

EVALUATION AND COMPARISON OF PRODUCTION INDICES IN THE CONSERVATION AND FOUNDATION FLOCKS OF OLD-TYPE POLISH MERINO SHEEP

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Abstract. The aim of this study was to determine basic production indices in the conservation flock of old-type Polish Merino Sheep and to compare them with the production results of the whole sheep flock of this breed kept on the Boguszyn farm belonging to the Lubiana Pedigree Breeding Establishment. Reproduction performance of dams as well as growth and rearing of their offspring in the period 2007–2009 were evaluated. Single born (birth type) dams predominated (56.8–62.9%) in both flocks. The percentage of twin births was approx. 38% for the ewes in the foundation flock and over 44% for those in the conservation flock. In the age structure of sheep from both flocks in the years 2007–2009, young sheep at the age of 2 to 5 years predominated, which could have affected the reproduction results of the dams. The mean body weight of all the evaluated lambs at 2 days of age was 4.14 kg. The lambs born in 2009 were the lightest. Their body weights were 3.55 kg and 3.69 kg in the foundation and conservation flocks, respectively. Statistically significantly heavier ($P \leq 0.01$) lambs were born in the conservation flock. Also, lambs from this flock gained significantly higher body weight (21.89–22.33 kg) at 56 days of age in the years 2008–2009, compared with the range of 17.85–21.84 kg for the lambs from the foundation flock in the period 2007–2009. The daily body weight gains in both flocks ranged from 240 g to 333 g and were statistically significantly better ($P \leq 0.01$) in the conservation flock. In both flocks, the significant effect of birth type and sex of lambs on their body weight and daily body weight gains was shown.

Keywords: conservation flock, foundation flock, Polish Merino Sheep, productivity

INTRODUCTION

Sheep are a source of many valuable materials such as mutton, wool, milk, hide and manure with a high content of minerals [Niżnikowski 1999]. Despite this, a sharp decrease in the population of sheep in Poland has been observed since 1980s, which is an effect of a decreased demand for sheep products, wool overproduction and a small population of typical mutton breeds [Klepacki 2005]. Therefore, a very important (besides mutton and

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prolificacy improvement) direction of breeding work in the Polish sheep farming is the conservation breeding of some sheep breeds [Klepacki and Rokicki 2005] predestined, among others, to alternative ways of use [Niznikowski 2005, Klepacki and Rokicki 2006].

In 2005, the “Sheep Genetic Resources Conservation Programme” was prepared, whose main aim is the conservation of the endangered native breeds that are a very valuable element of sheep genetic diversity. The conservation programme covers 13 breeds including old-type Merino Sheep. It involves conservation breeding of breeds, varieties or lines for which a small number of breeding animals or the downward tendency in this number poses a risk of their extinction [Kawęcka and Sikora 2009].

As a part of government programmes, actions aimed at increasing prolificacy and improving meatiness of sheep have been taken since 2004, which should result in hindering a decrease in the population size of this farm animal species [Szymańska 2009].

The aim of the present study was to evaluate and compare production indices in the conservation and foundation flocks of old-type Polish Merino Sheep.

MATERIAL AND METHODS

The data were derived from the breeding documentation of the Polish Merino Sheep flock from the Boguszyn sheep farm belonging to the Lubiana Pedigree Breeding Establishment. The study was conducted between 2007 and 2009.

With regard to the reproduction performance of the evaluated sheep, the following was determined: age of sheep in a given year, number of breeding seasons, number of lambings, number of lambs born and reared as well as the mean prolificacy of the flock.

Litter size, body weight of lambs at 2 and 56 days of age as well as daily body weight gains for this period were also determined. Taking into account the year of evaluation (2007, 2008, 2009), the collected material was split into foundation flock (1) and conservation flock (2). The animals were further divided according to sex (ewe lambs and ram lambs) and birth type: singletons and twins.

The results of reproduction indices, body weight and body weight gains of lambs in individual groups were compared using the one-way ANOVA statistical test and Duncan's test by means of Statistica®7.1 PL software.

RESULTS AND DISCUSSION

The most frequent birth type in all years and flocks was singletons (Table 1). Their number ranged from 189 in 2009 to 222 in 2007 in the foundation flock and from 50 to 59 in the conservation flock between 2008 and 2009. On the other hand, the number of dams in the foundation flock born as twins was estimated at 117 in 2009 and 137 in 2008. The number of dams from the conservation flock born as twins was 48 in 2008 and 38 in 2009. There were 2 and 3 dams born as triplets in 2008 and 2007, respectively. All of them came from the foundation flock and due to such a low number of cases these animals were not included in the statistical analysis.

Table 1. The structure of birth types for dams in the foundation and conservation flocks in the years 2007–2009

Tabela 1. Struktura typów urodzenia matek w stadzie podstawowym i zachowawczym w latach 2007–2009

| Flock type Typ stada | Lambing year Rok wykotu | Birth type – Typ urodzenia | | | | | |
|---------------------------------|----------------------------|----------------------------|-------|---------------------|-------|-----------------------|------|
| | | singleton pojedynczy | % | twins bliźniaczy | % | triplets trojaczki | % |
| Foundation 1 Podstawowe 1 | 2007 | 222 | 62.89 | 128 | 36.26 | 3 | 0.85 |
| | 2008 | 204 | 59.48 | 137 | 39.94 | 2 | 0.58 |
| | 2009 | 189 | 61.17 | 117 | 37.86 | 3 | 0.97 |
| Conservation 2 Zachowawcze 2 | 2008 | 59 | 55.14 | 48 | 44.86 | 0 | 0 |
| | 2009 | 50 | 56.82 | 38 | 43.18 | 0 | 0 |

Birth type of ewes is inseparably associated with their later productivity and especially with reproduction traits. As a general rule, higher values of reproduction indices have been observed in dams born as twins [Kałuża et al. 1994, Niżnikowski et al. 2007].

The age structure of a flock is mainly affected by the selection intensity and culling level. On the other hand, the age structure of a flock determines its reproductive efficiency. In both flocks (Table 2), young sheep at the age of 2 to 5 years were in majority, irrespective of the year. The percentage of such sheep in the period 2007–2009 (foundation flock) and 2008–2009 (conservation flock) was over 70% and over 80%, respectively. Dankowski and Bernacka [1994], analyzing an effect of age on the reproduction performance in a flock of Merino ewes, showed that their reproductive ability increased with age with the lowest level being in primiparae.

The comparison of the number of sheep with a given number of lambings in both evaluated flocks is presented in Table 3. In 2007 (foundation flock), the largest group (over 60%) comprised sheep with 1–3 lambings. No sheep with 9 lambings were found. In 2008, the largest number of dams (approx. 70%) with 1–4 lambings was recorded in this flock. In this year, the group of sheep with 3–5 lambings was the most numerous (approx. 90%) in the conservation flock. No animals with 1 or 9 lambings were identified. In 2009, dams with 1–5 lambings accounted for approx. 83% and over 90% in the foundation and conservation flocks, respectively.

The results presented in the table under discussion are supplementary to those in the previous table. According to Szymanowska [1994], the high prolificacy at the first and second lambing of ewes assures obtaining higher prolificacy in the later years of reproduction.

By comparing the years 2007 and 2008 in the foundation flock, it can be concluded that the age, number of services, number of lambings and the remaining indices were at a similar level (Table 4). When comparing the foundation and conservation flocks in 2008, the non-significant differences in the number of past breeding seasons can be noticed. This index was 3.71 and 4.25 in the foundation and conservation flocks, respectively. Besides age, the clear but non-significant differences in the number of lambs born can be observed in 2008 to the advantage of the conservation flock, whereas the opposite trend was found in 2009.

In 2009, the dams from flock 1 differed in age compared with those from flock 2. The mean age of sheep in flock 1 was 4.43 years and in flock 2 it was 4.06 years. In 2009,

small differences in the number of lambings between both flocks were recorded. The value of this index was 3.36 and 3.05 for the foundation and conservation flocks, respectively, and for the latter, it was lower than that in 2008.

Table 2. The age structure of the sheep from foundation and conservation flocks in the years 2007–2009

Tabela 2. Struktura wiekowa owiec stada podstawowego i zachowawczego w latach 2007–2009

| Item Wyszczególnienie | Age, years – Wiek owiec, lata | | | | | | | | |
|--|-------------------------------|-------|-------|-------|------|-------|------|------|------|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| No. of lambs in 2007 (Foundation flock – 1) Liczba owiec w 2007 (stado podstawowe – 1) | 96 | 81 | 62 | 33 | 27 | 49 | 25 | 9 | 0 |
| % of the whole flock % do ogółu stada | 25.13 | 21.20 | 16.23 | 8.64 | 7.07 | 12.83 | 6.54 | 2.36 | 0 |
| No. of lambs in 2008 (Foundation flock – 1) Liczba owiec w 2008 (stado podstawowe – 1) | 99 | 92 | 67 | 54 | 30 | 18 | 41 | 12 | 7 |
| % of the whole flock % do ogółu stada | 23.57 | 21.90 | 15.95 | 12.86 | 7.14 | 4.29 | 9.76 | 2.86 | 1.67 |
| No. of lambs in 2009 (Foundation flock – 1) Liczba owiec w 2009 (stado podstawowe – 1) | 48 | 113 | 95 | 50 | 40 | 20 | 12 | 24 | 4 |
| % of the whole flock % do ogółu stada | 11.82 | 27.83 | 23.40 | 12.32 | 9.85 | 4.93 | 2.96 | 5.91 | 0.98 |
| No. of lambs in 2008 (Conservation flock – 2) Liczba owiec w 2008 (stado zachowawcze – 2) | 0 | 18 | 24 | 7 | 3 | 5 | 3 | 1 | 0 |
| % of the whole flock % do ogółu stada | 0 | 29.51 | 39.34 | 11.48 | 4.20 | 8.19 | 4.92 | 1.64 | 0 |
| No. of lambs in 2009 (Conservation flock – 2) Liczba owiec w 2009 (stado zachowawcze – 2) | 40 | 9 | 30 | 21 | 8 | 4 | 5 | 3 | 2 |
| % of the whole flock % do ogółu stada | 32.78 | 7.38 | 24.59 | 17.21 | 6.56 | 3.28 | 4.10 | 2.46 | 1.64 |

This was associated with the fact that many young sheep, lambing for the first time, were selected for the conservation flock (over 30% of the flock) in 2009. The prolificacy indices in the foundation flock in the analysed years were at a similar level ranging from 1.37 to 1.39. A somewhat higher prolificacy index was recorded in the conservation flock (1.41–1.48).

Table 3. The number of sheep with a given number of lambings in the foundation and conservation flocks in the years 2007–2009

Tabela 3. Liczebność owiec z określoną liczbą wykotów w stadzie podstawowym i zachowawczym w latach 2007–2009

| Item Wyszczególnienie | Number of lambings – Liczba wykotów | | | | | | | | |
|--|-------------------------------------|-------|-------|-------|-------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| No. of lambs in 2007 (Foundation flock – 1) Liczba owiec w 2007 (stado podstawowe – 1) | 95 | 57 | 94 | 33 | 39 | 34 | 28 | 2 | 0 |
| % of the whole flock % do ogółu stada | 24.87 | 14.92 | 24.61 | 8.64 | 10.21 | 8.90 | 7.33 | 0.52 | 0 |
| No. of lambs in 2008 (Foundation flock – 1) Liczba owiec w 2008 (stado podstawowe – 1) | 104 | 88 | 643 | 83 | 31 | 30 | 24 | 15 | 2 |
| % of the whole flock % do ogółu stada | 24.76 | 20.95 | 10.24 | 19.76 | 7.38 | 7.15 | 5.72 | 3.57 | 0.47 |
| No. of lambs in 2009 (Foundation flock – 1) Liczba owiec w 2009 (stado podstawowe – 1) | 52 | 112 | 90 | 29 | 66 | 18 | 19 | 11 | 5 |
| % of the whole flock % do ogółu stada | 12.94 | 27.86 | 22.39 | 7.21 | 16.41 | 4.48 | 4.73 | 2.74 | 1.24 |
| No. of lambs in 2008 (Conservation flock – 2) Liczba owiec w 2008 (stado zachowawcze – 2) | 0 | 19 | 17 | 17 | 1 | 5 | 1 | 3 | 0 |
| % of the whole flock % do ogółu stada | 0 | 30.16 | 26.98 | 26.98 | 1.59 | 7.94 | 1.59 | 4.76 | 0 |
| No. of lambs in 2009 (Conservation flock – 2) Liczba owiec w 2009 (stado zachowawcze – 2) | 40 | 9 | 30 | 18 | 12 | 2 | 5 | 1 | 4 |
| % of the whole flock % do ogółu stada | 32.78 | 7.38 | 24.60 | 14.75 | 9.84 | 1.64 | 4.09 | 0.82 | 3.28 |

The indices of reproductive ability of sheep are the most significant production traits of a flock, determining the possibilities of increasing population size and improving the aspects of the economic profitability of sheep farming [Rzepecki and Krupiński 1994]. According to Drożdż [2002], animal genotype determines its potential reproductive abilities. It is, however, only the “base”. Environment, management conditions and feeding affect to a large extent the expression of the genetic potential of animals [Patkowska-Sokoła and Barczyńska 1985].

The strategic goals of native sheep breeding are mainly directed at the improvement in prolificacy and nursing ability of ewes, improvement in growth rates and quality traits of lamb carcasses as well as good feed conversion into body weight gains [Gruszecki et

al. 2000]. These authors indicate that the prolificacy of the Polish sheep breeds has remained the same (120%–140%) for many years, which was observed in the present work and which is a too small value under current economic conditions. The situation is worsened by a too high mortality rate of lambs during rearing (6%–10%) and this inevitably leads to the fact that reproduction performance, which is the measure of productive efficiency, does not exceed 1.3 lambs per ewe in a foundation flock.

Table 4. The basic reproduction indices for the evaluated ewes
Tabela 4. Podstawowe wskaźniki rozrodcze ocenianych maciorek

| Flock and year Stado i rok użytkowania | Statistical parameters Miary statystyczne | Mean age Średni wiek | No. of breeding seasons Liczba sezonów rozrodczych | No. of lambings Liczba wykotów | No. of lambs born alive Liczba urodzonych jagniąt | No. of lambs reared Liczba odchowanych jagniąt | Prolificacy Plenność |
|--|--|-------------------------------|---|---|---|---|-------------------------|
| Foundation – 1 2007 | \bar{x} | 4.28 | 3.91 | 3.23 | 4.64 | 4.35 | 1.39 |
| Podstawowe – 1 2007 | s | 2.08 | 2.34 | 1.92 | 3.11 | 2.94 | 0.35 |
| | V | 48.54 | 59.78 | 59.55 | 66.97 | 67.49 | 25.47 |
| Foundation – 1 2008 | \bar{x} | 4.34 | 3.78 | 3.29 | 4.68 | 4.39 | 1.37 |
| Podstawowe – 1 2008 | s | 2.18 | 2.49 | 2.06 | 3.34 | 3.17 | 0.37 |
| | V | 50.09 | 65.98 | 62.58 | 71.25 | 72.18 | 27.27 |
| Foundation – 1 2009 | \bar{x} | 4.43 | 3.71 | 3.36 | 4.78 | 4.52 | 1.39 |
| Podstawowe – 1 2009 | s | 1.96 | 2.28 | 1.93 | 3.22 | 3.08 | 0.35 |
| | V | 44.30 | 61.29 | 57.50 | 67.36 | 68.14 | 25.06 |
| Conservation – 2 2008 | \bar{x} | 4.46 | 4.25 | 3.54 | 5.22 | 4.95 | 1.41 |
| Zachowawcze – 2 2008 | s | 1.52 | 1.91 | 1.59 | 2.86 | 2.83 | 0.33 |
| | V | 34.13 | 44.87 | 45.05 | 54.86 | 57.16 | 23.69 |
| Conservation – 2 2009 | \bar{x} | 4.06 | 3.48 | 3.05 | 4.42 | 4.25 | 1.48 |
| Zachowawcze – 2 2009 | s | 2.00 | 2.53 | 2.04 | 3.25 | 3.11 | 0.39 |
| | V | 49.32 | 72.53 | 67.05 | 73.61 | 73.13 | 26.52 |

According to Rzepecki [1995], it would be ideal to rear 2 lambs per litter. Meanwhile, this index is much lower. Many data show that it ranges from 0.7 to 1.3 lambs depending on the breed and type of sheep. Some pedigree flocks and appropriately managed commercial flocks obtain 1.5 lambs weaned (or ready for sale) per litter. Only with such a reproduction level, sheep farming can be profitable [Seremak-Bulge 1992]. However, according to Martyniuk [1995], too high prolificacy relative to the farm's abilities causes large losses in lambs during perinatal and rearing periods. Especially, the postnatal period is still one of the critical stages of farm animal husbandry [Szymanowska 1994]. The growth of offspring depends not only on the lactational abilities of the dam but also on the nursing behaviour [Borys et al. 1995, Janicki et al. 1995]. According to Niżnikowski [1995], the ability of lambs to survive until 7 days of age strongly depended on the age of

dam, lambing number and litter type. A considerable decrease in the survival and rearing rates can also be caused by an increased number of lambs per litter [Niznikowski et al. 1995].

The results obtained in the present study and concerning the reproduction of ewes from both foundation and conservation flocks were worse than those reported by the Polish Union of Sheep-Farmers for the years 2007–2009. Klewicz and Gabryszak [1996], when analyzing reproduction performance of Polish Merino Sheep, estimated the dams' fertility at 90%, prolificacy at 141–152% and lambs' mortality during rearing at 10%.

In 2007, the mean birth weight of lambs was 4.41 kg, the mean body weight at 56 days of age was 17.85 kg and the calculated mean body weight gains for this period were 240 g (Table 5). Coefficients of variation for these 3 indices were 7.32, 14.50 and 17.50% for the birth weight of lambs, body weight at 56 days and mean body weight gains, respectively. In 2008, the lamb birth weight did not change relative to the previous year and averaged 4.41 kg.

Table 5. Body weight (kg) and daily body weight gains (g) for the evaluated lambs
Tabela 5. Masa ciała (kg) i przyrosty dobowe (g) ocenianych jagniąt

| Flock Stado | Lambing year Rok wykotu | Statistical parameters Miary statystyczne | Birth weight, kg Masa ciała jagniąt po urodzeniu, kg | Body weight at 56 days Masa ciała jagniąt w 56. dniu, kg | Daily gains from birth to 56 days, g Przyrosty dobowe od urodzenia do 56. dni, g |
|-------------------------------------|----------------------------------|--|---|---|--|
| Foundation – 1 Podstawowe – 1 | 2007 | \bar{x} | 4.41 ^A | 17.85 ^B | 240 ^D |
| | | s | 0.32 | 2.59 | 49 |
| | | V | 7.32 | 14.50 | 17.50 |
| | 2008 | \bar{x} | 4.41 ^{AJ} | 20.31 ^{BCK} | 284 ^{DEL} |
| | | s | 0.34 | 2.89 | 52 |
| | | V | 7.79 | 14.25 | 16.65 |
| 2009 | \bar{x} | 3.55 ^{AH} | 21.84 ^{BCa} | 329 ^{DE} | |
| | s | 0.50 | 2.77 | 48 | |
| | V | 14.11 | 12.70 | 13.32 | |
| Conservation – 2 Zachowawcze – 2 | 2008 | \bar{x} | 4.64 ^{FJ} | 21.89 ^K | 301 ^{GL} |
| | | s | 0.46 | 2.44 | 43 |
| | | V | 10.03 | 11.13 | 12.25 |
| | 2009 | \bar{x} | 3.69 ^{FH} | 22.33 ^a | 333 ^G |
| | | s | 0.62 | 2.16 | 37 |
| | | V | 16.92 | 9.68 | 9.60 |

Small letters – differences significant at $P \leq 0.05$; capital letters – differences significant at $P \leq 0.01$.
Małe litery – różnice istotne przy $P \leq 0,05$; duże litery – różnice istotne przy $P \leq 0,01$.

In 2008, a statistically significantly higher ($P \leq 0.01$) body weight of lambs at 56 days of age was recorded compared with the previous year. Also, a significant difference ($P \leq 0.01$) was shown in the case of daily body weight gains of lambs in both analysed years. A mean daily body weight gain in 2008 was over 40 g higher than that in the previous year and amounted to 284 g. In 2009, the birth weight of lambs was significantly lower ($P \leq 0.01$) by almost 0.9 kg compared with that in the two previous years, whereas an opposite situation

was observed in the case of body weight at 56 days of age. It equaled 21.89 kg and was significantly higher ($P \leq 0.01$) by over 1.5 kg than the body weight of lambs in 2008 and by almost 4 kg than that in 2007. This situation favourably affected the mean body weight gains in this year, which amounted to over 300 g and were significantly higher ($P \leq 0.01$) than those in the previous years (by 45 kg compared with 2008 and by 89 kg compared with 2007).

In the conservation flock in 2008, the mean birth weight of lambs was 4.64 kg, the mean body weight at 56 days of age was 21.89 kg, whereas the calculated mean body weight gains were 301 kg. Coefficients of variation were 10.03, 11.13 and 12.25% for the birth weight of lambs, body weight at 56 days and mean body weight gains, respectively. In 2009, the birth weight of lambs was significantly lower ($P \leq 0.01$) by over 0.95 kg compared with that in 2008, whereas an opposite situation was observed in the case of body weight at 56 days of age in the conservation flock. The mean body weight at 56 days was 22.33 kg and was significantly higher ($P \leq 0.05$) by almost 0.5 kg than the body weight in the foundation flock in 2009. The mean body weight gains of lambs in the conservation flock in 2009 were significantly higher ($P \leq 0.01$) compared with the mean body weight gains in this flock in 2008.

Appropriately fed lamb, suckling its dam for 90 days should gain body weight approx. 5 times higher than that at birth, and the mean daily body weight gain should amount to approx. 250 g. It is in accordance with the results of Lachowski [2001], who found that the body weight of Polish Merino lambs was 4.3 kg at 2 days post lambing, and 29.9 kg at weaning (at the age of 100 days) with the daily gains of 254 g.

Niznikowski [1992], who analysed rearing results of Corriedale lambs, found that the body weight of animals at 2 days post-lambing was relatively high (5.82 kg); however, small daily body weight gains from lambing to weaning resulted in lambs at 100 days of age being approx. 6–11 kg lighter than the ram lambs and approx. 3–6 kg than the ewes.

Birth weight of ewe lambs and ram lambs in individual flocks and years (Table 6) was considerably different. It ranged from 3.44 kg in 2009 in ewe lambs from the foundation flock to 4.97 kg in ram lambs in 2008 in the conservation flock. The birth weight of ewe lambs in all years and flocks was significantly lower compared with the body weight of ram lambs. Heavier lambs of both sexes were born in the conservation flock. The lowest body weight at 56 days of age was gained by the lambs of both sexes born in 2007 in the foundation flock (17.4 kg) and the highest body weight at 56 days was characteristic of ram lambs born in 2008 in the conservation flock (24.1 kg). It was over 1 kg higher than that for the remaining groups represented by ram lambs from the conservation flock in 2009.

Similarly to birth weight, the body weight of ram lambs at 56 days of age was significantly ($P \leq 0.01$) higher compared with that for the ewe lambs in all years and flocks. This difference ranged from 0.8–0.9 kg between the lambs of both sexes from the foundation flock in 2007 and 2009 to approx. 4.0 kg in the case of ewe lambs and ram lambs in the conservation flock in 2008. Ewe lambs and ram lambs born in 2008 and 2009 in flock 2 were significantly heavier ($P \leq 0.01$) compared with the lambs of both sexes in flock 1.

Body weight gains in ewe lambs ranged from approx. 233 g for those born in 2009 in the foundation flock to 326 g for those from the conservation flock ($P \leq 0.01$). Significantly higher body weight gains were characteristic of ram lambs compared with ewe lambs in all years and flocks ($P \leq 0.01$).

In the study by Niżnikowski et al. [2007], the effect of sex on the rearing results of Wrzosówka lambs was non-significant. Also Borys and Osowski [1999] state that the sex of lambs does not significantly affect their usefulness for fattening; however, they consider that ram lambs are characterized by the better body weight gains with the lower feed consumption.

Table 6. Body weight (kg) and daily body weight gains (g) for the evaluated lambs depending on sex

Tabela 6. Masa ciała (kg) i przyrosty dobowe (g) ocenianych jagniąt w zależności od płci

| Flock Stado | Lambing year Rok wykotu | Sex Płeć | Statistical parameters Miary statystyczne | Birth weight, kg Masa ciała jagniąt przy urodzeniu, kg | Body weight at 56 days, kg Masa ciała jagniąt w 56. dniu odchowu, kg | Daily body weight gain, g Dobowy przyrost masy ciała, g |
|-------------------------------------|----------------------------------|-------------|--|---|--|---|
| Foundation – 1 Podstawowe – 1 | 2007 | ♀ | \bar{x} s V | 4.37 ^A 2.53 6.97 | 17.41 ^B 2.53 14.52 | 233 ^C 0.04 17.65 |
| | | ♂ | \bar{x} s V | 4.45 ^A 0.34 7.85 | 18.30 ^B 2.58 14.09 | 247 ^C 0.04 16.91 |
| | 2008 | ♀ | \bar{x} s V | 4.31 ^A 0.27 6.17 | 19.13 ^{EP} 2.43 12.68 | 265 ^{FR} 0.04 15.21 |
| | | ♂ | \bar{x} s V | 4.51 ^{DS} 0.38 8.41 | 21.45 ^{ET} 2.85 13.27 | 303 ^{FU} 0.05 15.23 |
| | 2009 | ♀ | \bar{x} s V | 3.44 ^G 0.45 13.07 | 21.43 ^H 2.46 11.49 | 321 ^a 0.04 12.07 |
| | | ♂ | \bar{x} s V | 3.65 ^{GT} 0.52 14.34 | 22.20 ^H 2.97 13.38 | 331 ^a 0.05 14.12 |
| Conservation – 2 Zachowawcze – 2 | 2008 | ♀ | \bar{x} s V | 4.33 ^J 0.32 7.36 | 20.29 ^{KP} 1.87 9.24 | 285 ^{LR} 0.03 10.61 |
| | | ♂ | \bar{x} s V | 4.97 ^{JS} 0.35 7.08 | 24.13 ^{KT} 1.73 7.16 | 332 ^{LU} 0.03 8.06 |
| | 2009 | ♀ | \bar{x} s V | 3.50 ^M 0.50 14.28 | 21.75 ^N 2.03 9.34 | 326 ^O 0.03 9.52 |
| | | ♂ | \bar{x} s V | 3.90 ^{MT} 0.67 17.27 | 22.95 ^N 2.11 9.20 | 340 ^O 0.03 9.18 |

Legend as in Table 5.

Objaśnienia jak w tab. 5.

In Table 7 is presented the effect of birth type (singletons, twins) on the body weight of evaluated lambs and their daily body weight gains at 56 days of age. Irrespective of the flock category, a clearly lower ($P \leq 0.01$) birth weight and body weight at 56 days of age as well as lower daily body weight gains for this period were obtained by twin lambs.

Table 7. Body weight (kg) and daily body weight gains (g) for the evaluated lambs depending on birth type

Tabela 7. Masa ciała (kg) i przyrosty dobowe (g) ocenianych jagniąt w zależności od typu urodzenia

| Flock Stado | Lambing year Rok wykotu | Birth type Typ urodzenia | Statistical parameter Miary statystyczne | Birth weight, kg Masa ciała jagniąt przy urodzeniu, kg | Body weight at 56 days, kg Masa ciała jagniąt w 56. dniu odchowu, kg | Daily body weight gain, g Dobowy przyrost masy ciała, g |
|-------------------------------------|----------------------------------|-----------------------------------|---|--|---|--|
| Foundation – 1 Podstawowe – 1 | 2007 | single pojedynczy | \bar{x} s V | 4.58 ^A 0.35 7.69 | 19.12 ^B 2.62 13.72 | 260 ^C 0.04 16.34 |
| | | twin bliźniaczy | \bar{x} s V | 4.28 ^A 0.19 4.48 | 16.88 1.94 11.51 | 225 ^C 0.03 14.60 |
| | 2008 | single pojedynczy | \bar{x} s V | 4.69 ^D 0.33 6.94 | 21.74 ^E 2.72 12.51 | 304 ^F 0.04 14.45 |
| | | twin bliźniaczy | \bar{x} s V | 4.22 ^D 0.17 4.02 | 19.30 ^E 2.56 13.24 | 269 ^F 0.04 16.35 |
| | 2009 | single pojedynczy | \bar{x} s V | 3.85 ^G 0.58 14.99 | 22.62 ^H 2.75 12.00 | 335 ^J 0.04 12.07 |
| | | twin bliźniaczy | \bar{x} s V | 3.33 ^G 0.25 7.46 | 21.32 ^H 2.62 12.27 | 321 ^J 0.04 13.65 |
| Conservation – 2 Zachowawcze – 2 | 2008 | single pojedynczy | \bar{x} s V | 4.89 ^K 0.4 9.07 | 22.98 ^L 2.36 10.28 | 323 ^L 0.04 11.23 |
| | | twin bliźniaczy | \bar{x} s V | 4.47 ^K 0.40 8.90 | 21.08 ^L 2.18 10.32 | 287 ^L 0.03 11.77 |
| | 2009 | single pojedynczy | \bar{x} s V | 4.26 ^M 0.63 14.79 | 23.33 ^N 1.86 7.96 | 341 ^a 0.03 7.73 |
| | | twin bliźniaczy | \bar{x} s V | 3.34 ^M 0.26 7.76 | 21.71 ^N 2.11 9.73 | 328 ^a 0.03 10.47 |

Legend as in Table 5.
Objaśnienia jak w tab. 5.

In the present study, a significant effect of both sex and birth type on the body weight and daily body weight gains of lambs was found. In the specialist animal production journals, much discussion has been devoted to estimating the magnitude of effects of various environmental factors determining animal growth dynamics. Certainly, sex and birth type of lambs belong to them. As for the body weight and daily body weight gains, ram lambs were always better than their female age mates during the rearing period [Niżnikowski et al. 1999, Gruszecki 2000], just as singletons compared with twins [Osikowski and Pakulski 1990, Śliwa and Gut 1990, Piechowicz et al. 1992]. However, the growth rates in the latter were usually higher [Piwczynski et al. 1999], which was confirmed in the present study.

Knapp [2009], in the study on Wrzosówka Sheep, found statistically significant ($P \leq 0.01$) effect of birth type on body weight and daily body weight gains. Despite the lower birth weight, lambs from multiple lambings (mainly twins) were characterized by better daily body weight gains and higher growth rates compared with those from single litters, which was also proved in the present study. The existence of such relationships is in accordance with the findings of Nowak [1994] and Jagiełło et al. [1997]. Also Niżnikowski et al. [2007] indicates the fact that the birth weight of lambs and their further growth are associated with birth type.

CONCLUSIONS

It can be concluded that the evaluated dams from both flocks were mainly born as singletons. In the studied period, this birth type accounted for 55.1–62.9% of all animals. In the age structure, young sheep (2–5 years old) predominated; however, the ewes from the conservation flock were somewhat younger. This flock was created relatively recently and mainly consists of young sheep. The values of the estimated reproduction indices were good. Prolificacy ranged between 137% for the dams from the foundation flock in 2008 and 148% for the dams from the conservation flock in 2009. The mean body weight of all lambs at 2 days of age was 4.14 kg and was the lowest in 2009 amounting to 3.55 kg and 3.69 for the foundation and conservation flocks, respectively. At 56 days of age, the lambs from flock 1 born in 2007 had the lowest weight and daily body weight gains and their age mates from flock 2 turned out to be the best. The differences between years and flocks with respect to the analysed growth traits were statistically significant. During the years 2007–2009, a significant effect of birth type and sex of lambs on their body weight and daily body weight gains was found in the evaluated flocks. Due to the selection of the best sheep for the conservation flock, the production results for this flock were better than those for the foundation flock.

REFERENCES

- Borys B., Miąskowska K., Janicki B., 1995. Próba określenia związków między behawiorem okolo-
porodowym maciorek mieszańców z kojarzenia owiec merynosa polskiego z trykami ras plennych
merynosa booroola i owcy Romanowskiej a wzrostem ich potomstwa [An attempt at determin-

- ing the associations between the perinatal behaviour of crossbred ewes (derived from mating Polish Merino Sheep with the rams of Booroola, Merino and Romanowska Sheep prolific breeds) and the growth of their offspring]. Zesz. Nauk. PTZ Prz. Hod. 19, 37–45 [in Polish].
- Borys B., Osikowski M., 1999. Użytkowość mięsno-mleczna maciorek F₁ fryz x merynos z tryczkami ile de France i berrichonne du Cher [Meat-and-dairy performance of ewes F₁ coming from Fresian x Merino ewes mated with rams of the Ile-dr-France and Berrichon du Cher]. Zesz. Nauk PTZ. 43, 43–47 [in Polish].
- Drożdż A., 2002. Czy mamy szansę przezwyciężyć kryzys w owczarstwie? [Is there any chance of overcoming the crisis in sheep farming?]. Prz. Hod. 8, 18–19 [in Polish].
- Gruszecki T., 1990. Analiza wzrostu mieszańców polskiej owcy nizinnej x rasy mięsne tuczonych do masy ciała 30–45 kg [Analysis of growth of crossbred [Polish Lowland x meat breeds] lambs fattened to 30–45 kg]. Prz. Nauk. Lit. Zootech. XXXV (Zesz. specjalny), 186–190 [in Polish].
- Gruszecki T., Niżnikowski R., Borys B., 2000. Uwarunkowania i szanse produkcji owczarskiej w Polsce [Trends and prospects of sheep production in Poland]. Prz. Hod. 5, 20–22 [in Polish].
- Jagiello M., Niżnikowski R., Rant W., Szytych D., 1997. Ocena jakości tusz jagniąt polskich owiec nizinnych i wrzosówek w porównaniu do ich mieszańców pochodzących po trykach berrichonne du cher. Rola i znaczenie hodowlane chronionych przed wyginieniem ras i odmian owiec [Quality evaluation of lamb carcasses of Polish Lowland and Wrzosówka Sheep compared with their crossbreeds derived from Berrichonne du Cher rams. The role and breeding significance of sheep breeds and varieties protected against extinction]. Wydaw. Fundacja Rozwój SGGW, Warszawa, 82–89 [in Polish].
- Janicki B., Borys B., Simińska E., 1995. Obserwacje przejawów instynktu macierzyńskiego w okresie okołoporodowym u maciorek rasy merynos polski oraz mieszańców F₁ booroola x merynos polski i romanowska x merynos polski [Observations on the manifestation of maternal instinct during the perinatal period in Polish Merino ewes and F₁ Booroola x Polish Merino as well as Romanowska x Polish Merino crossbreeds]. Zesz. Nauk. PTZ Prz. Hod. 19, 29–36 [in Polish].
- Hodowla owiec i kóz w Polsce w latach 2007–2009 [Sheep and Goat Breeding in Poland in the Years 2007–2009]. Polski Związek Owczarski, Warszawa [in Polish].
- Kawęcka A., Sikora J., 2009. Rodzime rasy owiec w górskich rejonach Polski [The native sheep breeds in the mountain regions of Poland]. Zesz. Nauk. PTG 11, 24–29 [in Polish].
- Klepacki B., 2005. Prowadzenie efektywnych gospodarstw owczarskich po przystąpieniu Polski do Unii Europejskiej. Poradnik dla producentów jagniąt rzeźnych [Effective Sheep Farming After Accession of Poland to the European Union. A Guide for Slaughter Lamb Producers]. Ed. R. Niżnikowski, TWIGGER, Warszawa, 151–154 [in Polish].
- Klepacki B., Rokicki T., 2005. Produkcja owczarska szansą zwiększenia dochodów dla gospodarstw rolnych [Sheep production as a chance of increasing profits from farms]. Wieś Jutra 11, 37–38 [in Polish].
- Klepacki B., Rokicki T., 2006. Produkcja owczarska jako element zrównoważonego rozwoju obszarów wiejskich [Sheep production as an element of sustainable development of rural areas]. Zesz. Nauk. AR Wroc. 87, 54–59 [in Polish].
- Klewiec J., Gabryszuk M., 1996. Efekty różnego udziału merynosa w genotypie mieszańców z owcą booroola [Effects of different percentage of Merino Sheep breed in the genotype of crossbreeds with Booroola sheep]. Pr. Mater. Zootech. 48, 7–16 [in Polish].

- Knapp P., 2009. Ocena rozrodu macierek rasy wrzosówka polska i wzrostu ich potomstwa utrzymywanych na murawach kserotermicznych w Owczarach. [Evaluation of the Reproduction of Polish Wrzosówka Ewes and the Growth of Their Offspring Kept on the Xerothermal Grass in Owczary]. Praca magisterska, AR Szczecin [in Polish].
- Lachowski W., 2001. Wpływ zastosowania probiotyków Yea-sacc¹⁰²⁶, Lacto-sacc oraz Acid-Pack 4-Way na produktywność owiec [Influence of the probiotics: Yea-sacc¹⁰²⁶, Lacto-sacc and of Acid-Pack 4-Way application on productivity of the sheep]. Rozpr. 198. AR, Szczecin [in Polish].
- Martyniuk E., 1995. Genetyczne doskonalenie plenności owiec. Intensywna produkcja jagniąt [Genetic improvement of fertility of sheep. Intensive lamb production]. Fundacja Programów Pomocy dla Rolnictwa. Instytut Zootechniki, Kraków, 49–62 [in Polish].
- Niżnikowski R., 1995. Wybrane zagadnienia z zakresu produkcji jagniąt rzeźnych w badaniach Zakładu Hodowli Owiec i Kóz [Selected issues of slaughter lamb production in the research of the Laboratory of Sheep and Goats Breeding]. Prz. Hod. 4, 13–17 [in Polish].
- Niżnikowski R., 2005. Ochrona środowiska i pielęgnacja krajobrazu. Poradnik dla producentów jagniąt rzeźnych [Environmental Protection and Landscape Cultivation. A Guide for Slaughter Lamb Producers]. Ed. R. Niżnikowski, TWIGGER, Warszawa, 54–58 [in Polish].
- Niżnikowski R., Trzebińska D., Rant W., 1995. Charakterystyka wzrostu oraz wstępna przyżyciowa i poubojowa ocena umięśnienia jagniąt corriedale i ich mieszańców z owcą żelaźnieńską [Growth characterization as well as preliminary pre-mortem and post-mortem conformation evaluation of Corriedale lambs and their crossbreds with Żelaźnieńska Sheep]. Zesz. Nauk. PTZ Prz. Hod. 22, 7–16 [in Polish].
- Niżnikowski R., Jagiełło M., Rant W., Gliński M., 1999. Wpływ dokarmiania jagniąt środkami mlekozastępczymi na tempo ich wzrostu i wartość rzeźną [Effect of the additional feeding of lambs with milk replacers on their growth rate and slaughter value]. Zesz. Nauk. PTZ 43, 199–207 [in Polish].
- Niżnikowski R., Popielarczyk D., Strzelec E., Brudka G., 2007. Poziom cech rozrodu u wysokoplennych wrzosówek utrzymywanych w ramach programu hodowli zachowawczej [Level of reproduction traits in highly prolific Wrzosówka Sheep covered by the conservation breeding programme]. Ann. Univ. Mariae Curie-Skłodowska, Sect. E. XXV, 110–117 [in Polish].
- Nowak W., 1994. Poziom wybranych cech produkcyjnych macierek wrzosówki polskiej ze szczególnym uwzględnieniem cech mleczności, na przykładzie jednego ze stad objętych programem hodowli zachowawczej [The Level of Selected Production Traits in Polish Wrzosówka Sheep with a Special Consideration of Milk Traits. An Example of One of the Flocks Covered by the Conservation Breeding Programme. Doctoral Dissertation]. Praca doktorska, SGGW, Warszawa [in Polish].
- Osikowski M., Pakulski T., 1990. Wstępne obserwacje nad odchowem jagniąt merynosa polskiego z barwną wełną [Preliminary observations on the rearing of Coloured Polish Merino Sheep]. Prz. Nauk. Lit. Zootech. XXXV, 146–151 [in Polish].
- Patkowska-Sokoła B., Barczyńska E., 1985. Wpływ wieku matek merynosowych na wskaźniki rozrodu [Effect of maternal age on indices of Merino breeding]. Pr. Mater. Zootech. 39, 45–51 [in Polish].
- Piechowicz B., Jezierski M., Szeliga W., 1992. Cechy budowy, rozwoju somatycznego i użytkowości wełnistej owiec rasy suffolk na Podlasiu [Design features of the body, development and utility of somatic woolly sheep Suffolk breed in Podlasie]. Prz. Hod. 10, 29–30 [in Polish].
- Piwczyński D., Mroczkowski S., Baranowski A., 1999. Ocena wzrostu mieszańców R₃ i R₄ pochodzących z krzyżowania wypierającego merynosa polski x suffolk [Evaluation of the

- growth of crossbreeds R₃ and R₄ deriving from the supplanting crossbreeding Polish Merino x Suffolk breed]. *Zesz. Nauk. Prz. Hod.* 43, 253–263 [in Polish].
- Rzepecki R., 1995. Plenność owiec rasy merynos a produktywność ich potomstwa [The prolificacy of Merino Sheep and the productivity of their offspring]. *Zesz. Nauk. PTZ* 19, 61–67 [in Polish].
- Rzepecki R., Krupiński J., 1994. Poprawa wskaźników reprodukcji owiec rasy merynos [An improvement in the reproduction indices in Merino Sheep]. *Zesz. Nauk. Prz. Hod.* 13, 111–116 [in Polish].
- Seremak-Bulge J., 1992. Ekonomiczne warunki produkcji owczarskiej w gospodarce rynkowej [Economic conditions for sheep production in a market economy]. *Zesz. Nauk. PTZ* 7, 19–32 [in Polish].
- Szymanowska A., 1994. Ocena niektórych czynników genetycznych i środowiskowych wpływających na śmiertelność jagniąt [Evaluation of Some Genetic and Environmental Factors Affecting Lamb Mortality. Doctoral Dissertation]. Praca doktorska. AR Lublin [in Polish].
- Szymańska A., 2009. Owce na czasie [Sheep as a topical issue]. www.zycie-na-wsi.netbird.pl [in Polish].
- Śliwa Z., Gut A., 1990. Wzrost jagniąt z syntetycznej czarnogłowej linii mięsnej oraz użyteczność wełnista i rozplodowa maciorek [Growth of lambs of a synthetic fleshy Blackhead line and wool and reproductive performance of ewe dams]. *Prz. Nauk. Lit. Zootech.* XXXV (Zesz. specjalny), 159–163 [in Polish].

OCENA I PORÓWNANIE WSKAŹNIKÓW PRODUKCYJNYCH W STADZIE ZACHOWAWCZYM I PODSTAWOWYM MERYNOSA POLSKIEGO W STARYM TYPIE

Streszczenie. Celem pracy było określenie podstawowych wskaźników produkcyjnych w stadzie zachowawczym merynosa polskiego w starym typie i ich porównanie z wynikami produkcyjnymi całego stada owiec tej rasy w gospodarstwie Boguszyn należącym do Ośrodka Hodowli Zarodowej Lubiana. Ocenie poddano użyteczność reprodukcyjną matek oraz wzrost i odchów ich potomstwa za lata 2007–2009. W obu stadach przeważał pojedynczy typ urodzenia matek (56,8–62,9%). Odsetek bliźniaczego typu urodzenia maciorek kształtował się w stadzie podstawowym na poziomie ok. 38%, zaś w stadzie zachowawczym wyniósł ponad 44%. W strukturze wiekowej owiec obu stad w okresie 2007–2009 przeważały owce młode w wieku od 2. do 5. lat, co mogło mieć wpływ na wyniki rozrodu matek. Średnia masa ciała wszystkich ocenianych jagniąt mierzona w 2. dniu po urodzeniu wynosiła 4,14 kg. Najlżejsze były jagnięta rocznika 2009. Ich masa ciała w stadzie podstawowym wynosiła 3,55 kg, a w stadzie zachowawczym – 3,69 kg. Statystycznie istotnie cięższe ($P \leq 0,01$) jagnięta rodziły się w stadzie zachowawczym. Również istotnie większą masę ciała w wieku 56. dni osiągnęły w latach 2008–2009 jagnięta ze stada zachowawczego (21,89–22,33 kg) przy rozstępie 17,85–21,84 kg u jagniąt stada podstawowego w okresie 2007–2009. Dobowe przyrosty masy ciała w obu stadach wahały się w granicach od 240 g do 333 g i były statystycznie istotnie lepsze ($P \leq 0,01$) w stadzie zachowawczym. W obu stadach wykazano istotny wpływ typu urodzenia i płci jagniąt na ich masę ciała i przyrosty dobowe.

Słowa kluczowe: merynos polski, produktywność, stado podstawowe, stado zachowawcze

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