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Foreign experience in state support for pig breeding development organizing and directions of its use in the domestic practice

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The article is devoted to the study systematization of the directions of state support for pig production in the countries with intensive pig production which includes the following tools: subsidies, interest rate subsidies; research funding; insurance, preferential lending; compensation for material and production costs; price regulation; government interventions. It is established that state regulation in pigs breeding in the leading countries of the world is focused on ensuring intensive development of the industry, ensuring the animals productivity, as well as strict adherence to environmental requirements.

World's leading producers tend to obtain lean pork due to consumer preferences which has led to a change in approaches in the entire production chain organization, from the revision of vectors of pigs breeding and feeding to technological innovations in the field of the processing, transportation and distribution.

It was found out that the increase in pig production in the leading countries of the world is provided through the advances in animal breeding and genetics. Breeding programs of the world's leading countries are characterized by a tendency to consolidate breeding material in the global market of genetic resources, where pork production is innovative and integrated. Several multinational genetic companies dominate in the supply chain.

Effective use of modern methods of animal reproduction makes it possible to store genetic material long-term and transport it to any place in the world, which enables to increase the sales of breeding products and inter-firm exchange of frozen sperm and embryos.

The market of genetic resources is characterized by intensive trade and intensification of international competition between national breeding companies as well as the transition from national and regional breeding programs to the purchasing breeding material from multinational companies.

Analysis of world experience in breeding programs and state support for pig breeding shows that the use of modern information technology and the development of information analytical support of breeding work with tribal recording as an important element can be the basic factors in accelerating the breeding process and increasing the efficiency of pig breeding in Ukraine.

Key words: pork production, world export and import of pork, pork production organizing, pig breeding, pig breeds, pig breeding world associations, state support.

Problem statement and analysis of recent research. Pork meat is an essential element of human nutrition. Being a complete food, pork occupies about 40% in the meat part of the human diet, and in some Western European countries (France, Italy, Denmark, Sweden, Germany, etc.) this figure reaches 60-80%. However, in Ukraine in recent years the consumption of pork, the offal and fat per capita was only 15-18 kg, which is much less than 37 kg consumed per capita in the EU [1, p. 76].

The situation can be stabilized by improving the products quality, increasing pigs productivity,

reducing cost price and labor costs [2]. All these require effective state support and the creation of conditions for intensification of investment processes in pig breeding.

The aim of the research. Generalization of the practice of using tools of state support for pig breeding development in the leading countries of the world and substantiation of the directions of their use in domestic conditions.

Material and methods of research. The monographic method was used for a comprehensive study of individual phenomena and processes and a method of identifying cause-and-effect relationships in the implementation of a set of tools to support the development of pig breeding were used in the study. The research involved studying foreign and Ukrainian researchers' scientific papers in the field of forming a set of tools to support pig breeding development and identifying the most effective of them on the basis of the studying.

Research results and discussion. The study found that the demand for meat and meat products in developing countries remains high, as increased incomes and urbanization lead to a change in food culture, which promotes increased consumption of animal proteins [3, p. 107].

According to the US Department of Agriculture, pork production amounted to 112,938 thousand tons (in slaughter weight) in 2018, down 3.5% compared to 2015. However, according to FAO forecasts, it can reach 127 million tons, or 36 % of world meat supply, by 2025. The dynamics of pork production, exports, imports and consumption in different countries is presented in Table 1.

The data in Table 1 show that pork production in 2015 was the highest in Asia - 66,425 thousand tons, including the largest production in China - 55,392 thousand tons. The situation in Japan seems interesting as current pork production in this country equals the value of the African continent.

Much of the Central America's pork production (1.84 million tons) comes from Mexico (1.3 million tons). Pork production in South America is provided mainly by Brazil (3.5 million tons), Chile (524 thousand tons) and Argentina (475 thousand tons). Also, significant amount of pork production in North America is provided by the United States (11.1 million tons) and Canada (2 million tons). The leading pork producer on the European continent are the EU countries, which produced 28,276 thousand tons in 2016 of which almost 11% were exported.

However, according to preliminary data, the growth in world pork production will slow down by the end of the next decade. Yet, the growth of world pork production will have a positive trend in the countries of the Asian region [5], with China as the absolute leader in pork production having the share of 50%. China has become a leader due to more intensive fattening of animals, intensification of work on improving the breeding and productive properties of pigs by crossing their own and imported pigs breeds [6, p. 9].

The EU countries, in particular, Germany, Spain, Denmark, the Netherlands are among the world's largest pork exporters. The United States and Canada also supply significant amount of meat to foreign markets. It should be noted that the United States and the EU are the world's leading suppliers of pig breeding products.

Table 1 – **Dynamics of pork production, sales and consumption by world regions and states, ths tons**

State/region	Production		Import		Export		Consumption	
	2015	2016	2015	2016	2015	2016	2015	2016
Asia	66 425	65 181	3 957	4 107	220	200	70 410	69 133
China	57 418	54 017	1 583	1 661	127	102	57 078	55 617
Japan	1 254	1 280	1 286	1 325	2	2	2 545	2 605
Africa	1 365	1 364	302	303	33	34	1 635	1 632
Central America	1 840	1 869	1 048	1 147	158	178	2 730	2 837
Mexico	1 323	1 349	845	930	137	157	2 030	2 123
South America	5 662	5 769	192	188	864	948	4 990	5 009
North America	13 172	13 424	853	884	3 353	3 533	10 617	10 786
USA	11 121	11 334	605	647	2 164	2 262	9 510	9 731
Canada	2 051	2 090	244	233	1 188	1 272	1 103	1 051
Europe	28 266	28 276	538	598	2 545	2 596	26 260	26 279
European Union	23 354	23 279	13	12	2 416	2 488	20 951	20 803
Russia	3 069	3 139	415	478	34	35	3 450	3 582
Ukraine	760	748	6	5	29	4	736	749
Oceania	508	520	302	327	35	36	776	811
World	117239	116402	7 193	7 554	7 208	7 525	117 418	116 487

Source: made and calculated according to FAO data ФАО [4].

Most countries around the world view agriculture as a strategically important sector of the economy and have a wide range of government support measures, including subsidies, protectionism, benefits, and specialized regulation.

According to researchers, the main activities of state regulation in pig farming in the leading countries are the measures aimed at guaranteeing maximum self-sufficiency in pig farming; maintaining a stable economic situation in the industry; achieving the maximum level of profitability in the industry, which provides its attractiveness for investments; limitation of surplus production; guarantee of domestic producers competitiveness in the international division of labor. In addition, mechanisms to maintain domestic markets have been established in the United States and the European Union in order to protect pork producers.

Areas of state support for pig breeding in intensive breeding countries are systematized according to the frequency of their use. Each area includes the following basic tools: subsidies, interest rate subsidies, research funding - USA, Canada, New Zealand, Germany, Belgium, Romania, Hungary, Estonia; insurance, soft loans - Estonia, Czech Republic, Slovakia, Canada, USA, New Zealand; compensation of material and production costs - Hungary and Romania; price regulation - Romania, Slovenia, Hungary; state interventions - Hungary, Poland, Canada; awarding - Romania.

It should be noted that increased attention is paid to pig industry in the leading countries of the world, and the influence of the state in the program activities development is significant.

Thus, in Kazakhstan, they provide for the construction of genetic hybrid breeding centers specialized in breeding three pig breeds (Big White, Landrace and Duroc) in order to provide highly productive and precocious hybrid livestock, which is widely used in the world practice. In addition, until 2020, it was planned to subsidize the costs of agricultural producers for pork production and to purchase breeding young pigs at the expense of the budget. The budget subsidies norm per 1 kg of the pork products sold was 98 tenge (UAH 6.2) [7].

In the Republic of Belarus, a State program for the development of agrarian business for 2016-2020 including the Subprogram "Development of breeding in animal husbandry" has been run since 2016 [8]. The main task of the program is to increase the number of purebred sows in breeding herds on breeding farms for the breed further reproduction and the remount young animals sale, and the task was performed by 124.0% in 2017 [9].

The practice of state support for pig breeding in China is noteworthy as well. Thus, in 2018, Chinese pork producers could count on the following types of state support: subsidies in the form of pig farms awarding which were standardized regarding environmental protection, resource saving and manure purification; subsidies for breeding, improving pigs diseases prevention and control, as well as production efficiency, and, accordingly, promoting continuous innovative improvement of the hybrids and breeds; subsidies for the pigs transfer from large farms to other areas to support the pig farms modernization; animal insurance; grant for advanced breeding farms; subsidies for disease control activities; providing free vaccines against common diseases; compensation in case of pigs culling [10].

It should be noted that trade restrictions imposed on the world pork market are imposed in the form of import tariffs on imported meat and they are caused by the countries' desire to support domestic meat producers through reducing meat imports from abroad. This kind of customs trade in pork is conducted within the European Union.

State regulation in pig breeding of the leading countries of the world is mostly focused on ensuring the industry intensive development, increasing animal productivity, as well as strict compliance with environmental requirements [11, p. 19]. It is obvious that the increase in pig production in the leading countries of the world is provided by the advances in animal breeding and genetics [12].

We have studied the features of pig breeding in the leading countries of the world in order to determine the factors that contribute to its competitiveness in domestic and foreign markets.

The rapid increase in the industry efficiency through the use of improved breeding traits of animals is a characteristic feature of pig breeding development in the United States. Thus, there is a tendency to replace pigs of fat and meat-fat productivity with meat type animals, usually hybrids and crossbreeds, in the country. Closed-loop enterprises dominate in pig farms structure and they account for 54% of the total. They produce up to 80% of slaughter livestock. Breeders specializing in raising piglets up to 20 kg occupy 8% in the structure of enterprises, specialized swine fattening farms occupy 19% and supply up to 20-25% of slaughtered pigs [13, p. 29; 14].

Intensive development of pig breeding in the United States has led to the creation of eight different industry unions and associations. In 1994, for example, four of them engaged with breeding Yokshire, Duroc, Hampshire and Landrace joined together to set up the National Swine Registry (NSR).

Documentary evidence of animal characteristics quality and predictability is paid special attention in the United States. To this end, the STAGES program of the National Swine Registry has been developed. It allows to calculate the most economically significant characteristics and predicts the genetic value of each pig using Best Linear Unbiased Prediction (BLUP) technology. Scientific and advisory support and control over the functioning of the system for the purpose of its rational use is carried out by a team of leading pig geneticists from American universities.

In recent years, genomic selection has become especially important in American pig breeding, which makes it possible to establish the variability of a set of economically useful traits at the genetic level. Intensive development of selection has also contributed to the creation of a production base in the United States, which allows to obtain pork that has consumer demand in the market, resulting in a sustainable and growing development of the pig industry.

At the same time, the impact of the 4H program implementation should be considered. The program seeks to provide a farmer's children and young farmers with public-funded training conducted by county counselors and state university researchers [15].

In France, breeding farms are a part of "Organization of pig breeding" - a single system of pig breeding [16]. The implementation of selection and breeding work is based on the pyramidal principle, which ensures its high efficiency.

Another feature of the organization of the French system of pig breeding is that the Ministry of Agriculture of the country maintains a list of selected animal populations with high parameters of valuable traits [17]. Populations are selected by the LGPC, which keeps records of breeding farms, by two state control stations, namely the French Pork and Pig Institute and the National Research Institute for Agricultural (INRA).

The French Ministry of Agriculture has also introduced an accreditation procedure for animal breeding, which is mandatory for obtaining details for export products producers and the status of breeders.

The work of the insemination center (collection, packaging, storage and distribution of pig sperm), which provides for accreditation (zootechnical and sanitary) of each of the sperm collection centers, is valuable for the domestic practice.

The Danish experience of pig breeding system organizing deserves special attention, as pig breeding in this country is an intensive and competitive industry on the world market. DanBred is the Danish breeding program for pig farming. The objectives of this program are determined by the National Committee for Pig Production and are based on close cooperation between pork producers and meat processing enterprises. Such cooperation provides a balance between the quality of raw materials and economically significant productive indicators of animals. The program brings together independent breeding companies that form the so-called Danish national pig nucleus. Currently, 30 nuclear herds with a total population of 15,800 pigs, 176 breeders with 51,700 sows, as well as commercial herds with a total population of 1,158,000 sows, which produce 26,300,000 slaughter animals per year, participate in this program [18].

Using modern breeding methods is an essential component of the Danish pig breeding system. In addition to DNA technologies for assessing animal productivity, BLUP methodologies and innovative biotechnological methods of herd reproduction are used. The effectiveness of the BLUP method in the DanBred breeding program is ensured by the creation of genetic links between animals in different herds, which is achieved due to using artificial insemination of 90-95% of sows participating in the program [19].

Intensive breeding work in Canadian pig farming and a well-developed breeding network consisting of large genetic centers, breeders and commercial farms has made the country one of the world leaders on the pork market and has lead the breeding corporations to the transnational level. Canada ranks sixth in the world in pigs number amounting 15 million animals.

Canada's strong position in the global pork market has been achieved due to the development of Canadian Swine Improvement Program (CSIP) - a science-based breeding and selection system. It includes the National Pig Identification and Registration System, which is supervised by the Canadian Swine Breeders Association (CSBA), the Canadian Livestock Recording Corporation (CLRC) and the Canadian Centre for Swine Improvement (CCSI) [20]. The CCSI operates through four regional offices. These regional centers deliver programs directly to breeders through accredited technicians. Currently, the main document confirming the origin, purity and productivity of breeding pigs in Canada is the registration certificate issued by CLRC.

Another distinctive feature of the Canadian pig genetic evaluation system is that in addition to genetic testing of animals, the CCSI coordinates the industry research programs, and the country uses the established pig DNA bank to conduct various scientific studies to predict pig productivity.

The program also provides for the calculation of estimated breeding value (EBV) on a number of their productivity traits, which allows further comparisons of animals from different herds.

Conclusions. The experience in organizing breeding programs in different countries of the world enables to establish a trend towards consolidation of breeding material in the global market of genetic resources. For example, in North America and some Western European countries, pork production is an innovative and integrated industry, and the supply chain is dominated by several multinational genetic companies that breed a limited number of breeds and create a small number of lines. Effective use of modern methods of animal reproduction enables developed countries to carry out long-term storage of genetic material and transport it to anywhere in the world. And this, in turn, makes it possible to increase the sales volume of breeding products.

In modern market conditions, pig farming shifts from regional and national breeding programs to the acquisition of breeding material from multinational companies. The BLUP procedure implemented by the world's leading companies in selection and breeding work, along with constant conducting molecular genetic research and the use of a small number of lines contribute to high genetic progress in the selected breeds.

Using the positive experience of the world's leading companies will allow Ukrainian producers to create a high-value breeding herd, produce competitive pork in domestic and foreign markets, reduce dependence on imported supplies of breeding products, preserve and improve the domestic gene pool. Analysis of world experience in breeding programs and state support for pig breeding shows that the use of modern information technology and the development of information analytical support of breeding work with tribal recording as an important element can be the basic factors in accelerating the breeding process and increasing the efficiency of pig breeding in Ukraine.

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Зарубіжний досвід організації державної підтримки розвитку племінного свинарства та напрями його використання у вітчизняній практиці

Хахула Б.В.

Статтю присвячено дослідженню систематизації напрямів державної підтримки свинарства у країнах інтенсивного свинарства, які включають такі інструменти: дотації, субсидування процентної ставки; фінансування наукових досліджень; страхування, пільгове кредитування; компенсація матеріальних та виробничих затрат; регулювання цін; державні інтервенції. Встановлено, що державне регулювання у племінному свинарстві провідних країн світу зорієнтовано на забезпечення інтенсивного розвитку галузі, підвищення продуктивності тварин, а також суворе додержання екологічних вимог.

Орієнтація провідних світових виробників одержувати все більш пісну свинину, що зумовлено споживчими перевагами, привело до зміни підходів в організації усього технологічного ланцюга виробництва, від перегляду векторів селекційно-племінної роботи і годівлі свиней до технологічних нововведень у сфері переробки, транспортування, дистрибуції та реалізації свинарської продукції.

З'ясовано, що нарощення обсягів виробництва продукції свинарства у провідних країнах світу забезпечено за рахунок досягнень у селекції та генетиці тварин. Для селекційних програм провідних країн світу характерною є тенденція до консолідації племінного матеріалу на світовому ринку генетичних ресурсів, де виробництво свинини є інноваційним та інтегрованим. У ланцюзі поставок домінує декілька транснаціональних генетичних компаній.

Ефективне використання сучасних методик репродукції тварин дозволяє здійснювати довготривале зберігання генетичного матеріалу та транспортувати його у будь-які точки світу, що дає можливість збільшити масштаб реалізації племінної продукції та проводити міжфірмовий обмін замороженої спермопродукції та ембріонів.

Для ринку генетичних ресурсів характерною є інтенсивна торгівля та посилення міжнародної конкуренції між національними селекційно-племінними компаніями, перехід від ведення національних та регіональних селекційних програм до придбання племінного матеріалу від транснаціональних компаній.

Аналіз світового досвіду організації селекційних програм та державної підтримки у свинарстві переконує, що основним чинником прискорення селекційного процесу та підвищення ефективності селекції свиней в Україні може стати використання сучасних інформаційних технологій, та розробка системи організації інформаційно-аналітичного забезпечення селекційно-племінної роботи, у якій важливим елементом є племінний облік.

Ключові слова: виробництво свинини, експорт та імпорт свинини в світі, організація свинарства, племінне свинарство, породи свиней, асоціації свинарства світу, державна підтримка.

Зарубежный опыт организации государственной поддержки развития племенного свиноводства и направления его использования в отечественной практике

Хахула Б.В.

Статья посвящена исследованию систематизации направлений государственной поддержки свиноводства в странах интенсивного свиноводства, которые включают такие инструменты: дотации, субсидирование процентной ставки; научных исследований; страхование, льготное кредитование; компенсация материальных и производственных затрат; регулирования цен; государственные интервенции. Установлено, что государственное регулирование в племенном свиноводстве ведущих стран мира ориентировано на обеспечение интенсивного развития отрасли, повышения продуктивности животных, а также строгое соблюдение экологических требований.

Ориентация ведущих мировых производителей вырабатывать все более постную свинину, что обусловлено потребительскими предпочтениями, привело к изменению подходов в организации всей технологической цепочки производства, от пересмотра векторов селекционно-племенной работы и кормления свиней к технологическим новшествам в сфере переработки, транспортировки, распределения и реализации свиноводческой продукции.

Выяснено, что наращивание объемов производства продукции свиноводства в ведущих странах мира обеспечено за счет достижений в селекции и генетике животных. Для селекционных программ ведущих стран мира характерна тенденция к консолидации племенного материала на мировом рынке генетических ресурсов, где производство свинины является инновационным и интегрированным. В цепи поставок доминирует несколько транснациональных генетических компаний.

Эффективное использование современных методик репродукции животных позволяет осуществлять долговременное хранение генетического материала и транспортировать его в любые точки мира, что позволяет

увеличить масштаб реализации племенной продукции и проводить межфирменный обмен замороженной спермопродукции.

Для рынка генетических ресурсов характерна интенсивная торговля и усиление международной конкуренции между национальными селекционно-племенными компаниями, переход от ведения национальных и региональных селекционных программ к приобретению племенного материала от транснациональных компаний.

Анализ мирового опыта организации селекционных программ и государственной поддержки в свиноводстве утверждает, что основным фактором ускорения селекционного процесса и повышения эффективности селекции свиней в Украине может стать использование современных информационных технологий, и разработка системы организации информационно-аналитического обеспечения селекционно-племенной работы, в которой важным элементом является племенной учет.

Ключевые слова: производство свинины, экспорт и импорт свинины в мире, организация свиноводства, племенное свиноводство, породы свиней, ассоциации свиноводства мира, государственная поддержка.

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