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ANALYSIS OF RESULTS ASSESSMENT OF GROWTH RATES OF SIMMENTAL BEEF CATTLE IN POLAND

ANALIZA WYNIKÓW OCENY WZROSTU BYDŁA RASY SIMENTAL W POLSCE

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Streszczenie. Celem pracy była analiza wybranych wyników oceny użytkowości rasy simental w odniesieniu do ich zgodności z celem hodowlanym i standardami rasowymi przyjętymi przez Polski Związek Hodowców i Producentów Bydła Mięsnego (PZHiPBM). Przedmiotem analiz były wyniki oceny użytkowości rasy bydła mięsnego rasy simental w Polsce. Opracowanie oparto na danych PZHiPBM z lat 2002–2013 oraz Krajowego Centrum Hodowli Zwierząt (KCHZ) z lat 1996–2001. Oceniano średnią masę ciała krów [kg], średnią masę ciała cieląt po urodzeniu [kg], terminy ocieleni krów i jałowic, rozkład populacji krów według kolejności ocielenia. Można zaobserwować znaczny spadek liczby mieszańców z rasą simental. Średnia masa krów w latach 2005–2006, wynosząca odpowiednio 569 i 523 kg, spełnia standardy hodowlane dla krów wpisywanych do części wstępnej księgi hodowlanej, które określają minimalną masę ciała krowy rasy simental po 1. ocieleniu na 470 kg. Średnia masa ciała przy urodzeniu jałówek w poszczególnych latach oceny była zbliżona, ale po roku 2009 zmniejszyła się poniżej 33 kg. U buhajków czystorasowych obserwowano systematyczny spadek średniej masy urodzeniowej. Różnica średniej masy urodzeniowej między jałówkami a buhajami wynosiła od 1 kg do 2 kg, w zależności od roku oceny. Uzyskane średnie dobowe przyrosty cieliczek dają gwarancję, że dalsze żywienie, gwarantujące przyrosty dobowe w granicach 550–560 g, pozwoli na uzyskanie w wieku 15 miesięcy masy ciała pozwalającej na rozpoczęcie użytkowania rozplodowego.

Key words: beef cattle, Simmental, beef cattle recording, average body weight.

Słowa kluczowe: bydło mięsne, simental, ocena użytkowości bydła mięsnego, średnie przyrosty masy ciała.

INTRODUCTION

Twenty years the Programme of Beef Cattle Breeding Development in Poland finished in 2014 (Jasiorowski et al. 1996). Due to the sparse pure-bred female population is difficult to talk about own national breeding program. Therefore, the maintenance of high standards of breed is the main task of PABPBC. Its implementation is, inter alia, beef recording conducted in cattle herds. The weight of a cow by its relationship with a caliber, has a direct impact on the course of calving (more cows tend to have a larger area of the pelvis channel) and body

weight of calf, which, along with nutrition, has a significant impact on daily gains of calves during rearing. The weight of the calf at birth has an influence not only on the course of calving, but also on the subsequent results of its rearing. Daily gains of calves to 210 days of age determine their body weight at weaning, this in turn has an impact on the profit from the sale of reared calves (mainly bulls), or the cost of winter feeding of heifers for breeding, which must receive the required, minimum weight at the moment their mating at the age of 15 months. Calving season has a direct impact on the cost of maintaining the basic herd (maximum utilization of the entire grazing season) and the quality of breeding calves (health, growth rate). Distribution of cows calving aptitude in order of calving tells us about the longevity of cows, which particularly in the herds of beef cattle is one of the main factors affecting the reduction of costs of the herd.

The aim of the study was to assess the utility of selected results of the Simmental breed with respect to their compliance with the goal of breeding standards adopted by PABPBC. Height at sacrum for females was 135 cm, and 145 cm for males at maturity and body weight for females 900 kg, 1300 kg for males. An important selection factor is to maintain a high level of milk production and the exclusion of breeding males with a tendency to transmit high weight of calves at birth. Simmental breed in terms of breeding is an excellent paternal line to be crossed and this aspect on a par with good results in pure bred breeding will be given special attention in the course of selection work.

MATERIAL AND METHODS

The subject of the analysis were beef cattle recording results for the Simmental breed in Poland with respect to their compliance with the goal of racial breeding and standards adopted by the Polish Association of Breeders and Producers of Beef Cattle (PABPBC). The subject of the analysis were recording results of the Simmental beef cattle breed in Poland. The study was based on data for the years 2002–2014 of PABPBC and the National Center of Animal Breeding (NCAB) for 2000–2001. The data set included: N – the number of animals tested, in. and minimum values in the studied traits, max. and min. value of the selected features, average values of the analyzed traits, SD – standard deviation. Evaluated properties are: average weight of cows [kg], the average body weight of calves after birth [kg], the terms of cows and heifers calving aptitude, the distribution of the population according to the order of calving cows.

The calculation of standardized animal body weight for given day in its life was done according to the following formula:

$$\text{MCS} = [(\text{MCB} - \text{MCU}) / \text{WW}] \cdot \text{WS} + \text{MCU}$$

where:

MCS – is a standardized animal body weight [kg],

MCB – mean body weight of the animal on the actual weighing [kg],

MCU – is the actual body weight set for 48 hours. at birth [kg],

WW – mean age of the animal on the weighing [days],

WS – standardized age of the animal [s].

RESULTS AND DISCUSSION

Table 1 presents the quantitative changes of the female purebred population of Simmental cattle in the years 2000–2014. It should be noted that in 2000–2006 the data included both cows and heifers, and since 2007, the data relate only to cows and excluding heifers. One can observe a gradual decrease in the breed discussed in the national cattle population, also shows a significant decrease in the number of crossbreds with Simmental breed.

Table 1. Quantitative changes of the female population of Simmental cattle in Poland^a
Tabela 1. Zmiany ilościowe żeńskiej populacji bydła rasy simental w Polsce

Year Rok	Beef breed female population Żeńska populacja bydła mięsnego			Simmental breed Rasa simental				
	pure- bred czysto- rasowa	cross- bred mieszkań- cowa	total razem	purebred czysto- rasowa	crossbred mieszkań- cowa	purebred + crossbred czysto- rasowa + mieszkań- cowa	share in the population udział w populacji [%]	
							pure- bred czysto- rasowa	cross- bred mieszkań- cowa
2000	9085	9468	18 553	507	715	1222	5.6	7.6
2001	9129	9748	18 877	530	741	1271	5.8	7.6
2002	9735	8968	18 703	606	555	1161	5.7	6.2
2003	11 768	9382	21 150	793	140	933	6.7	1.5
2004	13 884	10 925	24 809	935	187	1122	6.7	1.7
2005	17 130	11 710	28 840	980	302	1282	5.7	2.6
2006	19 597	13 100	32 697	1206	456	1662	6.2	3.5
2007	14 541	11 676	26 217	851	283	1134	5.9	2.4
2008	17 481	12 097	29 578	1008	296	1304	5.8	1.7
2009	15 435	7711	23 146	701	123	824	4.0	1.6
2010	16 436	7576	24 012	618	124	742	3.8	1.6
2011	16 216	7459	23 675	605	67	672	3.7	0.9
2012	16 724	7070	23 794	598	66	664	3.6	0.9
2013	17 481	6633	24 114	502	45	547	2.9	0.7
2014	18 061	6302	24 363	538	35	573	3.0	0.6

^a From 2007 the list includes only the cows – Od 2007 roku zestawienie obejmuje tylko krowy.

Table 2 shows the mean body weight of purebred Simmental cows in the period in which this trait was evaluated. The average body weight of cows were much smaller than the predefined by PABPBC, according to which the weight of adult cow of discussed breed should be about 830 kg. Average weight of cows in 2005 amounting 569 and 2006 523 kg meet the standards for breeding of cows entered in the initial part of the herd book, which define the minimum weight of Simmental cows after first calving as 470 kg. It should be noted that the average weight of the cow did not change significantly over 8 years of evaluation of this trait, but rather high standard deviations indicate the wide variety of cows of the breed body weight. Genotype and weight of the mother cows are always described among the many factors involved in normal growth and development of calves. Numerous studies have shown that the weight of the cow has a significant impact on calf birth weight and daily gains during

the rearing (Przysucha et al. 2002a, b, c, d; Przysucha and Grodzki 2004, 2007). Therefore, the weight of a cow in adulthood is an important trait to be considered for breeding programs (Andersen 1978; Brown et al. 1989). Breeding goals for most beef breeds are focused on massive cow with a high caliber.

Table 2. Body weight of purebred Simmental cows
Tabela 2. Masa ciała czystorasowych krów rasy simental

Year Rok	N	Cow body weight Masa ciała krowy [kg]			
		min.	max.	average średnia	SD
2000	224	430	730	574	66.0
2001	213	420	700	590	68.2
2002	274	400	710	589	53.9
2003	312	440	700	590	51.3
2004	393	495	710	591	46.7
2005 ^a	109	470	750	568	34.8
2006 ^a	54	467	615	522	32.2

^a Body weight after first calving – Masa ciała po pierwszym ocieleniu.

Table 3 shows how the average natal weight of calves. The average weight at birth of heifers in each year assessment was similar, but after 2009 began be lower than 33 kg. In purebred bulls decrease in the average birth weight was noticed. The difference in birth weights between heifers and bulls ranged from 1 to 2 kg depending on year. 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 (Przysucha et al. 2002a, b, c).

Table 3. Average body weight of purebred heifers and bulls at birth
Tabela 3. Średnia masa ciała czystorasowych jałówek i buhajków po urodzeniu

Year Rok	N heifers jałówki	N bulls buhajki	Body weight – Masa ciała [kg]							
			min. heifers jałówki	min. bulls buhajki	max. heifers jałówki	max. bulls buhajki	average heifers jałówki	average bulls buhajki	SD heifers jałówki	SD bulls buhajki
2000	121	101	25	20	45	50	33	35	4.7	4.9
2001	102	113	15	24	45	50	33	35	5.2	2.6
2002	150	123	22	27	50	42	34	34	4.4	3.6
2003	163	145	25	26	45	50	34	36	3.6	4.0
2004	191	177	28	26	41	43	35	35	2.6	3.0
2005	277	250	20	25	55	55	34	36	3.9	3.8
2006	299	357	19	24	40	50	33	34	2.1	3.7
2007	232	217	18	24	45	48	34	36	3.9	3.6
2008	281	241	22	22	62	59	36	38	5.0	5.7
2009	271	283	20	22	44	70	33	36	3.9	5.1
2010	257	276	18	22	48	59	32	35	4.0	4.5
2011	314	299	20	21	67	61	31	33	4.9	5.5
2012	297	292	20	16	45	58	31	33	4.0	5.3
2013	242	247	20	20	52	53	32	32	5.0	5.2
2014	238	252	20	20	55	45	31	34	4.8	6.3

Table 4 presents data on the average daily gains of heifers and bulls from birth up to 210 days of age. Average daily gains of heifers evaluated ranged from 818 to 1127 g in various years of assessment. While the average daily gains of bulls evaluated (1100 g) exceeded 12 times during the 15 years of the assessment. Analyzing the data presented, it should be noted the large difference between the minimum and maximum daily gains in both heifers and bulls. High average daily weight gains of bulls to 210 days of age means that at short extra supplementary fattening period of about one month allow to export the animals weighing about 300 kg at a good price. Dobicki (1996) study showed that the average daily gains of heifers (550–560 g), guarantee obtaining at 15 months of age body weight allowing the commencement of breeding.

Table 4. Average daily gains of purebred heifers and bulls to 210 days of age
Tabela 4. Średni dobowy przyrost masy ciała jałówek i buhajków do wieku 210 dni

Year Rok	N heifers jałówki	N bulls buhajki	Daily gains Przyrost dobowy [g]							
			min. heifers jałówki	min. bulls buhajki	max. heifers jałówki	max. bulls buhajki	average heifers średnia jałówki	average bulls średnia buhajki	SD heifers jałówki	SD bulls buhajki
2000	43	29	540	598	1199	1383	915	950	191.1	179.5
2001	90	77	639	649	1472	1486	1017	1152	222.4	268.4
2002	43	29	619	647	1025	1010	818	839	109.6	92.5
2003	93	90	633	672	1133	1286	879	998	96.1	128.7
2004	152	129	512	564	1487	1782	1016	1169	163.6	229.0
2005	170	158	560	710	1633	1623	1107	1201	156.2	122.3
2006	130	290	671	638	1598	1947	1055	1240	128.9	231.2
2007	183	164	691	872	1641	1507	1065	1159	159.9	138.7
2008	307	231	654	794	1892	1529	1079	1178	167.3	131.1
2009	288	309	436	736	1543	1633	1060	1199	150.1	136.2
2010	258	245	759	750	1520	1540	1108	1256	146.6	124.3
2011	271	239	606	712	1409	1550	1055	1235	107.5	133.9
2012	265	217	900	909	1511	1687	1113	1330	72.7	178.0
2013	233	230	574	1000	1415	1570	1015	1229	151.9	83.3
2014	237	242	878	996	1437	1669	1127	1309	15.9	139.9

Table 5 contains a summary of the terms of cows and heifers calving aptitude of analyzed breed in the following months of the year in 2000–2014. Seasonality in breeding beef herds calving aptitude is very important. because it allows more appropriate term of calving to receive in the future a very good quality breeding material with the least amount of cost of rearing (maximum utilization of pastures). Many authors believe (Dobicki 1996; Jasiowski 1999; Jasiowski and Przysucha 2004), that the period of mating and the resulting of calving aptitude time should not be longer than 2–3 months. Beef cows, maintained all year round in grazing system should make the best offspring in the winter. Calves born in the period after the completion of the first period of milk drinking are prepared to make full use of the pasture, then their growth rate is fast. Calves are healthy and good developed and breeder bear the smallest rearing costs. It should also be noted that in the winter calvings weaning calves moment coincides with the impoverishment of pastures in autumn. the consequence is natural dry-off pregnant cows. With winter calvings cows mostly deliver in the barn so that it

is easier to monitor deliveries and possible assistance in the event of complications. Analyzing the obtained results and assuming that the most favorable period of cows calving aptitude is the period from December to March. It should be noted that since 2011 over 70% of the Polish Simmental cows delivered during the relevant period. It follows that still more than about 30% of the calves born at other times of the year only to a small degree can take full advantage of the pasture.

Table 5. Calving time of purebred cows and heifers
Tabela 5. Czas wycieleń czystorasowych krów i jałówek

Year Rok	Months Miesiące												Total Razem	
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
2000	N	8	34	58	36	36	16	15	6	6	7	2	1	225
	%	3.6	15.1	25.8	16.0	16.0	7.1	6.7	2.7	2.7	3.1	0.9	0.4	100.0
2001	N	20	28	61	31	26	25	11	7	3	–	3	2	217
	%	9.2	12.9	28.1	14.3	12.0	11.5	5.1	3.2	1.4	–	1.4	0.9	100.0
2002	N	29	37	85	53	26	12	11	8	8	7	3	2	281
	%	10.3	13.2	30.2	18.9	9.3	4.3	3.9	2.8	2.8	2.5	1.1	0.7	100.0
2003	N	23	58	53	69	25	16	8	12	7	7	9	25	312
	%	7.4	18.6	17.0	22.1	8.0	5.1	2.6	3.8	2.2	2.2	2.9	8.0	100.0
2004	N	35	42	108	57	23	30	40	19	12	4	6	18	394
	%	8.9	10.7	27.4	14.5	5.8	7.6	10.2	4.8	3.0	1.0	1.5	4.6	100.0
2005	N	43	53	125	76	32	36	45	27	19	9	24	24	513
	%	8.4	10.3	24.3	14.8	6.2	7.0	8.8	5.3	3.7	1.8	4.7	4.7	100.0
2006	N	54	66	78	77	66	65	55	56	56	13	35	32	653
	%	8.3	10.1	11.9	11.8	10.1	10.0	8.4	8.5	8.5	2.0	5.4	4.9	100.0
2007	N	98	62	107	50	35	60	50	39	31	25	30	130	717
	%	13.7	8.6	14.9	7.0	4.9	8.4	7.0	5.4	4.3	3.5	4.2	18.1	100.0
2008	N	73	101	67	68	56	57	38	25	23	17	41	77	643
	%	11.4	15.7	10.4	10.6	8.7	8.9	5.9	3.9	3.6	2.6	6.4	12.0	100.0
2009	N	159	112	54	73	81	27	25	20	11	13	32	73	680
	%	23.4	16.5	7.9	10.7	11.9	4.0	3.7	2.9	1.6	1.9	4.7	10.7	100.0
2010	N	151	67	110	88	41	38	18	7	6	8	36	49	610
	%	24.4	10.8	17.8	14.2	6.6	6.1	2.9	1.1	1.0	1.3	5.8	7.9	100.0
2011	N	234	98	67	52	36	21	17	11	7	7	46	96	692
	%	33.8	14.2	9.7	7.5	5.2	3.0	2.5	1.6	1.0	1.0	6.6	13.9	100.0
2012	N	162	110	85	35	23	8	14	7	11	17	59	89	620
	%	26.1	17.7	13.7	5.6	3.7	1.3	2.3	1.1	1.8	2.7	9.5	14.4	100.0
2013	N	103	101	63	29	17	11	3	6	13	4	60	96	506
	%	20.4	20.0	12.5	5.7	3.4	2.2	0.6	1.2	2.6	0.8	11.9	19.0	100.0
2014	N	135	108	57	32	10	6	10	8	1	5	53	130	555
	%	24.3	19.5	10.3	5.8	1.8	1.1	1.8	1.4	0.2	0.9	9.5	23.4	100.0

Table 6 shows the percentage distribution of calving aptitude of purebred Simmental cows according to calving order. The greatest number of cows calved in the years of evaluation was reported in primiparous cows and cows calving for the second time. It should be noted that in 2000 primiparous cows and the animals calving for the second time constituted more than 50% and in 2014 35% of the population. It means that the life of the cow increases, which is of particular economic importance. Long life of cows in herds of beef cattle is one of the main factors allowing for reducing the cost. so the breeders should try to use cows as long as possible.

Table 6. Distribution of calvings related to the order of calving
Tabela 6. Rozkład wycieleń w zależności od kolejności ocielenia

Year Rok		Months Miesiące												Total Razem
		1	2	3	4	5	6	7	8	9	10	11	≥12	
2000	N	66	56	24	74	5	–	–	–	–	–	–	–	225
	%	29.3	24.9	10.7	32.9	2.2	–	–	–	–	–	–	–	100.0
2001	N	41	54	36	27	54	4	–	–	–	–	–	–	216
	%	19.0	25.0	16.7	12.5	25.0	1.9	–	–	–	–	–	–	100.0
2002	N	58	46	69	38	28	39	3	–	–	–	–	–	281
	%	20.6	16.4	24.6	13.5	10.0	13.9	1.1	–	–	–	–	–	100.0
2003	N	108	34	43	47	26	19	21	3	–	–	–	–	301
	%	35.9	11.3	14.3	15.6	8.6	6.3	7.0	1.0	–	–	–	–	100.0
2004	N	105	102	40	46	47	20	12	21	1	–	–	–	394
	%	26.6	25.9	10.2	11.7	11.9	5.1	3.0	5.3	0.3	–	–	–	100.0
2005	N	148	96	93	38	48	43	22	8	17	–	–	–	513
	%	28.8	18.7	18.1	7.4	9.4	8.4	4.3	1.6	3.3	–	–	–	100.0
2006	N	54	211	203	121	23	10	9	5	6	7	4	–	653
	%	8.3	32.3	31.1	18.5	3.5	1.5	1.4	0.8	0.9	1.1	0.6	–	100.0
2010	N	115	103	108	80	65	55	40	26	11	8	8	–	619
	%	18.5	16.6	17.4	12.9	10.5	8.8	6.4	4.2	1.7	1.2	1.2	–	100.0
2011	N	91	105	105	114	88	57	46	37	23	7	7	3	692
	%	13.1	15.1	16.4	16.4	12.7	8.2	6.6	5.3	3.3	1.0	1.0	0.3	100.0
2012	N	97	82	72	90	90	64	42	30	24	17	3	9	620
	%	15.6	13.2	11.6	14.5	14.5	10.3	6.7	4.8	3.8	2.7	0.4	1.4	100.0
2013	N	74	82	66	38	57	70	42	28	20	12	13	4	506
	%	14.6	16.2	13.0	7.5	11.3	13.8	8.3	5.5	4.0	2.4	2.6	0.8	100.0
2014	N	127	67	77	65	41	52	53	26	20	11	7	9	555
	%	22.9	12.1	13.9	11.7	7.4	9.4	9.5	4.7	3.6	2.0	1.3	1.6	100.0

RECAPITULATION

One can observe a gradual decline in the share of the national Simmental beef cattle population. It also shows a significant decrease in the number of crossbreds with Simmental breed. The average weight of cows in 2005–2006 amounting to 568.5 and 522.5 kg meet the breeding standards for cows entered in the initial part of the herd book, which define the minimum weight of Simmental cows after first calving as 470 kg. The average weight at birth of heifers in each year assessment was similar, but after 2009 began to be lower than 33 kg. In purebred bulls a decrease in the average birth weight was noticed. The difference in birth weights between heifers and bulls ranged from 1 to 2 kg depending on year. Average daily gains of heifers evaluated ranged from 818 to 1127 g in various years of assessment. While the average daily gains of bulls evaluated (1100 g) exceeded 12 times during the 15 years of the assessment. The average daily gains of heifers (550–560 g), guarantee obtaining at 15 months of age body weight allowing the commencement of breeding. Since 2011 over 70% of the Polish Simmental cows delivered during the relevant period.

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Abstract. The aim of the study was to assess the utility of selected results of Simmental breed with respect to their compliance with the goal of racial breeding and standards adopted by the Polish Association of Breeders and Producers of Beef Cattle (PABPBC). The subject of the analysis were recording results of the Simmental beef cattle breed. The study was based on data for the years 2002–2014 of PABPBC and the National Center of Animal Breeding (NCAB) for 2000–2001. Evaluated properties are: average weight of cows [kg], the average body weight of calves after birth [kg], the terms of cows and heifers calving aptitude, the distribution of the population according to the order of calving cows. The average weight of cows in 2005–2006 amounting to 568.5 and 522.5 kg meet the breeding standards for of cows entered in the initial part of the herd book. which define the minimum weight of Simmental cows after first calving as 470 kg. The average weight at birth of heifers after 2009 began be lower than 33 kg. In purebred bulls decrease in the average birth weight was noticed. The average daily gains of heifers (550–560 g), guarantee obtaining at 15 months of age body weight allowing the commencement of breeding.