

Beef cattle breeds in Poland

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Abstract: *Beef cattle breeds in Poland:* Various of beef cattle breeds offer many different paths of breeding for Polish breeders. Understanding their predisposition is the key to effective and profitable production. The current level of beef consumption in Poland barely exceed 3 kg per person per year, what is lower result than in the past when it amounted nearly to 18 kg per person per year. It is strongly connected to lack of beef cattle production and consumption tradition. The rapid development of poultry and pork production results in prices drop of those products and deepen marginalization of the culinary beef. To repopularize beef on the Polish market, it is necessary to increase its quality in order to meet the current requirements of customers and become attractive for them. According to many authors, the key element is the promotion of knowledge in this field among farmers to produce better quality beef. Quality is a key due to the increase in nutritional value and improvement of its taste and appearance which is crucial during making a choice. The difficult market situation forces breeders to make a deliberate decision and apply new solutions in breeding. The mentioned and described breeds are present on Polish farms, however their populations differ significantly despite the diverse potential they have.

Key words: breeds, cattle, breeds in Poland

INTRODUCTION

The availability of different breeds on the market is the first choice of breeders. The variety of breeds determine many possibilities of using the genetic potential of beef cattle. Depending on the farm profile of and the availability of meadows and pastures, Polish breeders face a complex and difficult choice of the appropriate breed (Grodzki et al. 2005). The dominant production profile of cattle is dairy use, where calves are fattening or sold (Grodzki and Przysucha 2010). In Polish farms beef cattle is more frequent than before, what indicate its growing popularity (Małkowski et al. 2013). According to the Polish Association of Cattle Breeders and Producers (PZHiPBM) data, the dominant position in the Polish beef cattle herds is occupied by the Limousine breed, what affects in to the highest availability of calves of this breed. However, this is not the only breed that can be used to create a new herd or replace the previous one. Basis of the

literature review, a list of meat cattle breeds was made. Polish Association of Cattle Breeders and Producers evaluate and characterize animals on the basis of its production results and potential use in Polish farms. The popularization of beef cattle production is currently an important element for the consumer due to the low availability of high quality culinary beef (Jasiorowski 2011), and for the producers to increase their income. Poland do not have tradition of beef consumption and consumers do not know how to cook beef properly and how to recognize high quality meat. Those aspects are very important in beef promotion planning. Predominate on Polish market beef came from dairy cows. Its quality is significantly lower than from the breeds predisposed to fattening and its negatively affect on consumer demand due to its lower quality and flavor (Jasiorowski 2010). The current level of beef consumption in Poland barely exceed 3 kg per person per year, what is lower result than in the past when it amounted nearly to 18 kg per person per year (Pisula et al. 2007). The rapid development of poultry and pork production results in prices drop of those products and deepen marginalization of the culinary beef (Bąk-Filipek 2014). To re-popularize beef on the Polish market, it is necessary to increase its quality in order to meet the current requirements of customers and become attractive for them. According to many authors (Bąk-Filipek and Parlińska 2011, Domaradzki et al. 2016), the key element is the promotion of knowledge in this field among farmers to produce better quality beef. Quality is a key due to the increase in nutritional value and

improvement of its taste and appearance which is crucial during making a choice (Damon et al. 1960, Połczyńska and Górska 1997).

REVIEW OF BREED

Angus

This breed split on two breeds Angus Red and Angus Black. It is one of two most popular beef cattle breeds worldwide. Easy adaptation to difficult environmental conditions, good use of feed and very good fertility are the reasons of current range of occurrence include almost all continents. The Angus Black breed originates from the Scotland shires Aberdeen, Banff, Kincardine and Angus. This breed derived from unhorned cattle from those regions. Originally small cattle has been changed to medium size with good parameters of body mass growth and meat carcasses content (Reverter et al. 2000). The history of Angus Red starts in 1878 year in United States when they start to import Angus Black. They perpetuated the red coat trait which is determined by recessive gene. They also provided body size increase (Grodzki et al. 2009, Cruz et al. 2010). The breeding program in Poland maintain the present breed traits as a current body mass, easy calving and strong mother instinct. Adult cows should have 550–600 kg of body mass and 125 cm height at the withers and bulls 800–1000 kg and 130 cm, respectively. Breed pattern indicate that the coat should be uniformly black or red with short or medium length hair. Skin, muzzle, mucous membranes white or red pigmented. Head should be short and well-muscled. Long torso with straight

wide back and deep chest. The abdominal line parallel to the backline. Sternum clearly marked and extended forward. Croup and loin well-muscled and wide. Strong limbs proportional to the body.

Early maturing allows first calving in 24 months old. Average birth body mass for heifers is 32.2 kg and 35.2 kg for bulls. It is important trait which allow easy calving. Following to PZHiPBM (2015) data, 210 days old Angus Black breed achieved 231.7 kg in heifers group and 244.1 kg for bulls with daily gains 933.5 g/day and 934.2 g/day, respectively. Crossbreeding with dairy cows maintain good daily gains and quality of meat (Nadarajah et al. 1984). Crossbreed heifers in first 210 days achieved 931.6 g/day mass growth and bulls 1020 g/day. Better growth results are observed in Angus Red group. This breed was created in United States and is characterized by higher growth speed. PZHiPBM data showed the average daily gain for heifers was 1020.9 g/day and bulls 1142.3 g/day. Results in crossbreed groups with dairy cows were 913.7 g/day and 1014.6 g/day, respectively. Data collected in Poland showed, that cows can provide even 12 lactations, what is very good result. Angus breed is characterized by many positive traits as good slaughter yield, good marbling, soft, tender and juicy meat with small fibers (Chambaz et al. 2003, Muchenje et al. 2009). Grodzki et al. (2009) indicated 70% of slaughter yield for bulls with small content of bones, significant amount of fat in carcasses. Red Angus have also good quality of the meat (Tatum et al. 1990). Breed is mostly kept on pastures rich in herbs, what provide excellent quality of meat (Jasiorowski and Przysucha

2005, Jasiorowski 2011). Population of Angus Black cows under evaluation slowly increasing in last 10 years from 328 heads in 2009 to 527 in 2018 and from (PZHiPBM 2018) but Angus Red cows population is decreasing from 412 in 2009 to 213 in 2018. The main reason of that is domination of French breeds on Polish farms, which are mainly focused on dairy production. Crossbreeding with Angus breeds, gives less profits than other breeds, which can provide higher speed of growth and less fat content in meat, what is not desirable by European customers.

Blonde d'Aquitaine

This breed came from south-west France. Three local breeds were crossed: Garonnais, Quercy and Blonde des Pyrenees and achieve new breed with very high body mass, high daily gains and impressive genetic potential, which can be used in cross with dairy cows. Grodzki et al. (2009) indicated 30 countries where this breed appeared. Many positive traits of this big breed, like good muscles carcasses content, easy calving and early maturing provided growing popularity. Easy calving is important aspect of Polish production which is mainly focused on dairy sector (Keane et al. 2010). The breeding program focuses maintain current parameters. High in withers 142 cm and 600 kg of body mass for cows and 145 cm and 1100 kg for bulls. Polish breed pattern indicate the coat colors from a wheat to slightly red. Hair should be soft and sort, but never wavy. Any color patches are not allowed. Older animals coat is changing to brighter, especially on abdomen and sides. Skin is flexible and soft, medium-thick, pink without pigmentation. Head

is medium-long, rather narrow. Forehead and muzzle are wide. The horns grow horizontally and then bend downwards. The neck is quite short and muscular with a single bulge. Long and wide torso with visible muscles. Withers is well connected and wide. The back is straight and wide. Chest deep and well filled. Loin wide and long. Croup rump with a very well developed musculature, with thick rounded quarters. Abdomen strongly suspended with parallel line to the backline. Limbs are firmly set.

This breed achieved breeding maturity at 15 months old. Fertility and calving are specific trait compared to other large breeds. Keane et al. (1989) indicated that Blonde d'Aquitaine have high growth potential. It stays in agreement with results of this breed documented by PZHiPBM. Heifers and bulls 210 days old achieved very good daily gains 1078 g/day and 1183 g/day, respectively. Those results requires good feed and care of welfare (Grodzki et al. 2009, Listrat et al. 2001). Comparatively big birth body mass is not affecting on difficult calving. New born calves weight 37 kg in heifers group and 40.9 kg in bulls group. Those traits make this breed popular in crossing with dairy cows. Its result also high birth body mass 38.3 kg for heifers and 39.6 kg for bulls and high daily gains 1100.3 g/day and 1138.3 g/day, respectively. Calving problems are rare issue in this breed, what is result of very wide hips of mothers and calves narrow head (Phocast and Sapa 2004). Data collected in Poland showed the best cows has been used eight lactations. Blonde d'Aquitaine is heavy breed characterized by high slaughtering yield, which can exceed 65% and even 1500 g of daily gains (Jasiorowski 1996, Grodzki

et al. 2009). Body mass of bulls is around 1200 kg. Listrat et al. (2001) indicated good quality of meat, what is result of good valorization of forage. Jasiorowski and Przysucha (2005) pointed that this breed need intensive feeding and good environment conditions. Meat is tender, with moderate fat content what makes this breed valuable in crossing with dairy cows (Grodzki 2007). Population of this breed is systematically growing up in many countries as a France, where estimated number of heads is about 100,000 cows under evaluation. Polish population of Blonde D'Aquitaine cows under evaluation increased form eight heads in 2009 to 274 heads in 2018 (PZHiPBM 2018).

Charolaise

Charolaise is a beef cattle breed from central France. It is heavy breed from Saone et Loire region. This is the heaviest France breed, which origin is working cattle from Charolaise in Burgundy. This breed was crossed with other breeds, including Shorthorn, Hereford and Angus (Grodzki et al. 2009). This breed is present in 92 countries around the world. Charolaise breed need intensive feeding and care. This docility cattle have high growth potential, adult bulls can growth to 1300 kg and 150 cm high at the withers. Cows can achieve 700–900 kg of body mass and 140 cm high at the withers. Excellent feed and care can provide daily gains at 1300–1400 g. Polish breed program is mainly focusing on increasing weight growth, maintain good milk yield and reject sires with high birth weight trait.

Charolaise breed pattern obtained that the coat should be white, cream and creamy white, other colors are not

allowed. Hairs should be medium length and soft. Allowed is hairy look, skin of medium thickness, clear, without pigment, same as mucous membranes, hatchet, hooves and horns. The head should be short and wide. Mandible should be strongly marked, dark eyes and wide muzzle. Horns of the horned animals should grow sideways from the inter-landscape, than turn forward and rise upwards. Neck have clearly marked muscles especially in adult bulls. The trunk is long, deep, even with a backline and perfectly arched ribs. Shape of pelvis have moderate length and inclination. Thighs fully muscled and rounded with a very well arched back. Limbs rather long with strong bones.

Age at puberty is about 18–24 months old. This late maturing cattle have fertility problems and average ease of calving, recommended is supervising (Przysucha et al. 2018). Average birth body mass in heifers group was 40.2 kg and 43.3 kg for bulls. Following to PZHiPBM (2015) data 210 days old Charolaise breed achieved 266.3 kg in heifers group and 290.2 kg for bulls with daily gains 1084.9 g/day and 1177.3 g/day, respectively. Crossbreed heifers in first 210 days achieved 1073.2 g/day mass growth and bulls 1116.3 g/day. Grodzki et al. (2010) research obtained difficult calving percentage in Charolaise (CH) and Black and White (BW) crossing. Three groups of BW cows with higher Body Condition Score than recommended were crossed with French breed bulls of Limousine (LM), Charolaise (CH) and Blonde d'Aquitaine (BA). Results showed that the lowest percentage of difficult deliveries were in CH×BW cross

(20%), followed by LM×BW (26.7%) and much worse BA×BW (100%).

Charolaise is a popular breed with excellent meat quality what provide its popularity in Europe. Chambaz et al. (2003) reported that meat is characterized by low fat content, juiciness and tenderness what stays in agreement with Bartoň et al. (2006). This breed is also rich in high value cuts (Fahmy and Lalande 1975). Slaughtering yield can exceed 65% and daily gains 1500 g (Jasiorowski and Przysucha 2005, Nowaczyk 2008, Jasiorowski 1996). Following to PZHiPBM (2018) data, population of Charolaise cows under evaluation in Poland was 1570 heads but constantly decreasing from 2417 heads in 2009. Iwanowska and Pospiech (2010) indicated the reason of this is replacing Charolaise breed by Limousine cattle. However, this is still second most popular breed of beef cattle in Poland.

Hereford

Story of this breed starts in the Hereford shire in west England. Created by crossbreeding local red work cattle with white-head Flander cattle. Benjamin Tomkin started the work on new breed by use a whitehead bull named Silver. Originally small size cattle has been changed to medium size due to USA breeding programs. This is the most worldwide popular beef cattle breed. Hereford was also used to create unhorned Polled Hereford, Braford, Beefmaster, Kazakh breeds and few more mostly in Asia. The reasons of its role in beef production are early maturing, good fertility, easy calving, docility, high daily gains and excellent meat quality (Peripolli et al. 2016, Pesonen et al. 2017, Pogorzelska

et al. 2018). This breed is also characterized by easy adaptation to difficult environment and good forage conversion (Bradley et al. 1966, Rozwadowska 2007, Nowaczyk 2008, Huuskonen et al. 2010). Breeding program focuses on maintain the present easy calving, great mother instinct and early maturing. Adult cows should have 550–600 kg of body weight and 130 cm height of withers and bulls 900–1000 kg and 135 cm. Head, neck, dewlap, belly, part of the tail and ankles should be white. Rest of the coat should be red. Horned animals should have bright horns. Dark colors are undesirable. Dark pigmentation around the eyes occurs often. Skin should be soft and flexible with thick hair. The head quite long, note too wide with slightly prominent keen eyes. Horned animals has a characteristic arrangement of horns descend in arcuately downwards. Neck is quite long, shoulders strong. Sternum is strongly connected and not too wide. Chest straight and well filled. Rounded ribs, wide back and loins. Back and belly line should be parallel. Long and rectangular croup with marked wide muscles. Stem of the tail should be on same height as backline. Thighs wide and muscular, hooves strong and healthy. Hereford age at puberty is 15–18 months old. Mating animals is allowed at this age and results of calving are very satisfying. Average birth body mass for heifer was 31.8 kg and 35 for bulls. Groups 210 days old achieved 246.7 kg and 269.2 kg respectively. Przysucha et al. (2019) indicated that purebred and also crossbred calves are characterized by relatively high daily gains and it stays in agreement with PZHiPBM (2015) data. Daily gains were 1001.9 g/day for heifers and 1104 g/day

for bulls. Crossbreed with dairy cows in Poland result 35.9 kg of birth body weight, 241.5 kg at 210 days old and 952.3 g/day of daily gains for heifers. In bulls group calves achieved 38.2 kg, 264.5 kg and 1029.9 g/day respectively (Papaleo et al. 2016). Hereford meat is characterized by intensive marbling, juiciness and tenderness due its high ground fat and intramuscular fat content (Berg and Butterfield 1966, Miciński et al. 2005, Muir et al. 2010). This popular breed is predisposed to extensive system with good fattening results which can exceed 1000 g of daily gains (Jasiorowski and Przysucha 2005, Muizniece and Kairisa 2017). Carcass important traits are high fat, moderate meat and low bones content and slaughter yield value can be even more than 65% (Guilbert and Gregory 1952, Grodzki et al. 2009). This most worldwide popular breed is not so know in Poland. Polish population of Hereford cows under evaluation was not stable in last 10 years but 1052 heads in 2018 was close to 1042 heads from 2009 (PZHiPBM 2018).

Limousine

Limousine cattle came from Limousine and Marche in central France. Hard environment created many positive features of this breed like good health, condition and adaptability. Those animals are strong and massive what allowed to use them in work. Nowadays it is one of the most worldwide popular breeds. High daily gains and excellent quality of meat guarantee to this breed important position in French cuisine. Characteristic trait of those animals is sustainable development of meat and skeletal development. This is the reason of good bones and meat ratio

in even early slaughtering. This breed is not so polite as others. Cows can react nervously during supervising (Grodzki et al. 2009). Breeding program focuses on maintain the present slaughter performance, body weight, easy calving and milk yield improve. Adult cow should have 600 kg of body weight and 135 cm height of withers and bulls should have 1100 kg and 145 cm. The coat is uniformly red with various shades from light yellow to dark cherry with lighter borders around the eyes and muzzle. Medium thickness, loose and soft skin with soft hair and devoid of pigmentation. Spots and other pigmentation are unacceptable. Small and short head with wide forehead, orbital arches slightly convex. Arched forehead with straight profile, keen, bright eyes and wide muzzle with thick lips. Horned animals have horizontally spread horns at the stem, bending forward at the middle and slightly upward at the end. The neck is short and the withers are not very clearly marked. Long torso, straight backline, deep chest with rounded ribs. Strongly muscular croup with rounded buttocks. Belly with a line almost parallel to the backline. Limbs firmly set and properly proportioned, strong and durable hooves. Limousine cattle is characterized by easy calving, low percentage of calves delivery problems and good daily gains of calves (Comeford et al. 1987). Following the PZHiPBM (2015) data average body birth mass heifers achieved 35.1 kg and bulls 38.3 kg. Body weight of 210 days old was 250.7 kg and 1010.3 g/day for heifers and 272 kg and 1096.6 g/day for bulls. Moreover good results are noticed for crossbred Limousine and dairy cows. Average birth body mass was 36,4

kg for heifers and 38.4 kg for bulls. Animals 210 days old achieved 246.5 kg and 989.6 g/day for heifers and 266.9 kg and 1078 g/day for bulls. This breed is also good to use in crossbreeding because of semen with muscles hypertrophy trait. Polish cattle sector is mainly focused on dairy production and Limousine is good fathers lane to produce beef from cross-bred calves (Nogalski et al. 2016). This breed is characterized by high content of meat, low content of fat in and low content of bones carcasses. Those traits provide good results in EUROPE classification (Wajda et al. 2004, Miciński et al. 2005) and excellent quality of meat (Keane et al. 1989, Alberti et al. 2008). Daily gains can exceed 1300 g and 67.5% slaughter yield. Grodzki (2008) reported that meat content in carcasses can achieve 75%. This breed shows muscles hypertrophy trait (Grodzki et al. 2009). Following to PZHiPBM (2018) data Limousine is most popular breed and count 13 893 cows under evaluation. Popularity of this breed in Poland can be observed in population changes. From 2009 to 2018 we could observed that population constantly increasing from 9995 heads to current 13,893 heads.

Simental

Simmental cattle is Switzerland old breed. Name of this breed comes from the Simme river in Canton of Bern. First information's about this breed came from XIII century. Good climate conditions, landform and working use determinate many positive traits in this breed. It is characterized by good wholesomeness, easy adaptation to difficult conditions, good feed conversion and three profiles of use. This cattle split on dairy use

profile, beef production and mixed. This is one of the most popular breeds on the world. Currently they are on five continents in the number of more than 40 million heads. This breed was also used to improve other breeds and create some new like Simbrah or Simbrasil (Choroszy and Choroszy 2006, Lukic et al. 2017). Breeding program indicate to develop growth and muscular features. Cows should keep their maternal characteristic and milk yields on currently level. Adult animals should have 750 kg of body mass and 143 cm height at the hip as a cow and 1300 kg and 150 cm as a bull. The coat is yellow-brown to cherry in various shades in combination with white spots. Head, dewlap, sternum, abdomen, lower parts of the limbs and tail end usually white, the ability to change the proportion of white patches, especially behind the shoulder blades and on the sides. The continuity of colored surfaces is desirable without being divided in to small patches or spots. Soft hair, light and elastic skin with medium thickness. The muzzle, tongue, palate and hooves are pale pink. The horned variety has white or yellowish corners, darker on the ends. Construction is rather longhead with a straight profile with a wide forehead and a wide, non-pigmented muzzle. Eyes large, keen with a bright border. Horns in the variety of horned cows at the base, the flattened deflects outwardly towards the front, and the ends facing upwards, horizontal and thick in bulls. Moderate muscled neck with medium length, deeply developed reaching up to the sternum, especially in bulls. Loosely bound strong shoulders, leaning slightly at the withers. Withers broad, medium tall, well-muscled long and straight. The back is wide, straight

and well-muscled. Loins are medium wide, straight and long. Chest deep with well arched ribs. Mid-wide pelvis, slightly tilted back. Croup slightly rise Towards the rear. Tail of medium length, acceptable tall and thick steam. Limbs Strong and tough. Simmental is late maturing breed. Big body birth mass can determine calving problems. Following the PZHiPBM (2015) data average body birth mass heifers achieved 30.6 kg and bulls 32 kg. Body weight of 210 days old animals was 276.1 kg and 1200.8 g/day for heifers and 320.2 kg and 1380 g/day for bulls. Those results were highest of all breeds. It showed how big genetic potential have this breed. Moreover good results were achieved in crossbreeding with dairy cows. Birth body mass in this group was 31.6 kg in heifers group and 32 kg for bulls. 210 days old animals achieved 241 kg and 982.7 g/day for heifers and 279 kg and 1197.9 g/day for bulls. Slaughter yield for this breed can exceed 60% with 1400 g of daily gains. Carcass consist of moderate amount of bones and fat and high content of meat (Jasiorowski et al. 1996, Jasiorowski and Przysucha 2005, Choroszy and Choroszy 2008). Adult bulls weight can be 1200 kg and its require intensive feeding. Meat is flavorful and like meat from other breed with more intensive marbling (Mandell et al. 1997, Mandell et al. 1998, Sami et al. 2004, Bel'kov and Panin 2011). Following to PZHiPBM (2018) data cows under evaluation was 368. Dairy profile production of this breed is more popular in Europe what explains population decline in this profile. Wajda et al. (2006) indicated positive results from crossbreeding with dairy cows what provide profitability for breeders.

Belgian Blue

The father of this breed was the bull named Gédéon du Vieux-Château de Maurenne. Muscles hypertrophy was spread in Belgian cattle population and result in very well-muscled beef cattle breed named Belgian Blue. Nowadays Belgian Blue breed is popular in many countries around the world. Easy adaptation to new environment, good growth potential and good feed conversion allowed to this breed become a popular in crossbreeding with dairy cows (Grodzki et al. 2010). Breeding program focuses on fertility increase and easier calving, decreasing of calves birth body weight and increasing of their health. Body mass of mature cows should be 700–900 kg and 138–145 cm height of the withers. For bulls 1100–1200 kg and 145–150 cm respectively. The coat can be white, blue and black. Combination of these colors is acceptable. Head and body is wide and massive with very well muscles. Muscles hypertrophy is characteristic for this breed (Biagini and Lazzaroni 2005). Posture is strong and look impressive. Belgian Blue is late maturing breed. First calving is recommended in 32 months old cows. Calves characterized by high birth body mass are delivered mostly by cesarean section. Grodzki (2009) indicated 44 kg of birth body mass for heifers and 48 kg for bulls. Pure bred animals can achieve 1300–1500 g of daily gains. This breed is often used in crossbreeding with dairy cows. PZHiPBM (2015) reported that crossbred calves achieved 41.6 kg for heifers and 51.8 kg for bulls. 210 days old animals weight was 291.6 kg with 1164.0 g/day of daily gains for heifers and 350.0 kg with 1184 g/day for bulls respectively. These were the highest

results of all records for crossbred calves in Poland reported in that year. Belgian-Blue is one of the newest breeds. In Poland its mostly used in crossing with dairy cows to improve quality of meat and carcass values. Good feed conversion, low content of bones and fat in carcasses and excellent slaughter yield makes this breed very efficient to mating dairy cows (Grodzki et al. 2009). Daily gains can exceed 1500 g/day and 70% of slaughter yield (Nowaczyk 2007). Biagini and Lazzaroni (2005) indicated characteristic body conformation in this breed as good shape of carcasses, high body weight and well-muscled hind-quarter. This breed have also high EUROP classification ratio. In 2018 there was no cow under evaluation (PZHiPBM 2018). This breed is not popular in Poland due of calving problems in purebred breeding. Semen is imported to Poland and use to cross with dairy breeds.

Galloway

Is the oldest cattle kept in Great Britain and it has been bred in Scotland for centuries. Nowadays its popularity decreased and its replaced by others breed with better parameters of growth speed and feed conversion. This small size cattle is genetically unhorned. Docility, good fertility and tolerance for difficult environment makes this breed easy to breeding. (Szewczyk 2008). This breed is predisposed to good feed conversion even with low quality of feed with no barn or shed (Grodzki 2009). Breeding program focuses on maintain good fertility, easy calving and good health of calves before weaning. Cows should have 420–680 kg of body mass and 125 cm height of withers and bulls 750–

–1050 kg and 130 cm. This medium size cattle should have compact body structure and good musculation. The coat is uniformly black, dark red, brown, dark yellow. This breed have no horns, medium length hair which become downy in winter season. Head is small, medium length with wide forehead, pigmented muzzle and small eyes. The neck is short and well-muscled. Back is wide and parallel to abdominal. Loins are wide, croup medium long and well-muscled. Limbs are strong, proportional to the logs. Healthy and tough hooves. Wide white belt behind ribs is allowed. Age at puberty is 15 months and it is good moment to first mating. Easy calving, good fertility and good calves wholesomeness reduce owner supervising to minimum. Following to PZHiPBM (2015) data birth body mass of calves was 29.2 kg for heifers group and 30 kg for bulls. Low body mass of calves provide very easy calving. 210 days old records showed 237.8 kg of body mass in heifers and 248.5 kg for bulls. Daily gains were 1004.7 g/day and 1087.3 g/day respectively. Crossbreeding data was not completed. White et al. (1934) research showed that the crossed Holstein and Galloway cattle achieved 41.3 kg of weight in bulls group and 38.6 kg in heifers group. Galloway is small size breed predisposed to extensive breeding systems what provide high quality of meat. Grodzki et al. (2009) indicated 57% of slaughter yield and 1000 g of daily gains for this breed. Ground fat and bones content in carcasses are low however intramuscular fat content is high and its guarantee good marbling, juiciness and tenderness and have good PUFA n-3/n-6 ratio (Dransfield et al. 1984, Nürnberg

et al. 1999). PZHiPBM (2018) inform about 22 cows under evaluation what is slightly higher value than 3 heads in 2009. Grodzki et al. (2009) indicated 13 countries where it is currently present and the total population is about 40,000 heads.

Highland

Highland is one of the oldest currently using cattle breed. From many centuries this docility animals were grazing on north and west Scotland mostly in Perth, Inverness and Ayrshire shires and Hebrides Islands. This small size breed characterized by long hair and impressive horns very popular attraction in Polish Agritourism Farms. Docility, attractive look and low feed storage requirements makes Highland more and more popular in this sector and live with other animal species in same place. Difficult conditions Scotland make this breed flexible in adaptation what allows them to live in low temperatures without feed intake decrease and with no difficult calving. All of those traits determined the presence of this breed in North and South Americas, Europe and Australia (Śmiełowski 2007, Nowaczyk 2008, Grodzki et al. 2009). Breed program focuses on maintain good fertility, easy calving and great health. Body mass of cows is 400–500 kg and 105 cm height of withers and 650–800 kg and 125 cm in bulls. The coat of this breed have many variations from light brown, red, black to white and silver color. Long horns can achieve 1.5 m of length. Double hair coat is long and thick on outer and soft and fluffy inner. On the head hair cover eyes and even muzzle what is characteristic to this breed. Skin is elastic and soft.

Head proportional to body size, wide forehead and hide dark eyes under wide and long forelock. Muzzle is wide and pigmented. Bull horns are massive and horizontally extended from the head than turning forward and downwards. Cow horns protrude more or less horizontally beyond the head and raised. Posture and body structure is wide and looks massive. Limbs are broadly spaced with a fairly thick bone. Hooves are strong and large. It is the result of long breeding work started at XVIII century. This is early maturing breed and first mating are allowed at 15 month old. This breed is characterized by docility and strong mother instinct. Cows are very caring and calves wholesomeness allows to calving even at -25°C degree. Following to PZHiPBM (2015) data birth body mass for heifers group was 25.4 kg and 26.6 kg for bulls. 210 days old animals achieved 158.6 kg of body mass for heifers and 166.5 kg for bulls. Daily gains were 637 g/day and 644.7 g/day respectively. Crossbreeding with dairy cows results in 26.8 kg of birth body mass in heifers group and 28.2 kg in bulls group. In 210 days old groups heifers achieved 177.8 kg of body mass and 174 kg for bulls. Daily gains were 684.3 g/day and 698.8 g/day respectively. Those results make this breed not attractive in crossbreeding with dairy cows. This small size breed is characterized by excellent quality meat what has been appreciated by royal British family. Fattening period can be twice longer than other breeds because of low daily gains and it can be even 36 months. Ground fat content is low but marbling is significant what provide tenderness, juiciness and tastiness. Average daily gains are 800 g/day. Bones and

ground fat content in carcasses are small but the meat content is high. Slaughter yield is about 60% (Jasiorowski et al. 1996, Jasiorowski and Przysucha 2005, Nowaczyk 2008, Grodzki et al. 2009). PZHiPBM (2018) data informed about 156 cows under evaluation in Poland.

Piemontese

This is old Italian breed from Lombardia and Ligurii regions. To achieve good results from cattle grazing cattle should be strong and have not many feed requirements. This part of Italy is characterized by hot and dry summers and difficult winters. In breeding was used zebu from Pakistan. Those factors and breeding programs determined medium size and well-muscled Piemontese cattle.

Almost whole population have muscles hypertrophy what is exposed on hindquarters. Part of cows population use to milking. Milk have specific composition what is used to produce parmesan cheese (Rogala 2008). Breeding program focuses on maintain current parameters. Cow high of hip should be 140 cm and bulls 145 cm. Body mass 600 kg for cows and 1100 kg for bulls. Bulls coat should have gray or salmon color with black hair on head, neck, shoulders, limbs and sometimes on sides. Cows coat is white or bright salmon. Gray discoloration is allowed. Young calves have strong salmon color hair. Dark pigmentation occurs on mucous membrane, tongue, palate, cheeks, ears, eyelashes, eyelids, foreskin, scrotum, labia and hooves. Horns are black until 20 months of age. Skin is soft and elastic. Bulls head is shorter and wider than cows. Forehead is flat and a bit recess between eyes. Ears are not big, big black

eyes and wide nose. Bulls have wide and well-muscled neck. Body structure is massive and wide. Limbs are strong and hooves are clenched and tough. First mating is allowed at 16–18 months old. Big problems in this breed are high percentage of calving with human assist and not good wholesomeness of calves. Due to those issues this breed is not good in extensive systems. Intensive production allow to achieve good production results and calving supervising. Cows mostly produce more milk than calves need so it is also use in dairy production for famous Parmesan cheese. Following the PZHiPBM (2015) data average body birth mass heifers achieved 35.1 kg and bulls 36.6 kg. Body weight of 210 days old was 224.4 kg and 891.3 g/day for heifers and 240.9 kg and 1001 g/day for bulls. Piemontese cattle is also use in crossbreeding with dairy cows. Average birth body mass was 35 kg for heifers and 42.5 kg for bulls. 210 days old animals achieved 251.45 kg and 1025.1 g/day for heifers and 266.7 kg and 1158,3 g/day for bulls. Piemontese is characterized by high daily gains (1000 g/day), excellent laughter yield (70%) and low fat and bones content in carcasses (Tatum et al. 1990, Jasiowski et al. 1996, Grodzki et al 2009). Meat is tender even with low marbling (Davies et al. 1992). Other important aspect is low cholesterol content what is important for consumers. This breed also occurs muscles hypertrophy (Jasiowski and Przysucha 2005). Following to PZHiPBM (2018) data 19 cows were under evaluation.

Salers

This breed came from south region of France where its population is mainly

concentrate. This big size cattle is characterized by low feed requirements and environment resistance. Moreover, docility, strong mother instinct, easy calving and good milk yield makes this breed good as mother line in crossbreeding with big beef cattle breeds. Breeding program focuses on achieving 600–650 kg body mass and 135–140 cm hip height of mature cows and 950–1050 kg and 145–150 cm for bulls respectively. The coat should be uniformly mahogany red. Thick skin should have brown pigmentation with brighten eye round and muzzle. Dark coat and skin pigmentation is acceptable. Head should be narrow with triangular shape. Horned animals have lyre shape, un horned individuals are acceptable Neck is long and massive, back wide and flat. Lumbar region massive and muscled. Chest convex especially in bulls. Back and stomach lanes almost parallel. Limbs muscled and strong. Salers cattle is late maturing, long-live breed with good fertility and easy calving. Grodzki et al. (2009) indicate that less than 5% of calving require human assistance. Following the PZHiPBM (2015) data average body birth mass heifers achieved 29.1 kg and bulls 31.1 kg. Body weight of 210 days old was 249.2 kg and 1103.3 g/day for heifers and 274.6 kg and 1214.8 g/day for bulls. Salers cattle is also use in crossbreeding with beef cattle bulls. Crossbreeding with dairy cows is not popular. Birth body mass in this group was 42.5 kg for bulls. Animals 210 days old achieved 244 kg and 972 g/day for heifers and 265 kg and 1036.3 g/day for bulls. Salers meat is characterized by juiciness and tenderness due to high content of intramuscular fat and ground fat. Intensive

marbling provide flavorful product for customers (Nowaczyk 2008). Slaughter yield is 57% and daily gains can achieve 1300 g (Jasiorowski and Przysucha 2005, Jurie et al. 2007). Adult bulls weight can be 1200 kg (Grodzki et al. 2009). Following to PZHiPBM (2018) data cows under evaluation was 132.

Welsh Black

Welsh Black breed is came from Wales region. This medium size cattle is characterized by good health, easy calving and docility. Easy adaptation to difficult environment. Breeding program indicate adults cows body mass around 500 kg and 130 cm height of withers. Very good maternal instinct should be kept. The coat should be black, only small amount of white hairs are allowed on udder of scrotum. Other white hairs are not allowed. During winter the coat can change his color on dark born especially in calves. Skin and muzzle are black. Horns are bright yellow and dark on tips. Head is quite light, short and wide, well-muscled. Back line is straight, ribs strongly arched, deep chest. Abdomen is large and deep. Loins and croup are long and wide. Following the PZHiPBM (2015) data average body birth mass of heifers achieved 31.4 kg and bulls 36.5 kg. Body weight of 210 days old animals was 230.5 kg and 870 g/day for heifers and 235.3 kg and 874.6 g/day for bulls. Birth body mass in crossbreed groups were 31.1 kg in heifers group and 34.7 kg for bulls. Animals 210 days old achieved 216.7 kg and 848.8 g/day for heifers and 241 kg and 931 g/day for bulls. Welsh black not require high quality forage and buildings and its mostly grazing. Good feed conversion

makes meat very juicy and flavorful due to intensive marbling and high fat content. Carcass consist of moderate bones and meat content, high fat content. Daily gains can achieve 1000 g and body mass of adult bulls can exceed 1000 kg (Szewczyk 2008, Grodzki et al. 2009). Following to PZHiPBM (2018) data in Poland was 31 cows under evaluation. Low popularity of this breed is connected to dairy profile of farms where cross breeding with Welsh Black did not provided satisfying results.

SUMMARY

The breed is an important factor in the production of beef cattle due to its connection with the profitability of production and the quality of raw material. Individual breeds are characterized by better or worse conversion of feed, various living requirements, increments, slaughter efficiency, fatness and fertility. The gradual development of meat cattle production has a positive impact on the quality of the available raw material. The breeds described in the article offer a wide range of applications from intensive to extensive breeding and crossbreeds with dairy cattle.

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- Streszczenie:**
Rasy bydła mięsnego w Polsce: Zróżnicowanie w obrębie ras bydła mięsnego dostępnego obecnie dla hodowców daje możliwość osiągnięcia pożądaných celów hodowlanych i efektywnego wykorzystania dostępnych w gospodarstwie zasobów paszowych. Poziom spożycia wołowiny w Polsce obecnie oscyluje na poziomie ledwie przekraczającym trzy kg na osobę rocznie. Dawniej spożycie wynosiło blisko 18 kg na osobę rocznie. Jednym z powodów tak drastycznego spadku spożycia wołowiny był gwałtowny rozwój produkcji trzody chlewnej oraz drobiu, co spowodowało spadek ich cen i marginalizację udziału mięsa wołowego w diecie Polaków. W celu zwiększenia rodzimej produkcji należy poprawić jakość mięsa dostępnego w sklepach oraz promować wiedzę pośród konsumentów dotyczącą licznych wartości odżywczych wołowiny. Trudna sytuacja na rynku zmusza hodowców do nowych kierunków rozwoju. Omówione rasy mogą znaleźć zastosowanie w wielu Polskich gospodarstwach, a ich popularyzacja może korzystnie wpłynąć na jakość mięsa dostępnego w sklepach oraz efektywniejsze wykorzystanie zasobów paszowych.
- Słowa kluczowe:** bydło, rasy, bydło w Polsce

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