



**Cuiavian University in Wloclawek  
Institute of Irrigated Agriculture  
of the National Academy of Agrarian Sciences of Ukraine**

**SCIENTIFIC DEVELOPMENTS OF UKRAINE  
AND EU IN THE AREA OF NATURAL SCIENCES**

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## METHODOLOGICAL FUNDAMENTALS OF THE CREATION OF SPECIALIZED MEAT BRANCH IN SHEEP BREEDING OF THE DNIPRO REGION

Pokhyl V. I., Mykolaichuk L. P.

### INTRODUCTION

From the beginning of the millennium, both the economic environment and priorities of manufacturing of food and agricultural goods have changed in many developed countries of the world. All of those things have the relevant consequences for the world agricultural sector, and the current situation influences the operation of agrarian formations of different subordination in Ukraine as well.

The global markets selling food and agricultural goods are in rapid evolution, however, the escalation of international commodity prices for the product of this category is on an upward trend.

At the same time, to the extent of economic development of multiple countries and simultaneous increase of the national income, there is an expansion of consumption of high-protein food products of animal origin<sup>1</sup> that is principally manifested in a growing trend of eating the meat of different types and forms. Besides, sheep breeding as an element of the livestock section keeps producing of such forms of organic raw materials like wool, milk<sup>2</sup>, thus enhancement of its effectiveness is one of the foreground tasks of the agrarian sector of the economy of many countries<sup>3</sup>.

Ukraine is at the stage of transformational advancement of the market economy and one of the major exporters of many important agricultural goods, the main of which are wheat, corn, sunflower seeds. Moreover, taking into account the congestion of European market producing beef, pork, chicken meat, Ukrainian manufacturers can become chief players in the market relations in the part of lamb and mutton.

Nowadays, a full supply of the population with meat, as the most abundant source of the native protein, is the most urgent and hard nut to crack in the global economy. Both the international and domestic experience furnish convincing proof that in the current context, this problem can't be solved

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<sup>1</sup> Катаманов С.Г., Катаманов Ю.Г., Селькин И.И. Результаты скрещивания овец алтайской породы с австралийскими и маньчжским мериносами. *Овцы, козы, шерстяное дело*. 2002. № 1. С. 44–46.

<sup>2</sup> Котарев В.И. Ерохин С.А. Овцеводство. Воронеж : ФГБОУ ВПО Воронежский ГАУ, 2014. 450 с.

<sup>3</sup> Туринський В.М., Антонік І.І., Бондаренко Г.П., Похил В.І. М'ясо-молочне вівчарство : підручник для студентів вищих навчальних закладів. Київ : Грамота, 2010. 412 с.

without cardinal reconstructing of some branches of animal husbandry, including sheep breeding which is undergoing significant changes<sup>4</sup>.

An economic situation at the market of products of the sheep industry inside the country, Ukraine's integration into the global market of agricultural goods need managing the issue concerning the improvement of its effectiveness. Considering the trends of using raw materials of the industry, reduced demand for wool, modern sheep breeding puts a great emphasis on the production of meat – lamb and mutton.

Specialization of sheep breeding in the production of lamb and mutton requires the availability of breeds and types of animals which are characterized by a high meat and milk productivity, prematurity and positive combinative capacity of productive features<sup>5</sup> against the background of prolificacy and viability. The breeds having intensive level of meat and meat-wool productivity whose dominant feature is prematurity fully meet the above requirements<sup>6</sup>.

Thus, the establishment of specialized branch of sheep breeding in Ukraine can be the outset of renewal of the industry which is based on favourable climate and environmental conditions and has long-standing national traditions of its management, mentality and economic experience of the population, diversity and high liquidity of obtained products as well as the interest of European and Asian countries in this organic production that subsequently will guarantee additional creation of workplaces in the agrarian sector of the Ukrainian economy.

### **1. Justification of the need to create specialized meet branch in sheep breeding**

According to the UN data, in the recent century, the population of the world has raised fourfold, and the average annual increase of output doesn't surpass 1%. The volume of increase of output from crop and livestock production, which provides the population with food products, is a much lower than the population growth, thus, one can confirm a substantial deficit of food products<sup>7</sup>.

Under modern economic conditions, the key element which adds to marketability of different branches of animal husbandry is the scale-up of various products for the population and processing industry. In this regard,

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<sup>4</sup> Похил В.І., Завийборода Д.І., Косякіна О.М. Сучасні завдання вівчарства Придніпров'я. *Тваринництво України*. 2012. № 3. С. 2–3.

<sup>5</sup> Аюпов И.Н., Сивков А.И., Аюпов Н.И., Вавилова Н.И. Эффективность скрещивания волгоградских маток с баранами северокавказской породы. *Овцы, козы, шерстяное дело*. 2012. № 4. С. 20–22.

<sup>6</sup> Похил В.І., Миколайчук Л.П. М'ясна продуктивність молодняку овець різного походження. *Theoretical and Applied Veterinary Medicine*. 2020 № 8 (1). С. 26–30. DOI: 10.32819/2020.81005.

<sup>7</sup> Абонеев В.В., Омаров А.А. Результаты скрещивания северокавказских маток с баранами разного направления продуктивности. *Овцы, козы, шерстяное дело*. 2012. № 2. С. 21–24.

the role of sheep breeding – the primary focus of which is the production of lamb – raises<sup>8</sup>.

Over the independent years of Ukraine, the unfavourable prevalent situation in the agricultural sector and sheep breeding as a whole has related to its poor adaptability to the environment of the world economy. There has been a decline in the production of outputs which is caused, on the one hand, by the non-conformity of price parity of raw materials, the livestock reduction and, on the other hand, downfall of production indicators.

If in the past, the key element for the development of sheep breeding in the classic sense was the meeting of domestic needs for the fine merino and cross-bred wool, and the principal task of the present is to raise meat production<sup>9</sup> along with simultaneous improvement of its quality.

The above has led to the reduction of the overall number of sheep and manufacturing of the relevant products, including mutton and lamb, however, as known, it occupies a particular niche in the overall meat balance and sometimes takes pride of place in catering services, taking into account the national traditions. None manufacturer can improve such a situation solely through fine- and semi-fine wool meat breeds using exclusively feeding livestock. As a result, the country has an overdue change to create specialized meat sheep breeding<sup>10</sup>.

Until recent times, the production of lamb and mutton in Ukraine has been based on the use of fattening young stock of fine-wool and semi-fine wool breeds of sheep and cull reproductive livestock on the level of process performance. The use of sheep of the relevant groups of productivity for the production of meat has never been treated as the priority because their primary function is to produce wool, sheepskin, and it is challenging to maintain selection following wool productivity and meat qualities.

Nowadays, the production of mutton is principally grounded on the slaughter of young sheep up to one year old. The expedience of slaughter of lambs in the birth year is conditioned by the fact that during this period, feed for the manufacturing of a production unit is used more effectively, and meat products are characterized by a high quality. In the early 8 months of lamb life, the most intensive deposition of the best cost part of the meat – animal protein – results<sup>11</sup>. In later years, the development of bone tissue and fat deposition ensures the gain in the live weight of sheep that strengthens its

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<sup>8</sup> Туринський В.М., Похил В.І., Похил О.М. Особливості заводського типу овець ТОВ «Шаролезька вівця» *Науковий вісник Національного університету біоресурсів і природовикористання України*. 2014. Вип. 190. С. 309–314.

<sup>9</sup> Похил В.І., Гончаров А.О. Особливості росту і розвитку молодняку інтенсивних генотипів різного походження. *Науковий вісник «Асканія Нова»*. 2012. Вип. 5. С. 164–170.

<sup>10</sup> Лисицин А.Б., Лушников В.П. Производство и переработка баранины. Саратов : ИЦ «Наука», 2008. 418 с.

<sup>11</sup> Бірта Г.О., Бургу Ю.Г. Товарознавство м'яса : навчальний посібник. Київ : Центр учбової літератури, 2011. 164 с.

morphological composition, reduces the biological value of the meat and economic effectiveness its production in general.

Taking into account the advantages of meat sheep breeding over other branches of animal husbandry, it should be emphasized this one is the most economical from the standpoint of energetic disbursements, and lamb and mutton of sheep of meat productivity is the less energy-consuming that is of fundamental importance in the context of the exacerbation of crisis in the world.

Sheep of this type of productivity has a higher growing capacity, feed efficiency and slaughter output, and carcass mass is greater than a live weight of reproductive livestock of sheep of karakul and woolskin breeds. The carcasses of these animals have less bones and tendons – cuts are more well-fleshed (heavier)<sup>12</sup> with an optimal correlation of protein and fat, and minerals have a light form for absorption. In the total mass of fat, its equal distribution on the top of carcass and intermuscular space prevails that contributes to the general cooking and eating qualities of meat<sup>13</sup>. And sheep of wool, milk, karakul type of productivity have a distinctive maldistribution of fat across the organs and tissues of carcasses.

At the same time, it is worth highlighting that in the context of heavy dependence on imports, Ukraine is carrying out significant work on improving genetic resources and extending reproductive base of advanced meat breeds of sheep.

The time requires trending pickup of meat sheep breeding in the country. We have to switch this branch to the intensive development methods to increase the production of a high-quality mutton in the coming years at little expenditure of labour and resources. In this regard, the vast experience of the farms of Europe, the USA, New Zealand and Australia deserves special attention. The better half of animals of specialized meat and meat-type breeds prevails in animal husbandry of the above countries over the number of milk-type ones.

The evolution of this branch in the European countries is being implemented through general increase of sheep of meat direction of productivity by creating promising breeds and types and, at the same time, the long-term programmes, which provide for the establishment of high-efficient bands of ewes using selection methods, are simultaneously being adopted.

Over the past 30 – 40 years, the world practice of development of meat sheep breeding has confirmed a rapid growth of breed-forming processes. In

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<sup>12</sup> Ponnampalam E.N., Butler K.L., Hopkins D.L., Kerr M.G., Dunshea F.R., Warner R.D. Genotype and age effects on sheep meat production. 5. Lean meat and fat content in the carcasses of Australian sheep genotypes at 20-, 30- and 40-kg carcass weights. *Australian Journal of Experimental Agriculture*. 2008. No. 48 (7). 893 p. DOI:10.1071/ea08054.

<sup>13</sup> Stolc L., Ptacek M., Stadnik L., Lux M. Effect of selected factors on basic reproduction, growth and carcass traits and meat production in Texel sheep. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*. 2011. № 59 (5). P. 247–252. DOI: 10.11118/actaun201159050247.

this context, as a rule, one uses a complex reproductive crossing with the use of two – three and more breeds of sheep of meat-wool and meat direction of productivity<sup>14</sup>, or exclusively meat, which mutually complement and enrich heredity of the obtained crossbreeds.

The global experience speaks volumes about the fact that one type of meat sheep in the country can't be similarly successful in all cases. The availability of a rich breed pool makes it possible to bring genetic resources in line with the demands of time at an accelerating pace. This stipulates a need for the rational use of not only national but also international genetic resources for rapid improvement of existing and fast development of new breeds and types of sheep of meat direction of productivity.

The most effective way for the formation of large arrays of high-productive sheep of meat direction in Ukraine is the crossing of reproductive livestock of aboriginal breeds with breeding rams of specialized meat directions, which combine productive features of an improving breed along with the adaptability to the local agroecological and climate conditions<sup>15</sup>. In such a way, a great number of the principal meat breeds of sheep is developed around the globe. This scheme of selection process permits extending export of breeding rams of specialized meat breeds to Ukraine and hastening a process of creating new intensive meat types with the use of a quiet large number of band of ewes of aboriginal breeds during breed-crossing. The mentioned way of the formation of specialized genotypes also makes it possible to reduce challenges<sup>16</sup> caused by the acclimatization and adaptation of imported livestock.

According to the authors' profound conviction, one of the reasonable ways for enhancing economic effectiveness of sheep breeding in the Dnipro region is the quantity input of sheep of specialized meat direction which contributes to the enhancement of manufacture of meat products.

In Dnipropetrovsk region (Ukraine) there are breeds of sheep which are well-adapted to modern production conditions: Asksnian fine-fleece breed; Asksnian meat-wool (AMW), Prydniprovsk meat (PM), Asksnian crossbred, Precoce, Suffolk, Merinolandschaf, Romanov, Hisor<sup>17</sup>. Different farms get two- and three-cross-breeds with clean and mixed wool in terms of tint and colour, which are marked by excellent meat qualities.

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<sup>14</sup> Гальцев Ю.И., Шохин В.И., Верзилен В.В. Результаты переменного скрещивания тонкорунных овец в Нижнем Поволжье. *Овцы, козы, шерстяное дело*. 2002. № 4. С. 24–26.

<sup>15</sup> Hernandez-Cruz L., Ramirez-Briebiesca J.E., Guerrero-Legarreta M.I., Hernandez-Mendo O., Crosby-Galvan M.M., Hernandez-Calva L.M. Effects of crossbreeding on carcass and meat quality of Mexican lambs. *Arquivo Brasileiro de Medicina Veterinária e Zootecnia*. 2009. No. 61 (2). P. 475–483. DOI: 10.1590/s0102-09352009000200027.

<sup>16</sup> Похил В.І., Похил О.М., Лінський О.В., Голинська О.В. Промислове схрещування у вівчарстві. *Науковий вісник НУБіП України. Серія «Технологія виробництва і переробки продукції тваринництва»*. 2018. С. 148–157.

<sup>17</sup> Похил В.І., Гончар А.О., Лесновська О.В. Використання м'ясних інтенсивних порід овець в зоні Придніпров'я. *Тваринництво України*. 2011. № 11.



To improve the meat qualities of aboriginal breeds of sheep in the Dnipro region, manufacturers have been carrying out the industrial cross-breeding where stud rams of the above breeds are involved to the full extent. The crossbred young livestock is characterized by good meat qualities depending on the origin.

As a rule, hybrid animals which are the result of such breeding, due to heterosis effect, have higher indicators of meatiness than purebred peers. At the same time, crossbred livestock grows up more intensively, and their live weight exceeds by 3 – 10%. Under external features, crossbred young stock of different origin differs by a wider and low barrel with well-developed coupling and more evident meat forms than maternal breeds have. Carcasses of crossbreeds compared to purebred peers of maternal breeds involve a high output of top-grade cuts and have a better development of lean tissue in humeroscapular section, back and coxal zone<sup>18</sup>.

It is beyond argument that domestic meat sheep breeding can't achieve a dominant position in the industrial manufacturing of mutton in the near future. However, in the context of a gradual and full meeting of the public needs for meat, a demand for quality product will raise, and the very meat sheep breeding can contribute to it. For the present and the future, ones have to resolve the issue of speeding up the process of establishment of meat sheep breeding through developing domestic meat breeds of sheep, further study and use of their biological and household characteristics and extension of the breeding base. The above substantially will strengthen state food security and improve nutrition of the Ukrainian people.

Consequently, food demands require and climate, economic and social conditions confirm that Ukraine has a long-felt need to establish meat sheep breeding as an independent branch, which will be in progress in parallel with others. The solution of the assigned task calls for a unified methodological approach to the development of zonal types of sheep of meat direction of productivity for their further use in the combined selection when creating meat direction within the industry. Keeping in mind the above, it becomes evident we have to deal with an extremely complex system which is a basis for the adoption of future programmes for breeding sheep of meat direction in Ukraine.

## **2. The use of cross-breeding for improving meat productivity of sheep**

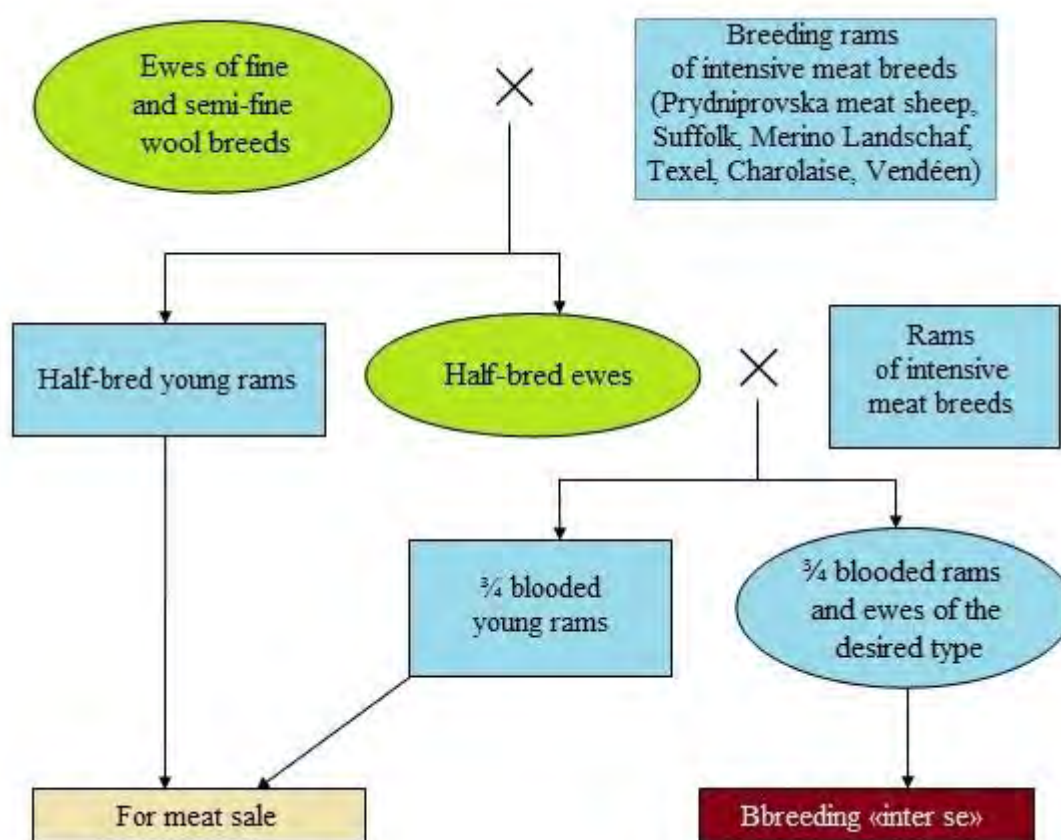
The interest in the production of meat for processing and green, high-calorie, low-cholesterol food products for the population encourages many manufacturers to import sheep livestock, which has a substantial potential of meat productivity, but these breeds are not adapted to new agroecological

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<sup>18</sup> Похил В.І., Лесновська О.В. Особливості росту і розвитку овець різних м'ясних генотипів. *Тваринництво України*. 2013. № 11. С. 7–10.

conditions. Taking into account this point involving the fact that introduced livestock is characterized by a low adaptability in the context of purebred breeding<sup>19</sup>, to produce a high-quality mutton and advancement of profitability of the industry, it is necessary to use stud rams of meat direction during the industrial breeding with reproductive livestock of aboriginal breeds providing the relevant nutritive base<sup>20</sup>.

Depending on the purpose and assigned tasks regarding the development of livestock which is characterized by excellent meat qualities, simple (two-breeds) and complex (three-breeds) crossing is used in sheep breeding<sup>21</sup>. This technological operation should be implemented according to the following scheme (fig. 1).



**Fig. 1. The scheme of two-breeds industrial crossing with further consolidation of heredity**

<sup>19</sup> Селекція сільськогосподарських тварин / М.Б. Гопка та ін. ; за заг. ред. Ю.Ф. Мельника, В.П. Коваленка та А.М. Угнівенка. Київ, 2007. 580 с.

<sup>20</sup> Ульянов А.Н., Куликова А.Я. Селекційно-генетичні методи використання порід світового генофонду для створення нових генотипів м'ясних порід у вівчарстві. Краснодар, 2005. 36 с.

<sup>21</sup> Лэнд Р.Б., Робинсон Д.У. Генетика воспроизведения у овец. Москва : Агропромиздат, 1987. 455 с.

Ewes of the principal breed, which is a base for the industrial crossing, are divided into two parts. The better part (near 60% of livestock of ewes) should be kept in the context of pure-breeding<sup>22</sup> to obtain reproductive livestock for herd replacement, and less valuable part (40%) is crossed with stud rams of one of the improving intensive meat breeds.

Under two-breeds crossing of obtained crossbreeds (F<sub>1</sub>) after fattening or growing period of both young rams and young ewes, it is essential to sell them for meat in the first year of technological use.

Besides, to form the population with a higher level of meat productivity, half-bred reproductive livestock of ewes (F<sub>1</sub>) should be crossed with breeding rams of another line of improving parental breed that ensures the consolidation of heredity at the level of basic productive features. Ewes of the desirable type (<sup>3</sup>/<sub>4</sub> blooded) in terms of reproductive ability and meatiness should be further bred “inter se”. Half-bred and <sup>3</sup>/<sub>4</sub> full blood young rams of improving breeds are sold for meat.

Meat qualities of young stock of sheep depend on a bulk of factors, and such as genotype and paratype ones are principal. Numerous researches have established that offspring originated due to the industrial cross-breeding, as a rule, differ by higher quantitative indices of productivity. These changes should include not only absolute measures of mass of carcass and fat but also relative: morphological and breed composition.

Sheep of intensive meat type should combine excellent reproductivity, high meat, wool productivity and wool quality upon good adaptability to natural environment and climate and technological conditions of their growing. Based on two-breeds industrial crossing, the authors produce a great number of crossbreeds of Askanian meet-wool (AMW). Breeding rams of Texel, Olibs are used as improving breeds (table 1).

Table 1

**Live weight of young livestock**

Breed	Live weigh at birth, kg	90 days live weight, kg	120 days live weight, kg
AMW	4,12 ± 0,128	23,03 ± 0,485	26,8 ± 0,55
F <sub>1</sub> Texel	4,7 ± 0,29	27,5 ± 0,61	32,1 ± 0,73
F <sub>1</sub> Olibs	4,35 ± 0,154	27,11 ± 0,54	31,91 ± 0,618

When comparing dynamics of change of live weight in the postnatal period of keeping, it is established the predominance of crossbred livestock over purebred peers of AMW of the Texel breed – from 14.1% at birth to 19.4-19.8 % upon 90 and 120 days respectively.

<sup>22</sup> Pokhyl V.I., Mykolaychuk L.P. Methods of improvement of the meat productivity of sheep. *International Scientific Conference Scientific Development of New Eastern Europe*. Riga, Latvia. 2019. C. 107–110.

One can note such a tendency among the young stock of F<sub>1</sub> Olibs in relation to AMW peers. The predominance is from 5.6% to 19.1% depending on the development stage.

The studies of meat productivity of Romanov sheep<sup>23</sup> and their crossbreeds (F<sub>1</sub>) with the Hisor breed<sup>24</sup> is not only of economic importance, but they also spark interest<sup>25</sup> from a theoretical standpoint (table 2).

Table 2

**Slaughter characteristics of young rams under study, (n = 5)**

Indicator	$\bar{X} \pm S\bar{x}$	Cv, %
Romanov sheep		
Mass, kg		
– prior to slaughtering	32,2 ± 1,03	7,12
– slaughtering	14,1 ± 0,38	6,06
Output, %		
– slaughter	43,8	
crossbreeds F <sub>1</sub>		
Mass, kg		
– prior to slaughtering	41,6 ± 1,18	6,36
– slaughtering	19,7 ± 0,78	8,83
Output, %		
– slaughter	47,4	

The difference between live weight of young rams under study prior to slaughtering is 29.2% – crossbreed young livestock dominates purebred peers of Romanov breed.

The predominance of crossbreed young rams in terms of mass prior to slaughtering has probably influenced their slaughter characteristics compared to purebreds. Thus, in terms of slaughtering mass, crossbreed young rams dominate peers of a control group by 39.7%. Slaughter output of young rams of the control group is 43.8% that is less than peers' indicator by 3,6 %.

The average mass of cold carcasses of young rams is 18.4 kg that exceeds Romanov sheep by 40.4%. Carcasses of crossbreeds are larger and lengthier compared to the carcasses of peers of Romanov sheep.

To assess the quality of carcasses, the authors have carried out grade cutting and clearing of carcasses. These technological techniques make it

<sup>23</sup> Похил В.І., Миколайчук Л.П. Вікова мінливість вовнового покриву овець романівської породи. *Theoretical and Applied Veterinary Medicine*. 2019. № 7 (3). С. 172–176. DOI: 10.32819/2019.71031.

<sup>24</sup> Похил В.І., Миколайчук Л.П., Іжболдіна О.О. Особливості овчинної продуктивності овець різного походження. *Theoretical and Applied Veterinary Medicine*. 2020. № 8 (2). DOI: 10.32819/2020.

<sup>25</sup> Turkyilmaz D., Esenbuga N. Increasing the productivity of Morkaraman sheep through crossbreeding with prolific Romanov sheep under semi-intensive production systems. *South African Journal of Animal Science*. 2019. No. 49 (1). 185 p. DOI: 10.4314/sajas.v49i1.21.

possible to correlate meat and bones of a carcass (meatiness index) as well as its grade composition (table 3).

Table 3

**Grade composition of carcasses of young rams, (n = 5)**

Indicator	Unit measure	$\bar{X} \pm S\bar{x}$	Cv, %
Control group			
Carcass mass	kg	13,1 ± 0,45	7,65
I grade meat	%	91,60	
II grade meat	%	8,40	
Study group (crossbreeds)			
Carcass mass	kg	18,4 ± 0,61	7,34
I grade meat	%	94,57	
II grade meat	%	5,43	

When dividing a carcass into cuts, the authors obtain data in absolute and relative measures of meat of different grades according to DSTU. The carcass of crossbreed young rams includes 94.57% of cuts of the first grade, which is higher than a similar indicator of the purebred young livestock. The difference in I grade meat between genotypes is 45.0%.

Impartial quality assessment of mutton meat is the correlation of the number of meat and bones of a carcass, coefficient of meatiness (table 4).

Table 4

**Morphological composition of carcasses of young rams**

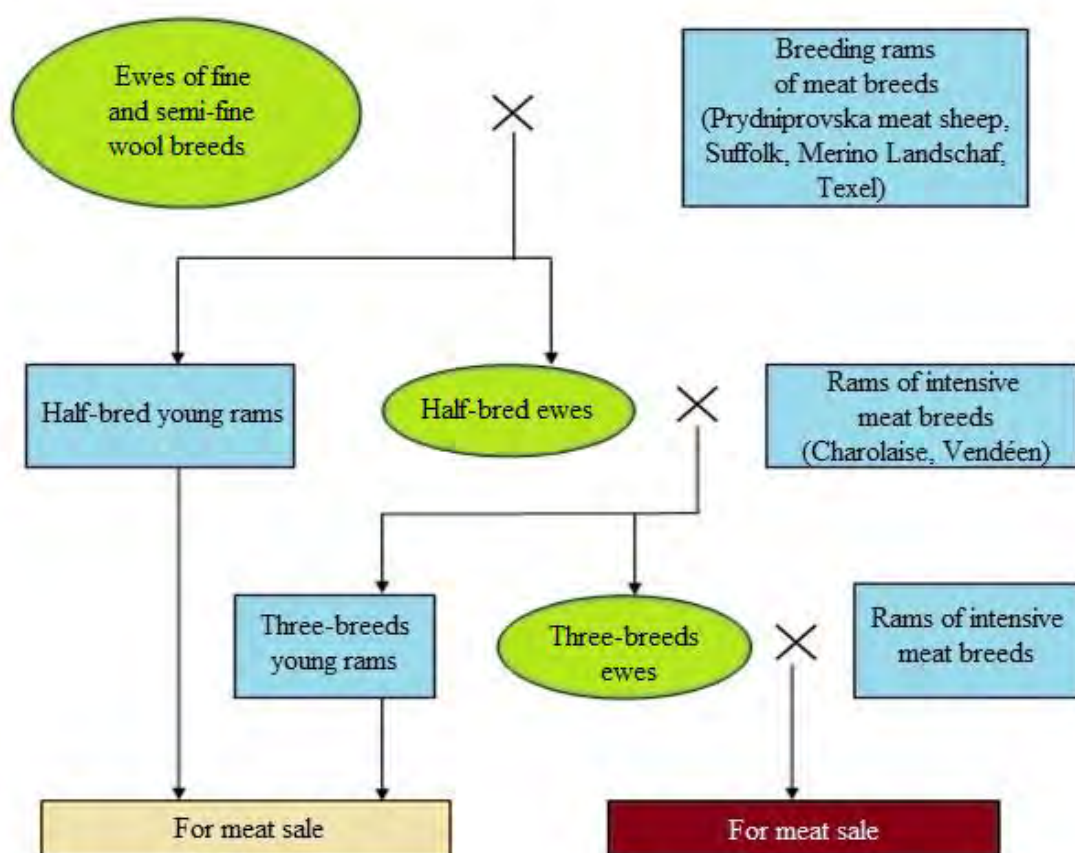
Indicator	Unit measure	Genotype			
		Romanov		crossbreeds F <sub>1</sub>	
		$\bar{X} \pm S\bar{x}$	Cv, %	$\bar{X} \pm S\bar{x}$	Cv, %
Carcass mass	kg	13,1 ± 0,45	7,65	18,4 ± 0,61	7,34
meat	%	73,3		78,8	
bones	%	26,7		21,2	
Meatiness coefficient		2,7 ± 0,07	5,54	3,7 ± 0,09	5,83

In terms of meat mass, there has been observed the predominance of crossbreed young livestock over purebred peers based on clearing of carcasses of young rams. The part of meat in the carcasses of purebred young rams is 73.3%, while the level of this indicator in crossbreed peers is 78.8%. Besides, the coefficient of meat of young rams of Romanov breed is 2,7 opposed to 3.7 in crossbreeds.

In the context of two-breeds industrial crossing at the age of 8 months and a relevant keeping and feeding, crossbreed young rams are characterized by higher indicators of meat productivity compared to Romanov purebred peers.

In the early stages of using a complex (three-breeds) crossing, ewes of fine and semi-fine wool breeds, which being kept and bred in the Dnipro zone, should be crossbred with stud rams of meat breeds (Prydniprovska meat sheep, Suffolk, Merino Landschaf, Texel) which have good compatibility. Further, it is essential to use breeding rams of another improving breed, which are well-proven in the Dnipro zone, for crossbreed ewes of F1 desirable type. They can be represented by breeding rams of Charolaise, Vendéen, which have a high level of meat productivity and reproductivity (fig. 2).

Two- and three-breeds hybrids originated through the industrial crossbreeding, as a rule, differ by the advanced intensity of growth and development of young livestock based on a full nutrition and enhanced vital function in comparison with purebred peers of the parental breed. At an early age, they can have a heavy live weight and produce a high-quality (in terms of value and eating qualities) meat. The growing of young livestock originated due to such crossings has better indicators of the economic efficiency than their purebred peers.



**Fig. 2. The scheme of three-breeds crossing**

Taking into account the abovementioned, the use of updated intensive breeds with a high coefficient of meatiness and a significant level of reproductivity while crossbreeding empowers to refine the degree of productivity of aboriginal breeds in terms of this feature. At the same time, the main features influencing the increase of meat productivity of sheep are as follows: prolificacy and milking capacity of ewes, the viability of lambs, intensity of accumulation of a live weight, feed consumption, meatiness<sup>26</sup>.

In view of the fact that prolificacy of ewes is evaluated in the number of all lambs at birth per one lambing, this genetic feature indicates a possible volume of obtained production from every ewe and is directly based on the level of reproductive functions.

The growth, development and survivability of lambs depend on the level of milk productivity of ewe (full-value of lactopoesis); however, the basic method for the improvement of milking capacity of ewes is the selection in the context of their productivity and genotype, as well as the implementation of crossbreeding through the use of stud rams of specialized dairy breeds (Lacaune, Ostfriz, Merino Landschaf), which don't influence the quality and colour of wool of offspring, as an improving breed in this regard.

According to the body structure, sheep of the desired type of meat direction of productivity must be characterized by a long, straight back, broad and rounded chest, well-developed sartorius, formed skeleton, wide apart limbs<sup>27</sup>.

The performance of works for the creation of intensive genotypes in terms of meat productivity requires constant control over a live weight of animals which is identified with a mass of carcass after sheep slaughtering. Breeds of sheep having a big exterior profile are characterized by a high prematurity but, at the same time, they have increased demands for the feed supplies.

Prematurity is an important selection feature. However, the intensity of the growth stipulates the term of sheep' practical use. Reduction of terms of the growth of young livestock for obtaining the final output cuts feed expenditures, including the gain in the live weight. Thus, sheep selection according to the value of the average daily gain facilitates the selection for upgrading the disposal of feedstuffs<sup>28</sup>.

The selection of livestock in terms of meat productivity is also carried out based on the results of control slaughter of young stock. Carcasses of animals of the desired type must have well-developed lean tissue, thin external streak of fat of a carcass, equal distribution of fat in the intermuscular space, and muscle tissue is marked by a high biological and nutrition value.

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<sup>26</sup> Генетические основы селекции животных. / В.Л. Петухов и др. ; под ред. В.Л. Петухова. Москва : Агропромиздат, 1989. 448 с.

<sup>27</sup> Буркат В.П. Теорія, методологія і практика селекції. Київ : БМТ, 1999. 376 с.

<sup>28</sup> Похил В.І., Литвищенко Л.О. Стан та перспективи розвитку овець асканійської м'ясо-вовнової породи дніпропетровського типу. *Проблеми зооінженерії та ветеринарної медицини: науково-технічний бюлетень ІТ УААН*. Харків, 2008. Вип. 16 (41). С. 297–302.

The implementation of genetic potential with respect to the above features is possible if the balanced feeding takes place. The feeding of sheep of different types is one of the key points in the intensive meat sheep breeding where the balance between nutrient elements is critical upon the condition of achieving genetically possible levels of productive features.

The best effective way in the intensive sheep breeding is when an animal converts energy of feedstuff into production energy (meat, milk, wool).

All types of chewy feedstuff are used when feeding sheep, moreover, the basic one in summer is the grass of natural and improved pasture. In the winter-stalled period of keeping, it is used hay of different origin, barley straw, corn silage, crushed and concentrated hay – in the form of granulated prepared feed or grain mixture, which consists of grains of different types of cereals, pulp and soybean meal.

When keeping sheep, there is a need to feed a reasonable number of foodstuffs, which must correspond the physiological state of an animal, the period of technological use, because the redundancy of food is less effective and their lack can do damage to the animal's health<sup>29</sup>.

In the context of sheep feeding, diets with a poor amount of energy or its overabundance have a negative impact. The features of energy deficit in the diet of lambs are the reduction of growth and development of young livestock, loss of live weight, which can lead to a lethal outcome. The deficit of ewes' dietary energy is described by the loss of live weight, deterioration of reproductive qualities (lowering of prolificacy), drop of milk supply or lack of its secretion. And breeding rams have the same signs – the loss of live weight and reproductivity (volume, ejaculate quality).

Under the overdosing of diet in terms of amount and nutritional content, there is a considerable increase in fat tissue that causes obesity, and depot fat worsens the productivity of sheep and their reproductivity.

The amount (volume) of consumed feedstuff depends on:

- the groups of technological use of animals (breeding rams during the year as well as in the period of intensive use (breeding season) consume more feedstuffs than ewes and young livestock);
- physiological state (ewes in suckling period of keeping consume more feedstuffs than virgin ewes, and a ewe with two lambs consume more than with one);
- live weight of animals (sheep with the above-average indicator of fatness have a higher level of feed consumption and digestion rate);
- chemical composition of feedstuff (young protein-rich feedstuffs are digested faster in the rumen than those which contain significant amounts of crude fibre);

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<sup>29</sup> Нормы и рационы кормления сельскохозяйственных животных : справочное пособие / А.П. Калашников и др. ; под ред. А.П. Калашникова. 3-е изд., переработ. и доп. Москва, 2003. 456 с.



- high-protein feeds intensively dissimilate, and thus there is a place for a new feed intake);
- storage method (silage is eaten less than hay).

Depending on the physiological state, one ought to bear in mind that the level of need of ewes' body for organic substances varies in time. Non-impregnated or first-time pregnant ewes can be fed mainly cost-effective food without harm to health through heavy use of pastures and hay, silage and mineral supplements as well.

When keeping ewes together with lambs, one should bear in mind that absorption of nutrients by the body during lactation is 70.0 – 80.0% of feed intake. At the same time, it is important to adhere to the basic technical provisions, and the main ones are as follows:

- to avoid a sudden change of the diet in the last weekends of pregnancy (modification of milk quality, lambs' diarrhea);
- ewes with twin lambs, if possible, should be fed separately calculating 0.3 kg of concentrated feedstuff per one lamb;
- to provide free access to vitamin-mineral premix.

The primary source of protein for nursing ewes and sucking young livestock is soybean meal, wheat millrace, brewer's grains, flaxseed meal, rapeseed meal, sunflower meal.

Nursing ewes suffer from a lack of protein, especially during the first three months of lactation. To better the level of protein in the diet of nursing ewes, it is necessary to add concentrated own-produced mixtures of grains to the diet. The grain should be fed in granulated or mashed form. In case of deficiency of dietary energy, immunity decreases that causes diseases<sup>30</sup>.

Consequently, based on longstanding practical work associated with the development of a technological scheme for the improvement of meat productivity of sheep of aboriginal breeds in the Dnipro region, it's worth mentioning that the use of crossbreeding makes it possible to transform the sheep population, which is kept in farms of different subordination, into the relevant direction of production focus quickly. Among new two- and three-breeds genotypes derived from the industrial crossbreeding, the latter combines valuable qualities of improving breeds in terms of meatiness than their purebred peers of source maternal breeds.

## CONCLUSIONS

The renewal of sheep breeding in the Dnipro zone is possible taking into account the international experience through increasing sheep of specialized meat direction which are adopted to the local agroecological conditions of their keeping and feeding.

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<sup>30</sup> Бомко В.С., Бабенко С.П., Москалик О.Ю. Годівля сільськогосподарських тварин : підручник. Київ : «Аграрна освіта», 2010. 278 с.

Such hereditary factors as a breed, individual characteristics, the level of compatibility of animals when breeding, type at birth (single, twins, triples), sex, age etc. significantly influence meat productivity of sheep and meat quality.

The implementation of genetic potential of meatiness holds promise in the context of relevant conditions of keeping and balanced diet according to the physiological state of animals.

## SUMMARY

The authors present the substantiation of the need to create specialized meat branch in sheep breeding of Ukraine and its state in the developed countries in terms of productivity. The research provides the schemes of cross-breeding which are designed to improve meat productivity of sheep of different breeds. The results of industrial cross-breeding based on Askanian meat-wool and Romanov breeds using stud rams of Texel, Olibs, Hisor are analysed. It is established the predominance of live weight of young livestock (in terms of the two-breed crossing) over purebred peers varying from 5.6% at birth and up to 19.8% in the time of weaning.

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