

## Comparison of recording results of purebred and crossbred Hereford cattle in Poland

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**Abstract:** *Comparison of recording results of purebred and crossbred Hereford cattle in Poland.*

The aim of the study was to compare purebred and crossbred Hereford cattle in respect to their compliance with the breeding goals and standards adopted by the Polish Association of Breeders and Producers of Beef Cattle. The study was based on data for the years 2002–2015 from the PABPBC and for the years 1996–2001 from the National Center of Animal Breeding (NCAB). The properties that were evaluated were the average body weight of calves after birth (kg), average daily weight gain of calves from birth to 210 days (g), average body weight of calves at 210 days (kg) and average milk yield of cows (kg). One can observe a gradual decline in the share of the national Hereford beef cattle population, it also shows a significant decrease in the number of crossbreds with Hereford breed. Purebred Hereford cows delivered calves about 2–3 kg heavier than calves from crossbreds ones. Higher birth weights, both within the purebred and hybrid population, had bulls. The difference between bulls and heifers was usually 2–3 kg depending on the assessment year. For both populations growing trend of bull calves body weight at birth could be observed. In case of heifers calves the growing trend was observed in purebred population only. The average daily weight gain of calves increased considerably in the last years of analysis. The presented data show that both pure-bred calves and hybrids were characterized by relatively high body weight gain in the rearing period. The average daily gain was 812–1002 g for pure-bred heifers and 852–1045 g for pure-bred bulls and for crossbred heifers 876–1039 g and 889–1081 g for bulls.

*Key words:* beef cattle, Hereford, beef cattle re-cording

## INTRODUCTION

There are currently 15 registered beef breeds which are recorded and evaluated in terms of their breeding value in Poland. Herd books and records are kept by the Polish Association of Breeders and Producers of Beef Cattle (PABPBC). The PABPBC breeding goals for the Hereford breed are maintaining easy calving courses as well as high level of maternal traits and maintaining early puberty. The goal for adult cows is a body weight of 550–600 kg with a height of 130 cm to the sacrum, and for bulls – a body weight of 900–1000 kg with a height of 135 cm to the sacrum. In the national breeding program for Hereford cattle, the breeding standards entered in the introductory part of the book include the following: the minimum weight gain from birth to 210 days of age should be 800 g, and the minimum weight after the first calving should be 460 kg. The share of purebred and crossbred Hereford cattle in the national beef cattle population is important and in 2015 constituted 5.0%. The

aim of this study is to compare selected recorded results of purebred and cross-bred Hereford populations with respect to their compliance to the breeding goals and standards adopted by the PABPBC.

## MATERIAL AND METHODS

Recorded results for purebred and cross-bred Hereford cattle in Poland were analyzed in this study. A comparison in respect to their compliance to the breeding goals and standards adopted by the PABPBC was made. The study was based on data for the years 2002–2015 from the PABPBC and for the years 1996–2001 from the National Center of Animal Breeding (NCAB). The data set included: *N* – number of animals tested, *Min.* – minimum values of the studied traits, *Max.* – maximum values of the studied traits, *Average* – average values of the studied traits, *SD* – standard deviation. The studied traits body weight of calves after birth (kg), daily weight gain from birth to 210 days (g), body weight of calves at 210 days (kg), milk yield (kg).

The standardized animal body weight for a given day in an animal's life was calculated according to the following formula:

$$MCS = [(MCB - MCU) / WW] \times WS + MCU$$

where:

*MCS* – standardized animal body weight (kg);

*MCB* – average body weight of the animal on the weighing day (kg);

*MCU* – birth body weight (measured within 48 hours post-partum) (kg);

*WW* – average age of the animal when weighed (days);

*WS* – standardized age of the animal.

The average daily weight gain of the animal from birth to 210 days of age was calculated according to the formula:

$$PDMC = (MCC - MCP) \times 1000 / (WK - WP)$$

where:

*PDMC* – increase in daily body weight (g);

*MCC* – final body weight of the animal on the weighing day (kg);

*MCP* – initial body weight of the animal on the weighing day (kg);

*WK* – age of the animal on the final weighing day (days);

*WP* – age of the animal on the initial weighing day (days).

Milk yield in beef cows is expressed in kg of milk in conversion to calf's body weight, according the formula:

$$WMM210 = McOds \text{ (kg)} \times 1700 / \text{calf age (days)}$$

where:

*WMM210* – amount of milk which was used during the 210 day lactation by calf of the initial birth weight of 35 kg, which consumed 10 kg milk/day during the first three months, and 8–9 kg/during 4–8 months;

*McOds* – actual weight of the calf at weaning (kg);

*calf age* – actual age of the calf at the time of weaning (days).

## RESULTS AND DISCUSSION

Quantitative changes in the female population of Hereford beef cattle are shown at Figure 1. In terms of numbers, this breed ranks third (after Limousine and

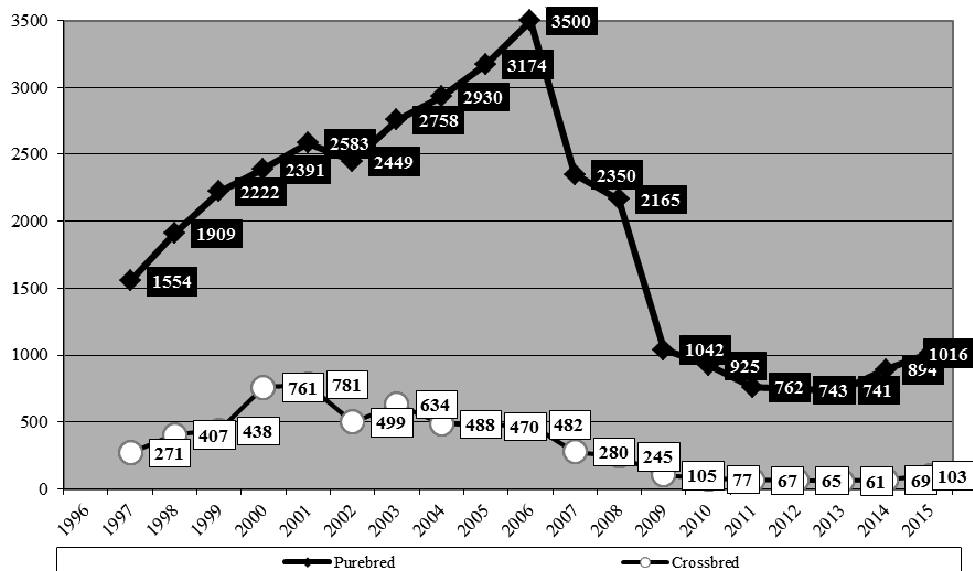


FIGURE 1. Changes in Hereford female population in Poland (heads)

Charolaise) in the national female population of beef breeds, in which its share is 5%. There is a clear systematic decrease in the share of this breed in the total population. In the year when the performance assessment was started in beef cattle herds in Poland, the share of the Hereford was 15.4%. This decrease concerns both pure-bred and hybridized populations. In the general population of this breed, hybrids now account for 9.2%. This is a positive phenomenon because it shows systematic genetic alignment.

Figures 2 and 3 show the average calf body weight at birth for heifer and bull calves. The birth weight of calves has a significant effect on weaning weight of calves and usually the calf is heavier at birth, the greater the weight at the time of weaning (Fitzhugh 1978, Nogalski et al. 2000, Przysucha et al. 2002, MacNeil 2003, Funston and Deutscher 2004, Drennan 2008). Nogalski et al. (2000) re-

ported a greater mortal rate of small, less vital calves. They also noticed that the mothers of dead calves had been significantly lighter and in worse condition during pregnancy, and consequently created worse conditions for the development of the fetus, and were less prepared to make effort in delivery. The dam genotype had significant influence on calf body weight at birth. Purebred Hereford cows delivered calves about 2–3 kg heavier than calves from crossbreds ones. Hereford breed is a medium-caliber breed, and the emerging calves are relatively small. When crossing the Holstein-Friesian breed with a very large caliber, the calves born are also of a larger caliber. Higher birth weights, both within the purebred and hybrid population, had bulls. The difference between bulls and heifers was usually 2–3 kg depending on the assessment year. For both populations growing trend of bull calves body weight at birth

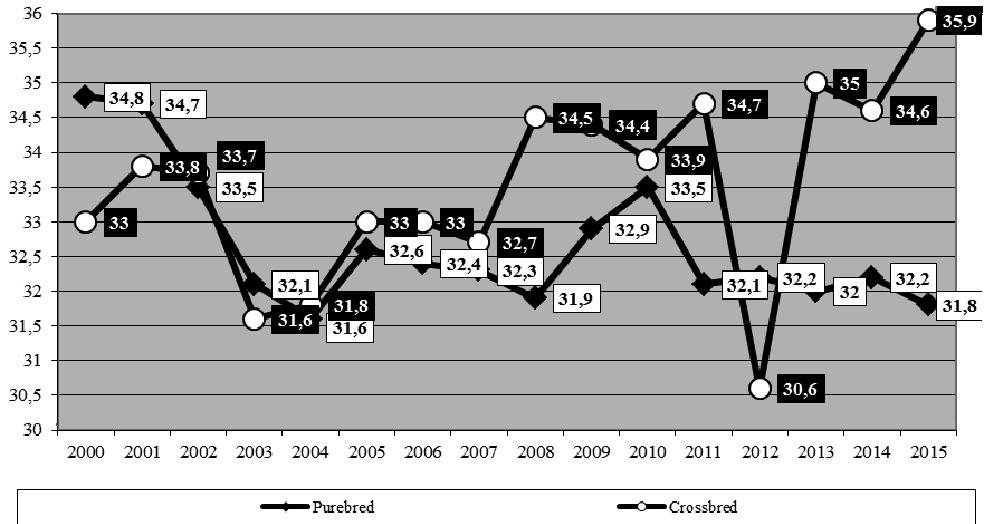


FIGURE 2. Average calf body weight at birth – heifer calves (kg)

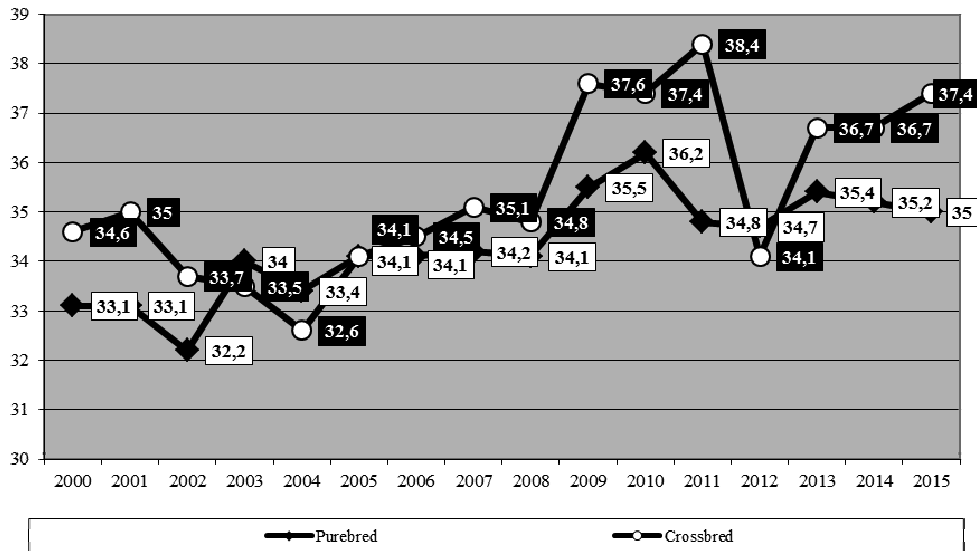


FIGURE 3. Average calf body weight at birth – bull calves (kg)

could be observed. In case of heifers calves the growing trend was observed in purebred population only.

Figures 4 and 5 show the average daily body gain to 210 days of age for heifer

and bull calves. It should be emphasized that the average daily weight gain of calves increased considerably in the last years of analysis. According to the PABPBC breeding standard, the mini-

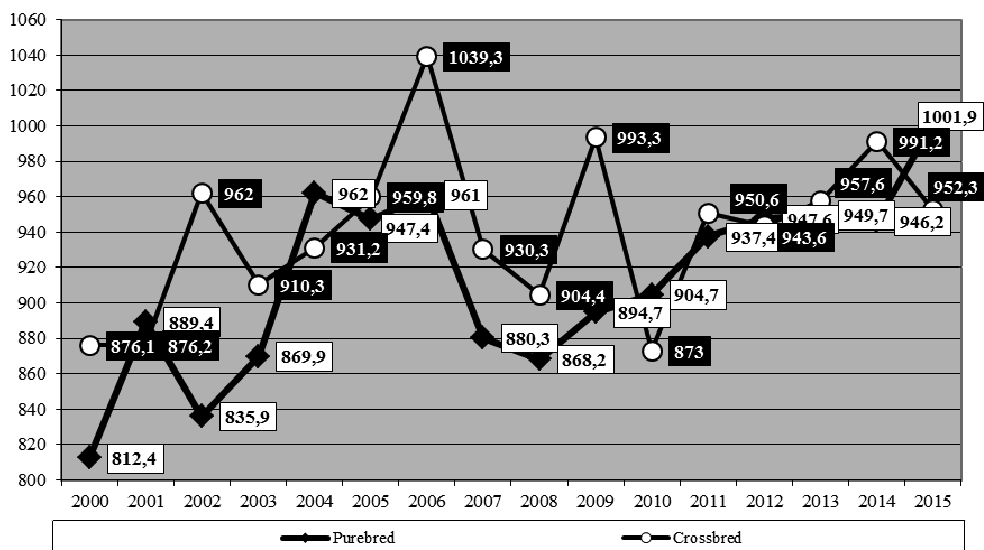


FIGURE 4. Average daily body gain to 210 days of age – heifer calves (g)

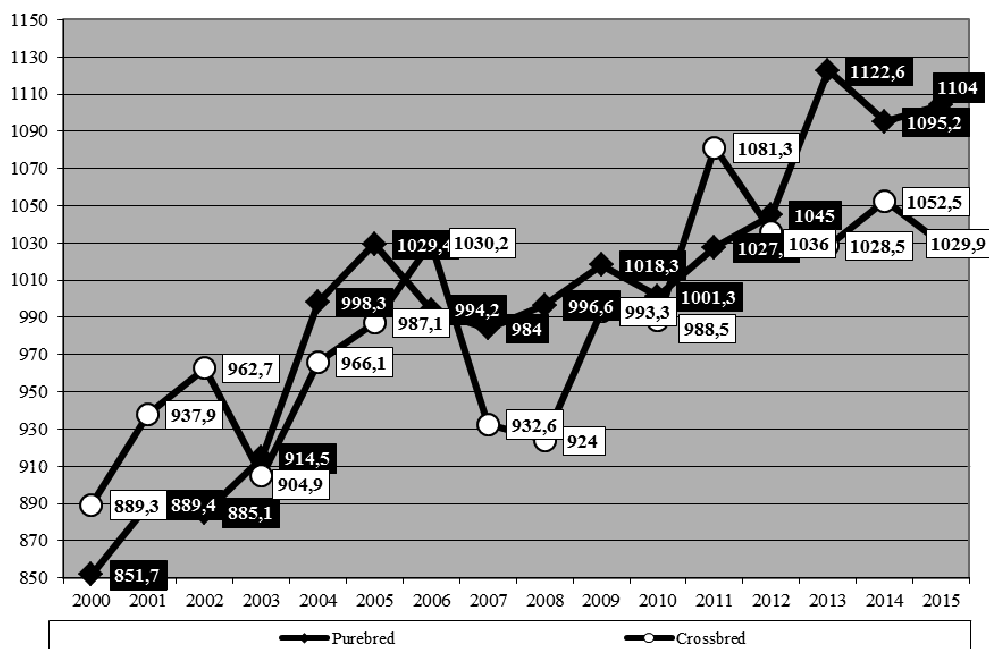


FIGURE 5. Average daily body gain to 210 days of age – bull calves (g)

imum weight gain from birth to 210 days of life for Hereford calves should be 800 g. The presented data show that both purebred calves and hybrids were characterized by relatively high body weight gain in the rearing period. The average daily gain was 812–1002 g for pure-bred heifers and 852–1045 g for pure-bred bulls and for crossbred heifers 876–1039 g and 889–1081 g for bulls. It should be noted that the systematic increase in growth since 2007. Such increments cause that after a short (about 1 month) supplementary beef bulls previously eliminated from breeding can be sold for export at a satisfactory price with a body weight of approx. 300 kg. Significant daily gains of the calves defined in the breeding standard guarantee that after weaning under appropriate nutrition they will obtain the required body mass required for covering (Przysucha et al. 2002) at the

age of 15 months. Among the Hereford calves, a very low percentage of falls is recorded. In addition, they are characterized by rapid growth and development as well as general vitality (Przysucha et al., 2002). It should be emphasized here that the average daily calf increments varied considerably in the last years of the assessment. This is confirmed by the high values of standard deviations.

Figures 6 and 7 show the average body weight at 210 days of age for heifer and bull calves. Purebred Hereford calves not always obtained higher body weight at 210 day of age than those delivered by crossbred cows. It is probably because of not so big differences in milk production between purebred dams and cows with 50% of genotype of reported breed. This means that according to breeding standards, body weight at weaning for both heifer and bull calves were at a medium level. The av-

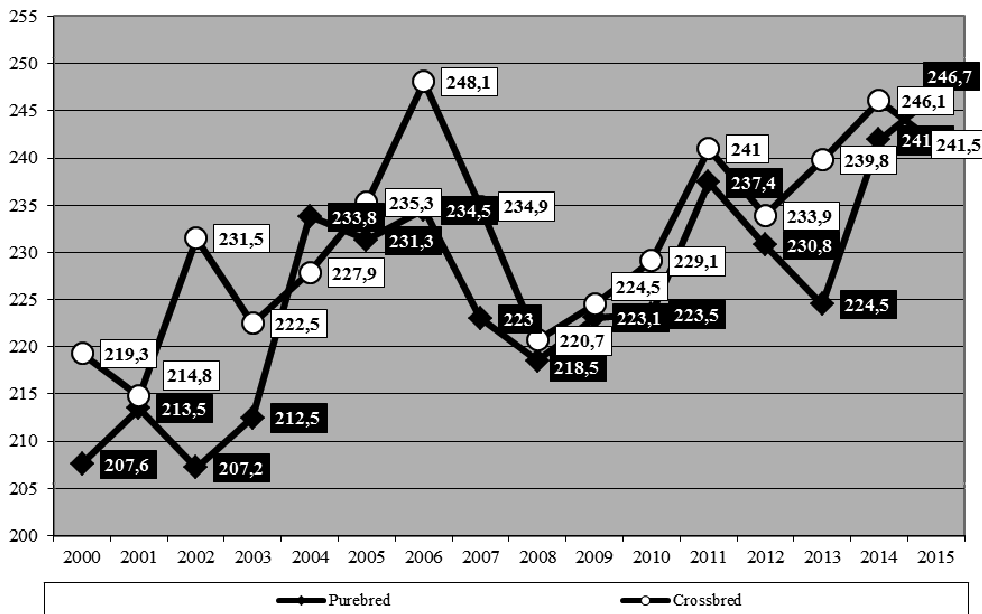


FIGURE 6. Average body weight of heifer calves at 210 days of age (kg)

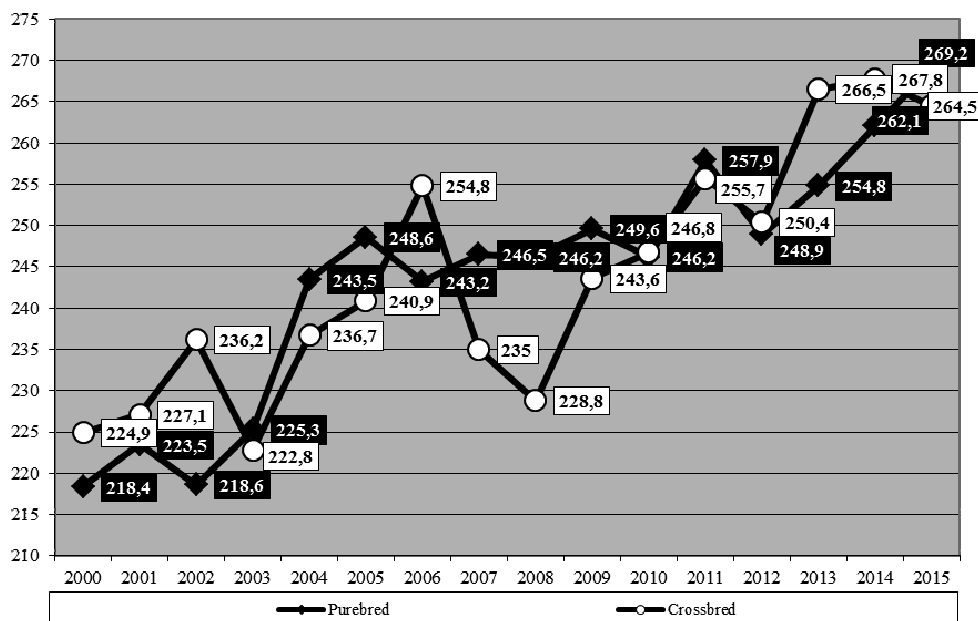


FIGURE 7. Average body weight of bull calves at 210 days of age (kg)

erage weight of bull calves was approx. 20 kg higher than the average weight of heifer calves of the same age in both purebred and crossbred populations. For both populations growing trend of body weight at weaning could be observed.

Figure 8 shows the average milk yield of cows over the analyzed years. Milk is the primary food consumed by calves from birth to weaning. Therefore, milk production is considered a key component of maternal ability and in beef cattle milk production is a main factor influencing pre-weaning growth (Clutter and Nielsen 1987, Meyer et al. 1994, Grings et al. 2008). A knowledge of milk production by beef cows might provide additional information which could be useful in improving calf weaning weights. According to Minick et al. (2001), Quintans et al. (2010) and Cortés-Lacruz et al. (2017) suckler cows' dairy performance is responsible for 60%

of daily calves' growth during that period. Many studies indicate that the highest milk yield is provided by Simmental cows, the average milk yield by Limousine and Charolaise cows, and the lowest by Hereford (Gregory et al. 1995, Quintans et al. 2010, Silva et al. 2015). Pilarczyk and Wojcik (2007) show that estimated milk yield of Hereford cows was 2121.1 kg and was higher than Angus and Salers cows and lower than Limousine and Simmental cows. As can be seen (Figure 8), the average milk yield of purebred cows was always higher than crossbred Hereford cows. However, the data should be approached with great caution because milk yield is calculated based on the weight gain of calves, and as we know, calves in a herd may approach the udders of cows other than their mothers or may be fed by the breeder. For this reason, from 2010, evaluation of this feature was ceased.

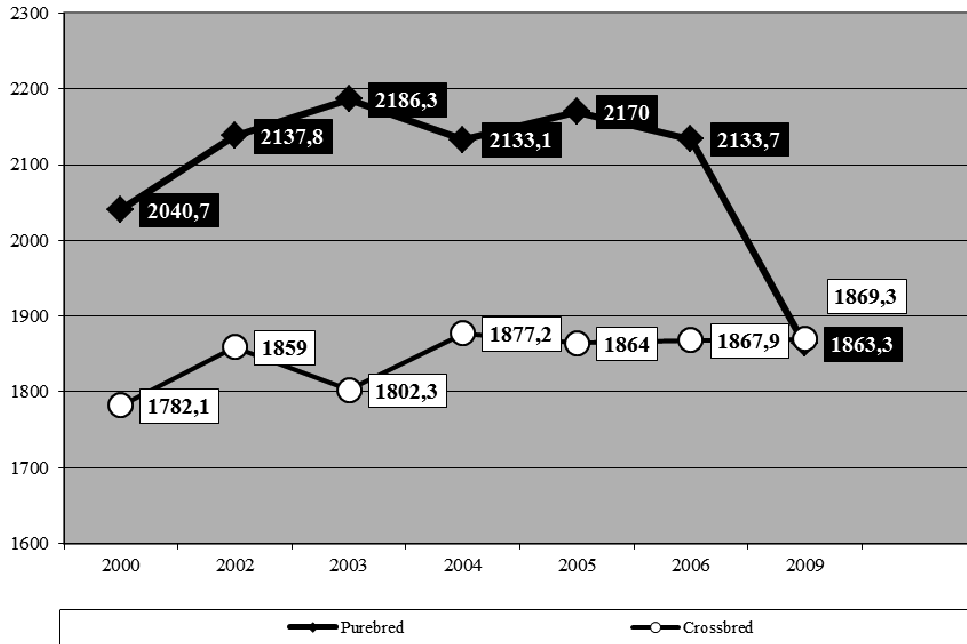


FIGURE 8. Average milk yield (kg)

## CONCLUSIONS

One can observe a gradual decline in the share of the national Hereford beef cattle population, it also shows a significant decrease in the number of crossbreds with Hereford breed. The dam genotype had significant influence on calf body weight at birth. Purebred Hereford cows delivered calves about 2–3 kg heavier than calves from crossbreds ones. Higher birth weights, both within the purebred and hybrid population, had bulls. The difference between bulls and heifers was usually 2–3 kg depending on the assessment year. For both populations growing trend of bull calves body weight at birth could be observed. In case of heifers calves the growing trend was observed in purebred population only. the average daily weight gain of

calves increased considerably in the last years of analysis. According to the PAB-PBC breeding standard, the minimum weight gain from birth to 210 days of life for Hereford calves should be 800 g. The presented data show that both purebred calves and hybrids were characterized by relatively high body weight gain in the rearing period. The average daily gain was 812–1002 g for pure-bred heifers and 852–1045 g for pure-bred bulls and for crossbred heifers 876–1039 g and 889–1081 g for bulls.

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**Streszczenie:** Porównanie wyników oceny użyteczności czystorasowej i mieszańcowej populacji bydła rasy hereford w Polsce. Celem pracy było porównanie wybranych wyników oceny użyteczności czystorasowej i mieszańcowej populacji rasy hereford w odniesieniu do ich zgodności z celem hodowlanym i standardami rasowymi przyjętymi przez PZHiPBM. Przedmiotem analiz były wyniki oceny użyteczności francuskiej rasy bydła mięsnego hereford w Polsce z lat 2002–2015 i Krajowego Centrum Hodowli Zwierząt z lat 1996–2001. Oceniane cechy to: średnie masy ciała cieląt po urodzeniu (kg), średnie przyrosty dobowe do wieku 210 dni (g), średnie masy ciała cieląt w wieku 210 dni (kg) i średnia mleczność krów (kg). Można obserwować stopniowy spadek udziału w krajowej populacji bydła rasy Hereford, jak również znaczny spadek liczby mieszańców z rasą Hereford. Rasowe krowy Hereford rodzily

cielęta o masie około 2–3 kg wyższej niż cielęta z krów rasowych. Wyższe masy urodzeniowe, zarówno w czystorasowej, jak i hybrydowej populacji, miały byki. Różnica między bykami a jałówkami wynosiła zwykle 2–3 kg w zależności od roku oceny. Dla obu populacji wykazano rosnący trend dla masy ciała buhajków przy urodzeniu. W przypadku jałówek tendencję wzrostową zaobserwowano tylko w populacji czystej. Średni dzienny przyrost masy cieląt znacznie wzrósł w ostatnich latach analizy. Przedstawione dane pokazują, że zarówno cielęta czystorasowe, jak i hybrydy charakteryzowały się stosunkowo dużym przyrostem masy ciała w okresie odchowu. Średni dobowy przyrost wynosił 812–1002 g dla czystorasowych jałówek i 852–1045 g dla buhajków czystorasowych oraz odpowiednio 876–1039 g i 889–1081 g dla mieszańców.

*Słowa kluczowe:* bydło mięsne, hereford, ocena użytkowości

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