуктивные качества свиноматок : автореф. дис. …

канд. биол. наук : 03.00.01. Троицк, 2002. 25 с.
289. Морозов Н. М. Механизация и автоматизация технологических процессов в животноводстве. *Зоотехния*. 1991. № 6. С. 54–60.
290. Мосолов В. П., Волощик П. Д., Пушкарский В. Г. Производство свинины на потоке. М. : Московский рабочий, 1981. 111 с.
291. Мошкутело И., Николаев В. Система кормопроизводства и кормления свиней. *Свиноводство*. 2003. № 2. С. 12–15.
292. Мункуева С. Д., Жимбуева Л. Д., Базарова М. В. Использование компьютерных технологий при определении влагосвязывающей способности мяса. *Мясная индустрия*. 2004. № 5. С. 20–22.
293. Мытарев Н. И. Воспроизводительные качества свиней в зависимости от стресс-чувствительности. *Зоотехния*. 2006. № 12. С. 23–24.
294. Навозенко А. Н. Разработка технологии выращивания свиней в фермерских и крестьянских хозяйствах : автореф. дисс. … канд. с.-х. наук : 06.02.04. Белгород, 2001. 22 с.
295. Навчально-науково-виробничий свинокомплекс Миколаївського національного агарного університету в системі інноваційного розвитку АПК [В. С. Шебанін, О. Є. Новіков, В. С. Топіха, В. Я. Лихач]. *Вісник аграрної науки Причорномор'я*. Миколаїв : МНАУ, 2015. Вип. 2(84), Т(2). С. 3–9.
296. Нагревательные плиты для локального обогрева поросят. [Электронный ресурс]. – Режим доступа: www.agrovent.ru/agro /hplate.asp.
297. Нарижный А. Г., Комова З. П., Бурлака Г. М. Коррекция воспроизводительной функции у хряков с нарушенной эрекцией. *Ветеринария*. 1997. № 10. С. 32–34.
298. Нарижный А. Г., Водяников В. И., Поморова Е. Г. и др. Повышение продуктивности хряков. Белгород : Изд-во «Крестьянское дело», 2001. 208 с.
299. Насонова Д. Холод на глубокой подстилке. *Агробизнес. Современные стратегии, технологии, менеджмент*. 2006. № 3. С. 44–46.
300. Некрасова А. В. Влияние «Сел-Плекса» на воспроизводительные качества хряков производителей. *Свиноводство*.2009. № 6. С. 42–44.
301. Некрасова А. В. Влияние препарата «Сел-Плекс» на рост и развитие поросят-сосунов. *Пермский аграрный вестник :* XIX Всероссийской науч. – практ. конф. молодых ученых, аспирантов и студентов. Пермь : Изд-во ФГОУ ВПО «Пермская ГСХА», 2009. С. 54–55.
302. Никитченко И. Н. Адаптация, стрессы и продуктивность сельскохозяйственных животных / И. Н. Никитченко, С. В. Плященко, А. С. Зеньков. – Мн. : Ураджай, 1988. – 200 с.
303. Никитченко И. Н. Гетерозис в свиноводстве. Л. : Агропромиздат, 1987. 213 с.
304. Новікова Н. В. Особливості біохімічного складу крові свиней з різною адаптаційною нормою в умовах племзаводу ТОВ «Фрідом Фарм Бекон». *Вісник аграрної науки Причорномор'я*. Миколаїв : МНАУ, 2013. Вип. 4(76). С. 104–109.

305. Ноздрин Г. А. Пробиотики и микронутриенты : монография [Г. А. Ноздрин, А. Б. Иванова, А. И. Шевченко, С. А. Шевченко]. Новосибирск, 2009. 207 с.
306. Нормы и рационы кормления сельскохозяйственных животных. Справочное пособие. 3-е издание переработанное и дополненное. / Под ред. А. П. Калашникова, В. И. Фисинина, В. В. Щеглова, Н.И. Клейменова. Москва, 2003. 456 с.
307. Нормы технологического проектирования систем удаления и подготовки к использованию навоза и помета (НТП 17-99). М., 2001. 24 с.
308. Околелова Т., Бевзюн В. Целловеридин в комбикормах нестандартной рецептуры. *Комбикорма.* 2003. № 5. С. 46–47.
309. Околелова Т. М., Удловой Э. В. Методические рекомендации по включению комплексных ферментных препаратов в комбикорма с повышенным содержанием трудногидролизуемых компонентов. Сергиев-Посад, 1966. 12 с.
310. Онищенко Л. В., Данильчук М. І. Селекційно-племінна робота зі свинями червоної білопоясої породи. *Науковий вісник «Асканія Нова»*. 2012. Вип. 5. Ч.2. С. 272–276.
311. Організація племінної справи : навч. посіб. [Топіха В. С., Нежлукченко Т. І., Луговий С. І., Лихач В. Я.] ; за ред. В. С. Топіха. Херсон : Грінь Д. С, 2012. 264 с.
312. Орлянкин Б. Г. Новые вирусные болезни свиней. Промышленное и племенное свиноводство. 2007. № 3. С. 47–48.
313. Орлянкин Б. Г., Алипер Т. И. , Непоклонов Е. А. Цирковирусные болезни свиней. *Ветеринария*. 2005. № 11. С. 3–6.
314. Особенности и перспективы развития рынка мяса и мясопродуктов. [Электронный ресурс]. – Режим доступа: //www.meat. com.ua/pol/? id=4.
315. Особливості селекційно-технологічних рішень та організаційних форм у сучасному свинарстві / В. М. Волощук, І. В. Хатько, О. І. Підтереба та ін. *Свинарство*. Міжвід. темат. наук. зб. Полтава, 2012. Вип. 61. С. 3–8.
316. Остапчук П. П. Выращивание и племенное использование хряков. К. : изд. УСХА, 1992. 61 с.
317. О'Сулливан Д. Микотоксины – бесшумная опасность. *Комбикорма*. 2005. №5. С. 54–56.
318. Панікар І. І. Гуморальний імунітет поросят неонатального періоду і вплив на нього молозива і молока. *Науковий вісник ЛНУВМБТ ім. С. З. Ґжицького.* 2014. № 3(60). Т.16. Ч.2. С. 231–241.
319. Панін Л. Є. Біохімічні механізми стресу. Новосибирск : Наука, 1983. 233 с.
320. Панкратов К. Г., Щелоков В. И., Плеханова Л. Д., Поташева Е. В. Экспрессное определение показателей качества мяса и мясных продуктов методом ИК-спектроскопии. *Мясная индустрия*. 1998. № 3. С. 38–40.
321. Патент на корисну модель № 100451. Самогодівниця для свиней Україна : / В. Я. Лихач, А. В. Лихач, Ф. А. Бородаєнко, В. О. Іванов (Україна); МПК A01K 5/01 (2006.01) № u201501057 заявл. 10.02.2015., опубл. 27.07.2015, Бюл. № 14.

322. Патент на корисну модель № 50266А Мікротом : / М. С. Козій, В. О. Іванов (Україна); опубл. 10.12.2001 р., Бюл. №10.
323. Патент на корисну модель № 80923. Спосіб відбору молодняку свиней : / Іванов В. О. Волощук В. М, Лісний В. А., Іванова Л. О., Попова Н. В. (Україна); МПК A01K67/02/ № u 2013 00622, заявл. 18.01.2013., опубл. 10.06.2013, Бюл. №11.
324. Патент на корисну модель № 92089. Станок для привчання кнурів до садки на штучну вагіну : / В. Я. Лихач, О. В. Волощук, С. І. Луговий, Ф. А. Бородаєнко, В. О. Іванов (Україна); МПК A61D 19/02 (2006.01) № u201402695 заявл. 18.03.2014., опубл. 25.07.2014, Бюл. № 14.
325. Патент на корисну модель № 64288А Спосіб заключення в парафін гістологічних об'єктів з фіксованою товщиною : / М. С. Козій, В. О. Іванов (Україна); опубл. 16.02.2004, Бюл. № 2.
326. Патент на корисну модель № 92090 Пересувне чучело для отримання сперми у кнурів : / В. Я. Лихач, О. В. Волощук, С. І. Луговий, Ф. А. Бородаєнко, В. О. Іванов (Україна); МПК A61D 19/02 (2006.01) № u201402696 заявл. 18.03.2014 ., опубл. 25.07.2014, Бюл. № 14.
327. Патент на полезную модель № 2181000 Способ определения стрессовой чувствительности свиней : / Е. Л. Капкова, А. И Кузнецов (Россия); A01K67/02; опубл. 10.04.2002.
328. Пахно В. Методы содержания свиней. *Свиноводство*. 1979. № 4. С. 39–40.
329. Пейн Х. Альтернативное свиноводство в Австралии. Сб. докл. межд. конф. «Возможности и перспективы альтернативного свиноводства». Донецк, 2005. С. 52-67.
330. Пейн Х. Исследования опороса в ангарах которое проводится в настоящий момент. Сб. докл. межд. конф. Альтернативное свиноводство – путь к успеху. Днепропетровск, 2006. С. 77–80.
331. Пелих В. Г. Селекційні методи підвищення продуктивності свиней. Херсон: Айлант, 2002. 264 с.
332. Перевезев Д., Пономарев Н., Душкин В. Повышение сохранности молодняка свиней в условиях промышленной технологии. *Свиноводство*. 2000. № 5. С. 24–25.
333. Перепелюк А. И., Сопова Ю. В. Экономически сбалансированная система регулирования половой функции свиней : от синхронизации овуляции до опороса. *Ветеринарная практика*. 2012. № 3. С. 28–29.
334. Перетятько Л. Г. Ареал разведения и перспектива сохранения полтавской мясной породы свиней. *Актуальные проблемы интенсивного развития животноводства* : труды междун. науч-практ. конф. 4-6 окт. 2012 г., Горки. Горки : БГСХА, 2012. С. 233–240.
335. Перетятько Л. Г. Племінна база та перспективи збереження полтавської м'ясної породи свиней. *Свинарство*. 2012. № 61. С. 33–38.
336. Перетятько Л. Г., Рибалко В. П., Шостя А. М. Полтавська м'ясна порода свиней. Державна книга племінних свиней полтавської м'ясної породи. К. : Арістей, 2005. Т.1. № 56. С. 10–27.

337. Перетятько Л. Г. Селекційно-генетичний потенціал продуктивності полтавської м'ясної породи свиней. *Свинарство*. 2008. № 56. С. 36–41.
338. Перетятько Л. Г., Метлицкая Е. И. Формирование высокопродуктивных генеалогических структур в полтавской мясной породе свиней с использованием популяционно-генетических методов. *Таврійський науковий вісник*. 2008. Вип. 58/2. С. 198–202.
339. Пестис В. К. Ассоциация полиморфизма гена *RYR1* с показателями продуктивных качеств свиней пород, разводимых в Беларуси. *Молодой ученый*. 2015. № 5/2. С. 33–37.
340. Петенко А. И., Кощаев А. Г., Гудзь Г. П., Калашников А. И. Эффективность препаратов на основе полезной симбионтной микрофлоры в свиноводстве. *Инновационные решения*: матер. межд. конф. Геленджик, 2007. С. 168–176.
341. Петренко І. Інтенсивне ведення промислового свинарства. *Тваринництво України*. 1996. № 6. С. 6–7.
342. Петренко І. Крупнотоварне виробництво свинини. *Тваринництво України*. 2003. № 11. С. 2–3.
343. Петрушко И. Перспективы развития свиноводства Беларуси. *Свиноводство*. 2006. № 1. С. 23–24.
344. Племінна робота з породами свиней / [Почерняєв Ф. К., Журженко Т. С., Кащенко А. Х. та ін.], під ред. М. І. Матійця. К. : Урожай, 1964. 324 с.
345. Плохинский Н. А. Биометрия. М. : Моск. ун-т, 1970. 366 с.
346. Плохинский Н. А. Руководство по биометрии для зоотехников. М. : Колос, 1969. 256 с.
347. Пляшенко С. Активный моцион ремонтных свинок. *Свиноводство*. 1984. № 10. С. 27–28.
348. Пляшенко С. И., Сидоров В. Т. Стрессы у сельскохозяйственных животных. М. : Агропромиздат, 1987. С. 160–176.
349. Повод М. Г., Головко В. М. Продуктивні якості свиноматок при різних способах їх утримання в період поросності. *Таврійський науковий вісник*. 2008. Вип. 58., Ч.2. С. 319–327.
350. Повод М. Г., Гетьман В. В. Утримання та годівля холостих і поросних свиноматок. *Пропозиція*. 2007. № 8. С. 116–121.
351. Повод М. Г. Вплив технологічних особливостей на відгодівельні показники свиней. *Вісник Сумського національного аграрного університету*. Суми, 2014. № 2(25). С. 30–36.
352. Повышение продуктивности свиней на промышленном комплексе/ [Е. Г. Федорчук, Г. С. Походня, Н. А. Маслова, А. В. Ковригин]. Белгород : Изд.-во. БелГСХА, 2012. 104 с.
353. Позняковский В. М. Экспертиза мяса и мясопродуктов. Новосибирск, 2001. 187 с.
354. Поливода А. М. Качество мяса и сала в связи с возрастом, полом и породой свиней. Генетика свиней и теория племенного дела в свиноводстве. М. : Колос, 1972. С. 172–182.
355. Поливода А. М. Порівняльна оцінка якості м'яса свиней різних порід.

Свинарство. К., 1980. Вип. 32. С. 37–46.
356. Поливода А. М. Физико-химические свойства и белковый состав мяса свиней. *Порода свиней*. М. : Колос, 1981. С. 19–27.
357. Поливода А. М. Оценка качества свинины по физико-химическим показателям. *Свинарство.* Міжвід. темат. наук. зб. Інститут свинарства УААН. К. : Аграрна наука, 1976. Вип. 24. С. 57–62.
358. Полиморфизм гена *RYR1* в популяции белорусской мясной породы свиней и его ассоциация с процессами метаболизма и продуктивными качествами / И. П. Шейко [и др.] // Доклады РАСХН. 2004. № 5. С. 30–32.
359. Полянцев Н., Ушакова Е. Современный взгляд на природу синдрома ММА свиноматок и основополагающие принципы борьбы с ним. *Свиноводство*. 2007. № 3. С. 30–32.
360. Понаморёв Н., Мошкутело И., Гегамян Н. Модель высокоэффективного свиноводческого предприятия. *Свиноводство*. 2005. № 1. С. 20–21.
361. Попова О. А. Влияние сезонов года на продуктивность свиноматок при использовании свежевзятой и замороженной спермы : дисс. ... канд. с.-х. наук : 06.02.04. Белгород, 2009. 139 с.
362. Породи та породовипробування свиней в Україні [Нагаєвич В. М., Рибалко В. П., Герасимов В. І., Березовський М. Д., Акімов С. В., Пронь О. В]. Х. : ХНАУ, 2005. 94 с.
363. Походня Г. С., Федорчук Е. Г., Манохіна Л. А. Продуктивность свиноматок в зависимости от сезона года. *Таврійський науковий вісник*. 2008. Вип. 58. Ч.II. С. 298–302.
364. Походня Г. С., Ковригин А. В., Федорчук Е. Г. Влияние принудительного моциона хряков на их воспроизводительную функцию : сб. науч. тр. научной школы профессора Г. С. Походни «Свиноводство и технология производства свинины». Белгород : Изд-во БелГСХА, 2008. Вып. 1. С. 45–48.
365. Походня Г. С., Шипилов Э. А., Залогин К. К. и др. Интенсификация воспроизводительных функций у свиномток. Белгород : Белгородская госсельхозакадемия, 1998. 207 с.
366. Походня Г. С. Оптимальные условия содержания маток на комплексе. *Свиноводство*. 1985. № 1. С. 30–31.
367. Походня Г. С., Федорчук Е. Г., Маслова Н. А. и др. Организация и технология производства свинины в колхозе им. Фрунзе Белгородского района Белгородской области. Белгород : Изд.-во. БелГСХА, 2011. 75 с.
368. Походня Г. С., Федорчук Е. Г., Дудина Н. П. Повышение воспроизводительных функций хряков-производителей за счет использования суспензии хлореллы в их рационах. *Перспективное свиноводство*. 2011. № 2. С. 20–24.
369. Походня Г. С., Гришин А. И., Стрельников Р. А., Федорчук Е. Г., Шабловский В. В. Повышение продуктивности маточного стада свиней. Белгород : Изд.-во. «Константа», 2013. 488 с.
370. Походня Г. С., Ескин Г. Н., Нарижный А. Г. Повышения продуктивности

свиней. Белгород : Изд-во. БелГСХА, 2004. 517 с.
371. Походня Г. С. Промышленное свиноводство. Белгород : Крестьянское дело, 2011. 483 с.
372. Походня Г. С. Свиноводство и технология производства свинины. Белгород : Издательство «Везелица», 2009. 776 с.
373. Походня Г. С. Теория и практика воспроизводства и выращивания свиней. М. : Агропромиздат, 1990. 270 с.
374. Походня Г. С. Влияние моциона хряков на их воспроизводительную функцию. *Свиноводство*. 2005. № 2. С. 21–23.
375. Прибытова О., Монастырев А. Влияние препарата Е-селен на показатели крови и мясную продуктивность герефордов. *Молочное и мясное скотоводство*. 2008. № 7. С. 30–31.
376. Проваторов Г. В., Проваторова В. О. Годівля сільськогосподарських тварин : Підручник. Суми : ВТД «Університетська книга», 2004. 510 с.
377. Програма селекції з локальними та зникаючими генотипами свиней України на 2003-2012 роки [Мельник Ю. І., Литовченко А. М., Рибалко В. П. та ін.]. Полтава, 2003. 98 с.
378. Прогулочная родилка Мардаровича. [Электронный ресурс]. – Режим доступа: www.Pl platon. man. Lublin. Pl.
379. Продуктивні якості свиней породи ландрас у період адаптації [В. Я. Лихач, А. В. Лихач, І. В. Коновалов, Р. О. Трибрат]. *Таврійський науковий вісник*. Херсон : Грінь Д. С., 2012. Вип. 78. Ч.2. Т.2. С. 110–115.
380. Проектные предложения свиноводческих комплексов с законченным производственным циклом на 6, 12, 18 и 24 тысячи голов годового откорм: Под ред. М. М. Севернева. Минск : ЦНИИМЭСХ, 1982. 57 с.
381. Рекомендации по организации поточной системы производства свинины в колхозах и совхозах : Под ред. П. И. Корнеева. М. : Агропромиздат, 1985. 40 с.
382. Рекомендации по реконструкции свиноводческих ферм. Запорожье, ЦНИИПТИМЭЖ, 1988. 134 с.
383. Ресурсозберігаючі технології виробництва свинини : теорія і практика : навч. посіб. [О.М. Царенко, О.В., Крятов, Р.Є. Крятова, Л.В. Бондарчук]; під заг. ред. О. М. Царенко. Суми : Університетська книга, 2004. 269 с.
384. Рибалко В. П., Бірта Г. О., Бургу Ю. Г. Гістоструктурний аналіз м’язової тканини свиней. *Міжвідом. темат. наук. зб. Інституту свинарства і АПВ НААН*. Полтава, 2014. Вип. 65. С. 145–148.
385. Рибалко В. П. Племінні ресурси України. К. : Аграрна наука, 1998. С. 172–174.
386. Рибалко В. П., Фесенко О. Г. Продуктивні якості нової червоної білопоясої породи м’ясних свиней. *Свинарство*. 2007. Вип. 55. С. 12–15.
387. Рибалко В. П., Нагаєвич В. М. Створення популяції червоно-поясних свиней м’ясного напрямку продуктивності. *Вісник Полтавського державного с.-г. інституту*. 2000. № 6. С. 59–62.
388. Рибалко В. П. Стратегія розвитку свинарства України у кризовий період.

Зоотехнічна наука Поділля : історія, проблеми, перспективи : матер. міжнародної науково-практичної конференції, 16-18 бер. 2010 р. : тези доп. Кам'янець-Подільський, 2010. С. 230–233.
389. Рибалко В. П. Сучасний стан та напрями розвитку вітчизняного свинарства. *Вісник аграрної науки Причорномор'я*. Миколаїв : Миколаївський ДАУ, 2010. Вип. 1(52). Т. 2. С. 21–25.
390. Рибалко В. П. Тенденції і напрями розвитку свинарства. *Ефективне тваринництво*. 2006. № 7. С. 7–11.
391. Родригес И. Влияние микотоксинов на продуктивность свиней. *Комбикорма*. 2010. № 2. С. 88.
392. Рыбалко В. П. Знаете ли вы, что ... *Свиноводство*. 2001. № 1. С. 27–28.
393. Рыбалко В., Курило Ю. Свиноводство Германии. *Свиноводство*. 1993. №2-3. С. 27–30.
394. Рыбалко В. П., Коваленко В. Ф. Прогрессивные технологии в свиноводстве Канады. *Зоотехния*. 2002. № 4. С. 30–32.
395. Рыбалко В. П., Фесенко О. Г. Создана новая популяция свиней мясо-окорочного направления продуктивности. *Проблемы сельскохозяйственного производства на современном этапе и пути их решения* : межд. науч.-произв. конф. 15-19 мая 2006 г. : тезисы докл. Белгород, 2006. С. 161.
396. Рыбалко В. П., Агапова Е. М., Иващук И. С. и др. Теоретические основы и практические результаты по созданию новой популяции свиней. Вісник аграрної науки Причорномор'я. 2002. Вип. 3(17). С. 25–28.
397. Рыбалко В. П. Проблемы производства свинины в странах СНГ. *Свиноводство*. 2010. № 7. С. 48–49.
398. Савельева Т. А. Ветеринарные технологии в промышленном свиноводстве. *Совершенствование технологии производства свинины на комплексах и фермах промышленного типа Минской области* : мат. науч.-практ. конф., Минск, 23-24 дек. 2003 г. Минск, 2003. С. 89–91.
399. Сагло А. Ф. Воздействие перегруппировок на поведение и интенсивность роста ремонтного молодняка свиней. Доклады ВАСХНИЛ. 1977. №2. С. 42–43.
400. Салаватулина Р. М., Алиев С. А., Любченко В. И. Новый метод определения основных функциональных свойств мяса. *Мясная индустрия СССР*. 1983. №9. С. 32–34.
401. Самнер В. Д., Сомерс Г. Ф. Химия ферментов и методы их использования : Под ред. В. А. Энгельгарда. М. : Гос. издатель-ство иностр. литературы, 1948. С. 58.
402. Самосплавная система навозоудаления из зданий [Электронный ресурс]. – Режим доступа: http://www.agrotex.com.ua/item/20.
403. Свинарство : монографія [В. М. Волощук, В. П. Рибалко, М. Д. Березовський та ін.]. К. : Аграрна наука, 2014. 587 с.
404. Свині для забою. Технічні умови : ДСТУ 4718:2007. – [Чинний від 2011-07-01]. К. : Держспоживстандарт України, 2008. 7 с. (Національний стандарт

України).
405. Світовий генофонд свиней / В. І. Герасимов [та ін.] ; за ред. В. І. Герасимова, М. Д. Березовського, В. М. Нагаєвича. Харків : Еспада, 2006. 520 с.
406. Селионова М., Кравченко М. Откормочные и мясные качества свиней скороспелой мясной породы разных генотипов RYR-1 локуса. *Свиноводство*. 2007. № 6. С. 13-15.
407. Сельскохозяйственные здания и сооружения [Электронный ресурс]. – Режим доступу: http://www.bibliotekar.ru/spravochnik-44/7.htm.
408. Семенов В. В., Рачков И. Г., Кононова Л. В. и др. Новые трехпородные кроссы свиней на Ставрополье. Сб. науч. тр. «Животноводство и кормопроизводство». Ставрополь : СНИИЖК, 2011. Вып. 4. С. 17–19.
409. Семенов В. В., Кононова Л. В., Плужникова О. В. и др. Экономическая эффективность использования генной диагностики стресс-устойчивости при откорме свиней. Сб. науч. тр. «Животноводство и кормопроизводство». Ставрополь : СНИИЖК, 2010. Вып. 3. С. 50–52.
410. Семенова А. А. Разработка метода комплексной оценки качества мяса и мясных продуктов : автореф. дисс. … канд. техн. наук : 05.18.04. М., 1993. С. 12–16.
411. Сенько И. П., Матох А. А., Полянский В. П. Эффективность промышленного свиноводства. Минск : Ураджай, 1981. 63 с.
412. Сидоркин В. А. Болезни свиней. М. : ООО «Аквариум-принт», 2007. 544 с.
413. Системы кормления и станочного оборудования для содержания свиноматок и выращивания поросят. [Электронный ресурс]. — Режим доступа: http:// Big Dutchman/digdutchman.
414. Сільське господарство України 2011. Статистичний збірник : За ред. Н.С. Власенко. К. : ДП «Інформаційно-аналітичне агентство», 2013. 402 с.
415. Сільське господарство України : статистичний збірник 2010 р. : За ред. Ю. М. Остапчука. К. : Державна служба статистики України, 2011. 385 с.
416. Скибенко И. Промышленное свиноводство Украинской корпорации Живпром. *Свиноводство*. 2002. № 2. С. 24–26.
417. Слинько В. Г. Фізико-хімічні показники м’яса і сала свинок різних генотипів. *Вісник аграрної науки*. 2000. № 3. С. 68–69.
418. Смирнов А. М. Контроль качества и безопасности мяса и мясопродуктов. *Ветеринария*. 2006. № 8. С. 3–5.
419. Смирнов А. М. Проблемы качества и безопасности мяса и мясных продуктов. *Мясной ряд.* 2006. № 2. С. 38–45.
420. Смислов С. Ю. Удосконалення та використання інформаційних систем і технологічних рішень у свинарських підприємствах різної направленості: дис. ... канд. с.-г. наук : 06.02.04. Миколаїв, 2012. 135 с.
421. Соловйов І. В., Жиркова Р. М., Луценко В. А., Брут Р. Т. Продуктивність свиней української м’ясної породи асканійської селекції. *Розвиток наукової спадщини академіка М. Ф. Іванова щодо породоутворення та селекції с.-г. тварин* : міжн. конф., присвяченій 125-річчю від дня народження М. Ф. Іванова : тези доп. К. : Україна, 1996. С. 87.

422. Соловйов І. В. Створення асканійського типу української м'ясної породи свиней : автореф. дис. ... докт. с.-г. наук : 06.02.01. Харків, 1994. 48 с.
423. Соловьев И. В. Севершенствование асканийского типа украинской мясной породы свиней. *Зоотехния*. 2000. № 7. С. 5–7.
424. Сосницкий А. Определение качества мяса. *Свиноводство*. 1998. № 6. С. 31–32.
425. Станки для содержания поросных свиноматок (тип №8; тип №17) [Электронный ресурс]. – Режим доступа: http://www.variant.kharkov.com/agriculture/ insemination
426. Станковое оборудование для содержания поросных свиноматок на участке искусственного осеменения [Электронный ресурс]. – Режим доступа: http://vektor.org.ua/oborudovanie/dlya-svinokompleksov/
427. Станок для фіксованого і напівфіксованого утримання підсисних свиноматок : В. О. Іванов, Д. В. Дудченко, В. М. Волощук [та ін.]. *Таврійський науковий вісник*. Херсон : Грінь Д.С., 2011. Вип. 76. Ч.2. С. 330–332.
428. Старков А. А., Денисов В. К. Проектирование энергоэффективных животноводческих ферм. *Землеустройство и земельный кадастр*. М., 2004. С. 440–449.
429. Старков А., Девин К., Пономарев Н. Влияние условий содержания на здоровье и продуктивность животных. Свиноводство. 2004. № 6. С. 30–33.
430. Створення конкурентоспроможного підприємства з виробництва свинини на базі навчально-науково-практичного центру миколаївського аграрного університету [О. Є. Новіков, В. Я. Лихач, П. О. Шебанін, Ф. А. Бородаєнко]. *Вісник аграрної науки Причорномор'я.* Миколаїв : МНАУ, 2014. Вип. 2(78). С. 3–15.
431. Степанов В. И., Михайлов Н. В. Свиноводство и технология производства свинины. М. : Агропромиздат, 1991. 336 с.
432. Степанов В. И. Взаимосвязь продуктивности и интерьерных показателей у свиней с различной стрессреактивностью. *Зоотехния*. 2002. № 1. С. 26–28.
433. Степанов В. И. Естественная резистентность свиней с различной стрессреактивностью. *Ветеринария*. 2000. № 7. С. 37–40.
434. Степанов В. И., Капелист И. В. Мясная продуктивность свиней. *Актуальные проблемы производства свинины* : мат. десятого зас. Межвуз. коорд. совета по свин. и республ. науч.-производ. конф. 28 - 29 мая 2001 г. п. Персиановский, 2001. С. 56–57.
435. Степанов В. И. Свойства мяса с пороками PSE и DFD. *Актуальные проблемы производства свинины* : мат. 10-го зас. межвуз. коорд. совета по свин. и республ. науч.-производ. конф. 28-29 мая 2001 г. п. Персиановский, 2001. С. 54–56.
436. Стрекозов Н. И., Вепрев В. В., Мошкутело И. И. Качество свинины отечественного производства. *Промышленное и племенное свиноводство*. 2006. № 4. С. 28–31.
437. Стрельцов В. А. Сохранность и продуктивность поросят в зависимости от

живой массы при рождении. Совершенствование технологии производства продукции животноводства, лечения и профилактики болезней сельскохозяйственных животных. Брянск : Издательство Брянской ГСХА, 2010. С. 60–62.
438. Стрижак Т. А., Мартинюк І. М., Мірошникова О. С. Відтворювальні якості кнурів породи ландрас вітчизняної та зарубіжної селекції. *Міжвідом. темат. наук. зб. «Свинарство»*. Полтава, 2014. Вип. 64. С. 57–60.
439. Стробикіна Р. В. Порівняльне вивчення деяких гістологічних показників найдовшого м'яза спини свиней великої білої, миргородської, ландрас, п'єтрен та їх двопородних помісей. *Свинарство*. К.: Урожай, 1969. № 10. С. 97–100.
440. Стробикіна Р. В. Порівняльні фізико-хімічні та гістологічні показники якості м'яса свиней. *Свиноводство*. К. : Урожай, 1975. № 23. С. 85–88.
441. Стробикіна Р. В., Циганчук Ю. С., Березовський М. Д., Троцький М. Я. Прижиттєве визначення м'ясної продуктивності та якості м'яса у свиней. *Свиноводство*. К. : Урожай, 1983. № 39. С. 24–26.
442. Стробыкина Р. В., Перетятько Л. Г. Гистоструктура мышечной ткани у чистопородных и помесных свиней в зависимости от уровня кормления. *Свиноводство*. К. : Урожай, 1990. № 46. С. 31–35.
443. Сучасні методики досліджень у свинарстві. Полтава, 2005. 228 с.
444. Сыроватка В. И. Механизация свиноводческих ферм в США. М., 1995.55 с.
445. Таранов Т., Сабиров А. Х. Биохимия кормов. М. : Агропромиздат, 1987. 224 с.
446. Татулов Ю. В., Миттельштейн Т. М. Внедрение системы объективной оценки качества туш свиней. *Свиноводство*. 1999. № 3. С. 22–24.
447. Татулов Ю. В., Миттельштейн Т. А., Мирзоян А. В. Значение объективной оценки мясных качеств свиней. *Свиноводство*. 1998. № 5. С. 24–26.
448. Татулов Ю. В. Качество свинины – одного из основных видов сырья мясной промышленности. *Свиноводство*. 1997. № 6. С. 24–26.
449. Темираев В. Х., Каиров В. Р., Газзаева М. С. Хозяйственно-биологические показатели молодняка свиней и цыплят-бройлеров при использовании в их кормлении биологически активных добавок. Владикавказ : издательство ФГБОУ ВПО «Горский госагроуниверситет», 2011. 128 с.
450. Теплостійкість та гематологічні показники свиноматок породи ландрас у період адаптації [В. С. Топіха, В. Я. Лихач, А. В. Лихач, І. В. Коновалов]. *Зоотехнічна наука поділля: історія, проблеми, перспективи* : зб. наук. пр. – Кам'янець-Подільський, 2012. Вип. 20. С. 271–274.
451. Технология для свиноферм / Проспект фирмы «Bauer-Agronomilk Group». [Электронный ресурс]. – Режим доступа: www.bauer agronomilk.
452. Технологічні карти з виробництва продукції тваринництва / За ред. Д. І. Мазуренка, О. А. Науменка, Є. З. Петруші, І. Г. Бойка. Харків : ХНТУСГ. 2007. 146 с.
453. Технологія виробництва продукції свинарства : Ю. В. Засуха, В. М. Нагаєвич, М. П. Хоменко та ін. За загальною редакцією

М. П. Хоменко. Вінниця : Нова Книга, 2008. 336 с.
454. Технологія виробництва продукції свинарства : Підручник для підготовки фахівців у аграрних вищих навчальних закладах III-IV рівнів акредитації із спеціальності «Технологія виробництва і переробки продукції тваринництва» [В. І. Герасимов, Д. І. Барановський, А. М. Хохлов, В. П. Рибалко, Ю. В. Засуха, А. А. Гетя, В. М. Негаєвич та ін.]. За ред. В. І. Герасимова. Х. : Еспада, 2010. 448 с.
455. Технологія виробництва свинини в умовах ТОВ «Таврійські свині» [В. С. Топіха, В. Я. Лихач, С. І. Луговий, О. І. Загайкан, П. О. Шебанін]. *Вісник аграрної науки Причорномор'я*. Миколаїв : МНАУ, 2015. Вип. 2(84), Т(2). С. 48–54.
456. Тимошенко Т. Н. Изучение качественных показателей свинины гибридных животных. *Перспективы развития животноводства* : материалы X междунар. науч.-практ. конф. Гродно, 2003. С. 103–105.
457. Ткаль В. А., Окунев А. О., Глущенко Л. Ф. Контроль качества мясного сырья по цветовым характеристикам. *Мясная индустрия*. 2007. № 6. С. 61–63.
458. Ткачев А. Ф., Хватов А. И. Методы создания харьковского заводского типа украинской мясной породы свиней. *Нові методи селекції і відтворення високопродуктивних порід і типів тварин* : наук.-виробн. конф. 29-30 травня 1996 р. : тези доп., 1996. С. 243.
459. Топиха В. С., Лихач В. Я. Ведение свиноводства в условиях ООО «Таврийские свиньи». *Инновационные технологи в животноводстве* : сб. науч. тр. Жодино, 2010. Ч.1. С. 160–163.
460. Топиха В. С. История создания и совершенствования стада свиней породы дюрок. *Свиноводство. Межвед. темат. научн. сб.* Полтава, 1990. Вып. 46. С. 6–11.
461. Топиха В. С. Итоги работы с породой дюрок в Украине. *Пути интенсификации отрасли свиноводства в странах СН*Г : межд. научн.-практ. конф. по свиноводству 14-15 сент. 2006 г. : тезисы докл. Жодино, 2006. С. 141–142.
462. Топиха В. С. Новое селекционное достижение в Украине – внутрипородный тип свиней породы дюрок «Степовый». *Современные проблемы интенсификации производства свинины* : междунар. науч.-практич. конф. 11-13 июля 2007 г. : статьи. Ульяновск, 2007. С. 348–357.
463. Топиха В. С. Продуктивные качества свиней в условиях ООО «Таврийские свиньи» [В. С. Топиха, В. Я. Лихач, А. В. Черненко, А. И. Загайкан] .сб. науч. тр. Ульяновск, 2010. Т. 3, 4. С. 169–174.
464. Топиха В. С. Беконные качества чистопородных и помесных свиней. *Научно-технический бюллетень УНИИЖ «Аскания-Нова»*. Херсон, 1977. Т.4. С. 33–35.
465. Топіха В. С. Використання та удосконалення генофонду свиней в умовах ТОВ «Таврійські свині» [В. С. Топіха, В. Я. Лихач, С. І. Луговий, О. І. Загайкан]. *Науковий вісник «Асканія-Нова»*. 2012. Вип. 5. Ч. II. С. 283–289.

466. Топіха В. С. М’ясні генотипи свиней південного регіону України. / В. С. Топіха, Р. О. Трибрат, С. І. Луговий, О. А. Коваль, В. Я. Лихач, В. А. Волков. Миколаїв : МДАУ, 2008. 350 с.
467. Топіха В. С., Лихач В. Я., Лихач А. В. Покращення беконних якостей свиней спеціалізованих м’ясних порід. *Свинарство*. Міжвідомчий тематичний науковий збірник. Полтава, 2014. Вип. 65. С. 126–131.
468. Топіха В. С., Лихач В. Я., Лихач А. В. Порода ландрас, її адаптаційні та продуктивні якості в умовах промислової технології. *Науково-технічний бюллетень Інституту тваринництва НААН*. Х., 2014. № 112. С. 150–159.
469. Топіха В. С., Лихач В. Я., Кіш С. В. Результати племінної роботи з внутрішньопорідним типом свиней породи дюрок української селекції «Степовий» в умовах ПАТ «Племзавод «Степной» Запорізької області. *Вісник аграрної науки Причорномор’я*. Миколаїв : МНАУ, 2014. Вип. 3, Т(2). С. 158–167.
470. Топіха В. С. Технологія виробництва продукції свинарства : навчальний посібник [В. С. Топіха, В. Я. Лихач, С. І. Луговий, Г. І. Калиниченко, О. А. Коваль, Р. О. Трибрат]. Миколаїв : МДАУ, 2012. 453 с.
471. Топіха В. С., Волков А. А., Трибрат Р. О. Характеристика генеалогічної структури свиней породи дюрок української селекції. *Тваринництво України*. 2002. № 1. С. 18–19.
472. Топіха В. С., Лихач В. Я., Лихач А. В. Якісні показники м’ясо-сальної продукції молодняку свиней породи ландрас за різних методів розведення. *Вісник аграрної науки Причорномор’я*. Миколаїв : МНАУ, 2012. Вип. 4(70), Т.2. Ч.2. С. 157–162.
473. Топіха В. С., Лихач В. Я., Іванов С.С. Забезпечення високої продуктивності свиней в умовах інтенсивної технології племзаводу «Миг-Сервіс-Агро» Миколаївської області. *Вісник аграрної науки Причорномор’я*. Миколаїв : МДАУ, 2008. Вип. 1(44). С. 151–157.
474. Топіха В. С., Лихач В. Я., Лихач А. В. Племінне господарство з розведення асканійського типу свиней української м’ясної породи. *Науковий вісник Львівського національного університету ветеринарної медицини та біотехнології ім. С. З. Гжицького*. 2011. Т.13. № 4(50). Ч.3. С. 306–309.
475. Топіха В. С., Лихач В. Я., Лихач А. В. М’ясні якості свиней породи ландрас за різних методів розведення. *Збірник наукових праць Вінницького НАУ*. 2013. Вип. 5(78). С. 217–221.
476. Торська С. М. Вплив водного моціону на поведінку і спермопродукцію кнурів-плідників. *Таврійський науковий вісник*. Херсон. 1998. Вип. 3. С. 63.
477. Тучкова А. Українське свинарство: розвивати, не можна покинути [Електронний ресурс]. – Режим доступу: http://pigua.info/uk/pigmarket/88/
478. Tompson J. N. Органический селен для птицеводства. *Feeding Times*. 2002. № 7. С. 10–11.
479. Украинцы потребляют сейчас в пять раз меньше мяса, чем при СССР. [Электронный ресурс]. – Режим доступа: http://www.20minut.ua/news/71619.
480. Україна посідає 85-е місце в світі за споживанням м’яса на душу населення.

[Електронний ресурс]. – Режим доступу: http://shuvar.com/index.php?mod=news&cmd=details&id=620
481. Україна у 2014 році наростила виробництво всієї продукції тваринництва – Держстат [Електронний ресурс]. – Режим доступу: http: // ua.korrespondent.net/ business/economics/3318808
482. Усова Н. Е. Научное и практическое обоснование новых биотехнологических приемов повышения производства свинины и ее пищевой ценности : автореф. дисс. … докт. вет. наук : 06.02.10. Троицк, 2010. 41 с.
483. Усова Н. Е., Хусаинова Н. В. Влияние гиподинамии и стрессовой чувствительности свиней на биологическую ценность мяса свинины. *Вестник РГТЭУ*. Москва, 2007. № 1(17). С. 99–102.
484. Усова Н. Е. Влияние стрессовой чувствительности свиней, выращиваемых в разных условиях интенсивной технологии, на биохимические процессы созревания и качество мяса. *Аграрный вестник Урала*. 2009. № 9. С. 89–92.
485. Усова Н. Е. Мясные и откормочные качества стресс-устойчивых свиноматок в зависимости от подготовленности их организма к воспроизводительной функции. *Актуальные проблемы ветеринарной медицины и производства продукции животноводства и растениеводства* ; материалы междунар. науч.-прат. конф. 22-23 марта 2006 г. : сб. науч. тр. Троицк : УГВАМ, 2006. С. 352–356.
486. Устинов Д. А. Стресс-факторы в промышленном животноводстве. М. : Россельхозиздат, 1976. С. 33.
487. Файзулін Р. А. Оцінка кнурів-плідників за запліднювальною здатністю їх сперми в умовах промислового комплексу. *Свиноводство*. К. : Урожай. 1991. № 47. С. 79–81.
488. Федоров В. Х. Продуктивность, биологические особенности и стресс-реактивность специализированных и универсальных мясных пород свиней : автореф. дисс. … докт с.-х. наук : 06.02.10. п. Персиановка, 1998. 49 с.
489. Федорчук Е. Г., Походня Г. С. Повышение воспроизводительной функции хряков. Белгород : Изд-во. ИП Остащенко А. А., 2014. 228 с.
490. Федотов И. Пути интенсификации производства свинины. *Свиноводство*. 1999. № 2. С. 20–22.
491. Фесенко О. Г., Акимов С. В. Использование свиней украинской мясной породы в скрещивании и гибридизации. *Пути интенсификации отрасли свиноводства в странах СНГ* : межд. научн.-практ. конф. по свиноводству 14-15 сент. 2006 г. : тезисы докл. Жодино, 2006. С. 145–146.
492. Фесенко О. Г. Вивчення особливостей м’ясних якостей свиней різного напрямку продуктивності залежно від методу їх розведення і забійної маси : автореф. дис. … канд. с.-г. наук : 06.02.01. Полтава, 2005. 19 с.
493. Фидлер. К. Содержание свиней в аспектах защиты окружающей среды и животных. *Немецкое птицеводство и свиноводство*. 1992. № 22. С. 641.
494. Филиппович Ю. Б. Основы биохимии. М. : Высш. Школа, 1993. 496 с.
495. Халак В. І. Біологічна повноцінність м’яса та сала молодняку свиней різного

екогенезу. *Аграрний вісник Причорномор'я*. 2010. Вип. 52. С. 54–58.
496. Харенко М. І., Черненко М. В. Біотехнологія розмноження свиней. К., 1996. 216 с.
497. Харламов К. В., Непоклонов Е. А., Имангулов Ш. А. Эффективность пробиотика «Баймикс». *Ресурсосберегающие технологии производства продукции животноводства* : сб. науч. тр. Краснодар, 2006. С. 112–116.
498. Хватов А. И., Россоха Л. В. Селекционно-племенная ситуация в основных популяциях свиней породы ландрас в Украине. *Шляхи підвищення виробництва та поліпшення якості свинини* : міжн. наук.-практ. конфер. : тези доповідей. Харків, 1995. С. 4.
499. Хватов А. І., Россоха Л. В. Сучасний тип свиней породи ландрас української селекції. *Нові методи селекції і відтворення високопродуктиних порід і типів тварин* : наук.-виробн. конференції 29-30 травня 1996 р. : тези доп. К. : Асоціація «Україна», 1996. С. 246.
500. Хвыля С. И., Донскова Л. А., Менухов Н. В. Использование гистологического метода для идентификации мясных продуктов. *Мясная индустрия*. 2006. № 12. С. 32–34.
501. Хвыля С. И., Пчелкина В. А. Оценка качества мясного сырья и готовой продукции на основе государственных стандартов. *Мясная индустрия*. 2007. № 9. С. 9–12.
502. Хегес Я. Альтернативы содержания свиней. *Немецкое птицеводство и свиноводство.* 1997. 137 с.
503. Хесс Дж. Б., Даунс К. М., Бильгили Ф. Селен в рационе и качество мяса птицы. *Зоотехния*. 2006. № 1. С. 20.
504. Ходосовский Д. Н. Ресурсосберегающие технологии содержания свиней как основа получения конкурентоспособной свинины. Жодино, 2011. 305 с.
505. Хохлов А. М. Генетичний моніторинг доместикації свиней. Х. : Еспада. 2004. 126 с.
506. Храмченко Н. М., Шейко Р. И., Федоренкова Л. А. и др. Автоматизированная система управления селекционной работой в племенных хозяйствах. *Зоотехническая наука Беларуси* : сб. науч. тр. 2011. Т. 46. Ч. 1. С. 199–208.
507. Храмченко Н. М. Откормочная и мясная продуктивность чистопородного и помесного молодняка свиней. *Зоотехническая наука Беларуси* : сб. науч. тр. к 55-летию Института, РУП «Институт животноводства НАИ Беларуси». Гродно, 2004. Т. 39. С. 143–147.
508. Хрусталева И. В. Гиподинамия как причина нарушения здоровья и продуктивности животных. *Ветеринарные проблемы промышленного животноводства* : тез. докл. респ. науч.-практ. конф. Белая Церковь, 1985. Ч. 3. С. 128–129.
509. Хусаинова Н. В. Влияние стрессовой чувствительности свиней на их рост, обменные процессы, мясные и откормочные качества : автореф. дисс. … канд. биол. наук : 03.00.13. Троицк, 2004. 26 с.
510. Хусаинова Н. В. Влияние стрессовой чувствительности свиней на пищевую

ценность мяса свинины. *Экономика и социум на рубеже веков* : матер. IV науч.-практ. межвуз. конф. Челябинск : ЧИ (ф) ГОУ ВПО РГТЭУ, 2004. С. 168–169.
511. Церенюк А. Н., Воловик М. Е. Перспективные направления племенной работы с уельской породой свиней. *Пути интенсификации отрасли свиноводства в странах СНГ* : межд. научн.-практ. конф. по свиноводству 14-15 сент. 2006 г. : тезисы докл. Жодино, 2006. С. 157–159.
512. Церенюк О. М., Хватов А. І., Стрижак Т. А. Об'єктивна оцінка материнської продуктивності свиней. *Таврійський науковий вісник*. 2010. Вип. 78, Ч. 2(І). С. 221–227.
513. Церенюк О. М. Модифікація імпортного генетичного матеріалу в Україні : монографія. Харків : ІТ УААН, 2010. 248 с.
514. Через заборону імпорту м'яса з Бразилії ціни на свинину у роздробі підвищаться на 5-10 грн. [Електроний ресурс]. – Режим доступу : http://news.finance.ua/ua/~/2/0/all/2013/03/22/298952.
515. Черекаева Е. Применение ДНК-технологии для виявления полиморфизма по гену *RYR1* у свиней крупной белой породы. *Свиноводство*. 2008. № 5. С. 8–11.
516. Черкасов В., Овчинников А. Использование летних лагерей. *Свиноводство*. 1990. № 3. С. 28.
517. Черненко А. В. Відтворювальні якості свиноматок при різних способах утримання. *Вісник аграрної науки Причорномор'я*. Миколаїв : МДАУ, 2006. Вип. 3(35). С. 85–88.
518. Черненко А. В. Вплив способу утримання свиноматок на продуктивні якості свиней різних генотипів : дис. … канд. с.-г. наук : 06.02.04. Херсон, 2008. 166 с.
519. Чернишов І. В. Підвищення відтворювальних і відгодівельних якостей свиней різного напряму продуктвносгі шляхом оцінки і відбору за вирівняності гнізд : дис. ... канд. с.-г. наук : 06.02.01. Херсон, 2009. 130 с.
520. Чернуха И. М., Орлова О. Н., Мкртичян В. С. Оценка функциональных свойств мяса по индексам атерогенности и тромбогенности. *Хранение и переработка сельхоз. сырья*. 2007. № 1. С. 35–37.
521. Черный Н. В., Купина З. П. Продуктивность и резистентность поросят, полученых от свиноматок при разных способах содержания. *Современные технологии сельскохозяйственного производства* : материалы 10-й междунар. науч.-практ. конф. Гродно, 2007. С. 116–117.
522. Черный Н. В., Момот Л. М., Онокиенко Н. И. Физиологические механизмы стресса, продуктивность и адаптация поросят после отъема. *Пути интенсификации отрасли свиноводства в странах СНГ* : тез. докл. XIII междунар. науч.-практ. конф. Жодино, 14-15 сент. 2006 г. Жодино, 2006. С. 161–162.
523. Чертков Д. Д. Наукове обґрунтування маловитратної технології виробництва продукції свинарства в Україні : дис.. ... докт. с.-г. наук : 06.02.04. Дніпропетровськ, 2007. 433 с.

524. Чертков Д. Малозатратная технология однофазного содержания свиней с элементами дифференцированного кормления при холодном методе их выращивания. *Свиноводство*. 2006. № 1. С. 16–17.
525. Чомаков Х., Бойчева С. Использование пробиотика антиколина в свиноводстве. *Международный агропромышленный журнал*. 1991. С. 65–70.
526. Чулков О. К. О профилактике микотоксинов животных. *Ветеринария*. 2007. № 12. С. 8–10.
527. Шарапова С. В. Система селекции в племенном свиноводстве на базе информационных технологий : дисс. … канд. с.-х. наук : 06.02.01. Лесные Поляны, 2006. 155 с.
528. Шахбазова О. П. Качество подкожного шпика и дегустационная оценка мяса свиней. *Современные аспекты разведения и селекции свиней на Дону* : сб. науч. труд. п. Персиановский, 1997. С. 86–90.
529. Шебанін В. С., Лихач В. Я. Підготовка фахівця-аграрія в рамках системи інноваційного розвитку АПК. *Вісник аграрної науки Причорномор'я*. Миколаїв : МДАУ, 2012. Вип. 1(65). С. 3–11.
530. Шевелева С. А. Пробиотики, пребиотики и пробиотические продукты. Вопросы питания. 1999. № 2. С. 32–37.
531. Шейко И. П., Смирнов В. С. Свиноводство : учебник. Минск : Новое знание, 2005. 384 с.
532. Шейко И. П., Хоченков А. А., Ходосовский Д. Н., Шейко Р. И. Улучшение откормочных и мясних качеств свиней в условиях промышленной технологии. *Свиноводство*. 2004. № 6. С. 12–14.
533. Шейко И. П., Смирнов В. С. Воспроизводство свиней. Минск, 2005. 334 с.
534. Шейко И. П., Епишко Т. И. Генетические методы интенсификации селекционного процесса в свиноводстве : монография. Институт животноводства НАН Беларуси. Жодино, 2006. 197 с.
535. Шейко Р. И. Теоретические и практические приемы и методы в селекции свиней, обеспечивающие высокий эффект гетерозиса в системах гибридизации : автореф. дисс. … докт. с.-х. наук : 06.02.07. Жодино, 2011. 44 с.
536. Шеффе Г. Дисперсионный анализ. М. : Физматгиз, 1963. 628 с.
537. Шилов А. В. Научно-технологическое обоснование интенсификации производства свинины : автореф . дис. … докт. с.-х. наук : 06.02.04. Уфа, 2006. 38 с.
538. Шульга Ю., Дудка О., Маслюк А. Генотипи свиней асканійської селекції : минуле та сьогодення. *Тваринництво України*. 2012. № 8. С. 76–79.
539. Шульга Ю. І Селекційно-генетична диференціація порід і типів свиней асканійської' селекції. *Науковий вісник «Асканія-Нова»*. Нова Каховка : «Пиел», 2008. Вип. 1. С. 79–88.
540. Шульга Ю. І., Маслюк А. М. Результати схрещування української степової білої та великої білої (англійської селекції) порід свиней. *Таврійський науковий вісник*. 2008. Вип. 58. Ч.2. С. 218.
541. Шульман И. М. Перспективные способы содержания свиней на фермах

промышленного типа. *Теория и методы индустриального производства свинины* : сб. науч. тр. ВАСХНИЛ. Л., 1985. С. 169–174.
542. Шуст О. А. Економічні засади виробництва та реалізації продукції свинарства в сільськогосподарських підприємствах. *Сталий розвиток економіки*. 2011. № 1 (4). С. 276–280.
543. Энциклопедия воспроизводства / [Морару И., Фогльмайр Т., Гриссlер А. и др.]. К. : Рема-Принт, 2012. 225 с.
544. Эрнст Л. К., Лисицын А. Б., Татулов Ю. В. Генноинженерная селекция свиней. *Мясная индустрия*. 1999. № 3. С. 12–14.
545. Яковлев А. И., Плахов А. В., Богомолов Ю. Г. Современные экологически чистые интенсивные энергосберегающие технологии производства свинины в условиях рыночной экономики. *Технологии XXI века*. М. : Ростиздат, 2006. 495 с.
546. Янковский К. С., Лисина Т. Н. Новые стандарты мясной промышленности. *Мясная индустрия*. 2006. № 11. С. 25–28.
547. Яременко В. І., Коваленко В. П. Технологія виробництва свинини у господарствах різних форм власності. Херсон, 1998. 214 с.
548. Яременко В. И. Репродуктивные качества свиней на крупных комплексах. *Зоотехния*.1991. № 6. С. 47–51.
549. Armstrong H. Big outdoors. *Pig Farming*. 1997. Vol. 35. № 10. P. 21–23.
550. Baas T. J. Swine Enterprise Records Program. *Swine Research Report*. Iowa State University Extension and Outreach, 1995. P. 23–54.
551. Barnett J. L. The effects of design of individual stalls on the social behaviour and physiological responses related to the welfare of pregnant pigs : J. L. Barnett, P. H. Hemsworth, C. G. Winfield. *Appl. Anim. Behav. Sci.*, 1987. P. 133–142.
552. Bartosik K. A. Zmechanizowane chlewnie. *Budown.* Wejskie. 1993. № 12. S. 11–13.
553. Bates R. O. Sow performance when housed either in groups with electronic sow feeders or stalls : R. O. Bates, D. B Edwards, R. L. Korthals. *Livest Prod Sci.* 2003. P. 29–35.
554. Becker D. E. Levels of wheat bran in meal fnd pelleted diets for pigs. *J. Animal Science.*2002. Vol. 3 (24). P. 873–881.
555. Beattie V. E. Effects of rearing environment and change of environment on the behavior of gilts : V. E. Beattie, N. Walker, A. Sneddon. *Appl. Anim. Behav. Sci*., 1995. P. 57-65.
556. Belonsky G. M. Selection on individual phenotype and best linear unbiased predictor of breeding value in closed swine herd : G. M. Belonsky, B. W. Kennedy. *J. Anim. Sc.*1988. V. 66. №5. P. 1124–1131.
557. Between-breed variability of stillbirth and its relationship with sow and piglet characteristics : L. Canario, E. Cantoni, E. Le Bihan [et al.]. *Journal of Animal Science*. 2006. Vol. 84. P. 3185–3196.
558. Boguslawski F., Soltan M., Bartosik A. Budynki dla trzody chlewnej. *Przeglad Hodowlany*. 1962. Vol. 10(30). S. 5–11.
559. Bolduan Y., Hacki W. Enzymeinsatz in der Schweinemast kraftfutter, 1995. Bd.

78. № 9. S. 376–390.
560. Bond T. E. Space allowance for hogs growsng confsnement. *California agric.* – 2002. Vol. 12. №16. P. 9–10.
561. Borges V. F., Bernardi M. L. , Bortolozzo F. P. [et al.]. Risk factors for stillbirth and foetal mummification in four Brazilian swine herds. *Prev. Vet. Med*. 2005. Vol. 70. P. 165–176.
562. Boyle L. A., Leonard F. C., Lynch P. B., Brophy P. Effect of gestation housing on behavior and skin lesions of sows in furrowing crates. *Appl. Anim. Behav*. *Sci.* 2002. № 76. P. 119–134.
563. Boyle L. A., Leonard F. C., Lynch P. B., Brophy P. Influence of housing system during gestation on the behavior and welfare of gilts in furrowing crates. *Anim. Sci*. 2000. № 71. P. 561–570.
564. Broom D. M., Mendl M. T., Zanella A. J. A comparison of the welfare of sows in different housing conditions. *Anim. Sci.* 1995. № 61. P. 369–385.
565. Broom D. M. Stereotypes as animal welfare indicators. In Indicators relevant to farm animal welfare. Matinus Nijhoff : the Haugue, 1983. P. 81–87.
566. Brumm M. C., Harmon J. D., Honeyman M. S., Kliebenstein J. B., Zulovich J. M.Hoop structures for gestating swine. Midwest Plan Service, 1999. P. 56–62.
567. Bure R. G. The influence of housing conditions on social behaviour in pigs. Proceedings of the International congress on applied ethology in farm animals. Kiel, 1984. P. 159–161.
568. Bure R. J. Automatisierung der von sannen. DGS. 1989. Bd. 41. № 13. S. 384–386.
569. Cauri S., Mital P. Eng. Food Biotechnology Technigues and application // Technonic publishing Co., Ink., Loncaster Basel. 1992. 380 p.
570. Cornelissen P. Top comfort pour 300 truies sur paille. Porc magazine, Fevrier, 2003. № 363. P. 32–36.
571. Cotter P. F., Lilburn A. E. Manipulating the immune system of layers and breeders : novel applications for mannan oligosaccharides Sefton. In : T.P. Lyons and K.A. Jacques (eds.) Nutritional Biotechnology in the Feed and Food Industries. Nottingham University Press, Nottingham, UK. 2002. P. 21–28.
572. Cutler R. S., Fahry V. A., Spicer E. M. Preweaning mortality. *Disease of Swine*, 7th Ed. Ames, IA. : Iowa State University Press. 1992. P. 842–860.
573. Direct, maternal and nurse sow genetic effects on farrowing-, pre-weaning- and total piglet survival : E. F. Knol, B. J. Ducro, J. A. M. van Arendonk [et al.]. *Livest. Prod. Sci*. 2002. Vol. 73. P. 153–164.
574. Dr. John F. Patience, Prairie Swine Centre Inc., Saskatoon, SKNew Technologies for Pork Production In the 21st Century. Saskatchewan Pork Industry Symposium. 2002. P. 84–85.
575. Drogemuller C., Hamann H., Distl O. Candidate gene markers for litter size in different German pig lines. *J. Anim. Sci*. 2001. Vol. 79. P. 2565–2570.
576. Durell J. L., Sneddon I. A., Beattie V. E., Kilpatrick D. J. Sow behavior and welfare in voluntary cubicle pens (small static groups) and split-yard systems (large dynamic groups). *Anim Sci*. 2002. №75. P. 67–74.

577. Edwards S. A. Scientific perspectives on loose housing systems for dry sows. *Pig. Vet.* 1982. № 28. P. 40–51.
578. Effect of slotted floors on rate and efficiency of gain in growing – finishing swine : D. L. Handlin. *J. Animal Sci*. 1964. Vol. 23. №1. P. 229–237.
579. Effect of the estrogen receptor locus on reproduction and production traits in four commercial pig lines : T. H. Short [et al.]. *Anim. Sci*. 1997. Vol. 75. P. 3138–3142.
580. Effects of combined actinobacillus pleuropneumoniae challenge and change in environmental temperature on production, plasma insulin-like growth factor I (IGF), and cortisol parameters in growing pigs : C.A. Kerr [et all.]. *Australl. J. Agr. Res.* 2003. Vol. 54. № 10. P. 1057–1064.
581. England D. C. Pelleted as meal barley rations for full or limited pigs. *J. Animal Sci*. 1998. Vol. 2. P. 597.
582. English P. R. Causes and prevention of piglet mortality : P. R. English, V. Morrison. *Pig News Inf*. 1984. Vol. 5. P. 369–375.
583. Ernst E. Integrierte Gruppenhaltung für Sauen. *Deutsche Geflügelwirtschaft und Schweineproduktion und G. Gertken*, 1993. №31. P. 18.
584. Ernst W. Die Vorteise der Goritzer Ab Ferkelbucht : W. Ernst. *Dtsch. Landw*. – 1965. T. 4(16). P. 194–198.
585. Evans A. C. O., Doherty J. V. O. Endocrine changes and management facters afecting puberty in gilts. *Production Science*. 2001. Vol. 68. P. 1–12.
586. Factors associated with stillborn and mummified piglets in high-prolific sows : Y. Le Cozler, C. Guyomarc'h, X. Pichodo [et al.]. *Anim. Res*. 2002. Vol. 51. P. 261–268.
587. Farrow J.A., Collins M.D. Enterococcus hirae a new species that (includes amino acid assay strain NCDO 1258 and strains causing growth jmdeprssion in young hickens. *Intern. J. pf Systematic Bacteriology*.1985. V. 35. P. 73–75.
588. Feher G., Fazekas S., Sandor J., Kollar N. Die Qualitat des Fleisches und der Zusammenhang zwischen Fleischqualitat und Fleischwirtschaftlich wertvollen Korperteilen bei einigen Schweinerassen. *Arch. Lebensmittelhyg*. 1990. Bd. 41. № 3. S. 63–67.
589. Fiedler E. Offenfrontstall für Absatzferkel : E. Fiedler. *Deutsche Geflügelwirtschaft und Schweineproduktion*, 1993. №10. P. 16.
590. Fiedler E. Schweinehaltung unter Umwelt und Tierschutzaspekten. *Deutsche Geflügelwirtschaft und Schweineproduktion*, 1992. № 22. P. 641.
591. Fuller R., Gibson G. R. Probiotics and prebiotics: microtlora management for improved gut health. *Clin Microbiol Infect*. 1998. № 4. P. 477–480.
592. Gandhi A. B., Nagarathnam T. Probiotics in veterinary use. *Poultry Guide*. – 1990. № 27. P. 43–49.
593. Gastmann Ch. Die Schlachtkorperbewertimg nach EUROP-Handelsklassen auch in der DDR. *Tierzucht*.1990.№ 9. S. 413–415.
594. Gonyou H.W. Selection of a Sow Group Housing System for Prairie Swine Centre at Elstow. *Western Hog Journal*, 2002. P. 48–54.
595. Gregory N. G., Devine C. D. Survey of sow accommodation systems used in New Zealand. *New Zealand Journal of Agricultural Research*, 1999. №42. P. 187–194.

596. Grudniewska B. Klatki porodowe I podwojne Kojce dla macior. *Przeglad Hodowlany*. 1993. T. 12(32). S. 12–14.
597. Hammer K. Schweinehaltung mit oder ohne Einstreu. *Schweinezucht und Schweinemast*, 1999. №39. P. 6.
598. Hansen K. Floor feeding. *Pig Farming*. 2006. № 2(14). P. 63.
599. Harmon J. D., Honeyman M. S., Klibenstein J. B., Richard T., Zulovich J. M. Hoop barns for gestating swine. Mid West Plan Servise, 2004. P. 44.
600. Harris M. J., Sorrells A. D., Eicher S. D., Richert B. T., Pajor E. A. Effects on Production, Health and Behavior of Two Types of Housing for Gestating Gilts. *American Society of Animal Science*, 2002. P. 25.
601. Harris M. J., Gonyou H. W. Increasing available space in a furrowing crate does not facilitate postural changes or maternal responses in gilts. *Appl. Anim. Behav. Sci.*, 1998. № 59. P. 285–296.
602. Hemsworth P. H., Coleman G. J., Barnett J. L. Improving the attitude and behaviour of stockpersons towards pigs and the consequences on the behaviour and reproductive performance of commercial pigs. *Appl. Anim. Behav. Sci.,* 1994. № 39. P. 349–362.
603. Hesse D. Beurteilung unterschiedlicher Haltungsverfahren für ferkelführende Sauen. Kuratorium für Technik und Bauwesen in der Landwirtschaft, Darmstadt, Schrift, 2009. P. 351.
604. Hobbs W. F. Low-cost boxer for fattening pigs. *Agriculture*. 1963. Vol. 11(70). P. 546–547.
605. Hodgkiss N. J. Welfare and nutrition of group-housed sows fed in an electronic sow feeding system. Behaviour, PhD thesis, University of Plymouth, 1998. 202 p.
606. Hofmann F. Hoike R. Indus triemabige Schweinefleisch – Produktion in einem umgebauten Altstall mit Spaltenboden. Tierzucht. 1964. Bd. 8(16). S. 425–428.
607. Höges J. Erfahrungen mit Scharrel-schweinen. Deutsche Geflügelwirtschaft und Schweineproduktion, 1989. 977 p.
608. Höges J. Ferkel und Sauen. Verlag Eugen Ulmer, Stuttgart. 1990. P. 58–64.
609. Höges J., Kempkens K. Nürtinger System und Alternative Schweinehaltung. Deutsche Geflügel Wirtschaft und Schweineproduktion, 1993. № 48. P. 17–25.
610. Höges J. Tiefstreusysteme im Test. Deutsche Geflügelwirtschaft und Schweineproduktion. 1993. № 41. P. 15–26.
611. Holden P., Ewan R., Jurgens M., Stably T., Zimmerman D. Life Cycle Swine Nutrition. Iowa State Univ., 1996. 17 p.
612. Honeyman M. S. Extensive bedded indoor and outdoor pig production systems in USA : Current trends and effects on animal care and product quality. *Livestock Production Science*, 2005. P. 15–24.
613. Honeyman M. S., McGlone J. J., Kliebenstein J. B., Larson B. E. Outdoor Pig Production. PIH-145. Pork Industry Handbook. Purdue University, 2001. 9 p.
614. Honeyman M. S., Kent D. A. Performance of a Swedish deep-bedded feeder pig production system in Iowa. *American Journal of Alternative Agriculture*, 2001. № 16(2). P. 50–56.
615. Honeyman M.S., Kliebenstein J., Harmon J. Iowa hoop structures used for swine:

a survey. Swine Research Report AS-646. ISU Ext. Serv., 2001. 720 p.
616. Hoppenbrock K. H. Ebermast – eine Alternative für Schweinemäster? Deutsche Geflügelwirtschaft und Schweineproduktion, 1994. 15 p.
617. Jensen A. H. Symposium on enviroment and facilities : Enviroment and facilities in swine production. *J. Anim. Sci*. 1964. Vol. 4(23). P. 1185-1196.
618. Jensen K. H., Pedersen L. J., Jorhensen E. Well-Being in Pregnant Sows – Confinement Versus Group Housing with Electronic Sow Feeding. *Acta Agric Scand Sect A – AnimSci*, 1995. № 45. P. 266–275.
619. Jnborr J. Enzymes combination. *Feeduntern*.1989. № 10. P. 26–27.
620. Johnson A. And now sow cubicles. *Farmer and Stock Breeder*. 1964. Vol. 78. P. 17–19.
621. Jorgensen J. H. Probiotika til svin. *Hyol. Tidsskr Svined*. 1999. 11. 2. P. 32–34.
622. Kaminski U., Marx D. Verhalten und Gesundheit abgesetzter Ferkel bei der Aufzucht in Großgruppe. Deutsche Geflügelwirtschaft und Schweineproduktion, 1991. 75 p.
623. Knol E. F., Ducro B. J., Arendonk M J. A. van [et al.]. Direct, maternal and nurse sow genetic effects on farrowing-, preweaning- and total piglet survival. *Livest. Prod. Sci*. 2002. Vol. 73. P. 153–164.
624. Kornegay E. T., Kornegay E. T., G. W. Van der Noot. Digestibility and N-retention of swine feed rations with added water. *J. Animal Sci*. 2009. Vol. 3(24). P. 892–899.
625. Kotlinski J. Wyniki tuczu swine a gestosc obsady w kojcach. *Prseglad Hodowlany*. 2008. № 3(32). S. 33–36.
626. Kosichki J. Nowa technologia w produkcji trzody chlewnej. *Nowe Rolnictwo*. 1965. Vol.14. № 12. S. 36–38.
627. Kraggerud H., Luse A. Die Bodenfutterung von Mastschweinen. *Schweinezucht, Schweinemast*. 1965. Vol. 10(13). P. 238–242.
628. Kraggerud H., Lyse A. Versuche mit verschiedenen Stall- und Buchten-formen fur Mastschweine. *Bauen suf dem Lande*. 1965. № 3(16). P. 57–60.
629. Kroneman A., Vellenga L., Vanderwilt F., Vermeer H. Field-Research on Veterinary Problems in Group-Housed Sows – a Survey of Lameness. *J. Vet Me*, 1993. P.704–712.
630. Kuwan K. Untersuchungen über die Wahlfutterung von Mastschweinen und die Möglichkeiten ihrer Anwendung in der stationären Fleischleistungs prufung. Bonn, 1996. 153 p.
631. Laird R. A comparison of cubes and meal for growing and fat tening pigs. *Animal Product*. 2006. № 1(5). P. 97–103.
632. Lammers P., Honeyman M., Mabry J., Harmon J. Sow and litter performance for individual crate and group hoop barn gestation housing systems : Progress report III. Iowa State University Animal Industry report, 2006. 260 p.
633. Larson M. E., Honeyman M. S., Penner A. D., Harmon J. D. Performance of finishing pigs in hoop structures and confinement during summer and winter. Iowa State University, 1998. 312 p.
634. Lawrence A. B., Terlouw E. C., Kyriazakis I. The behavioral effects of under

nutrition in confined farm animals. *Proc Nutr Soc.*, 1993. P. 219–229.
635. Lawrence A. B., Petherick J. C., McLean K. A., Deans L. A., Chirnside J., Vaughn A., Terlouw E. C. The effect of environment on behaviour, plasma cortisol and prolactin in parturient sows. Anim. Behav. Sci., 1994. P. 313–330.
636. Lemback J., Wassmuth R., Glodek P. Comparison of Performance, Body Constitution and Behaviour of Sows in Different Housing-Systems.1. Performance and Body Constitution of Sows During Pregnancy. Zuchtungskunde, 1995. P. 274–287.
637. Lilly D.M., Stillwell R.H. Probiotics: growth promoting factors produced by microorganisms. *Science*. 1995. № 147. P.747–748.
638. Lynch P. B., O'Grady J. F., Keamey P. A. Effect of housing system on sow productivity. *Animals of Veterinary Research*, 1998. P.181–184.
639. Marchant J. N., Broom D. M. Effects of dry sow housing conditions on muscle weight and bone strength. Anim. Sci., 1996. P. 105–113.
640. Mason I. L. A world dictionary of live stock breeds, types and varieties. Wallingford, Oxon, UK : CAB International. 1996. 273 p.
641. Melaren D. C., Buchanan D. S., Johson R. K. Growth performance for four breeds of swine; Crossbreed females and purebred and crossbreed board. *J. Anim. Sc.* 1987. V.64. №1. P. 99–108.
642. Mußlik M., Hoy St., Gernand E. Untersuchungen zum Einflug des Haltungsverfahren im Besamungsbereich auf die Reproduktionsleistung von Schweinen. *Bernburger Biotechnik Workshop*. Mai. 2000. S. 61–70.
643. Nordo H. Versuche und Erfahrungen mit Splatenfubboden fair Rinder und Schweine in Norwegen. *Dtsch. Askad. Landwirtsch*. Berlin, 1966. № 59. S. 107–116.
644. Oldigs B., Schrift M., Schlichting C., Ernst E. Untersuchungen zum Gruppieren von Sauen. Kuratorium für Technik und Bauwesen in der Landwirtschaft. Darmstadt, 1992. 351 p.
645. Olsson A. C., Svedsen J., Andersson M., Rantzer D., Lenskens P. Group Housing System for Sows. 1. Electronic Dry Sow Feeding on Swedish Farms- an Evaluation of the Use of the System in Practice. *Swedish Journal of Agricaltural Researche*, 1992. P. 153–162.
646. Pajor E. A., Busse C., Torrey S., Shea-Moore M., Stewart T.The effect of selection for lean growth on swine behavior and welfare. *Purdue Swine Day Publication*, 2000. P. 1–3.
647. Patterson R. Sow wastage in the Australian pig herd-degree, cost and prevention : R. Patterson, A. Pointon, C. Cargill. *Report to the Pig Research and development Corporation*, 1997. 232 p.
648. Patton B. S. Effects of deep-bedded finishing system on market pig performance, composition and pork quality. *Animal*. 2008. V. 2(3). P. 459–70.
649. Pejsak Z. Some pharmacological methods to reduce intrapartum death of piglets. *Pig News Inf*. 1984. Vol. 5. P. 35–37.
650. Peltonen K. Aflatoxin B1 binding bu dairy strains of bactie acid bacteria and bifidobacteria. *J. Dairy Sc.* 2001. Vol. 84. № 10. P. 2152–2156.

651. Phelps A. Milky mums? No, thank you. *Pig Farming*. 1966. № 14. P. 2–3.
652. Prince-Smith W. Britain's largest mechanized piggery. *Farm and Country*. 1962. № 21.P. 56–59.
653. Production and Marketing Characteristics of U.S. Pork Producers : John D. Lawrence, Glenn Grimes. *Department of Agricultural Economics Working Paper*. 2007. Vol. 5. P. 1–24.
654. Richardson B. Swedish drill for success with slats. *Pig Farming*. 1965. Vol. 13, № 9. P. 51.
655. Roller W. L. Past feed for pigs. *J.Animal Sci*. 1995. Vol. 3(24). P. 857.
656. Sanders M. E. Probiotics : considerations for human health. *Nutr. Rev*. 1:91-99. 2003. 197 p.
657. Savage T. F., Cotter P. F., Zakrzewska E. I. The effect of feeding mannanoligosaccharide on immunoglobulins, plasma IgG and bile IgA of Wrolstad MW male turkeys. Poultry Sci. 1996. 75:143 (abst.).
658. Selye H. The stress of life. McGraw-Hill Book Co. Inc. New York-Toronto-London. 1956. 73 p.
659. Simmins P. H. Reproductive-Performance of Sows Entering Stable and Dynamic Groups after Mating. *Anim Prod*, 1993. №57. P.293–298.
660. Smith P., Gorman N., Payne J. An Alternative to Stalls and Tethers, a Straw-Based Housing System for Dry Sows Using a Computerized Sow Feeder. *Anim Prod*. 1996. № 42. P. 467–467.
661. Stamer S., Ernst E. Investigations About the Wellbeing of Sows in Single and Group Housing. Deutsche Tierarztliche Wochenschrift. 1992. P. 99:151-154.
662. Standal N., Lynch G. Effect of pen size on the performance of fattening pigs. *Act. agric. Scand*. 2003. № 11. P. 334–340.
663. Stanley V. G., Brown C., Sefton T. Single and combined effects of dietary protease and mannanoligosaccharide on the performance of laying hens. *Poultry Sci.* 2000. 79:62 (abstr.).
664. Stoll P., Zihmann U., Hofstetter P. Production porcine et elevage saisonnier en plein air. *Rev. suisse Agr*. 2008. Vol. 40. № 2. P. 87–92.
665. Szyndler-Nedza M., Tyra M., Blicharski T., Piorkowska K. Effect of mutation in MC4R gene on carcass quality in Pulawska pig included in concervation breeding programme. *Animal Science Papers and Reports*. 2010. Vol. 28 (№ 1). P. 37–45.
666. The effects of gender and slaughter weight on the growth performance, carcass traits, and meat quality characteristics of heavy pigs [M. A. Latorre, R. Lazaro, D. G. Valencia, P. Medel and G. G. Mateos]. *ANIM SCI*. 2004. Vol. 82. P. 526–533.
667. Thodberg K., Jensen K.fI., Herskin M.S., Jorgensen E. Influence of environmental stimuli on nest building and farrowing behaviour in domestic sows. *Appl. Anim. Behav. Sci*. 2012. T. 63. P. 131–144.
668. Topiha V., Likhach V., Likhach A Bacon quality of pigs from landrace breed under different methods of breeding. *Agricultural Sciences*. Plovdiv : Academic Publishing House of the Agricultural University, 2013. Volume V. Issue 14. P. 141–145.
669. Torrey S., Weaver S., Pajor E. A., Kuhlers D., Stewart T. Evaluating differences

in stress levels in lean growth versus control landrace pigs. *Swine DayPublication.* 2005. P. 4-5.
670. Touger S., Krieter J., Ernst E. Effects of Single and Group Housing of Pregnant Sows on Reproduction traits, General Health and Behavior.1. Evaluation of Housing Systems by Reproduction Traits and General Health. Zuchtungskunde. 1991. P. 63: 469-477.
671. Tournut J., Anadin A., Ravnaud J. P. Prevention of enteritis in calves with probiotics microbial 390 bioregulators: Rationale and target Proc. *15 World buiatries congr. Leon.*1988. № 1. P. 390–394.
672. Trezona-Murray M. Conventional and deep-litter pig production systems: the effects on fat deposition and distribution in growing female large white X landrace pigs. Murdoch University. 2008. 329 p.
673. Vanroose G., Kruif A. de, Soom A. Van. Embryonic mortality and embryo-pathogen interactions. *Anim. Reprod. Sci*. 2000. Vol. 60–61. P. 131–143.
674. Wähner M., Pfeiffer H., Schröder Ch., Hoy St. Untersuchungen zur Tiefstreuhaltung von Mastschweinen mit mikrobiell-enzymatischer Einstreuhaltung im Vergleich zur Vollspaltenbodenhaltung. Mitteilung : *Schlachtkörperzusammensetzung und Fleischqualität. Fleisch*. 1993. № 47. S. 75–77.
675. William McBride, Nigel Key. Hog Production From 1992 to 2009 : Technology, Restructuring, and Productivity Growth. *Economic Research Report No*. (ERR-158). 2013. 48 p.
676. Wirt F. Technologie der Verazbeitung Von Fleich mit abweichender Beschaffenkut. *Fluschwirt – Schaft*. 1985. № 9. P. 43–49.
677. Wren W. B. Probiotics fact or fiction. *Anim. Health. NuNutrit*. 1987. V. 42. № 8. P. 28–30.
678. Zaleski H. M., Hacker R. R. Variables related to the progress of parturition and probability of stillbirth in swine. *Can. Vet. J.* 1993. Vol. 34. P. 109–113.

Scientific-production-educational publication

LYKHACH Vadym, LYKHACH Anna, DUCZMAL Marian, JANICKI Marek,
OHIENKO Mykola, OBOZNA Alyona, KUCHER Olena, FAUSTOV Rostislav

MANAGEMENT OF INNOVATIVE TECHNOLOGIES CREATION OF BIO-PRODUCTS

Monograph

Technical editor: A. Lykhach

Computer set: A. Lykhach

The monograph presents the scientific substantiation, experimental developments on the management of innovative echnologies in industrial pig breeding, taking into account the internal division of enterprises into production shops.

For managers and specialists of industrial enterprises for pork production, teachers and students of the faculties of management and technology of production and processing of livestock products of agricultural educational institutions, graduate students, doctoral students, researchers.

ISBN 978-83-66567-16-0