

## FEATURES OF THE NEW BREED OF SHEEP IN SERBIA CALLED MIS SHEEP 1. REPRODUCTIVE CHARACTERISTICS AND BODY DEVELOPMENT

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**Abstract.** This paper presents the results of reproductive characteristics and body development of the new breed of sheep in Serbia, called Mis sheep. Mis sheep as a type of sheep for meat, had been developed for the past 20 years at the Institute of Animal Husbandry, Belgrade-Zemun. Main method of development is complex combinatory three-breed crossing. As material, three breeds of sheep have been used in this project, namely: Pirot Pramenka, Merinolandschaf and Ile de France. Mis sheep is characterized by a strong constitution with emphasized carcass conformation and excellent meat traits. These are very persistent long-lived animals, well adjusted to conditions of the environment. Mis sheep are white without any spots. Sexual maturity is acquired at the age of 6–8 months, what includes them into the population of early maturing sheep. However, as well as in the case with other noble breeds their first fertilization should be at the age of 10 to 12 months. Mis sheep could be considered as sheep of higher fertility because from 100 sheep giving birth approximately 150 lambs are obtained. At the age of 90 days, the body weight of lambs is approximately 34.26 kg. At the age of 18 months, when sheep are already mature but not completely developed, the body weight is 71.63 kg. Finally, at the age over of 3 years, when they are completely developed, the average weight is 78.89 kg. The body weight of rams varies from 120–140 kg, although even in this case it depends on the production phase and use of male heads in breeding.

**Keywords:** Mis sheep, new breed, reproduction characteristics, body development.

## SERBIJOJE IŠVESTOS NAUJOS AVIŲ VEISLĖS *MIS SHEEP* YPATUMAI

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**Santrauka.** Šiame darbe pristatomos naujos serbų avių veislės *Mis Sheep* reprodukcinės charakteristikos ir kūno vystymosi savybės. *Mis Sheep* yra mėšinių avių veislė, per 20 metų išvesta Belgrado gyvulininkystės institute. Naujoji veislė gauta sukryžminus *Pirot Pramenka*, *Merinolandschaf* ir *Ile de France* veisles. *Mis Sheep* veislės avims būdingas tvirtas sudėjimas, gerai išreikštas reljefas ir puikios mėsos savybės. Šios veislės gyvūnai gyvena ilgai ir gerai prisitaiko prie aplinkos sąlygų. *Mis Sheep* avys yra baltos spalvos, be dėmių. Lytinį brandumą jos pasiekia 6–8 mėnesių, taigi gali būti priskiriamos ankssti subręstančių avių populiacijai. Kaip ir kiti tauriųjų veislių gyvuliai, šios veislės avys turėtų būti apvaisinamos sulaukusios 10–12 mėnesių. *Mis Sheep* avys yra vislios: 100 avių gali atvesti 150 ėriukų. 90-ties dienų avys sveria maždaug 34,26 kg. Būdamos 18 mėnesių, jau subrendusios, bet ne visai išsivysčiusios, jos sveria 71,63 kg. Vyresnių nei 3 metai visiškai išsivysčiusių avių vidutinis kūno svoris yra 78,89 kg. Avinai sveria nuo 120 iki 140 kg. Jų svoris priklauso nuo augimo fazės ir reprodukcinio panaudojimo.

**Raktažodžiai:** *Mis Sheep*, nauja veislė, reprodukcinės charakteristikos, kūno išsivystymas.

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**Introduction.** Sheep breeding currently tends towards production of less wool and more meat. Therefore, the main aim of sheep breeders is to look for suitable breeds and their combinations to produce quality mutton (Zapasnikienė and Nainienė, 2012).

Sheep production in Serbia is generally extensive.

The bulk of our breeds is made up of the local Pramenka sheep (80%); it is followed by the next most common strains: Pirot, Svrlig and Sjenica. The remaining 20% consists of Tsigai (5%) and Pramenka crosses with foreign breeds (15%), primarily with Merinolandschaf. According to statistics and recent studies, the average

production of Pramenka sheep per ewe is low. In the population of Tsigai and crosses, the productivity is somewhat higher but due to the small share of the total number of sheep the effects are negligible. No matter what sheep strain is bred the most important thing is the opportunity to obtain three useful products (meat, milk and wool). However, in order to achieve greater specialization of production it is necessary to work in one direction. In our country, the emphasis is on the lamb. (The structure of the total production of mutton includes about 70% of slaughtered lambs and ewes and the rest of rams). However, the current production cannot meet the needs of our country and the export opportunities. In order to make the production of lamb meat profitable it is necessary that the sheep population is of high genetic potential in terms of body development, yield and meat quality, and lower food consumption and nutrient generated per unit increment. Starting from the unsatisfactory state in sheep production, the Department of Sheep and Goat, the Institute of Animal Husbandry, Belgrade - Zemun in the 1990s began the work on finding opportunities to increase the production of high quality lamb meat. The creator of this idea, Dr. Milan P. Petrovic, was supported by the leadership of the Institute in 1991. They established an experimental sheep farm and started the initial research. This idea transformed into research projects which received a positive review and was accepted for funding by the Ministry of Science and Technology of Serbia and the Federal Ministry of Science and Development of the former Yugoslavia. The idea of developing a new breed of sheep is not new, as other authors in the world are working on it (Hinkovski et al. 1980; Hulet et al., 1984; Fahmy and Shrestha, 1993; Moroz, 1992; Boujenane, 2002; Hinkovski and Bojkovski, 2007; Yakan and Unal, 2010). Today, Serbia has more than one thousand of Mis sheep grown under controlled conditions. The goal of this paper is to present the reproductive and body development characteristics of the new breed of sheep to the scientific community.

#### Material and Methods

Long-term scientific research on the development of new sheep population began in 1991 in the experimental sheep farm of the Institute of Animal Husbandry, Belgrade - Zemun, with 300 animals, whereas some of the activities took place on a sheep farm "White Water", Pirot, with the capacity of 4000 heads. For realization of this project, three breeds of sheep were used, namely: Pirot pramenka, Merinolandschaf and Ile de France. The reasons for the choice of just these three sheep populations are as follows: Pirot pramenka is one of the most revered strains in terms of meat quality, which will serve as a maternal basis. It is used to humble sheep growing conditions, also is disease resistant and at the

intersection with the nobler races shows high heterosis. Merinolandschaf is the most common foreign breed in our country. It has easily acclimatised to the new growing conditions and achieved good results in the improvement of body measurements when crossed with Pramenka; so it is widely accepted as meliorator. Ile de France is characterized by a good growth, widths and depths, high dressing percentage and carcass yield and excellent quality meat. It is early-maturing and highly fertile; it is in a state of estrus almost throughout the year. It has good power and acclimation ability to transfer desirable traits to offsprings. A complex combination crossing is the basic method of development of new meaty breed of sheep. Schematic representation of the methodology is shown in Fig. 1. The data for analysis have been taken from a flock with 300 ewes in 2002 to 2010. The number of lambs taken for processing data by year varied from 120 to 300. Statistical analysis of data was conducted using the software program SPSS (2007). Procedure was applied using the following linear model:

$$Y_{ijkl} = \mu + G_i + S_j + T_k + B_l + b_1(x - \bar{x}_1) + e_{ijkl}$$

Where,

$Y_{ijk}$  - value of traits on the  $l$ th litter size

$K_{th}$  - type of birth  $j$ th season and  $i$ th year

$\mu$  - overall population mean

$G_i$  - effect of  $i$ th year

$S_j$  - effect of  $j$ th season

$T_k$  - effect of type of birth

$B_l$  - effect of litter size

$b_1$  - linear regression coefficient of age of rams at first insemination

$e_{ijk}$  - random error

#### Results and Discussion

##### *Appearance and Description*

The Mis population is a fleshy type of sheep, with a strong constitution, distinctive conformation and exceptional carcass characteristics of meat. They are durable and long-lasting animals well adapted to the environment. The head is fine, medium length and width. The neck is fleshy, short and broad. They have broad and deep chest. The sternum is slightly pointed forward, and if we look at the sheep from the side, its hull has a rectangle form. It is characterized by distinct latitudes especially in the area of rump and hams or back of the body, and a large width of the back. Muscle mass of these parts of the body is stressed; rounded muscular hams and ends are in the area of the ankles. The legs are of medium height, width, and set. This sheep population is of white color with no spots, covered with white wool all over the body including the legs to the hock. Mis sheep can be grown in all parts of the country, although it is mostly intended for areas of

intensive agriculture because of better conditions of nutrition, which may exhibit their optimum genetic potential.

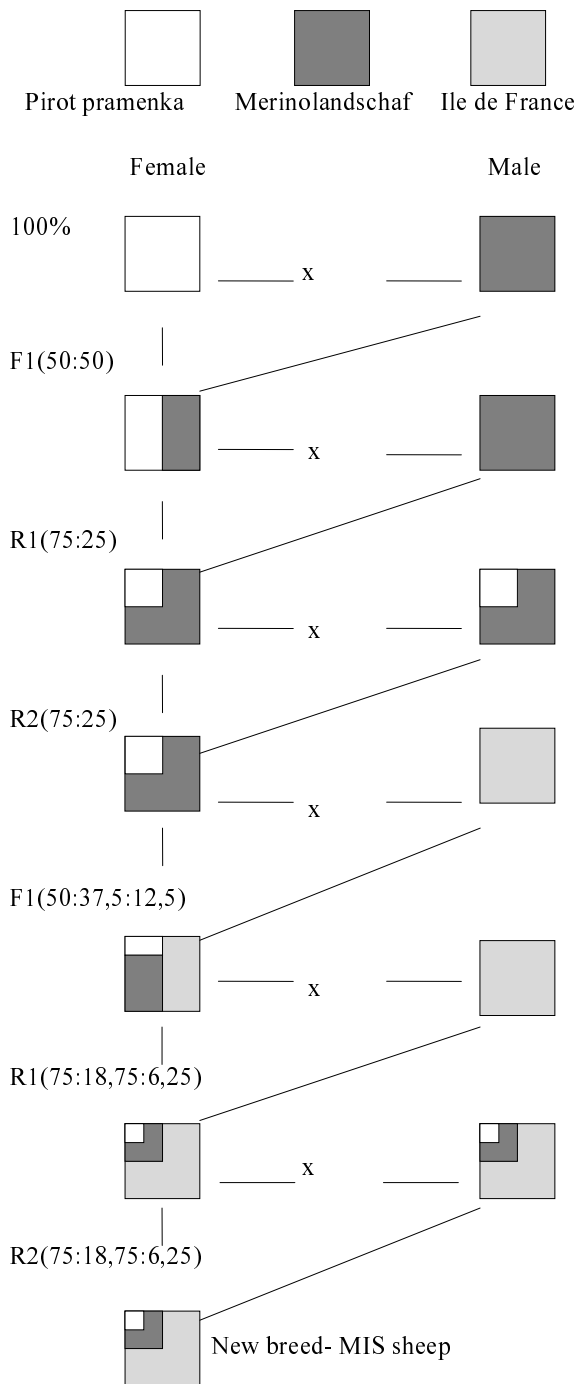


Figure 1. Scheme for development of Miss sheep



Fig. 2. Physical appearance of Mis sheep

### Reproductive Characteristics

Mis sheep reaches sexual maturity at the age of 6–8 months, which puts them in a row of fast growing population. However, as with other noble races, the first fertilization should be at the age of 10–12 months. In addition, what makes this population valuable is its fertility as estrus occurs during most of the year. This means that under optimal growth conditions, (especially proper nutrition) lambing fertilization can take place throughout the year and the gap between the last lambing and a new conception amounts to 90–120 days. Mis sheep is highly fertile as from 100 sheep 150 lambs are born. Reproduction as the main link in the extension of biological species is particularly important in sheep because the success of the production is measured by the number of offspring per ewe and year (Rosati et al., 2002). Improvement of reproductive traits can have a greater economic impact than improvement of growth rate (Wang and Dickerson, 1991). Maintenance of high levels of realized fertility and appropriate levels of fecundity are critical for efficient sheep production. The optimal level of fecundity in most situations is well below the maximum attainable level and can be targeted by combining selection among and within breeds (Petrovic, 2000, Notter, 2008), Therefore the quality of each breed of sheep primarily is measured in time necessary for reaching sexual maturity and first reproduction capabilities, shortening the sterile period and increased fertility. Different factors can modify fertility of sheep. In reproductive planning, intervals between lambing, season, age of ewe, heat stress, nutrition state or breed are some of the factors which have a great effect on fertility results (Arrebola et al., 2009, Esmailizadeh et al., 2009). Compared with other breeds of sheep, especially with the breeds that were used for the development of Mis sheep, we can see that the new breed has a higher fertility than Pirot sheep (Skalicki et al., 2003) and Merinolandschaf (Petrovic, 1992, 2007). Fertility of Mis sheep is similar to the Ile de France bred in France, or slightly higher than the results of the mentioned French breed obtained under our growing conditions (Mekic, 1994).

### Physical and Exterior

The results of linear measurements of Mis sheep are shown in Table 1. They confirm the description of Mis

sheep in terms of features of meaty type, which are reflected in the marked width, depth and scope. Based on the linear measurements, we can conclude that Mis sheep is closest to the race Ile de France, which is normal because of the largest share of the French breed. According to Petrovic (2007), Merinolandschaf has a greater height at the withers and back than Mis sheep.

Table 2. **Linear measures of sheep in different age (cm)**

Traits	Age of sheep			
	1 year		3 years	
	Mean	S.E.	LSM	S.E.
Height to withers	67.45	±0.21	73.39	±0.26
Height to back	67.31	±0.20	73.34	±0.23
Height to backbone	67.40	±0.23	73.38	±0.24
Depth of chest	29.15	±0.13	33.40	±0.17
Width of chest	28.05	±0.12	32.31	±0.14
Body length	70.81	±0.32	74.01	±0.33
Width of hips	29.12	±0.12	32.16	±0.15
Girth of chest	99.34	±0.19	112.11	±0.24
Girth of leg	38.26	±0.17	43.13	±0.21
Girth of shin bone	9.04	±0.09	10.01	±0.11

Morphological specification of sheep is one of the main criteria of the classification of breeds, and also has significance in the selection (Iyeghe et al., 1996, Afolayan et al., 2006). Whatever is the structure of sheep largely depends on the quantity and quality of products and duration of exploitation in breeding. Under the constitution of sheep is meant a set of basic anatomical-physiological characteristics involved in the structure and function of organisms in certain environmental conditions. In sheep practice, study and assessment of the constitution is done through assessment of linear measure, or from the animal's picture (Afolayan et al., 2006).

Table 2. **Body development from birth to 6 month (kg)**

Traits	Male	Female	Mean	S.E.
Body weight of lambs at birth	4.62	4.40	4.51	±0.43
Body weight of lambs at 30 days	12.41	11.61	12.01	±0.84
Body weight of lambs at 60 days	22.68	21.60	22.14	±1.31
Body weight of lambs at 90 days	34.77	33.75	34.26	±1.92
Body weight of lambs at 6 month	47.58	45.20	46.39	±2.05

Table 3. **Body development from 12 month to 3 year (kg)**

Traits	Mean	S.E.
Body weight of ewe lambs at 12 month	63.51	±2.98
Body weight of ewe at 18 month	71.63	±3.04
Body weight of ewe over 3 year	78.89	±5.04
Body weight of rams over 3 year	130.12	±10.02

#### *Development of body weight*

Table 2 shows that the lambs were born with an average weight over 4.5 kg, and in a month they tripled their initial body weight. At 60 days of age, Mis sheep lambs reached a value of body weight over 22 kg; the offsprings of our domestic sheep-breed pramenka reach this weight until a month later, ie. in three months. At 90 days, the average body weight of lambs was 34.26 kg. Already at the age of 6 months, the body weight of lambs recorded the average value of 46.39 kg. Yearlings retain the ability (Table 3) of intensive development until the age of one year when their body weight exceeds 63 kg. The same trend continues, and at 18 month, when the sheep were already mature but not fully developed, the body weight of Mis sheep was 71.63 kg. Finally, when the sheep aged 3.5 years and fully complete their biological development, thus obtaining the status of adult sheep, the average body weight was 78.89 kg or close to 79 kg.

The body weight of sheep is part of the breed characteristics and is particularly important in populations of meaty type, which includes Miss sheep. We find a significant effect of environmental factors (year, season, type of birth) on body development. Fasae et al. (2005) found that age and season have a tremendous effect on live-weight. The increase of meat yield requires genetic improvement of live weight. Proper measurement of this trait is a requisite for achieving this goal (Olatunji-Akioye and Adeyemo, 2009). The speed of lambs reaching the market weight is crucial for profitability of farms and total sheep production. As we know, the body weight of sheep may have its maximum and minimum. In other words, the stretch in the plus and minus depends on growing conditions, especially on food and housing. The mentioned value of weight is, actually the optimal body weight in terms of production and profitability and should not be attempted at increase in spite of the sheep potential, which allows higher values of weight (weight of individual animals exceeding 100 kg). The weight of rams has a range of 120–140 kg, although in this case it depends on the stages of production and use in breeding. According to the comprehensive studies carried out by two researchers in their doctoral dissertations (Petrovic, 1992 and Mekić, 1994), Merinolandschaf and Ile de

France in our growing conditions showed lower production performance than in original conditions, indicating a delay in their complete adaptation to our climate. In addition, Mis sheep has better growing performances than the two above mentioned foreign breeds.

#### Conclusion

Based on 20 years of work on the development of new breed of sheep, we arrived to the following conclusions. Mis population is a new meaty type of sheep, whose genetic structure is composed of representatives of the three breeds. Production parameters show that the new sheep had better reproductive performance and greater body weight of all three parental breeds in the Serbian growing conditions. This fact confirms the hypothesis of the early scientific work on this project, which is based on the genetic effect known as heterosis. Thus, crossing over breed comes to a far greater number of combinations of genes and thus is more likely to express favourable allele carriers of economically important traits.

#### Acknowledgements

This study is a part of the projects TR 31053 "Modern biotechnology solutions in the breeding and feeding of cattle sheep and goats for the production of valuable and safety food" and TR 31001 "An environmental approach and implementation of modern biotechnologies as a basis for the improvement of ruminant breeding technology", financially supported by the Ministry of Education and Science of the Republic of Serbia.

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Received 23 April 2012

Accepted 2 October 2013