

Sows' longevity – a case study of a native breed

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Abstract: *Sows' longevity – a case study of a native breed.* The aim of the study was to assess the length of use of Złotnicka Spotted sows, which are covered by the National Programme for the Conservation of Genetic Resources. The research was conducted on 3,585 sows removed from herds between 2002 and 2017. On average, Złotnicka Spotted sows were removed from the herd when they were 1,112 days old and had farrowed 3.88 times. The research proved statistically significant dependencies between sows' functional traits and the parameters determining their longevity. The research findings showed that the length of use of sows depended on the number of piglets in the first and last litter as well as the number of piglets reared up to the 21st day per litter. The study also includes data on the percentage of Złotnicka Spotted sows removed (%) from herds during the period under study and the percentage share of primiparous sows introduced into herds. During the research period the values of both indicators fluctuated considerably, which indicated the unstable size of the population. These dependencies were closely related with the RDP 2007–2013 and 2014–2020 and the amount of subsidies allocated to native breeds. The length of use of sows is a very complex feature. It is of great economic importance and closely related with the profitability of pig production. Therefore, although breeders received subsidies to native breed of sows, the downturn in the pig market caused instability of the pig population.

Key words: sows longevity, sow, Złotnicka Spotted, native breed

INTRODUCTION

Although pigs' life expectancy is estimated at about 12–15 years, these animals are not maintained for such a long period of time due to the current volume of production. The length of the use of sows is directly proportional to the economy of pig breeding or raising. Sows are removed from herds when the results of production are falling and it is no longer profitable to keep these animals (Stalder et al. 2007). Sows are usually removed due to lower production results and health problems (Nikkilä et al. 2013). However, there may also be non-agricultural reasons such as bad situation on the pork market or unfavourable relation between cereal and pork prices, which affect the profitability of pig breeding.

The maintenance system and environmental conditions also significantly affect sows' welfare and the length of their stay in a herd (Anil et al. 2008). Longer maintenance of sows is financially profitable because it reduces the herd exchange rate. Older animals, which have achieved maximum efficiency are maintained then (Hoge and Bates 2011). Apart from that, the number of reared

piglets increases, whereas the herd is healthier and more immune to diseases (Sobczyńska and Blicharski 2014). The selection aimed at improving meatiness and acceleration of the production cycle caused rapid removal of sows, on average after 3–4 litters (Hoge and Bates 2011). It is estimated that as much as 15–20% of sows are removed after only one litter. Reproduction disorders are the main cause (30%) of the removal of sows. It is a serious problem, because profitability can be achieved only after 3 litters, whereas 5.5 litters is a satisfactory number (Sobczyńska and Blicharski 2014).

Recently the length of the use of sows has become increasingly important and the possibility of including longevity traits into breeding programmes for various breeds has been considered. For example, in Denmark this feature is already taken into account when animals are selected and it makes about 10% of the breeding target, depending on the population. However, there are problems to assess the value of this feature, because it can be analysed only when the animal dies or is removed from the herd (Sobczyńska and Blicharski 2014).

The aim of the study was to assess the length of the use of Złotnicka Spotted sows, which are covered by the National Programme for the Conservation of Genetic Resources.

MATERIAL AND METHODS

The research was conducted on a population of Złotnicka Spotted pigs, which are classified as rare breeds threatened by extinction. They are protected by law in Poland.

The research involved the analysis of data on Złotnicka Spotted pigs from the records provided by the Poznań University of Life Sciences. Sows' longevity was measured according to the age of their removal from herds and the number of litters. Reports with information on 3,585 sows removed from herds between 2002 and 2017 were generated from the electronic database OSHZ-Trzoda belonging to the Poznań University of Life Sciences. The data were analysed statistically by means of the SAS software suite.

Apart from the sow's age on removal from the herd (days) and the number of litters (pcs), the following elements were included in the statistical analysis of the sow population: the inbreeding ratio, the sow's age at the first farrow (days), the period between farrows (days), the number of nipples (pcs), the number of litters per sow (pcs), the number of live piglets per litter (pcs), the number of piglets reared up to the 21st day per litter (pcs), piglets lost by the 21st day of rearing (%), the number of live piglets in the last litter (pcs), the number of piglets reared up to the 21st day in the last litter (pcs) and piglets in the last litter lost by the 21st day of rearing (%). As the covariance method with the PROC GLM procedure was used for statistical calculations, the probit transformation described by Lynch and Welsh (1998) was used for the traits that were discrete random variables (the number of piglets born and reared and the number of litters), because it enabled their conversion into continuous random variables. The data collected in the study enabled the following calculations: the removal of sows from the herd (the number of sows

removed from the herd in a year/the average number of sows in the year $\times 100\%$) and the removal of sows from herds after consecutive litters (the number of sows removed from the herd after consecutive litters/the total number of sows removed $\times 100\%$).

The Pearson phenotypic correlation coefficient between the sows' functional traits and the parameters determining their longevity was estimated with the CORR-SAS procedure v. 9.3. (2014).

RESULTS AND DISCUSSION

Table 1 shows the statistics of the sows included in the study. On average, between 2002 and 2017 the Złotnicka Spotted sows were removed from herds when they were 1,112 days old and had had 3.88 litters of piglets. The inbreeding ratio was 0.0238. On average, the sows were 432 days old when they farrowed for the first time. The average period

between farrows was 212 days. On average, in each litter 9.04 piglets were born alive and 8.01 piglets were reared up to the 21st day. On average, 13.71% of the piglets were lost by the 21st day of rearing. On average, in the last litter 8.61 piglets were born alive and 7.29 piglets were reared up to the 21st day. On average, 14.57% of the piglets in the last litter were lost by the 21st day of rearing. On average, each sow had 13.53 nipples. The sows' reproductive performance indicators differed from the results reported by Nowak et al. (2016), who studied cross-bred sows (Polish Large White, Polish Landrace, Pietrain, Hampshire, Duroc). On average, the sows had 11.3 piglets per litter. There were 9.78 weaned piglets, on average. The reproductive cycle lasted 163.1 days. Also, the research conducted on pure Polish Large White and Polish Landrace pigs by Schwarz et al. (2007) proved that native breeds of sows were characterised by worse reproductive

TABLE 1. The statistical characterisation of the traits determining the length of use of Złotnicka Spotted sows and their functional parameters between 2002 and 2017

Traits	\bar{x}	SE
Sow's age on removal from herd (days)	1 112	13.86
Inbreeding ratio	0.0238	0.0009
Sow's age at first farrow (days)	432	5.33
Period between farrows (days)	212	2.12
Number of nipples (pcs)	13.53	0.54
Number of litters per sow (pcs)	3.88	0.07
Number of live piglets per litter (pcs)	9.04	0.05
Number of piglets reared up to 21st day per litter (pcs)	8.01	0.05
Piglets lost by 21st day of rearing (%)	13.71	0.46
Number of live piglets in last litter (pcs)	8.61	0.07
Number of piglets reared up to 21st day in last litter (pcs)	7.29	0.06
Piglets in last litter lost by 21st day of rearing (%)	14.57	0.62

performance parameters. The Pearson phenotypic correlation analysis (Table 2) showed that both the age of sows' removal from herds and the number of litters were positively correlated with the number of piglets born alive in each litter, the number of piglets born alive in the last litter and the number of piglets reared up to the 21st day in the last litter at a significance level of $P \leq 0.01$. These parameters were negatively correlated with the number of piglets reared up to the 21st day per litter at a significance level of $P \leq 0.05$. The results of our study were in agreement with the findings of the research conducted by Hoge and Bates (2011), who proved that the number of piglets born in sows' first and last litters as well as the number of dead piglets in the first litter significantly affected sows' longevity ($P < 0.0001$). Sevón-Aimonen and Uimari (2013) researched the genetic parameters of longevity and found high genetic correlations (> 0.9) between the length of use of herds, the total number of litters, the number of piglets born, the number of piglets born alive and the number of piglets weaned. They found low correlations between

the traits referring to piglet mortality. In our study on the population of Złotnicka Spotted sows the number of piglets lost by the 21st day of rearing did not depend on the traits referring to the length of use of the sows (Table 2).

Noppibool et al. (2016) and Rohrer et al. (2017) also confirmed high positive genetic correlations between traits referring to the length of the use of sows and the number of piglets weaned per litter.

Aasmundstad et al. (2014) indicated that there was no relationship between traits referring to sows' body build and their longevity. Figure 1 shows the percentage of Złotnicka Spotted sows removed (%) from herds between 2002 and 2017. The lowest percentage of sows removed from herds was noted in 2016 (17.14%), whereas the highest percentage was observed in 2014 (66.66%). It was so high because Poland started implementing the Rural Development Programme (RDP) 2014–2020. At the time some breeders abandoned the maintenance of Złotnicka Spotted pigs within the Programme. In the following years fewer sows were removed. Figure 2 shows the percentage of Złotnicka Spot-

TABLE 2. The Pearson phenotypic correlation coefficient between the sows' functional traits and the parameters determining their longevity

Item	Number of live piglets per litter (pcs)	Number of piglets reared up to 21st day per litter (pcs)	Piglets lost by 21st day of rearing (%)	Number of live piglets in last litter (pcs)	Number of piglets reared up to 21st day in last litter (pcs)	Piglets in last litter lost by 21st day of rearing (%)
Sow's age on removal from herd (days)	0.612**	-0.322*	-0.099	0.088	0.079	-0.108
Number of litters per sow (pcs)	0.889**	-0.488*	-0.075	0.709**	0.598**	-0.157

** statistically significant correlation ($P \leq 0.01$), * statistically significant correlation ($P \leq 0.05$)

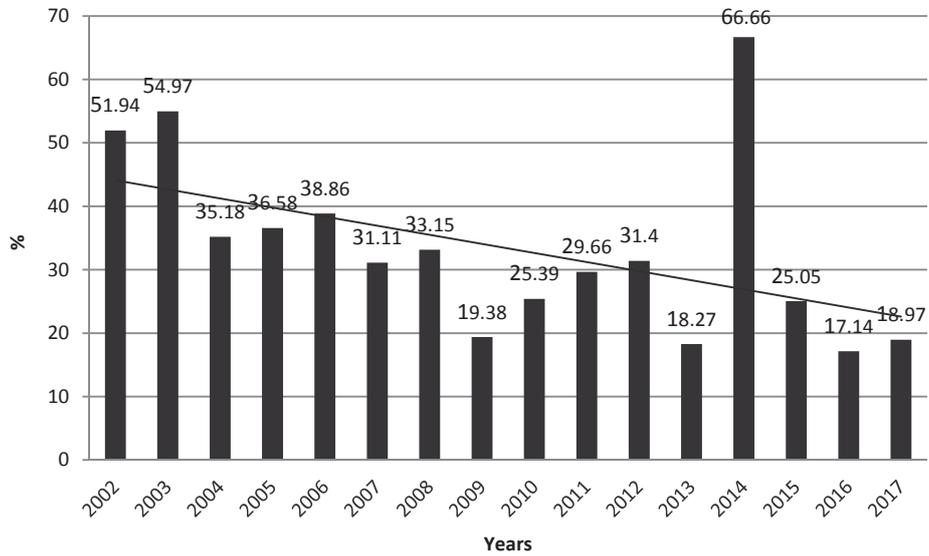


FIGURE 1. Złotnicka Spotted sows removed from herds between 2002 and 2017

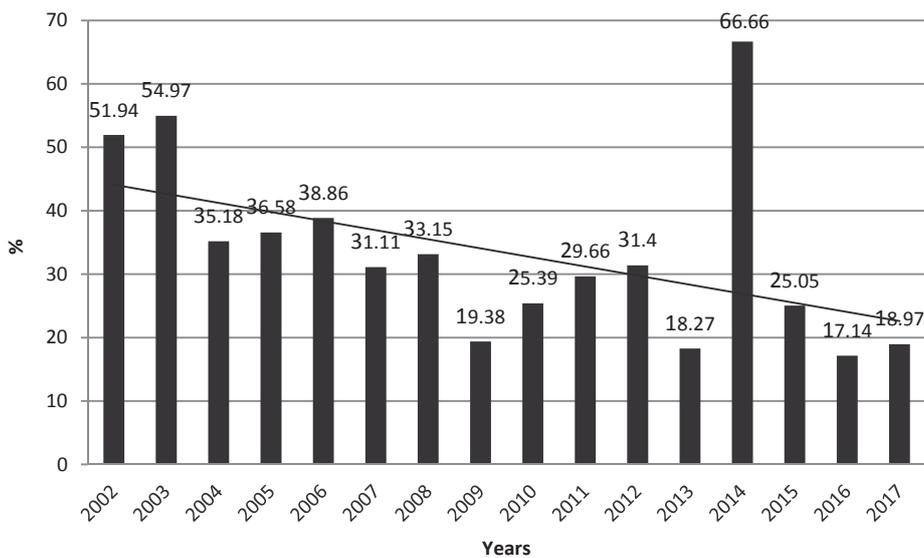


FIGURE 2. Złotnicka Spotted primiparous sows introduced into herds between 2002 and 2017

ted primiparous sows introduced into herds between 2002 and 2017.

The most primiparous sows were introduced into herds in 2007, i.e. 80.32%. At the time new herds were formed due to

the implementation of the Rural Development Programme (RDP) 2007–2013 and the allocation of subsidies to native breeds. As the time passed, there was a decreasing tendency due to the ageing

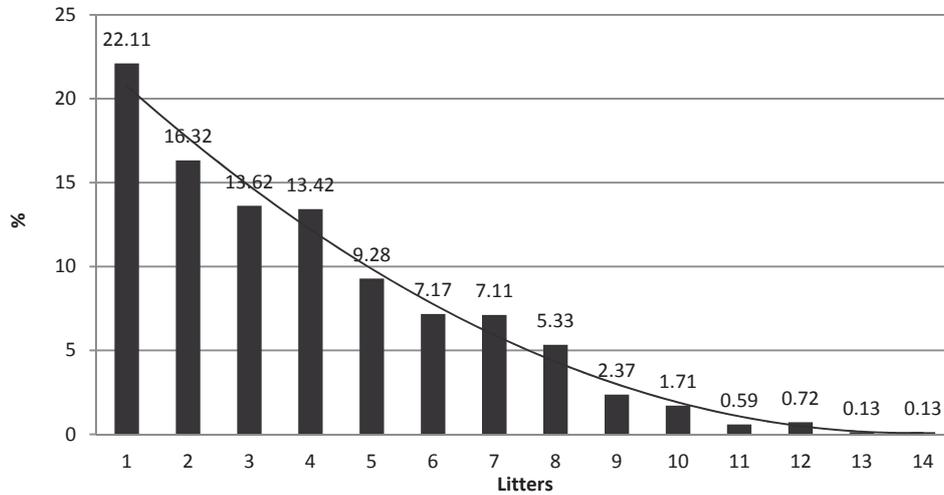


FIGURE 3. The percentage of Złotnicka Spotted sows removed from herds after consecutive litters

of the population of Złotnicka Spotted pigs. In consequence, the results of production worsened and breeders were less interested in this breed. However, in 2014 the interest in the breed began to increase again. There were new herds, so the number of primiparous sows began to rise. The rising trend was also strictly related with the RDP 2014–2020 and higher subsidies allocated to sows. It is believed that the values of both indicators (Figures 1 and 2) should be similar in a herd with a stable population. During the period under study the values of both indicators fluctuated considerably due to the unstable size of the population caused by poor cost-effectiveness of pig production.

Figure 3 shows the percentage of sows removed from herds after consecutive litters. As can be seen, more than a half of the sows (52.05%) were removed after their third litter. This trend tended to decrease. The sows were usually removed due to reproductive problems. Many other authors also observed that after a

short period of time sows were removed from herds due to reproduction failures, decreasing fertility in consecutive cycles and mechanical injuries (Stalder 2006, Karpiesiuk et al. 2018). Tani et al. (2018) indicated that sows were removed from herds after a short period of time when they farrowed 3 or more dead piglets. According to Hoge and Bates (2011), sows were removed after 3–4 litters due to selection because farmers wanted to improve meatiness in the intensive production system. However, the results of recent studies show that the selection oriented at rapid growth had negative influence on longevity (Nikkilä 2013). The herd in our study was not influenced by attempts to increase the meat content in the carcass, because it was covered by the National Programme for the Conservation of Genetic Resources, which is supposed to protect the gene pool of native breeds. The research results show that the length of use of native breeds of sows was chiefly influenced by the profitability of pig production.

CONCLUSIONS

The research showed that the sows were removed from herds due to the decreasing number of piglets in litters and fewer piglets reared up to the 21st day of life. More than a half of the sows were removed after the first three litters. The trend tended to decrease. The decreasing share of primiparous sows in herds indicated the ageing of the population. This phenomenon might negatively affect the results of production. The research proved statistically significant dependencies between sows' functional characteristics and the parameters determining their longevity. The research results showed that the length of use of sows depended on the size of their first and last litters as well as the number of piglets reared up to the 21st day per litter. Between 2002 and 2017 the percentage of primiparous sows and the share of sows removed from herds fluctuated considerably, which indicated the unstable size of the population, resulting from the economic factor of poor cost-effectiveness of pig production.

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Streszczenie: *Długowieczność loch na przykładzie rasy rodzimej.* Celem pracy była ocena długości użytkowania loch rasy złotnickiej pstrej objętej Krajowym Programem Ochrony Zasobów Genetycznych. Badaniami objęto 3585 loch wybrakowanych z hodowli w latach 2002–2017. Lochy rasy złotnickiej pstrej były wycofywane z hodowli w wieku średnio 1112 dni, dając 3,88 miotu. Wykazano, że istnieją statystycznie istotne zależności między cechami użytkowymi loch a parametrami określającymi ich długowieczność. Otrzymane w pracy wyniki wskazały, że długość użytkowania loch zależy od wielkości miotu podczas pierwszego i ostatniego oproszenia, jak również od liczby prosiąt odchowanych do 21. dnia życia z miotu. Przedstawiono również brakowania loch rasy złotnickiej pstrej (%) ze stad w omawianych latach, jak i procentowy udział pierwiastek wprowadzo-

nych do stad. W badanym okresie odnotowano duże wahania wartości obu wskaźników świadczące o niestabilizowanej wielkości populacji. Zależności te były ściśle związane z PROW w latach 2007–2013 i 2014–2020 i wielkością subwencji do ras rodzimych. Długość użytkowania loch jest cechą bardzo złożoną o ogromnym znaczeniu ekonomicznym i ściśle powiązana z rentownością produkcji trzody chlewnej, dlatego pomimo dotacji, którą otrzymali hodowcy do loch rasy rodzimej, zła koniunktura na rynku wieprzowym wpłynęła na brak stabilizacji w liczebności populacji.

Słowa kluczowe: długowieczność loch, locha, złotnicka pstra, rasa rodzima

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