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REPRODUCTIVE AND PRODUCTIVE PERFORMANCE OF MEAT-FAT SHEEP UNDER THE CONDITIONS OF NORTHEASTERN KAZAKHSTAN

ANNATATION

Sheep are the most widespread farm animal species on the globe due to many valuable biological and constitutional features, especially their high adaptive capacity. They are more technologically advanced animals, suitable for any industry system, namely, from purely stabling to year-round pasture keeping. One of the main directions of sheep breeding in Kazakhstan is meat sale, which gives a significant amount of the cheapest mutton and coarse wool necessary for the industry. Curd sheep by number of livestock occupy one of the first places in the country. The main mass of them is spread in semi-desert, desert, and dry-steppe zones of Abay and Pavlodar regions.

The relevance of our study is due to the high importance of sheep breeding in the agrarian sector of the Republic of Kazakhstan. This industry provides production of meat, wool, leather and other demanded products, which have a stable demand both in domestic and foreign markets. However, for the sustainable development of sheep breeding, it is necessary not only to preserve the existing gene pool but also to ensure its rational use and improvement. Changes in climatic conditions, growing requirements for product quality, and high competition in the market require the application of modern approaches in breeding and stock management.

The research aims to develop and apply modern breeding-technological and molecular-genetic methods to improve the genetic resources of sheep of different productivity directions.

The results of the research were used to develop plans of selection and breeding work, which include the formation of new highly productive genotypes of sheep of different directions of productivity using the potential of domestic and foreign gene pools for the approbation of new breeding achievements.

Thus, the conducted work confirms the efficiency of the developed selection-technological approaches. The obtained data not only demonstrate the high productivity and adaptability of the studied animals but also open new opportunities for further development of sheep breeding in Kazakhstan. The use of research results in the practice of basic farms contributes to the improvement of quality indicators of products and increases the competitiveness of the industry at the national and international levels.

Key words: *Sheep farming, sheep, breeding, wool clip, live weight, productivity, reproduction.*

Introduction. Sheep breeding is an important and specific link in animal husbandry, which produces a large number of diverse products: mutton, lamb, milk, fatty raw materials - foodstuffs; wool for various purposes, fur and leather raw materials, Karakul smoothies - valuable raw materials for light industry. Such a variety of products is provided by a large number of sheep breeds**.**

In Kazakhstan the systems of meat-fat sheep breeding and methods of selection for fat-rumped sheep have been developed, taking into account the peculiarities of breeding areas. Local sheep are characterized by strong constitution, endurance, good backbone, high body weight, early maturity, milk production, ability to fatten and adaptation to pastures with sparse vegetation and lack of water [1].

Production of young lamb should be carried out at the expense of using natural pastures, which makes this direction of sheep breeding low-cost and increases the efficiency of breeding these sheep in the conditions of market economy [2].

Sheep farming supports agribusiness and contributes to job creation, stimulating economic growth in rural areas. Long-term studies have shown that sheep farming can provide economic stability in regions prone to climate change due to the high adaptive capacity of sheep [3,4].

The social importance of sheep farming is that it provides employment for many people in rural areas. Since sheep farming requires labor-intensive care of the flock, especially on pasture, it has a positive impact on employment and income. In Central Asia, including Kazakhstan, sheep breeding plays an important cultural role, as historically sheep breeding was the mainstay of nomadic economies. Modern social programs to support agriculture often focus on small and medium-sized farms engaged in sheep farming, which helps to improve the quality of life of rural residents and prevent out-migration to urban areas [5-7].

The relevance of our study is due to the high importance of sheep breeding in the agricultural sector of the Republic of Kazakhstan. This industry provides the production of meat, wool, leather and other demanded products, which have a stable demand both in domestic and foreign markets. However, for sustainable development of sheep breeding it is necessary not only to preserve the existing gene pool, but also to ensure its rational use and improvement. Changes in climatic conditions, growing requirements for product quality and high competition in the market require the use of modern approaches in breeding and stock management [8-11].

Modern methods of molecular genetic analysis and breeding and technological approaches open new opportunities for the formation of highly productive sheep genotypes with high adaptability, productivity and resistance to unfavorable environmental factors. Of particular importance is the study of the domestic gene pool in combination with the use of the best breeding material, which allows integrating the best characteristics of breeds in new genotypes [12-17].

The aim of the research is to develop and apply modern breeding-technological and molecular-genetic methods to improve genetic resources of sheep of different productivity directions.

Materials and methods of research. Experimental work was carried out in base farms: LLP «PF «Ak Bas-Pavlodar» of Pavlodar region, PF «Ardak» of Aqquly district, PF «Birlik» of Aqquly district of Pavlodar region, PF «Bepen» of Beskaragai district of Abay region.

At the first stage of the research experimental and control groups of sheep of meat-fat breeds were formed for further formation of new highly productive genotypes of sheep of different directions of productivity. The use of linear rams-producers was envisaged for the Kazakh fat-rumped semi-coarse wool breed in order to consolidate breed traits, as well as to increase adaptation and productive characteristics.

At the next stage, the class composition of sheep in the base farms was analyzed. For this purpose, standard methods of zootechnical control were used, including exterior inspection, control

weighing and recording of breed characteristics according to established standards. Based on the data, the structure of the livestock in terms of classes was formed and the quality of breeding work was assessed.

The study of sheep productivity was determined by weighing the live weight and by the results of shearing the wool of the autumn woolcut.

Evaluation of reproductive qualities included the study of such indicators as fertility of ewes (number of lambs per 100 ewes), survival rate of lambs before weaning (in %). In the farms on the Kazakh fat-rumped semi-coarse wool breed, a control group was formed, which included (non-linear animals) and an experimental group (linear animals).

The structure and class composition of the sheep stock were studied according to the IAS database, logs and other accounting documents. Statistical processing of data was carried out using Jamuvi software and standard MS Office package.

Results and discussions. Pedigree accounting is one of the most important elements of livestock farm management, providing an opportunity for effective breeding and pedigree work, especially in the breeding of such breeds of sheep as Kazakh fat-rumped coarse wool sheep and Kazakh fat-rumped semi-coarse wool sheep. These breeds are characterized by high adaptability to severe climatic conditions and are in demand in different regions of the country. The main objective of breeding records is to preserve and improve the genetic potential of the herd, increase animal productivity, and prevent degeneration of breeds (Table 1).

Table 1 – Breed-class composition of sheep, 2024.

Age group	n, heads	Elite		I class		II class	
		n	%	n	%	n	%
PF «Bepen»							
Producing sheep	20	20	100	–	–	–	–
Sheepfolds	686	380	55	210	31	96	14
Lambchops	149	115	77	34	23	–	–
Ewe-lamb	174	135	78	39	22	–	–
Total	1 029	650	63	283	28	96	9
PF «Birlik»							
Producing sheep	16	16	100	–	–	–	–
Sheepfolds	550	320	58	180	33	50	9
Lambchops	240	180	75	60	25	–	–
Ewe-lamb	220	152	69	68	31	–	–
Total	1 026	668	65	308	30	50	5
LLP «PF «Ak Bas-Pavlodar»							
Producing sheep	67	67	100	–	–	–	–
Sheepfolds	832	521	63	250	30	62	7
Lambchops 1,5 years	566	396	70	170	30	–	–
Ewe-lamb 1,5 years	974	504	50	389	40	81	10
Total	2 439	1 488	61	809	33	143	6
PF «Ardak»							
Producing sheep	44	44	100	–	–	–	–
Sheepfolds	977	650	66	241	25	86	9
Lambchops1.5 years	123	93	76	30	24	–	–
Ewe-lamb 1,5 years	362	205	57	125	34	32	9
Total	1 506	992	66	396	26	118	8

The analysis of breed and class composition of sheep in farm «Bepen» and farm «Birlik» shows a high enough level of selection work in both farms. In farm «Bepen» the share of elite animals among

rams-producers reaches 100%, which indicates a strict approach to the selection of producers. Among sheepfolds 55 % are categorized as elite, 31 % - to I class, and 14 % - to II class. The high proportion of elite among the young stock (77 % in rams and 78 % in ewes) indicates successful reproduction and a high level of genetic potential of the flock. In general, the percentage of animals classified as elite on the farm is 63%, which is a good indicator.

In farm «Birlik» there is also a high level of breeding work. All rams-producers (100 %) belong to the elite class. Among sheepfolds 58 % are classified as elite, 33 % - as I class, and only 9 % belong to II class, which demonstrates small reserves for improvement. The number of young stock of elite class is 75 % in rams and 69 % in ewe-lambs, which is slightly lower than in farm «Bepen», but still confirms quality breeding work. The total level of elite class in the farm is 65%, which exceeds the indicators of farm «Bepen».

Sheep of I class are higher in farm «Birlik» (30% against 28% in farm «Bepen»), which indicates a good overall level of flock productivity in both farms.

Studies on sheep of Kazakh fat-rumped coarse-wool sheep breed were conducted in LLP «PF «Ak Bas-Pavlodar» and KH «Ardak» of Pavlodar region, where the total number of sheep is 3.9 thousand heads, including ewes - 1.8 thousand heads.

In «Ak Bas-Pavlodar» LLP the number of elite animals among rams-producers is 100 % that testifies to strict approach of selection of producers. The number of elite class ewes reaches 63 %, I class - 30 %, with a small share of II class (7 %), which indicates a high level of work with the main breeding stock. The number of young stock is elite class 70 % among lambs and 50 % among shearlings, which reflects the stable quality of breeding work.

In farm «Ardak» all rams-producers belong to the elite class (100%), which corresponds to strict selection criteria. Among sheepfolds 66 % are referred to elite class, to I class - 25 %, to II class - 9 %, which confirms quality work with breeding stock. Young stock shows a high level of eliteness: 76 % among lambs and 57 % among sheep. The overall level of desirable type on the farm reaches 66 %, and I class - 26 %, which reflects the stability of the herd.

In general, the percentage of animals referred to the elite class on the farm «Ak Bas-Pavlodar» LLP is 61% and in «Ardak» farm - 66%, which is a good indicator. The analysis of breed and class composition of sheep in «Ak Bas-Pavlodar» LLP and «Ardak» farm demonstrates high indicators of breeding work in both farms.

Thus, both farms demonstrate a high level of breeding work, a minimum share of class II animals and significant genetic potential. To further increase productivity, it is recommended to strengthen the work on increasing the share of elite sheep and transition of animals from class I to the elite category. This will improve the reproductive and productive performance of the flock. The data on reproductive qualities of sheep sows of Kazakh fat-rumped coarse-wooled and Kazakh fat-rumped semi-coarse-wooled breeds are presented in Diagram 1.

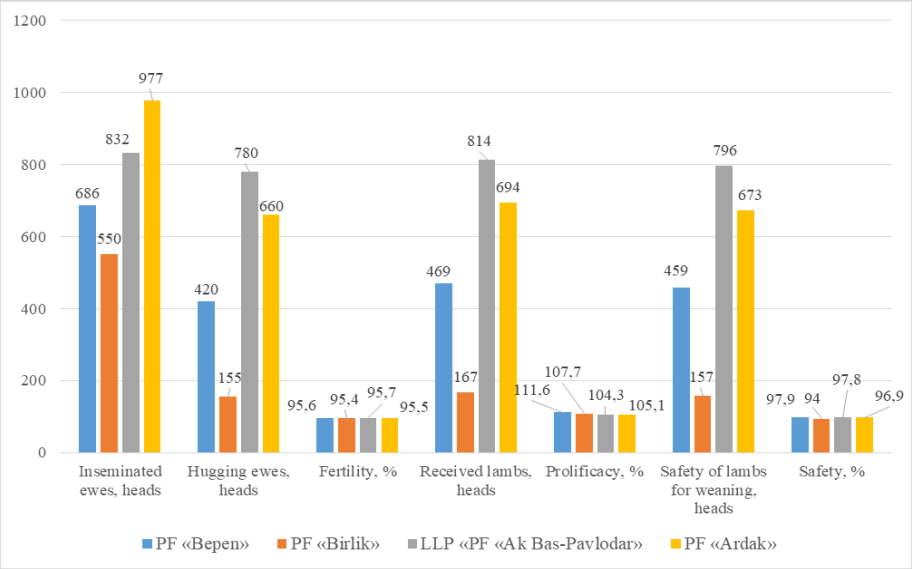

Diagram 1 – Reproductive qualities of sheep

The analysis of reproductive indicators in farms engaged in breeding of Kazakh semi-coarse wool sheep breed shows high results. In farm «Bepen» 686 ewes were inseminated, 420 of which were born, which gives fertilization rate of 95,6 %. In farm «Birlik» 550 ewes were inseminated, of which 155 were rotted, with fertilization rate of 95,4 %. Fecundity in farm «Bepen» amounted to 111,6 %, which is 3,9 % higher than in farm «Birlik» (107,7 %). Safety of lambs to weaning in farm «Bepen» amounted to 97,9 %, which is 3,9 % higher than in farm «Birlik» (94,0 %). These data confirm higher efficiency of reproduction in farm «Bepen», which is due to more favorable conditions of housing and feeding, as well as more improved methods of breed improvement. However, the best indicators of fertility and safety were noted in «Bepen» farm, which may be due to the optimal conditions of keeping breeding stock. «Birlik» farm requires additional analysis of the factors affecting the relatively low level of lamb safety (94,0 %) to develop measures to improve it. To further improve reproductive performance, it is advisable to conduct an in-depth analysis of the factors of housing, feeding and veterinary care in each farm.

In «Ak Bas-Pavlodar» LLP out of 832 inseminated uteruses 780 were born, which provides the level of fertilizability of 95,7 %. In farm «Ardak» 977 ewes were inseminated, of which 660 were declawed, with the fertilization rate of 95.5 %. Fecundity in farm «Ak Bas-Pavlodar» amounted to 104,3 %, in farm «Ardak» – 105,1 %. Safety of lambs in «Ak Bas-Pavlodar» LLP is 97,8 %, and in «Ardak» farm – 96,9 %. The results confirm the high level of reproduction in both farms.

The general of the main tasks of selection and breeding work in sheep breeding is the skillful use of the existing genetic diversity of sheep breeds. The rich gene pool of sheep breeding of any direction of productivity creates wide opportunities for improvement of existing and creation of new highly productive breeds, well combining the most valuable economically useful features with adaptability of animals to different natural and climatic conditions of a huge country and systems of conducting the industry.

The effectiveness of selection and breeding work to improve the productive and pedigree qualities of animals, first of all, depends on the quality of the main rams and ewes used. Animal weight most fully reflects the process of growth and development in different periods of its life. Productivity of an animal, especially meatiness and wool shearing, depends on its size, as other things being equal, there is a positive correlation between these indicators [18-20].

At the same time, the change of live weight in sheep by age periods in different breeds is not the same: fast-ripening animals have the ability to develop quickly and reach a higher live weight at an earlier age. Analysis of live weight and wool cut of Kazakh fat-rumped semi-coarse-wool sheep and Kazakh fat-rumped coarse-wool breeds of different sex and age groups (Table 2).

Table 2 – Live weight and wool shearing by gender and age groups of sheep

The breed	Age group	n	Live weight, kg	Wool shearing, kg
1	2	3	4	5
PF «Bepen»				
Kazakh fat-rumped semi-coarse-wool breed	Adult rams	30	95,5± 0,68	3,8 ±0,16
	Lambchops	20	63,5 ±1,16	2.95 ±0,74
	Adult sheep females	100	65,5 ±0,27	2.6 ±0,17
	Ewe-lambs	100	50,5 ± 1,61	2,2± 0,07
PF «Birlik»				
Kazakh fat-rumped semi-coarse-wool breed	Adult rams	30	94,5± 0,70	3,3 ±0,14
	Lambchops	20	61,4 ±0,76	1,7 ±0,23
	Adult sheep females	100	66,3 ±0,33	2,1 ±0,05
	Ewe-lambs	100	48,6 ±0,21	1,4 ± 0,06
LLP PF «Ak Bas-Pavlodar»				

1	2	3	4	5
Kazakh fat-rumped coarse-wool breed	Adult rams	30	93,5± 0,50	3,2 ±0,15
	Lambchops	20	61,4 ±0,52	1,8 ±0,65
	Adult sheep females	100	65,3 ±0,22	2,2 ±0,07
	Ewe-lambs	100	50,0 ±0,11	1,5 ± 0,05
PF «Ardak»				
Kazakh fat-rumped coarse-wool breed	Adult rams	30	93,5± 0,43	3,2 ±0,12
	Lambchops	20	61,4 ±0,36	1,8 ±0,47
	Adult sheep females	100	65,3 ±0,11	2,2 ±0,10
	Ewe-lambs	100	50,0 ±0,13	1,5 ± 0,07

As can be seen from Table 2, rams-producers of Kazakh fat-rumped semi-coarse wool breed, selected in the selection group exceed the minimum indicators of the breed standard for animals of elite class by 5,5 kg or by 6,1% in live weight, and by 0,3 kg or by 8,6 % in wool cutting. Ewes assigned to the breeding group exceeded the standard in live weight by 5,5 kg or 9,1 %, and in wool shearing corresponded to the standard. Repair lambs exceeded the minimum indicators of the standard elite animals in live weight by 3,5 kg or by 5,8 %, and in wool shearing – by 0,15 kg or by 5,4 %. At the same time, the ewe-lambs were inferior in live weight to the breed standard by 0,5 kg or by 1,0 %. Significant superiority of rams-producers and repair rams both in live weight and wool shearing over the standard should be explained by the fact that the selection of rams is more rigorous, as well as by better forage conditions than those of yaks.

To study the productive qualities of sheep of experimental and control groups, we studied the productivity indicators taking into account the lineage. Productivity indicators of rams-producers taking into account the lineage are presented in Table 3.

Table 3 – Productivity indicators of rams-producers with regard to lineage

Farms	Breed	Group	Ram-producers				
			n	Live weight, kg		Wool cutting, kg	
				M±m	Cv,%	M±m	Cv, %
PF «Bepen»	KSCW	control	6	90±0,25	0,70	3,8 ±025	1,31
	KSCW	experienced	4	98,2±0,25	0,50	3,5±0,021	2,28

The analysis of Table 3 shows the influence of breeding methods on productive parameters of rams-producers of Kazakh semi-coarse wool breed in farm «Bepen».

In the control group (non-linear breeding), the average live weight of rams is 90 kg, with minimal variability (Cv 0,70 %), indicating high homogeneity of indicators. Wool cutting in this group reaches 3,8 kg with a low coefficient of variation (Cv 1,31 %), which reflects the stability of productivity.

In the experimental group (linear breeding), live weight increases to 98,2 kg and variability decreases to 0,50 %, which emphasizes the effectiveness of linear breeding in increasing the homogeneity of animals for this trait. However, wool cutting decreases to 3,5 kg, with the coefficient of variation increasing to 2,28 %, which may be due to the influence of genetic factors or housing conditions.

Thus, linear breeding provides a significant increase in live weight of rams-producers while maintaining low variability, but leads to a decrease in wool shearing with an increase in its variability, which requires further analysis to optimize breeding work.

Conclusion. As a result of the study, significant results aimed at improving the genetic resources of sheep and increasing their productivity were achieved. Modern methods of breeding work were successfully introduced in four base farms, which allowed to achieve a high level of breeding control. According to the conducted analysis, the number of elite animals in the farms amounted to

61–66 %, and the number of I class animals – 26–33 %. These indicators demonstrate a high level of breeding work and significant genetic potential of the study population.

Reproductive qualities of sheep also showed positive dynamics. Fertility of ewes amounted to 95,4–95,7 %, fertility varied from 104,3 % to 111,6 %, and safety of lambs to weaning reached 97,9 %. These indicators confirm the success of reproductive ability and high quality of care of young stock in the base farms.

Ram producers and replacement rams of the Kazakh fat-tailed semi-coarse wool breed significantly exceed the breed's minimum standards for live weight and wool shearing. Ewes exceed the standard for live weight and meet the standard for wool, but the ewe lambs slightly lag behind in live weight. These results emphasize the importance of a rigorous approach to selection and feeding to achieve high breeding performance.

Productive indices of sheep confirmed the efficiency of the applied selection methods. The average live weight of rams-producers amounted to 90–98 kg, sheep females – 58–65 kg and wool cutting varied from 2,0 to 3,5 kg. Line breeding methods allowed not only to improve productive performance, but also to increase the homogeneity of the flock, which is especially important for further breeding.

The research results were used to develop plans of breeding and pedigree work, which include the formation of new highly productive genotypes of sheep of different productivity directions using the potential of domestic and foreign gene pool for approbation of new breeding achievements.

Thus, the conducted work confirms the effectiveness of the developed selection and technological approaches. The obtained data not only demonstrate high productivity and adaptability of the studied animals, but also open new opportunities for further development of sheep breeding in Kazakhstan. The use of research results in the practice of basic farms contributes to the improvement of quality indicators of products and increasing the competitiveness of the industry at the national and international levels.

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ТҮЙІН

Қой көптеген құнды биологиялық және конституционалдық ерекшеліктерінің және жоғары бейімделу қабілетінің арқасында әлемде ең көп тараған ауыл шаруашылығы жануарларының түріне жатады. Құйрықты қойлар саны жағынан елдегі алғашқы орындардың бірін алады. Олардың негізгі бөлігі Абай және Павлодар облыстарының жартылай шөлейтті, шөлейтті және құрғақ далалық алқаптарында өсіріледі.

Зерттеу жұмысының өзектілігі Қазақстан Республикасының аграрлық секторында қой шаруашылығының жоғары маңыздылығымен байланысты. Бұл сала ет, жүн, тері және басқа да сұранысқа ие өнімдер өндірісін қамтамасыз етеді, олар ішкі және сыртқы нарықтарда тұрақты сұранысқа ие. Алайда, қой шаруашылығының тұрақты дамуы үшін тек қолданыстағы геноқорды сақтау ғана емес, оны рационалды пайдалану мен жетілдіруді қамтамасыз ету де қажет. Климаттық өзгерістер, өнім сапасына деген жоғары талаптар мен нарықтағы жоғары бәсекелестік селекция және мал басын басқаруда заманауи тәсілдерді қолдануды талап етеді.

Зерттеу жұмысының мақсаты әртүрлі өнімділік бағытындағы қойлардың генетикалық ресурстарын жетілдіру үшін заманауи селекциялық-технологиялық және молекулалық-генетикалық әдістерді әзірлеу және қолдану болып табылады.

Зерттеу нәтижелері селекциялық-асыл тұқымдық жұмыс жоспарын әзірлеу үшін пайдаланылды, олар отандық және шетелдік генофонд әлеуетін пайдалана отырып, өнімділік бағыттарының әртүрлі жаңа жоғары өнімді генотиптерін қалыптастыруды, жаңа селекциялық жетістіктерді апробациялауды қамтиды.

Осылайша, жүргізілген жұмыс әзірленген селекциялық-технологиялық тәсілдердің тиімділігін растайды. Алынған деректер зерттелген жануарлардың жоғары өнімділігін және бейімделу қабілетін ғана емес, сонымен қатар Қазақстандағы қой шаруашылығын одан әрі

дамыту үшін жаңа мүмкіндіктер ашады. Зерттеу нәтижелерін негізгі шаруашылықтардың тәжірибесіне енгізу өнім сапасының көрсеткіштерін жақсартуға және саланың ұлттық және халықаралық деңгейде бәсекеге қабілеттілігін арттыруға ықпал етеді.

РЕЗЮМЕ

Овцы являются наиболее распространенным на земном шаре видом сельскохозяйственных животных благодаря многим ценным биологическим и конституциональным особенностям, прежде всего высокой адаптивной способности. Курдючные овцы по численности поголовья занимают одно из первых мест в стране. Основная масса их распространена в полупустынной, пустынной и сухостепной зонах Абайской и Павлодарской областей.

Актуальность нашего исследования обусловлена высокой значимостью овцеводства в аграрном секторе Республики Казахстан. Эта отрасль обеспечивает производство мяса, шерсти, кожи и других востребованных продуктов, которые имеют стабильный спрос как на внутреннем, так и на внешнем рынках. Однако для устойчивого развития овцеводства необходимо не только сохранить существующий генофонд, но и обеспечить его рациональное использование и совершенствование. Изменения климатических условий, растущие требования к качеству продукции и высокая конкуренция на рынке требуют применения современных подходов в селекции и управлении поголовьем.

Цель исследования заключается в разработке и применении современных селекционно-технологических и молекулярно-генетических методов для совершенствования генетических ресурсов овец разных направлений продуктивности.

Результаты исследований были использованы для разработки планов селекционно-племенной работы, которые включают формирование новых высокопродуктивных генотипов овец разных направлений продуктивности с использованием потенциала отечественного и зарубежного генофонда для апробации новых селекционных достижений.

Таким образом, проведенная работа подтверждает эффективность разработанных селекционно-технологических подходов. Полученные данные не только демонстрируют высокую продуктивность и адаптивность исследуемых животных, но и открывают новые возможности для дальнейшего развития овцеводства в Казахстане. Использование результатов исследования в практике базовых хозяйств способствует улучшению качественных показателей продукции и повышению конкурентоспособности отрасли на национальном и международном уровнях.

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CONTENT

ANIMAL HUSBANDR

Rules for authors on the design of an article for publication

Scientific and practical journal «Ğylym jäne bilim» is a periodical of the West Kazakhstan Agrarian and Technical University named after Zhangir Khan K. The journal is published kuarterly and articles are published in Kazakh, Russian and English languages. The journal publishes scientific works on actual problems of fundamental and applied researches in the field of agricultural, veterinary, biological, technical, economic and socio-humanitarian sciences.

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