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Analysis of the dynamics of quantitative parameters of the breeding stock of Polissya beef cattle

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Objective. To monitor the controlled population of Polissya beef cattle in the time interval from 2001 to 2022. **Methods.** The research was conducted by statistical analysis of the results of the annual comprehensive individual assessment of animals of meat breeds and catalogues of bulls of meat breeds and types for reproduction of the breeding stock. Information on the current state of the breed was assessed on the basis of data from the expeditionary survey of the livestock. **Results.** From 2001 to 2008, there was an annual increase in the number of breeding farms and expansion of their representation by regions. The maximum number of entities engaged in breeding Polissya meat breeds was 28 and was recorded in 2008. Zhytomyr, Lviv, and Chernihiv regions had the highest share of the livestock in the study period. In 2009, the number of the breed was 6.2 times higher than in 2001, which amounted to +Δ 7030 heads. The number of cows increased by 8.1 times over the same period, to +Δ 3047 heads. Negative trends in the number of cows have been observed since 2010. The maximum decline in the number of cows was recorded in 2012 and 2013, which amounted to - Δ 1294 and - Δ 1105 heads, respectively. Over the period from 2009 to 2021, the number of controlled animals decreased by 2.9 times, i.e. by 5493 heads. The number of cows decreased by 2.8 times, which amounted to Δ 2237. When analysing the dynamics of the volume of accumulated sperm production from Polissya beef bulls, it was found that the highest number of sires included in the catalogue was 8 heads with a volume of 155.4 thousand doses of sperm. Currently, the stocks of genetic material amount to 26.1 thousand doses and are accumulated from 5 bulls. **Conclusions.** The upward development of the Polissya beef breed from the moment of testing lasted until 2009 inclusive and was carried out by quantitatively increasing its representation in the subjects of breeding by region.

Key words: *cows, livestock, bulls, semen production, statistical analysis, breeding sales, business entities.*

Introduction. The general direction of increasing the volume of beef production in Ukraine starting from the 60s of the 20th century formed a thorough basis for the intensification of cattle herd growth. The domestic way of achieving the planned performance indicators of the industry and the general state policy contributed to two parallel directions: strengthening the production base and

implementing a scientifically based concept of rock formation [1, 2]. In the breed-forming process of beef cattle breeding, the Polish beef cattle appears as a breeding achievement in cattle breeding since 1999. The main idea of its formation provided for the productive adaptation of animals to unsuitable for agricultural production and the creation of cultural pastures of agricultural lands in the Ukrainian Polity [3]. The original Ukrainian black-spotted dairy and Simmental breeds ensured the high milk yield of the brood stock. Constitutional and exterior features regarding tallness, relief of musculature and energy of growth are inherited from the Charolais breed. Adaptation and maternal qualities, a balanced type of nervous system, efficiency of pasture use - from the Aberdeen-Angus breed [4]. The structure of the final genotypes 3/8Ch1/4A3/8S, 3/8Ch1/4A1/4S1/8K, 5/8A1/4Ch1/8S, 5/8Ch1/4A1/4S, 11/16Ch1/8A3/16S determined the maximum effective blood ratio of the starting breeds to ensure a high level of phenotypic realization of the genetic potential of productivity. The originators of the Polissya beef cattle aimed scientific and practical work at reducing dystocia, increasing the milk yield of cows and average daily gains in live weight of young animals. Breeding improvement was focused on animals of domestic populations by creating powerful breeding herds and increasing the stock in commodity farms at the expense of repair young animals of own selection. This contributed to the acceleration of the process of formation of an array of animals that met the planned target standard of the Polissya beef cattle [5]. However, the peculiarities of foreign economic relations and the functioning of the domestic meat market have become the basic factors for negative trends in breeding livestock. The decrease in the regulatory influence of the state on the selection process and management of genetic resources has led to a shift in priorities in the breed structure of meat cattle breeding and a rapid reduction of controlled livestock, in particular the Polissya beef cattle [6, 7]. Accordingly, systematic monitoring studies of the state of the breed are determined to be relevant for the implementation of the basic elements of its selection improvement and preservation of the gene pool.

The purpose of research. To conduct a statistical analysis of the population of the Polissya beef cattle of cattle for the period from 2001 to 2022.

Research materials and methods. The study of the quantitative and qualitative composition of the herd was carried out based on the results of the annual comprehensive individual assessment of cattle of meat breeds. The analysis of the use of bulls in the mating campaign was carried out based on the data of the Catalogs of bulls of meat breeds and types for the reproduction of brood stock for the years 2002–2022 and the Catalogs of bulls of meat breeds for the natural mating of brood stock for the years 2013–2022 [8– 10]. Information on individual herds was assessed on the basis of an expedition survey. Statistical processing of research materials was carried out using the "STATISTICA 10.0" software package.

Research results and their discussion. The internal potential of the breed is effectively realized only with a sufficient quantitative composition of the population, its optimal sex-age and genealogical structure. For the meat cattle industry of Ukraine, it is traditional to concentrate the main production resources on the basis of subjects from the breeding business in animal husbandry. According to the predicted indicators provided by the selection program, the further development of the Polissya beef cattle after approval and approval took place by intensifying the formation and certification of breeding herds. According to the data of the State Register of Breeding Animals from 2002 to 2008 inclusive, a gradual annual increase in the number of breeding farms was observed (Fig. 1). At the beginning of the specified period, 6 herds were registered in 3 regions of Ukraine.

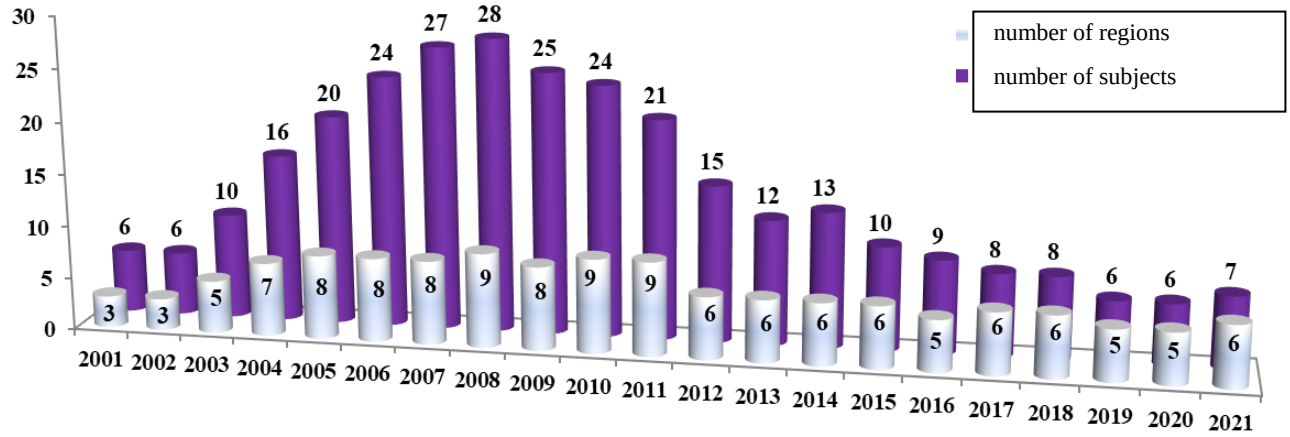

Fig. 1. Dynamics of the number of breeding subjects in livestock breeding of the Polissya beef cattle by region

With the increase in the number of business entities, their geographical representation by regions also expanded. Thus, in 2008, at the peak value of breeding farms (28), the breed was represented in 9 regions. As in 2001, Zhytomyr and Lviv regions were the leaders in terms of the share of livestock, the number of animals in each of which was 27.3% and 30.3% of the total.

The current distribution by regions as of January 1, 2022 reflects the long-term preservation of positions (over 20 years) regarding the breeding of Polish beef cattle in three regions: Lviv, Zhytomyr, and Chernihiv. The share of livestock is 35.3%, 6.9% and 22.0%, respectively. At almost the same quantitative level (15.1% and 15.9% of the total population), the breed is also represented in the Volyn and Ivano-Frankivsk regions.

Based on the analysis of the dynamics of the number of animals under control, an annual increase in the number of animals up to and including 2009 was noted (Fig. 3, Table 1). This is connected with the formation of new enterprises, the opening of the direction of meat cattle breeding on the basis of existing livestock complexes, the branching of the breed structure and the increase of livestock in farms thanks to the intensively operating mechanism of annual state subsidies to subjects from the breeding business for the maintenance of breeding stock. I am cattle of meat breeds.

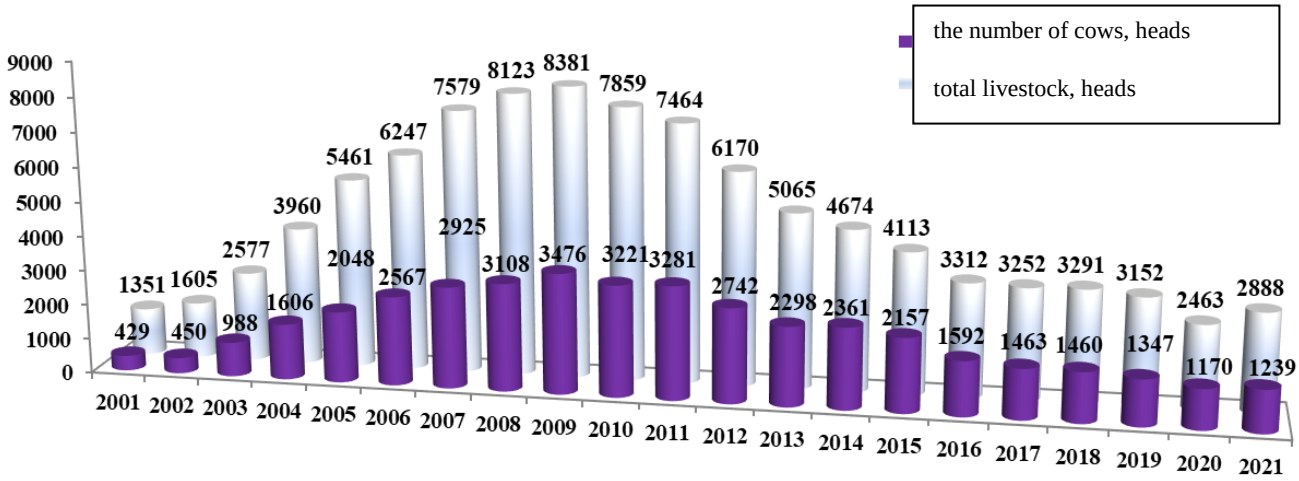

Fig. 3. Dynamics of the total population and the number of cows of the Polish beef breed by year

From 2001 to 2012, stable leadership positions in terms of the number of Polissya beef cattles were held by the farm of the SFG "Maple" of the Lviv region. Since 2005, the enterprise has increased its livestock to 1,132 heads, including 445 cows. In the system of the National Academy of Agrarian Sciences, from 2004 to 2017, breeding work with the Polissya beef cattle was carried out by the research farm of the SE "Horodetske" State Enterprise of the Rivne region with an average annual herd of 439 heads.

The peak values of the population at the level of 8381 heads were noted in 2009, which is 6.2 times higher compared to 2001 with +Δ 7030 heads. The number of cows during the same period increased by 8.1 times from + Δ 3047 heads. The highest growth rates were noted in 2004, 2005, 2007 with + Δ1383, + Δ1501, + Δ 1332.

Since 2010, negative dynamics have been observed against the background of a general decrease in the production of breeding genetic resources of beef cattle. However, a tendency to increase livestock was noted for individual economic entities. For example, in SFG "Bilak" the total number has been increased to 1,032 head with the advantages of breeding stock, which is 478 head. Also during this period, the enterprise "Kolos" LLC was formed in the Kirovohrad region to keep 780 heads of the Polissya beef cattle.

In 2015, the numbers are almost at the level of 2004, but at the same time, the Polish beef cattle ranks second among domestic breeds of beef cattle. The share of livestock is 14.4% in the total breed structure of the breeding resources of meat cattle breeding [11].

Table 1. Rates of increase/decrease of the herd for the considered period

Time interval	Change in total livestock, *once*	+/- Δ, *heads*	Change in the number of cows, *once*	+/- Δ, *heads*
2002 – 2003	↑ 1,606	+ 972	↑ 2,201	+ 538
2003 – 2004	↑ 1,537	+ 1383	↑ 1,626	+ 618
2004 – 2005	↑ 1,379	+ 1501	↑ 1,275	+ 442
2005 – 2006	↑ 1,144	+ 786	↑ 1,253	+ 519
2006 – 2007	↑ 1,213	+ 1332	↑ 1,139	+ 358

2007 - 2008	↑ 1,072	+ 544	↑ 1,063	+ 183
2008 – 2009	↑ 1,032	+ 258	↑ 1,118	+ 368
2001 – 2009	↑ **6,204**	**+ 7030**	↑ **8,103**	**+ 3047**
2009 – 2010	1,066 ↓	- 522	1,079 ↓	- 255
2010 – 2011	1,053 ↓	-395	↑ 1,019	+ 60
2011 – 2012	1,210 ↓	-1294	1,197 ↓	- 539
2012 – 2013	1,218 ↓	-1105	1,193 ↓	- 444
2013 - 2014	1,084 ↓	-391	↑ 1,027	+ 63
2014 – 2015	0,880 ↓	-561	1,095 ↓	- 204
2015 – 2016	0,805 ↓	- 801	1,355 ↓	- 565
2016 – 2017	1,018 ↓	- 60	1,088 ↓	- 129
2017 – 2018	↑ 1,012	+ 39	1,002 ↓	- 3
2018 – 2019	1,044 ↓	-139	1,084 ↓	- 113
2019 – 2020	1,280 ↓	-689	1,151 ↓	- 177
2020 – 2021	↑ 1,173	+ 425	↑ 1,059	+ 69
2009 – 2021	↓ **2,9**	**-5493**	↓ **2,8**	**- 2237**
2001 – 2021	↑ **2,138**	**+ 1537**	↑ **2,888**	**+ 810**

he maximum indicators of population decline were recorded in 2012 and 2013. Thus, the total number decreased by 1.2 times, which amounted to - Δ 1294 heads and - Δ 1105. During the period from 2009 to 2021, the number of controlled animals decreased by 2.9 times, that is, by 5493 heads. The number of cows decreased by 2.8 times, which amounted to Δ 2237.

At the moment, promising breeding farms for the breeding of the Polissya beef cattle are SFG "Bilak" of Lviv region, STOV "Ratnivskyi agrariy" of Volyn region and LLC "Agrikor Holding" of Chernihiv region with the number of 1021, 435 and 636 heads, respectively. At the enterprises, partial artificial insemination of the brood stock is introduced, control of the use of breeders of improving breeds is carried out, and a comprehensive assessment of repair young animals is carried out according to their own productivity. Accumulation of sperm production as a basic element of preserving the gene pool and increasing the effectiveness of the organization of the mating campaign is especially relevant for domestic breeds of cattle. Based on the

analysis of the use of bulls of the Polissya beef cattle, a low quantitative representation of the bulls from which genetic material has been accumulated was established. Thus, the highest number of breeders included in the catalog was 8 heads with a volume of 155.4 thousand doses of sperm (Fig. 4).

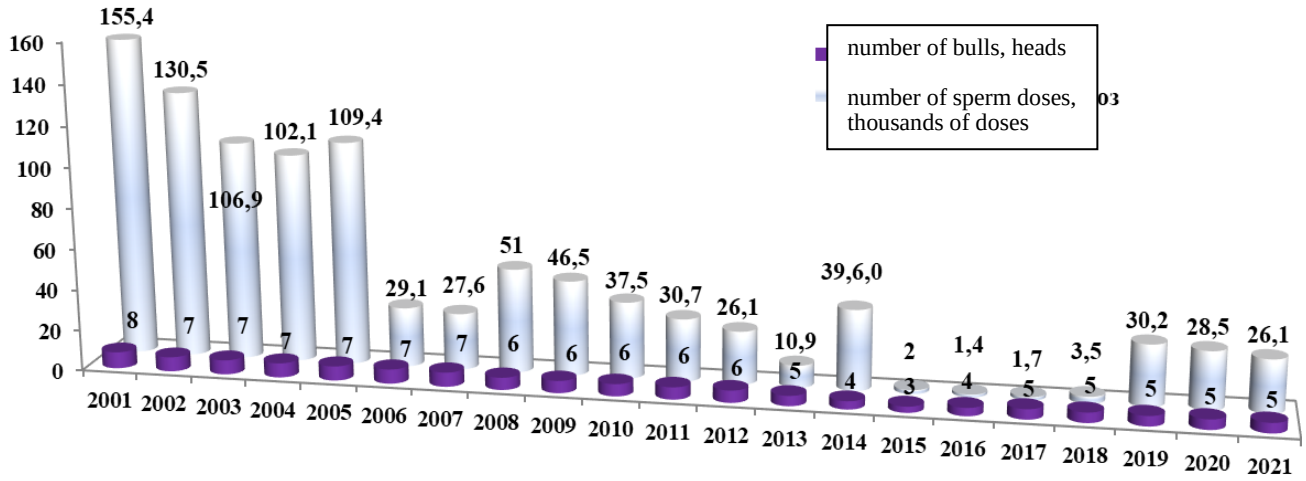

Fig. 4. Quantitative analysis of available sperm production of bulls of the Polish beef breed by year

During the period from 2001 to 2003, all sperm production from bulls of the Polish beef breed was concentrated in Novograd-Volyn Agricultural Union of Zhytomyr Oblast. The company stored an average of 113.2 thousand doses of 7 breeders of 3 lines. The largest amount of sperm production was obtained from breeders of the Irisa 559 line (3 heads) - 36.8 thousand doses. The maximum volume of sperm production from one broodstock was 16.3 thousand doses, the minimum – 6.6 thousand doses.

Since 2004, sperm production from bulls of the Polissya beef cattle in the amount of 5.9 and 3.7 thousand doses has also been laid on the basis of Zhytomyroblplemobydenia OJSC (since 2011 renamed to Ukrainian Genetic Company) and OJSC " Korosten agro-tribe union", which is 20.3 and 12.7% of the total number, respectively. Since 2005, there has been a decrease in stocks of genetic material from 109.4 to 29.1 thousand doses. Thus, from 2005 to 2012, these enterprises stored 26.6 and 4.4 thousand doses of sperm products, or 81.9 and 13.3% of the total amount, respectively.

In 2014, there was an increase in stocks from 10.9 thousand doses to 39.6 thousand doses, which is connected with the inclusion in the catalog of sperm products of the breeder Bandurist 0957, which is stored on the basis of the SE "Donetsk Regional Enterprise for Breeding Affairs in Livestock Breeding".

It is worth noting the critical period from 2015 to 2018. The quantitative level of the volume of genetic material of breeders ranged from 1.4 thousand doses (2015) to 3.5 (2018). In 2016, the entire stock of sperm products was concentrated only in the bank of animal genetic resources of the M.V. Zubets Institute of Animal Breeding and Genetics of the National Academy of Sciences. Since 2019, a sharp increase in the amount of genetic material has occurred due to the accumulation on the basis of PrJSC "Ukrainian Genetic Company" of the sperm products of the breeder Angel UA8011590299. Bugai was born in 2015 at the "Yerchyki" PAF in Zhytomyr Region. Represents the basic potential of breed-specific traits by exterior type. Belongs to Kaskader 530 line. Live weight at 4 years 1100 kg, index according to own productivity A 105.5. Current stocks of genetic material amount to 29,100 doses and are laid from 5 breeders in uncoated granules and sequins.

One of the factors of the sustainable upward development of certain branches of the agro-industrial complex is the level of profitability of entities working in a given direction. The basic components of profitability in meat cattle breeding are the cost of a unit of live weight gain, annual depreciation of the main biological assets due to the yield and preservation of calves, the volume of demand and the sale price of products. The limited number of enterprises with a closed production cycle, the low volume of the domestic market for beef consumption, unproductive cooperation between producers and the final consumer determined the need to orient meat cattle breeding to foreign raw material markets. The expansion of veterinary approvals and the intensification of the work of consulting companies have expanded the export potential of genetic resources of beef cattle. But the question of the sales price remains open, in the formation of which a significant share is taken by the pedigree of the animals. International breeds, which are included in the international classifier, are in higher demand.

According to the analysis of statistical information regarding the purchase/sale of Polissya beef cattles within the studied time interval, it was found that in 2001, 2002 and 2007, the volumes of animal purchases exceeded the quantitative parameters of realization with Δ + 103, + 129 and + 199 heads (Fig. . 5). 131 and 110 repair heifers, respectively, were purchased from SFG "Klen" (Lviv region) to increase the herd. The high purchasing parameters in 2007 are explained by the purchase of 114 repair young animals by the company "Agrikor Holding" LLC.

In 2016, 2018, 2020 and 2021, economic entities did not purchase breeding animals. This indicates the use of self-breeding repair bulls in the reproduction of the breeding stock or the involvement of Charolais breeders in the mating campaign.

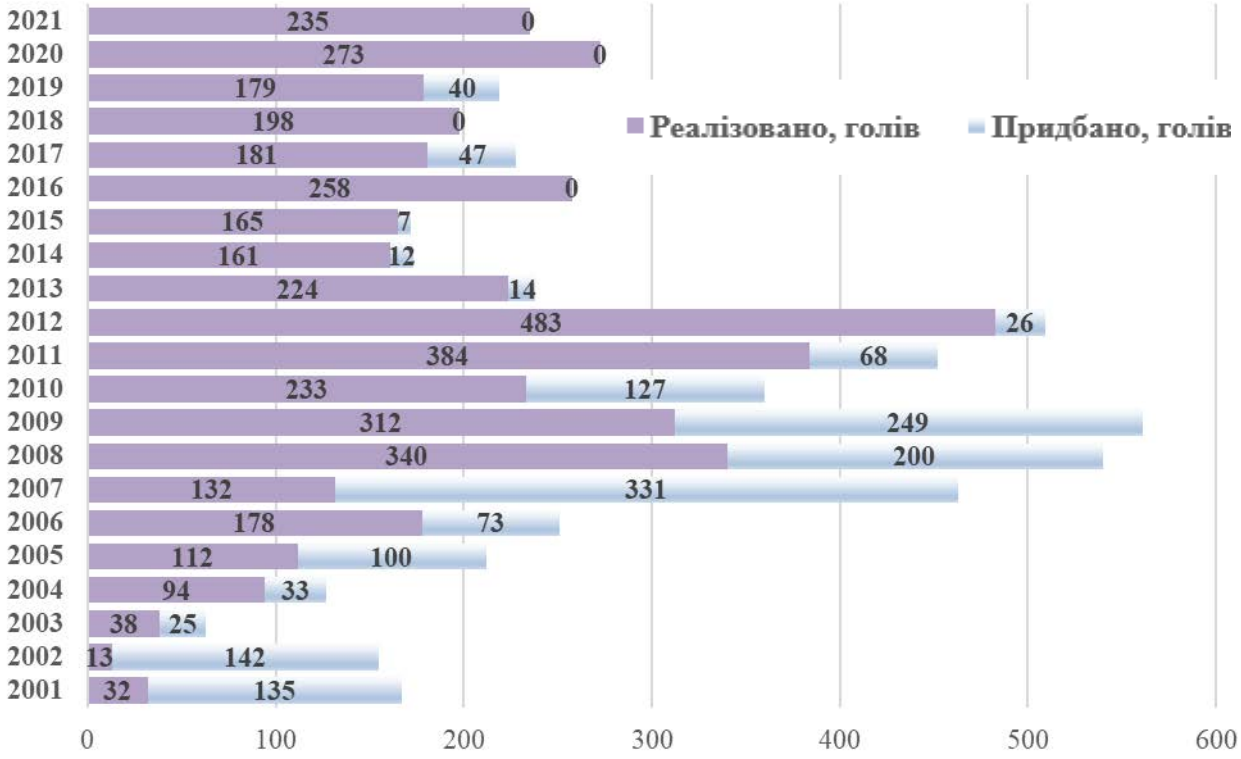

Fig. 5. Analysis of the volume of purchase/sale of breeding young of the Polissya beef cattle by year

With sales of more than 300 heads in 2008, 2009, 2011, 2012, an intensification of demand for breeding animals of the Polissya beef cattle was noted. The largest amount of livestock was realized in 2012 at the level of 483 heads. The leaders in sales were LLC "Rachanske" (Zhytomyr region) - 230 heads and SFG

"Klen" (Lviv region) - 162 heads. In 2020, 150 repair heifers were sold by the "Ratnivskiy Agrarian" STOV enterprise of the Volyn region. In general, through the sale of farms, surplus livestock is realized, which quantitatively exceeds the planned volumes of repair of own herd.

Conclusions. The upward development of the Polissya beef cattle continued until 2010. The maximum number of economic entities was 28 (2008), the maximum number was 8,381 heads, including 3476 cows (2009). An effectively functioning state mechanism for partial reimbursement of the cost of the purchase of breeding animals (heifers, cows, heifers) contributed to the certification of farms breeding the Polissya beef cattle, which expanded the possibility of obtaining individual information about animals and organizing the management of the breeding situation at the population level. Currently, the presence of the status of a subject from the breeding business in animal husbandry allows enterprises to slightly increase the level of marginal income due to the higher price of selling livestock (live weight) for export. The dynamics of livestock reduction, the systematic use of Charolais bulls for natural mating and general situational processes in domestic cattle breeding require the development of practical measures aimed at preserving the gene pool of the Polissya beef cattle.

Бібліографія

1. *Почукалін А. Є., Вдовиченко Ю. В., Джус П. П., Марченко Н. І.* Поліська м’ясна як елемент генетичного різноманіття у м’ясному скотарстві України. *Селекційні, генетичні та біотехнологічні методи удосконалення і збереження генофонду порід сільськогосподарських тварин ;* за ред. М. В. Гладія, Ю. П. Полупана. Полтава: ТОВ «Фірма «Техсервіс», 2018. С. 305–307.
2. *Зубець М. В., Буркат В. П., Гузєв І. В.* Стратегія розвитку м'ясного скотарства в Україні у контексті національної продовольчої безпеки ; за ред. М. В. Зубця, І. В. Гузєва. Київ: Аграр. наука, 2005. 176 с.
3. Матеріали для апробації нового селекційного досягнення: «Поліська м’ясна порода великої рогатої худоби». К., 1998. 406 с.
4. Програма селекції худоби поліської м’ясної породи на період 2002–2010 роки. 2-ге вид. доп. і доопр. ; відпов. за вип. В. М. Білошицький. Київ : Аграрна наука, 2003. 44 с.
5. *Спека С. С., Зубець М. В., Буркат В. П. та ін.* Новостворена поліська м’ясна порода великої рогатої худоби: методи селекції та господарськи корисні ознаки. Вісник аграрної науки. 1999. № 2. С. 49–56.

6. *Почукалін А. Є., Прийма С. В., Різун О. В.* Поліській м’ясній породі великої рогатої худоби – 20 років: минуле, сучасне і майбутнє розвитку селекційного досягнення. Таврійський науковий вісник. Херсон, 2019. Вип. 108. С. 172–176. https://doi.org/10.32851/2226-0099.2019.108.23.

7. *Лемешко Ю. О., Скляров О. О., Джус П. П., Ткачук В. П.* Аналіз походження маточного поголів’я великої рогатої худоби поліської м’ясної породи у СФГ «Верес». Розведення і генетика тварин: міжвідомчий тематичний науковий збірник. 2021. Вип. 62. С. 59–64. http://dx.doi.org/10.31073/abg.62.09.

8. *Полупан Ю. П., Гладій М. В., Прийма С. В. та ін.* Каталог бугаїв м’ясних порід і типів для відтворення маточного поголів’я в 2020 році ; за ред. Ю. П. Полупана і С. В. Прийми. Київ, 2020. 34 с.

9. *Гладій М. В., Прийма С. В., Полупан Ю. П. та ін.* Каталог бугаїв м’ясних порід і типів для відтворення маточного поголів’я в 2021 році; за ред. Ю. П. Полупана і С. В. Прийми. Київ, 2021. 32 с.

10. *Гладій М. В., Джус П. П., Полупан Ю. П. та ін.* Каталог бугаїв м’ясних порід для природного парування маточного поголів’я в 2020–2021 роках ; за ред. П. П. Джус. Київ, 2021. 15 с.

11. *Джус П. П., Вишневський Л. В., Сидоренко О. В. та ін.* Програма селекції великої рогатої худоби поліської м’ясної породи на 2016–2020 роки. Чубинське, 2015, 41 с.

References

1. Pochukalin A. Ye., Vdovychenko Yu. V., Dzhus P. P., Marchenko N. I. (Editors, M. V. Hladii, & Yu. P. Polupan). (2018). Poliska miasna yak element henetychnoho riznomanittia u miasnomu skotarstvi Ukrainy [Polissian Beef as an element of genetic diversity in the beef cattle breeding of Ukraine]. *Selektsiini, henetychni ta biotekhnolohichni metody udoskonalennia i zberezhennia henofondu porid silskohospodarskykh tvaryn [Breeding, genetic and biotechnological methods for improving and preserving the gene pool of farm animal breeds]*. (pp. 305–307). Poltava: TOV «Firma «Tekhservis». [In Ukrainian].

2. Zubets M. V., Burkat V. P., Huziev I. V. (Editors, M. V. Zubets, & I. V. Huziev). (2005). *Stratehiia rozvytku miasnoho skotarstva v Ukraini u konteksti natsionalnoi prodovolchoi bezpeky [Strategy for the development of beef cattle breeding in Ukraine in the context of national food security*]. Kyiv: Ahrar. Nauka [In Ukrainian].

3. *Materialy dlia aprobatsii novoho selektsiinoho dosiahnennia: Poliska miasna poroda velykoi rohatoi khudoby» [Materials for testing a new breeding achievement: "Polissian Beef breed of cattle"*. (1998). Kyiv. [In Ukrainian].

4. *Prohrama selektsii khudoby poliskoi miasnoi porody na period 2002–2010 roky [Program of breeding of Polissian Beef cattle for the period 2002–2010]*. (2003). 2-nd edition add. and finished. (Answer. for the issue. V. M. Biloshytskyi). Kyiv : Ahrarna nauka. [In Ukrainian].

5. Speka S. S., Zubets M. V., Burkat V. P., Vinnychuk D. T., Bilozerskyi O. L., Yanovych V. M. (1999). Novostvorena poliska miasna poroda velykoi rohatoi khudoby: metody selektsii ta hospodarsky korysni oznaky [Newly created Polissian Beef breed of cattle: breeding methods and economically useful features. *Visnyk ahrarnoi nauky [Bulletin of Agricultural Science]*, *2,* 49–56. [In Ukrainian].

6. Pochukalin A. Ye., Pryima S. V., Rizun O. V. Pochukalin A. E., Priyma S. V., Rizun O. V. (2019). Poliskii miasnii porodi velykoi rohatoi khudoby – 20 rokiv: mynule, suchasne i maibutnie rozvytku selektsiinoho dosiahnennia [Polissian Beef of cattle – 20 years: the past, present and future development of the selection achievement]. *Tavriiskyi naukovyi visnyk [**Taurida Scientific Herald**]*, *108*, 172–176. https://doi.org/10.32851/2226-0099.2019.108.23. [In Ukrainian].

7. Lemeshko Yu. O., Skliarov O. O., Dzhus P. P., Tkachuk V. P. (2021). Analiz pokhodzhennia matochnoho poholivia velykoi rohatoi khudoby poliskoi miasnoi porody u CFH «Veres» [Analysis pedigree of livestock of Polissian Beef cattle breed in SFG «Veres»]. *Rozvedennia i henetyka tvaryn: mizhvidomchyi tematychnyi naukovyi zbirnyk [Animal Breeding and Genetics : Interdepartmental thematic scientific collection]*, *62*, 59–64. http://dx.doi.org/10.31073/abg.62.09. [In Ukrainian].

8. Polupan Yu. P., Hladii M. V., Pryima S. V., Dzhus P. P., Basovskyi D. M., Bondaruk H. M., … Mentiu I. L. (Editors, Yu. P. Polupan & S. V. Pryima).

(2020). *Kataloh buhaiv miasnykh porid i typiv dlia vidtvorennia matochnoho poholivia v 2020 rotsi [Catalog of beef breeds and types of bulls for breeding stock reproduction in 2020]*. Kyiv. [In Ukrainian].

9. Hladii M. V., Pryima S. V., Polupan Yu. P., Dzhus P. P., Basovskyi D. M., Bondaruk H. M., … Mentiu I. L. (Editors, Yu. P. Polupan & S. V. Pryima). (2021). *Kataloh buhaiv miasnykh porid i typiv dlia vidtvorennia matochnoho poholivia v 2021 rotsi [Catalog of beef breeds and types of bulls for breeding stock reproduction in 2021]*. Kyiv. [In Ukrainian].

10. Hladii M. V., Dzhus P. P., Polupan Yu. P., Pryima S. V., Basovskyi D. M., Bondaruk H. M., … Mentiu I. L. (Editor, P. P. Dzhus). (2021). *Kataloh buhaiv miasnykh porid dlia pryrodnoho paruvannia matochnoho poholivia v 2020–2021 rokakh [Catalog of beef Bulls for natural mating of breeding stock in 2020–2021*]. Kyiv. [In Ukrainian].

11. Dzhus P. P., Vyshnevskyi L. V., Sydorenko O. V., Bondaruk H. M., Chop N. V., Sharan P. I., … Uhnivenko A. M. (2015). *Prohrama selektsii velykoi rohatoi khudoby poliskoi miasnoi porody na 2016–2020 roky [Polissian Beef cattle breeding program for 2016–2020]*. Chubynske. [In Ukrainian].