ECONOMIC SUPPORT OF THE PRESERVATION GENEPOOL LOCAL BREEDS OF FARM ANIMALS UKRAINE

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Abstract

The calculation of minimal number of local and endangered breeds of farm animals in Ukraine, by which it is possible to preserve the genetic diversity and small homozygotic index in population, have been conducted. In the current economic conditions, execution of biodiversity preservation task of farm animals in Ukraine is not possible without budget support. The sizes of limited financial support for preserving them *in situ* and *ex situ* have been defined. The need to develop and implement two methods of storage of the gene pool of local and endangered breeds of farm animals is caused by the risks, that encountered in the keeping animals *in situ* (epizootic situation, the genetic trend, natural disasters, etc.). Annual financial support from the State Budget of Ukraine according with our methodology will ensure that the genepool of local and endangered breeds of farm animals will be preserved, as well as implemented in breeding programs of farm animals within 2-3 generations or for the next 10 years. These research results have used in the development of the Draft programme of preservation of local and endangered breeds farm animals in Ukraine for 2017-2025 years.

Key words: breed, local, genepool, cryobank, financial expenses

Introduction

In the agricultural enterprises of Ukraine there are 29 breeds of cattle, 13 of pigs, 18 sheep, 10 horse breeds and 30 poultry breeds and crosses, which are different for biological and economic characteristics, are adapted to breeding in specific geoclimatic areas and are the basis for the creation of new highproductivity breeds. During the years of independence (since 1991), using the best world and domestic gene pool, the specialized Ukrainian red-and-white, black-and-white, red and brown dairy breeds, and volyn and woodland meat breeds of cattle have been created. The spread of highly productive specializide breeds of livestock led to a sharp decrease in numbers of local domestic breeds, which are carriers of valuable genetic traits, such as adaptation to specific environmental conditions, simplicity to the feed, high resistance of the organism, the fortress of the constitution, the duration of productive use, reproductive capacity, product quality, resistance to diseases and others.

Institute of Animal Breeding and Genetics nd. a. M. V. Zubets NAAS became the initiator and coordinator of special programs of conservation and sustainable use of local and endangered breeds of farm animals in Ukraine. It was the first in Ukraine in 1976 had created Cryobank farm animals genetic resources to conserve and long-term use of the genetic material necessary supplies for use in developing new breeds, ensuring pure breeding in closed-type outbred populations genepool herds of local cattle breeds, breed recovery if necessary. About 2 million bulls semen doses leading 22 dairy and beef breeds was laid in

Cryobank genetic resources during the period 1976-2000. From 12 bulls of local grey ukrainian breed in bank was laid 16.0 thousand, whiteheaded ukrainian - 26.0 thousand units, which provided constituting breeding plans with the breedspure breeding outbreeding type in herds of whiteheaded and grey ukrainian breeds with local population of cows on level 450-500 animals in each. In order to preserve the genetic diversity of other species we have improved the technology of cryoconservation of semen of rams, stallions, pond fish, laid their stocks in Cryobank, confirmed preserve fertility sperm stored in liquid nitrogen for 40 years (Kruglyak, 2001), and this is confirmed by the prospects for preservation of genetic diversity of species in the form of gametes and embryos in cryobanks.

Questions of methods and forms of preservation local breeds were studied in the works of ukrainian and foreign scientists Burkat at al. (1997), Dragunesku (1975), Eysner (1988), Ivanov (1977), Kharchuk at al. (1987), Kovtun (2007), Kruglyak (1978, 1987, 2001), Roosen at al. (2005), Zubets at al. (2007) and others. In a difficult economic situation in Ukraine, there is a need to substantiate the minimum number of farm animals in the local breeds, in order to calculate the size of the state support for its preservation.

Objective of the study is to calculate the amount of the necessary support for preservation of gene pool of local and endangered breeds in Ukraine based on reasonable minimum number all forms of its preservation and to identify possible sources of funding.

Materials and methods

Justification forms and limit the number of farm animals necessary for the preservation of local and endangered breeds, was based on the method of bloodlinear thoroughbred breeding and rendomizational fixing bulls in the lines (Dragunesku, 1975). The optimum number of sperm units for bloodlines reproduction local and endangered breeds have been determined, for each breed (Kruglyak, 1978). Determining the amount of the costs of conservation have been calculated on the statistical reporting materials of agricultural enterprises of Ukraine for 2016-2017 years.

Results and discussion

In accordance with the Draft programme of preservation of local and endangered breeds farm animals in Ukraine for 2017-2025 years, developed at the Institute of Animal Breeding and Genetics nd. a. M. V. Zubets NAAS, subjects to preservation are: whiteheaded ukrainian, brown carpathian, lebedynska, red steppe, grey ukrainian cattle breeds; myrgorodska, ukrainian steppe white and ukrainian steppe speckled pig breeds; ukrainian girskokarpatska, sokilska, askanian inbred breeding type of multiparasitic karakul sheep and tavrian type of askanian fine-brown breed sheep breeds; hutsul breed of horses; romenska breed of geese; poltavska clay and ukrainian vuhanka breeds of chickens; duck breeds - ukrainian grey, ukrainian clay and ukrainian black whitechested.

According to the Law of Ukraine "On State Support of Agriculture of Ukraine" preservation genetic species *in situ* and *ex situ* should subsidize the state budget. However, in view of the critical situation in the economy, funding for all costs of keeping animals of local breeds is problematic. As a result, during the last time the number of females whiteheaded ukrainian, lebedynska, grey ukrainian cattle breeds; mirgorodska pig breed; hutsul breed of horses is at the lowest, the critical level. The number of females brown carpathian cattle breed has decreased 8.1 times and have been deprived the tribal status. The purebred poultry stock have been lost.

According to the analysis of scientific sources, preservation of the gene pool of local and endangered breeds of farm animals is provided in two ways: using their *in situ* (during life) and cryoconserving their genetic products ("virtual" cryoherds *in vitro*).

Preservation of the gene pool of dairy and dual purposes breeds of cattle *in situ* according to the theoretical calculations of Dragunesku (1975), possibly through the creation of each breed genepool herds of animals that include all major blood lines, where each line should contain not less than 2-3 living bulls and 60 cows. The gene pool of beef cattle breeds may keep the population numbers at least not less than 3 bulls and 20 cows in a bloodline. Breeding all breeds of cattle should be carried out by the method of bloodlinear thoroughbred breeding and rendomizational fixing bulls in each bloodlines. Under these conditions, according to the authors, it is possible to save the thoroughbred breeding cattle herds within 5-6 generations, or 20 years.

To prevent a critical number of local breeds of domestic animals and avoid mating of closely related, we offered to retain the minimum number of cows - 60 female and 4-6 sires in each bloodline, which will provide preservation of the genetic diversity of breed, economic-useful traits and keep a low coefficient of homozygosity in the population.

On the basis of characteristics such as earliness and prolificacy, for *in situ* preservation the genepool of local and endangered breeds of pigs, sheep, horses and poultry we recommend to provide livestock numbers not less than 25 breeding boars and 150 sows; 20 rams and 200 ewes; 10 stallions and 50 mares; 50 geese and 200 goose; 50 drakes and 250 ducks; 50 cocks and 250 hens.

The effectiveness of the use of local and endangered breeds of farm animals depends on the level of productivity, the cost and nutritional value of feed and the size of the sale price for their products. In the current economic conditions in Ukraine, livestock production in these subjects genepool is unprofitable, and, consequently, they cannot function in future without financial support. Thus, during the 2014 genepool lost cows brown carpathian breed.

The forecast of an increase the number farm animals of local and endangered breeds recommended for preservation in 2017-2025 is given in Table 1. In addition, it is necessary to restore the recommended number of females brown carpathian cattle breed and poultry. Up to 2025 it will not be possible to restore to the recommended number of hutsul cubs and brown carpathian cows.

Table 1. The forecast the number farm animals of local and endangered breeds recommended for preservation on term 2017-2025

Species and breeds of animals	Number of females		Number of females recommended for preservation in 2017-2025				
	(minimal) recommended to the preservation	presence on the 1 Jan 2017	2017	2019	2021	2023	2025
Cattle of dairy and dual purposes breeds	1320	2655	1271	1280	1290	1301	1313
Whiteheaded ukrainian	300	300	300	300	300	300	300
Brown carpathian	120	-	71	80	90	101	113
Lebedynska	420	713	420	420	420	420	420
Red steppe	480	1642	480	480	480	480	480
Beef breeds	240	354	354	354	354	354	354
Grey ukrainian	240	354	354	354	354	354	354
Pigs	450	281	357	376	405	450	475
Myrgorodska	150	150	150	150	150	150	150
Ukrainian steppe white	150	175	175	175	175	175	175
Ukrainian steppe speckled	150	32	32	51	80	125	150
Sheep	800	3016	950	972	1003	1049	1100
Ukrainian girskokarpatska	200	550	300	300	300	300	300
Sokilska	200	50	50	72	103	149	200
Askanian inbred breeding type of multiparasitic Karakul sheep	200	450	300	300	300	300	300
Tavrian type of Askanian fine-brown breed	200	2012	300	300	300	300	300
Horses	50	16	16	16	20	28	36
Hutsul	50	16	16	16	20	28	36
Geese	250	-	50	250	250	250	250
Romenska	250	-	50	250	250	250	250
Ducks	900	-	150	750	900	900	900
Ukrainian grey	300	-	50	250	300	300	300
Ukrainian clay	300	-	50	250	300	300	300
Ukrainian black whitechested	300	-	50	250	300	300	300
Chicken	600	-	100	600	600	600	600
Poltavska clay	300	-	50	300	300	300	300
Ukrainian vukhanka	300	-	50	300	300	300	300

Provision of state subsidies for preservation of local breed animals *in situ* is practiced in the amount of compensation the full costs of their maintenance or the cost only for feeding. We suggest for a period of economic crisis in the country to finance such costs on the basis of

public-private partnerships, where the expense of the state budget shall be reimbursed only for the feeding of animals, and the remaining costs are financed from the local budgets, organizations and institutions, interested investor or the owner of the animals. Annual amount of budgetary subsidies is proposed to determine on the basis of substantiated normative costs of feed produced under the cost price. The definition of normative costs of feed is based on scientifically sound rations by species and breeds of animals, taking into account actual data of their productivity (Table 2).

Table 2. The forecast of the annual budget subsidy per head of local and endangered breeds of farm animals on term 2017-2025, thousand UAH

Species, breeds of females		The size of the annual budget subsidy per head, thousand UAH[1]				
		2017	2019	2021	2023	2025
Cow	Whiteheaded ukrainian	9.09	11.87	13.53	15.10	16.65
	Brown carpathian	8.56	11.18	12.74	14.22	15.67
	Lebedynska	10.66	13.92	15.86	17.71	19.52
	Red steppe	9.44	12.33	14.05	15.68	17.29
	Grey ukrainian	8.00	10.69	12.30	13.75	15.16
Sow		4.18	5.52	6.32	7.06	7.78
Ewe		1.02	1.36	1.57	1.75	1.93
Mare		9.66	12.76	14.60	16.32	17.99
Goose		0.59	0.77	0.88	0.98	1.08
Duck		0.32	0.44	0.51	0.57	0.63
Hen		0.16	0.22	0.25	0.28	0.31

[1] Forecast Ukrainian Hryvnia (UAH) exchange rate for 2017: 1 euro = 30.3 UAH

The certification of genepool herds requires annual inspections by the specialists of the Institute of Animal Breeding and Genetics n.a. M. V. Zubets NAAS, which is the main institution for the implementation of the scientific and technical program "Preservation of the gene pool of agricultural animals", together with the collaborators among the 11 institutes of the NAAS system.

Along with this, the preservation of the gene pool of local and endangered breeds of farm animals *ex situ* is provided by creating a "virtual" cryoherds in cryoconserved form. For this, it is necessary to collect sperm sires in an amount of one thousand units and preserve in cryofunds an amount of 3 thousand units from 10-15 bulls each bloodline annually. The annual volume of the accumulation and storage of semen of breeding rams must be 1.2 and 2.4 thousand, respectively, breeding boars - 2 thousand units.

We recommend the part from accumulated sperm, up to 10%, to be deposited in the Bank of Animal Genetic Resources in Institute of Animal Breeding and Genetics nd. a. M. V. Zubets NAAS. The amount of financing from the state budget to offset the costs of storage of cryoconserved gametes of local breeds cattle, pigs and sheep in this cryobank in 2017 would be UAH 523.5 thousand. Expenditure of funds for the purchase of semen of bulls, boars and rams during this period would be UAH 3657.0 thousand and storage - UAH 961.9 thousand.

For the restoration of the population of local and endangered cattle breeds, the Bank of Animal Genetic Resources in Institute of Animal Breeding and Genetics nd. a. M. V. Zubets NAAS will be expected to accumulate the cryoconserved embryos 250 units per each breed of cattle for a long period.

Genetic testing (confirmation of origin by genetic systems of blood types) and biochemical testing (by DNA analysis) also are very important for effective preservation of local breeds of farm animals.

Conclusions

The need to develop and implement two methods of storage of the genepool of local and endangered breeds of farm animals is caused by the risks that arise in the course of keeping animals in situ (epizootic situation, the genetic trend, natural disasters, etc.).

The forecast of an increase the number farm animals of local and endangered breeds recommended for preservation in 2017-2025 has been developed, which would provide to restore the recommended number of females brown carpathian cattle breed and poultry. But it will not be possible to restore to the recommended number of hutsul cubs and brown carpathian cows up to 2025.

Annual financial support according with our methodology will ensure that the genepool of local and endangered breeds of farm animals will be preserved, as well as implemented in breeding programs of farm animals within 2-3 generations or for the next 10 years. These research results have used in the development of the Draft programme of preservation of local and endangered breeds farm animals in Ukraine in 2017-2025.

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