

**PERFORMANCE EVALUATION OF ALPINE  
AND SAANEN GOATS IN POLAND  
IN THE YEARS 2000–2011**

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**Key words:** goats, milk performance, reproductive performance.

**Abstract**

Our study was based on the following data provided by the Central Statistical Office and the Polish Goats Breeders Association for the years 2000–2011: the total of all goats in Poland, including the Alpine and Saanen breeds; the number of goats under performance evaluation; milk and reproductive performance results. To determine developmental directions of the traits in the analysed period, we used the trend method; and to calculate the trends, we used a first degree linear function. Among the Polish goats evaluated in 2011, the most numerous is the Boer breed (meat), which constitutes 45.87% of the total; whereas among milk breeds, the most popular are the White Improved (14.95%), Coloured Improved (9.79%), Saanen (6.19%) and Alpine (4.64%). Reproductive performance for the Alpine goats was 83.5% to 100%, and for the Saanen goats 73.3% to 100%; whereas prolificacy was respectively 139.6% to 193.3%, and 126.1% to 213.1%. Analysing trend lines of milk performance traits in the examined goats in the years 2000–2011, we observed an extension of the milking period by approx. 2.5 days per year, as well as an increase of milk yield per lactation by approx 1.7 kg (Alpine breed) and approx. 1.6 kg (Saanen breed), fat yield by approx 0.5 kg and approx 0.9 kg, and protein yield by approx 0.4 kg and 0.5 kg per year. All milk from evaluated goats had similar fat and protein content.

**OCENA UŻYTKOWOŚCI KÓZ RAS ALPEJSKIEJ I SAANEŃSKIEJ W POLSCE  
W LATACH 2000–2011**

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**Słowa kluczowe:** kozy, użytkowość mleczna, użytkowość rozplodowa.

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## Abstrakt

W pracy uwzględniono: stan pogłowia kóz w Polsce ogółem, w tym rasy alpejskiej i saaneńskiej, liczbę kóz objętych kontrolą użytkowości oraz wyniki użytkowości mlecznej i rozplodowej, korzystając z danych opublikowanych przez Główny Urząd Statystyczny oraz Polski Związek Owczarski w latach 2000–2011. Do nakreślenia linii rozwojowych badanych cech w omawianym okresie zastosowano metodę trendów, a do wyliczenia trendów wykorzystano funkcję liniową pierwszego stopnia. W krajowym pogłowiu kóz dominującą rolę odgrywa rasa burska (mięsna), która stanowi 45,87% pogłowia kóz objętych oceną użytkowości, z ras mlecznych – biała uszlachetniona (14,95%), barwna uszlachetniona (9,79%), saaneńska (6,19%) i alpejska (4,64%). Płodność kóz rasy alpejskiej wynosiła od 83,5% do 100%, saaneńskiej od 73,3% do 100%, natomiast plenność odpowiednio od 139,6% do 193,3% i od 126,1 do 213,1%. Analizując linie tendencji cech użytkowości mlecznej ocenianych kóz w latach 2000–2011, zaobserwowano wydłużanie się okresu dojenja o około 2,5 dnia na rok, wzrost wydajności mleka za laktację o około 1,7 kg (rasa alpejska) i ok. 1,6 kg (rasa saaneńska) oraz wzrost wydajności tłuszczu o ok. 0,5 kg i ok. 0,9 kg, a białka o ok. 0,4 i 0,5 kg na rok. Mleko ocenianych kóz charakteryzowało się zblizoną zawartością tłuszczu i białka.

## Introduction

Rearing and breeding of goats have a long history in Poland. After World War II, there were approx 800 thousand goats in the country, but over the following years, this number was constantly decreasing. In 1970, it was already down to 40 thousand, resulting in discontinuation of breeding and performance evaluation, and the animals were even no longer listed in the statistics prepared by the Central Statistical Office (RYNIEWICZ and KRZYŻEWSKI 1997, STRZELEC and NIŻNIKOWSKI 2009). The subject of goat breeding returned in the 1980s, which was caused by social and economical changes occurring in Poland and people's growing interest in goat milk (RYNIEWICZ and KRZYŻEWSKI 1997). In 1983, goat performance evaluation was resumed, mainly focussing on goat milk recording, selection of kids and young animals, choosing animals for further breeding, recording animals in their flock books, and keeping goat breeding documentation. In 1991, a standard was introduced for qualitative requirements of pasteurized goat milk (BAGNICKA and ŁUKASZEWICZ 2000, MROCZKOWSKI et al. 1997, SZYMANOWSKA and LIPECKA 2000).

Data gathered so far on our goats by milk recording indicate that milk from Polish goats is not the same in terms of yield and chemical content (RYNIEWICZ and KRZYŻEWSKI 1997, STRZELEC and NIŻNIKOWSKI 2009). Milk yield improvement in goats can be achieved through selection of existing goats and improvement of native breeds, which may be done by mixing them with bucks from countries with a strong record of highly productive bucks, such as France (RYNIEWICZ and KRZYŻEWSKI 1997, BAGNICKA and ŁUKASZEWICZ 2000).

The objective of the research was to analyse both reproductive and milk performance in Alpine and Saanen goats in Poland evaluated in 2000–2011.

## Material and Methods

Our study was based on the following data provided by the Central Statistical Office and the Polish Goats Breeders Association for the years 2000–2011: the total of all goats in Poland, including the Alpine and Saanen breeds; the number of goats under performance evaluation; milk and reproductive performance results. To determine developmental directions of the traits in the analysed period, we used the trend method. we calculated the trends using a first degree linear function, as in the following formula (ZAJĄC 1988):

$$y_t = a_t + b$$

where:

- $a_t$  – slope (of regression line), indicating annual rate of a given trait's increase;
- $t$  – time indicated as subsequent years;
- $b$  – trait level in a given period.

Accuracy of trend lines was evaluated based on coefficients of determination ( $R^2$ ), where:

$$R^2 = \frac{\sum_{t=1}^n \left( y_t - \hat{y}_t \right)^2}{n}$$

- $y_t$  – actual value of the  $y$  variable at the  $t$  time;
- $y \wedge t$  – theoretical value of the dependent variable (based on model);
- $\bar{y}$  – arithmetic means of dependent variable empirical values.

## Results and Discussion

According to the Central Statistical Office, the total number of goats in Poland in 2011 was 111,824, and 194 animals were under performance evaluation, which constitutes merely 0.18%. Currently, among all goats in Poland, the most numerous is the Boer meat breed, which constitutes 45.87% of the total; whereas among milk breeds, the most popular are the White Improved (14.95%), Coloured Improved (9.79%), Saanen (6.19%) and Alpine (4.64%) – Figure 1.

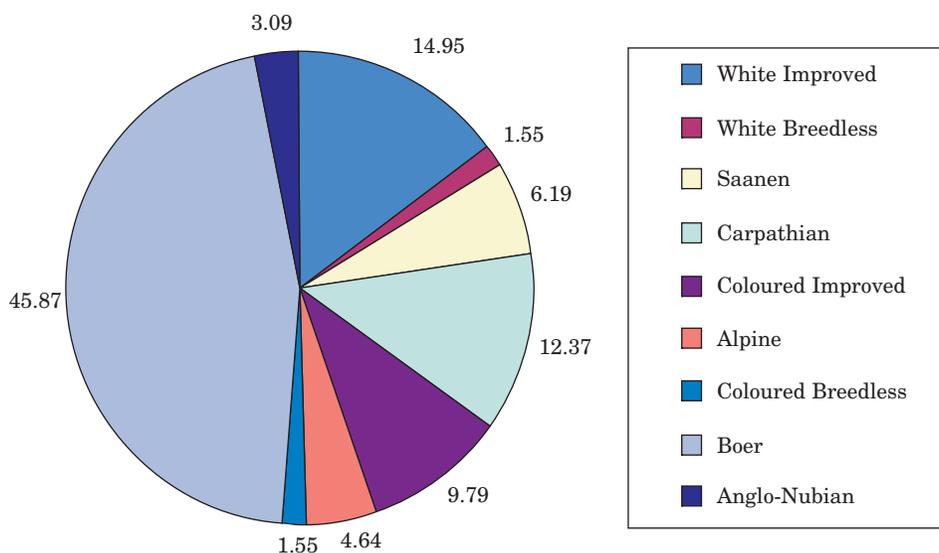


Fig. 1. Percentage of goats evaluated in 2011

As shown by data in Figure 2, the number of evaluated goats decreased from 278 animals for the Alpine breed, and 477 for the Saanen breed in 2009, down to 9 and 12 animals respectively in 2011. A dramatic drop in goat population was noted in 2007, which saw the number of Alpine goats falling from 144 (in 2006) to only 20, and Saanen from 726 to 23. This could have been caused, among other reasons, by introduction of payments for evaluation of milk performance of goats.

Temporal trends for the population of Alpine and Saanen goats evaluated in terms of their performance were negative. This means that the number of goats of both evaluated breeds has decreased over the 10 years, by the annual average of approx 33 Alpine and approx. 67 Saanen goats (Figure 2).

When milk production is the predominant use of goats, reproductive indexes play a very important role, not only because they define milk production but also economic effectiveness of goat rearing. Supplied details indicate that, over 12 years, fertility of evaluated goats was 83.5% to 100% in Alpine goats, and 73.3% to 100% in Saanen goats; whereas prolificacy 139.6% to 193.3% and 126.1% to 213.1% respectively. The highest fertility (in proximity of 100%) was found in goats in the years 2008–2010. In 2011, this result was lower by approx. 8% as compared to 2010. Analysing prolificacy in Alpine goats, we found an increase until 2008, and then a drop. In Saanen goats, prolificacy grew in the years 2002–2010, except for 2007, when it was the lowest at 108.5%. In 2011, a prolificacy increase was observed in Alpine goats

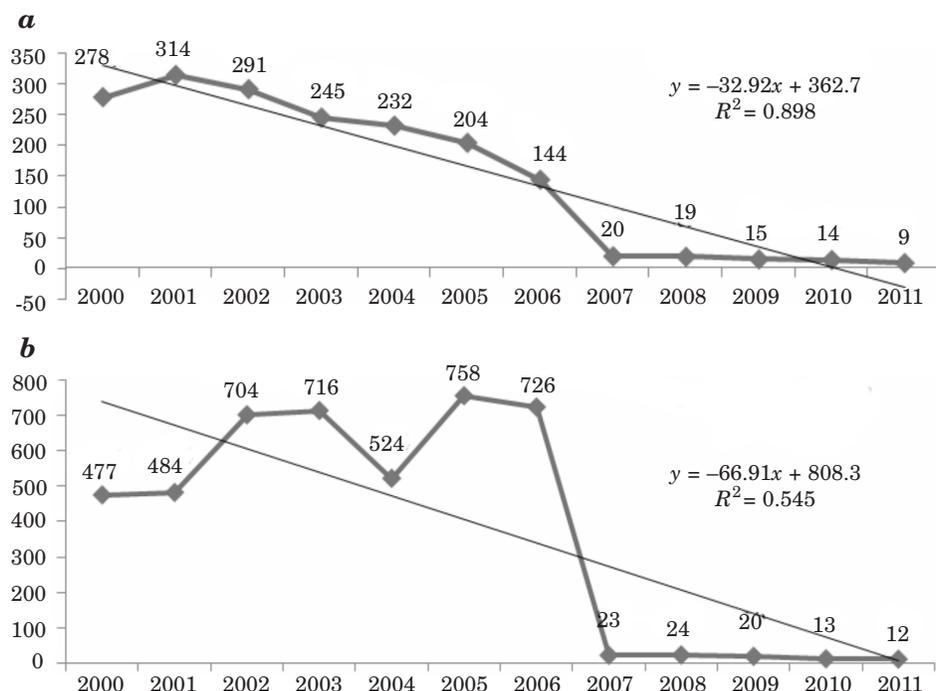


Fig. 2. Temporal trends for the population of Alpine (a) and Saanen (b) goats evaluated in terms of performance

by nearly 10 percent, whereas in Saanen goats a significant drop by as much as 50% as compared to 2010 (Figure 3).

Developmental trend lines for traits related to reproductive performance of Alpine and Saanen goats indicate constant, however small, increase in fertility in the years 2000–2011, on average by approx. 1 and 0.5%, and prolificacy respectively by 2.4 and 5.2% annually. Coefficient of determination ( $R^2$ ) varied from 0.049 to 0.433 (Figure 3).

SZYMANOWSKA and LIPECKA (2000), analysing fertility and prolificacy of goats evaluated in terms of their performance in the years 1990–1999, observed that fertility in Polish goats was 85.3% to 97.4%, whereas prolificacy 164% to 187%. These values are similar to those found in our study (2000–2011). Higher prolificacy in Saanen goats in the years 2008–2010 (188.1–213.1%) may be connected with a small number of animals under performance evaluation.

Data shown in Figure 4 and Table 1 indicate that the average milk yield for Alpine goats in 2000 was 639 kg per a 243-day lactation, which translates to a daily yield of 2.6 kg. The lowest yields were found in 2002 (510.7 kg) and 2006

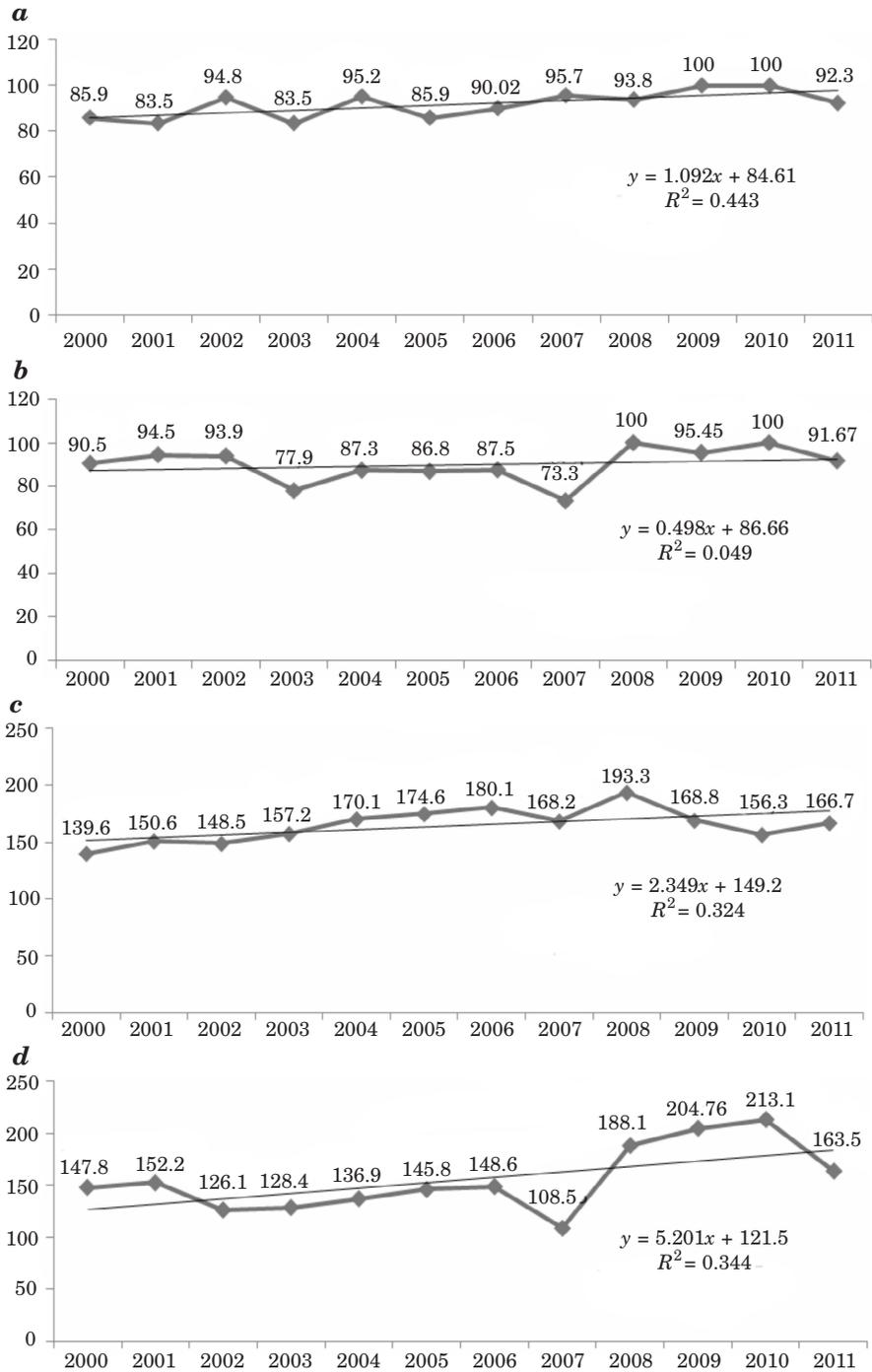


Fig. 3. Temporal trends for reproductive performance traits in Alpine and Saanen goats: *a* – Alpine goats fertility, *b* – Saanen goats fertility, *c* – Alpine goats prolificacy, *d* – Saanen goats prolificacy

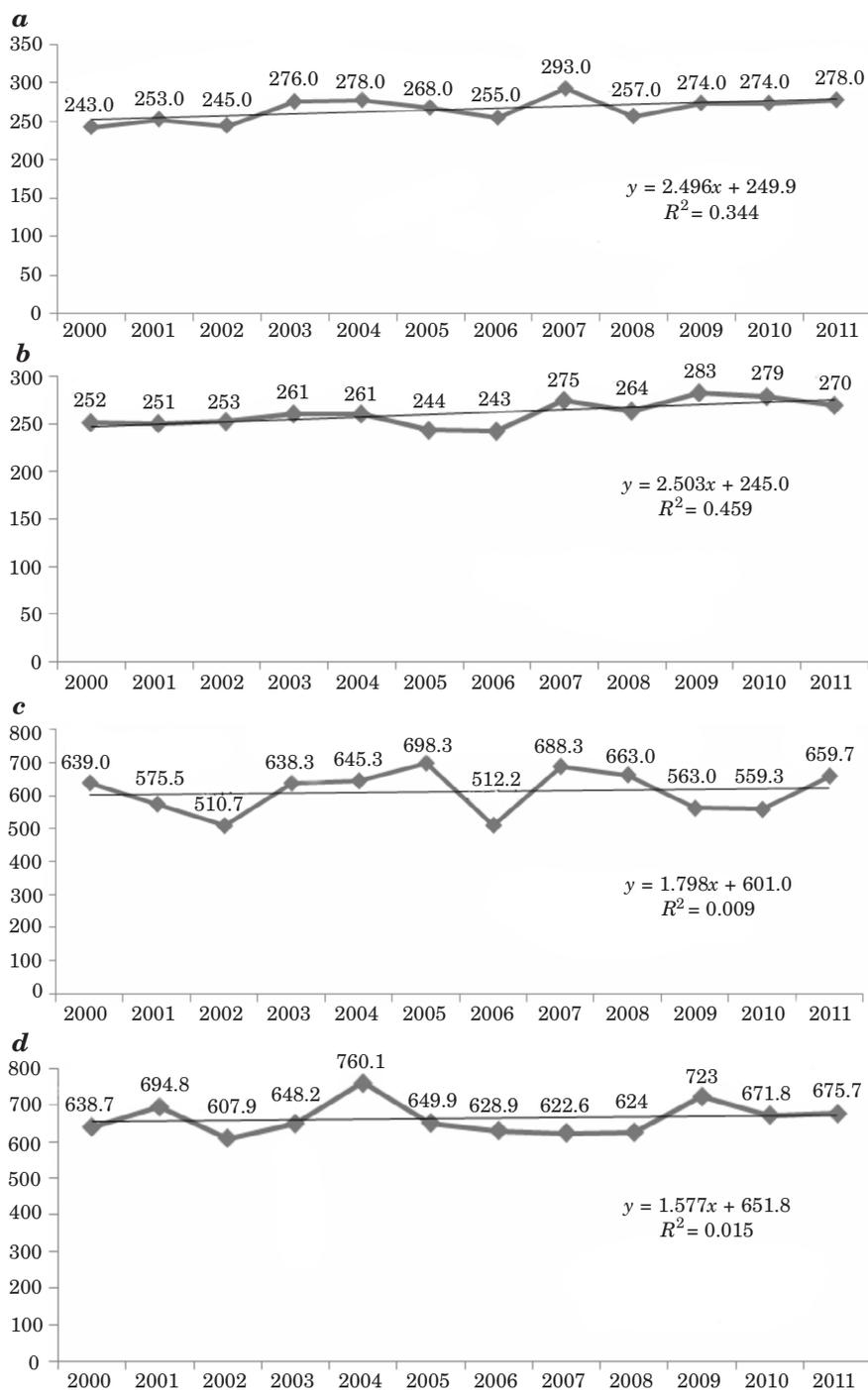


Fig. 4. Temporal trends for milk performance in Alpine and Saanen goats: *a* – Alpine goats lactation time, *b* – Saanen goats lactation time, *c* – Alpine goats milk yield, *d* – Saanen goats milk yield lactation

(512.2 kg). In 2011, lactation of evaluated goats lasted up to 278 days with the yield of 660 kg, and a daily yield of approx 2 kg (Figure 4 and Table 1). Milk performance in the year 2000 was similar in both analysed breeds. The longest lactation and the highest milk yield in these goats was recorded in 2009, equalling respectively 283 days and 723 kg of milk. In 2011, lactation was shortened by 13 days, and yield per lactation decreased by approx. 50 kg (Figure 4).

Table 1  
Trait trends for daily milk yield as well as fat and protein yield and concentration in the milk of Alpine and Saanen goats in the years 2000–2011

| Traits                | Breed  | Trend                 | Coefficient of determination ( $R^2$ ) |
|-----------------------|--------|-----------------------|--|
| Daily milk yield [kg] | Alpine | $y = 0.068x + 1.992$  | 0.3215                                 |
|                       | Saanen | $y = 0.031x + 1.292$  | 0.3325                                 |
| Fat yield [kg]        | Alpine | $y = 0.503x + 17.223$ | 0.1613                                 |
|                       | Saanen | $y = 0.889x + 20.765$ | 0.2314                                 |
| Fat content [%]       | Alpine | $y = -0.055x + 3.559$ | 0.4453                                 |
|                       | Saanen | $y = 0.036x + 3.578$  | 0.1427                                 |
| Protein yield [kg]    | Alpine | $y = 0.371x + 14.653$ | 0.1433                                 |
|                       | Saanen | $y = 0.493x + 16.902$ | 0.2674                                 |
| Protein content [%]   | Alpine | $y = 0.015x + 2.815$  | 0.1349                                 |
|                       | Saanen | $y = 0.018x + 2.836$  | 0.5405                                 |

Similar dependencies were pointed out by BAGNICKA and ŁUKASZEWICZ (2000) in their analyses concerning assessment of the national goat milk performance database.

In milk production breeding of goats, not only the amount of milk is important but also its quality, which defines suitability of milk for processing. Average fat content in milk from Alpine goats was 3.0% to 3.8%, and protein content 3.0% to 3.4%; in milk from Saanen goats, these values equalled 3.0% to 3.8% and 2.9% to 3.2% respectively (Table 1).

Similar results of goat productivity assessment in the region of the town of Lublin was observed by SZYMANOWSKA et al. (2008). Whereas ŽAN et al. (2006), who evaluated milk quality in Saanen and Alpine pasture-fed goats, found that their milk contained the average of 3.77% (Saanen) and 3.36% (Alpine) of fat, and 3.40% and 2.95% of protein respectively. Alpine goat milk in a study conducted by SORYAL et al. (2005) contained the average of 2.76% fat and 2.53% of protein, which is less than what we established in our study. Whereas milk from Greek goats in a study by KONDYLI et al. (2007) was rich in these substances: concentration of fat was 3.93–4.46% and protein 3.18–3.70%.

Analysing trend lines for milk performance of evaluated goats in the years 2000–2011, we observed that the milking period lengthened by approx. 2.5 days a year, milk yield per lactation grew by approx 1.7 kg (Alpine goats) and approx. 1.6 kg (Saanen goats) – Figure 4. We also established an increase in fat yield in Alpine and Saanen goat milk by approx 0.5 kg and approx 0.9 kg, as well as protein by approx 0.4 and 0.5 kg per year respectively. We found a minor increase in fat concentration in Saanen goat milk (by approx 0.04%) and a decrease of fat content in Alpine goat milk by approx. 0.06% per year. Protein content in milk from both evaluated breeds increased by approx. 0.02% annually. The  $R^2$  value equalled 0.009 to 0.5405 (Table 1).

Earlier research on goat milk performance conducted for the entire population of evaluated animals showed that the milking period becomes shorter and the yield decreases. Furthermore, fat content in milk was higher, whereas protein content lower (MISTRZAK and BERNACKA 2011, NIŻNIKOWSKI 1996, STRZELEC and NIŻNIKOWSKI 2009, SZYMANOWSKA and LIPECKA 2000).

The conclusion is that over the years 2000–2011 the number of Alpine and Saanen goats evaluated in terms of their performance decreased dramatically. The current goat breeding situation in Poland predominantly results from the lack of breeding programmes and small interest of breeders in animal evaluation. Consequently, possibilities of any efficient goat breeding in Poland are limited, mainly due to the small population size of animals under performance evaluation and the fact that they are scattered over a large area.

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## References

- BAGNICKA E., ŁUKASZEWICZ M. 2000. *Ocena krajowej bazy danych o użytkowości mlecznej i rozplodowej kóz pod względem przydatności do pracy hodowlanej*. Warsaw. Agricult. Univ.-SGGW, Anim. Sc., 37, 13–20.
- Hodowla owiec i kóz w latach 2000–2011. Polski Związek Owczarski, Warszawa.
- KONDYLI E., KATSIARI M.C., VOUTSINAS L.P. 2007. *Variations of vitamin and mineral contents in raw goat milko for the indigenous Greek breed during lactation*. Food Chem., 100: 226–230.
- MISTRZAK M., BERNACKA H. 2011. *Evaluation of the productivity of white and coloured improved goats in the Kujawy-Pomerania Province in comparison with the domestic population*, Acta Sci. Pol. Zootechnica, 10(2): 63–76.
- MROCKOWSKI S., BARANOWSKI A., BERNACKA H., DANKOWSKI A. 1997. *Analiza stanu hodowli kóz w Polsce*. Zesz. Nauk. Zakładu Hodowli Owiec i Kóz SGGW Warszawa, 1: 55–64.
- NIŻNIKOWSKI R. 1996. *Wybrane aspekty mleczności owiec i kóz*. Prz. Hod., 9: 9–16.
- RYNIEWICZ Z., KRZYŻEWSKI J. 1997. *Aktualne problemy w hodowli kóz w Polsce*. Zesz. Nauk. Zakładu Hodowli Owiec i Kóz SGGW Warszawa, 1: 9–28.
- SORYAL K., BEYENE F.A., ZENG S., BAH B., TESFAI K. 2005. *Effect of goat breed and milk composition on yield, sensory quality, fatty acid concentration of soft cheese during lactation*. Small Ruminant, Research, 58: 275–281.

- STRZELEC E., NIŻNIKOWSKI R. 2009. *Pochodzenie, znaczenie hodowlane oraz charakterystyka populacji kóz na świecie i w Polsce*. Prz. Hod., 4: 7–12.
- SZYMANOWSKA A., LIPECKA C. 2000. *Stan i aktualna sytuacja w hodowli kóz w Polsce*. Ann. Warsaw. Agricult. Univ.-SGGW, Anim. Sc., 37: 3–12.
- SZYMANOWSKA A., LIŚKIEWICZ M., BOJAR W. 2008. *Stan pogłowia i produktywność kóz w regionie lubelskim*. Prz. Hod., 5: 17–19.
- ZAJĄC K. 1988. *Zarys metod statystycznych*. PWE, Warszawa, pp. 338–433.
- ŽAN M., STIBILJ V., ROGELJ I. 2006. *Milk fatty acid composition of goat grazing on alpine pasture*. Small Ruminant Research, 64: 45–52.