Trakia Journal of Sciences, No 2, pp 103-112, 2022
Copyright © 2022 Trakia University
Available online at:
http://www.uni-sz.bg

ISSN 1313-3551 (online) doi:10.15547/tjs.2022.02.004

Original Contribution

GALLOWAY BREED IN BULGARIA – CONTRIBUTION TO SUSTAINABLE BEEF CATTLE BREEDING

D. Yarkov*

Faculty of Veterinary medicine, Trakia University, Stara Zagora, Bulgaria

ABSTRACT

It is important for beef cattle breeding to ensure responsible animal husbandry and food production, which entails economic, social and environmental implications. Furthermore, it is essential to guarantee a genetic resource prepared for the different challenges of our times. This study includes information about beef cattle breeding in Bulgaria, and describes the characteristics of the Galloway breed. The numerical data presented in the study are based on the available information included in various references in the Agrostatistics database of the Ministry of Agriculture and Foods, agrarian reports of the same ministry and the Executive Agency for Selection and Reproduction in Animal Breeding (EASRAB). The Galloway breed is one of the oldest and purest of local cattle breeds. They are known for their resilience and can subsist on the scarcest of lands, which is important under the conditions of current climatic and other challenges. Regarding the Genetic Reserve and the Gen Bank, registered by the EASRAB, the available information shows that there is no registered reserve and genetic bank for the Galloway breed in Bulgaria. This requires further studies and proposals for the inclusion of the Galloway breed in the selection and reproduction aimed at the development of sustainable beef cattle farming.

Key words: beef cattle breeding, Bulgaria, Galloway breed

INTRODUCTION

Beef cattle breeding has the potential to become an important component of sustainable agriculture globally. The ability to transform non-human plant foods into high-quality food products will be of great importance in the long term to feed the growing population. Other aspects of beef cattle farming which must be identified as contributing to sustainable development are the maintenance and protection of landscape, as well as the preservation of rural communities.

A number of Bulgarian authors have studied the trends and opportunities for the development of beef cattle breeding in Bulgaria, including its sustainable forms (1-7). Moreover, beef cattle farming can undertake a number of proven sustainability practices in every step of the pasture-to-table chain that contribute to the responsible rearing of beef cattle.

It is important that beef cattle farming ensure responsible animal husbandry and food production, which implies much more than only environmental considerations. Sustainable food supply means balancing efficient production with environmental, social and economic impacts. Progress in the sustainability of beef cattle is crucial to ensure its rightful place in sustainable food production, because beef plays an important role in ensuring a healthy, nutritious diet, supplies high quality protein and contributes to improving health. At present, consumers are increasingly looking for natural food without toxicities that is grown organically with respect to animal welfare. The main technology applied in beef cattle farming is based on grazing, which is more

***Correspondence to:** *Dobri Yarkov, Faculty of Veterinary medicine, Trakia University, Stara Zagora, Bulgaria, yarkov@abv.bg*

beneficial in terms of environmental impact, animal welfare and the quality of the meat produced.

Beef cattle farming must ensure the production of meat, with care for the planet, humans, animals and progress. Given the possibilities for significant future changes in production conditions and in livestock farming objectives, it is essential to ensure a genetic resource prepared for the various challenges of our times.

MATERIAL AND METHODS

This study includes information about beef cattle breeding in Bulgaria and describes the characteristics of the Galloway breed. The numerical data presented in the study are based on the available information included in various references in the Agrostatistics database of the Ministry of Agriculture and Foods, agrarian reports of the same ministry, and the Executive Agency for Selection and Reproduction in Animal Breeding (EASRAB).

We have presented the conclusion from the data review by the EASRAB (https://www.iasrj.eu/) on the genetic reserve in beef cattle breeding for the years 2019-2022.

The study explores the characteristics and advantages of the Galloway breed. Literary sources have been cited to provide objective information about the Galloway breed, its introduction and related genetic research. For greater visibility, some of the digital information is presented as tables.

Based on the analysis, important recommendations for the further reproduction of the Galloway breed in Bulgaria have been drawn.

RESULTS AND DISCUSSION

A process of mass reorganization in agriculture has taken place in Bulgaria over the last 20 years, which has had an impact on cattle breeding and all obtained products. The numbers of farms, their livestock and the resulting production have significantly decreased. The organisational, structural and regulatory changes introduced with respect to our EU membership, the need to comply with the requirements imposed by the implementation of the Common Agricultural Policy (CAP), as well as the economic environment in the country have influenced farming significantly. In 2020, animal farms raising livestock, birds and bee families' amounted to around 71 500 units (8). About 31 thousand farms reared 608 600 bovines. In 2020, the average number of farm animals was significantly higher than in previous periods. The average number of cattle reached 20 per farm, whereas in 2010 they were 6 and in 2003 - 3 on average. The total number of specialized beef cows was just over 116 thousand in 2019 (8). The share of beef cows in the total number of cattle has been growing rapidly, reaching almost 23% in 2019, and according to the Agrarian Report 2020 (page 39) (9) the percentile share of beef cows to the total number of cows in 2019 was 35%, compared to 31.3% in 2018.

It was only after 2016 that a growing interest in importing animals of specialist breeds from abroad and fresh investment in the sector were noted. It attracted both farmers seeking diversification and optimization of their crop business, and entirely new investors for the agricultural sector. As commented above, even dairy farms that did not meet the requirements for the production of quality milk also expressed interest in this area.

There are enough prerequisites in the country for the development of a successful meat industry in cattle breeding. Available pastures, with proper care and investment may conveniently allow the rearing of at least 100 000 beef cows. This number would ensure that 100% of domestic demand is met, both for fresh consumption and for processing.

The main breeds that are expanding the population of beef cattle in Bulgaria are: Aberdeen Angus, Hereford, Charolais, Limousine, Galloway, Aubrac.

The Executive Agency for Selection and Reproduction in Animal Breeding presents several main characteristics of these breeds (10).

The main characteristics of Galloway breed and herds in Bulgaria are presented in **Tables 1, 2, 3, 4.**

- Origin: Scotland
- Methods and conditions of selection: Popular selection
- Commercial use: for meat

Breeding status 2017. Executive Agency for Agriculture and Reproduction in Animal Breeding (EASRAB) – Order No. РД 09-55/30.01.2015 of the Minister of Agriculture and Foods. The year of registration of the herd-book is 2015. As of 2017, 343 animals are under selection control (cows – 333, bulls – 10); herds – 8.

Table 1. *Number of animals under selection control by region*

Blagoevgrad	80
Burgas	91
Vidin	38
Plovdiv	30
Sliven	38
Smolyan	66

Source: EASRAB

Major distinctive features

The animals are relatively small, densely and robustly built, and with a harmoniously developed constitution. The body is cylindrical with rounded shapes. The head is short and wide with a straight profile line with large eyes and wide nares and wide, forward and upward-facing, heavily haired ears. The neck is medium-long, well-muscled. The withers are short, muscular, and slightly distinguishable. The croup is moderately wide, muscular, and straight. The backbone line is straight. The animals have a healthy bone system, well developed musculature, healthy legs and hooves. The most visible feature of Galloway is their long fur, composed of two layers. The outer layer has longer and coarse hairs, designed to protect the animal from wind and rain, while the second layer, providing good thermal and waterproofing is soft and tender. The Galloway breed is characterised by high absorption of herbaceous forage, which is responsible for the production of high-quality meat only from grass. The animals have an extremely calm temperament and are highly resilient to diseases and climate change. The cows have strong maternal instincts.

Coloration

- coat colour – atypical, uniform – from white, light brown, brown to brown-black, black. According to their coat color, there are three main types of Galloway cattle.
- muzzle – dark - from grey-brown to black
- mucosae-lead-gray, black
- horns - hornless - both females and males
- hooves-lead-gray to black
- udder – as the main colour

Table 2. *Basic exterior measurements*

Measurements	Cows	Bulls	Calves at birth
Height at withers (cm)	20 (118-125)	38 (135-140)	
Hair length (cm)	138-140	150	
Live weight (kg)	40 (410-570)	00 (770-955)	26-30

Source: EASRAB, 2017

Table 3. *Reproduction and use*

Sexual maturity (months)	14-16
Production maturity (months)	20-27
Duration of use (years)	over 15

Source: EASRAB, 2017

Table 4. *Beef productivity*

Average daily gain (grams)	850-900
Carcass yield, %	60-62

The Galloway breed is one of the oldest and purest of local cattle breeds. They are known for their endurance and can live on the scarcest of lands. The female Galloway is an ideal suckler cow and gives birth to excellent, plump calves, which are increasingly sought after by both producers and consumers who want the highest quality meat from naturally reared animals.

Galloway has a lot to offer and can fit into any system, be it a traditionally hilly area or farms from plain regions. Galloway's popularity is growing due to increased interest in cattle and environmental issues. In 2009, at the Royal Highland Exhibition, Galloways won all major trophies, including individual, local crosses, crosses and pairs. Never has a single breed dominated all the cattle championships at Scotland's flagship show.

Galloway is a breed with a strong maternal instinct; the cows calve easily and secrete plenty of milk. She is long-lived and can be relied on to produce calves every year, with many cows giving birth regularly as young animals. Only this trait can determine much of the economy and efficiency of any farm. She can develop and bear calves with cheap winter rations and in summer with unimproved rough grazing. Galloway females are an ideal base for crossing with strong hybrid vitality.

Galloway calves, both pure and cross, are resilient, energetic and has a 'will to live' that makes them suckle quickly while they are still very young; they grow quickly from their mother's rich milk.

Galway cattle are naturally hornless - a trait they easily transmit to any cross, eliminating the need for horn removal.

Galloway cows can be kept outdoors in winter and require only minimal feeding, reducing the cost of feeding, straw and lodging. One aspect by which the Galloway cow surpasses other beef breeds is precisely its rearing method. Comparisons show that it needs about 25% less concentrates and nearly 10 kg less of silage per day. On hilly and mountainous pastures, Galloway's indiscriminate grazing improves natural grass for domestic animals, wild animals and game by removing excess roughage. Galloway is increasingly popular for controlling weeds, and grasses on hills where sheep no longer graze. In some areas, local cattle breeds, such as Galloway may receive additional subsidies for grazing on disadvantageous land.

The female Galloway, when crossed with a bull of any breed, can serve to produce lactating cows inheriting all the traits of her mother - excellent maternal ability, milkiness and stamina.

Galloway x Saler heifers are highly sought after as suckler cows because of their size and easy passing of beef qualities on to their offspring.

Galloway sires, dams and heifers produce the highest quality beef at low ration costs. 23- to 30-month-old bulls are usually slaughtered at over 350 kg per R4H class. They are much sought after by many local butchers, whose customers appreciate the taste of this natural, aromatic beef.

Studies have shown that Galloway beef is low in total fat and saturated fat. Their beef is also high in beneficial Omega 3 and Omega 6 fatty acids, which is why it is more salubrious than pork and as good as chicken and salmon.

The Galloway breed has been proven to be a superb feed processor. During tests at Olds Agricultural College, over a period of 10 years it was found that Galloways used the least amount of food for weight gain of one kilogram. These high levels of feed conversion are what make Galloway breeds highly profitable.

Meat quality is one of the most important breed characteristics of the Galloway breed. The veal is lean but well-marbled. Due to Galloway's double fur, the carcasses do not have an additional layer of back fat present in many other breeds. A study by the University of Guelph, discussed at Healthy Beef, shows the extremely low fat content of Galloway beef. Research at the University of Montana shows that beef cows with fur only an inch thicker, than the average require 20% to 25% less digestible feed to maintain body weight in cold weather. Double fur, found in all three varieties of the breed, means that Galloways need less food to maintain a good body condition. An additional advantage of double fur is its ability to repel water. Rain barely penetrates, even in cold weather. Galloways thrive all year round even in

the harshest climate and require minimal shelter from winter cold to summer heat.

Galloways are naturally hornless. Most farmers believe that using any of the varieties of Galloway will eliminate the problem of horns in the resulting offspring of calves.

Studies conducted by the Mols laboratory in Denmark show that of all tested breeds, Galloway consume more varieties of plants than any of the other tested breeds. This ability to absorb the less desirable types of plants means that Galloways will feel comfortable in far less ideal conditions.

Over the last 25 years, beef has become much leaner and healthier. Galloway meat consumers have long known where to find the best source of extremely lean beef – precisely from Galloway.

It has been well-documented by Health and Welfare Canada that the saturated fats in our diet increase the cholesterol of low-density lipoproteins (LDL) in human blood. It's the LDL in our blood that is responsible for heart attack and strokes.

An analysis of the fat content of Galloway beef from 1994 at the National Science Department of the University of Guelph (Ontario) revealed the healthiest composition - the total fat content of Galloway beef is extremely low, ranging at 2% and particularly the content of harmful saturated fats is very low, within the range of 1%. Nutritional diets for humans should contain certain essential fatty acids, namely linoleic acid (Omega 6) and linolenic acid (Omega 3). These fatty acids, also called polyunsaturated fats, are essential for human cells and cannot be produced by the human body.

However, linoleic (Omega 6) fatty acid in excessive amounts can cause some types of cancer. It is recommended that the Omega 6: Omega 3 ratio in food should be less than 10:1. In this respect, Galloway meat is extremely healthy with an Omega 6: Omega 3 ratio of about 3:1.

These findings reveal that Galloway beef is as good as chicken or fish in a healthy diet. A healthy diet should contain a certain amount of lean meat. Lean veal is a good source of dietary protein. In this respect, nothing can be better than Galloway's meat.

According to information from the Australian Galloway Association (Aga)[1], the characteristics that the Galloway breed brings to each herd have been stabilised over many generations. These characteristics include:

1. Fertility — Galloway bulls are very fertile at an early age. In Tasmania a beef producer compared a 3-year-old bull from Hereford to an 18-month-old Belted Galloway bull (white-belted Galloway). The Hereford was much larger and the farmer doubted whether the Belted Galloway bull would be able to cover the 26 heifers. Nine months later his opinion of the Belted Galloway bull changed. The first 24 calves born were sired by the Belted Galloway bull.

2. Easy calving — A study conducted by the Nebraska Animal Research Center tested 11 breeds for their ability to give birth and raise their calf. Galloways recorded the highest weaning rate (95.5%) and the highest calf survival rate (95.2%). Galloways also had an extremely low rate of calving difficulties (0.8%). The Galloway calf is very energetic at birth, which helps it survive these important first days of life.

3. Maternal instinct and longevity — Galloway females are very caring for calves and raise a viable calf at an early age. They produce high-quality milk and take care of their calves under all conditions.

4. Unpretentious to grazing — Studies in Europe show that Galloways can graze on anything, which allows grass to compete with weeds. They have the ability to feed under scarce conditions and, as a result, can be fed on pastures with just pasture hay or silage as a supplement.

5. High-quality and high-yielding carcasses — The typical Galloway carcass is well-muscled, long and with optimal fat coverage. Galloway crosses rarely contain a lot of fat. During experiments it was found that Galloway crosses have the same marbling and growth rate as Angus crosses, but better yield and less fat on the back (external fat). The carcass competitions show that Galloway carcasses are usually of high yield, with a frequency of around 73%.

[1] https://www.galloway.asn.au/

6. They produce high-quality healthy beef — Studies in Canada, the US and Switzerland show that veal, which is produced extensively, can be of great benefit in a healthy diet. Galloway beef, grown under extensive conditions, is rich in linoleic acid. The human body does not produce linoleic acid, so it should be included in our diet. Linoleic acid reduces the dangerous type of cholesterol (LDL), prevents thrombosis and therefore protects the coronary vessels. Studies by Dr. Butson, Canada also show that Galloway beef has good levels of essential fatty acids Omega 6 (linolenic acid) and Omega 3 (linolenic acid).

7. Easy crossbreeding — Results from crossbreeding Galloway with other breeds: Galloway females are easy to calve, they are caring and long-lived mothers, and have the ability to do well under any conditions. The Galloway F1 cow has a hybrid power that adds significant efficiency to the herd. It has been demonstrated for decades in grazing/feeding trials and carcass competitions that weight gain and carcasses are those desired by the producer, butcher and end-user.

Galloway bulls have the ability to produce a uniform line of calves – in color, hornlessness and high-quality carcasses from mixed lines of cows. Galloway's hornlessness dominates in crossbreeding and provides 100% hornless calves of horned females.

Modern genetic research on the Galloway breed

The development of highly informative genetic markers is crucial for the individual identification and origin of bovine animals and is therefore essential for the traceability and effective management of the bovine population of beef breeds. Microsatellites are highly polymorphic DNA markers that are suitable for such research. Co-dominant microsatellite markers are currently well-established and successfully used in cattle (11-14). Microsatellites are the most widely used genetic markers due to their ease of use and analysis, as well as the high percentage of information provided by a large number of locus alleles (15). However, the single nucleotide polymorphism (SNP), which is one of the means of studying DNA, has some promising advantages over microsatellite markers such as high-performance automated analysis and mammalian genetic stability (16-19). SNP markers are becoming very popular, although they are only biallelic codominant markers. Two different SNP marker sets were used by Heaton et al. (2002) and Werner et al. (2004) to identify animals and test for origin in American and European cattle.

The 'more from less' approach is the key basis on which the ICBF programme for the genetic evaluation of beef cattle has been developed. Productivity, origin and genomic estimates from more than 15 million beef cattle have been used (the largest database of beef cattle in the world). The aim is to identify the best animals within the breeding programme by key characteristics such as breast milk, female fertility, calving costs, feeding costs and growth rate. These indicators are combined into a common index, which is a common indicator of breeding sustainability adopted in 2011: the €uro-Star reproductive index.

In Ireland, the Beef Data and Genomics Programme (BDGP) works as part of the 2015-2020 EU Rural Development Programme. With the clear objective of increasing the sustainability of suckler herds, the programme seeks to curb some of the negative trends associated with the cost of production and instead to balance and improve all the characteristics associated with sustainable beef cattle breeding. One of the most significant results of the programme so far is the clear evidence that animals with higher genetic traits have significantly lower methane per day release than animals with lower genetic traits (up to 10% difference). These results are based on the direct measurement of methane emitted under project F 'RumenPredict'.

Another example of sustainability-focused breeding is the drive to further improve weaning performance characteristics by promoting large-scale recording of the weight of cows, and calves on farms.

An important focus for future sustainability breeding includes: additional animal genotyping to accelerate genetic progress, new sustainability characteristics, such as slaughter age and meat quality; further direct methane measurement, including the future introduction of these new features in the €uro-Star reproductive index.

As genomic evaluation becomes cheaper, such tools are expected to be widely used in the commercial sector. However, because of its nature, it will be breed-specific and associated with the presence of strong breed-based genomic reference populations.

The choice of a genotyping method depends on multiple criteria. From the point of view of genetics, the genotyping procedure should be as simple, stable and inexpensive as possible, as it is often necessary to generate huge amounts of genotype data. From a statistical point of view, the accuracy of each type of analysis may depend on several key characteristics, such as information content, neutrality, map positions, or genetic independence of the markers. Therefore, any method can be used for genotyping, as long as the choice of method is tailored to the specific purpose of the study and the equipment available.

Despite the growing interest in specialized beef breeds of cattle, their number is extremely low – 7,132 are under selection control in 2017, according to MAFF data.

Regarding the Genetic Reserve and the Gen Bank, registered by the Executive Agency of Selection and Reproduction in Animal Breeding, the available information shows that there is no registered reserve and genetic bank for the Galloway breed in Bulgaria. The beef cattle breeds with the genetic reserve and the gene bank are: Limousine, Charolais, Blonde d'Aquitaine, Gascon, Chianina, Marchigiana, Romagnola, Aberdeen Angus-black.

Proposals for breeding program of the Galloway breed in Bulgaria

On 01.11.2009 the first Galloway animals were imported from Belgium, Ruhrhof Farm, to Petro-G company, village of Levochevo, Smolyan Municipality. As a result of the very good and easy adaptation and acclimatization of these first imported animals, they attracted the increased interest of breeders. Currently, the population of the Galloway breed in Bulgaria is over 2500, which corresponds to the growing interest in this breed in Europe and the world.

The animals are imported from the best herds from Germany, Belgium, Denmark, Austria, France, Luxembourg. The main import partner is the Galloway Breed Association in Germany in close cooperation with the Galloway Breed Association in the UK.

The spread of the breed in Bulgaria has already covered almost the whole country: Vodniantsi (Dimovo Municipality, Vidin Region), Gorsko Kalugerovo (Suhindol Municipality, Veliko Tarnovo Region), Badevtsi (Elena Municipality, Veliko Tarnovo Region), Paskalevo (Dobrich Municipality, Dobrich Region), Balchik (Varna Region), Vezenkovo (Sungurlare Municipality, Burgas Region), Gorska Polyana (Bolyarovo Municipality, Yambol Region), Stefan Karadzhovo (Bolyarovo Municipality, Yambol Region), Kotel (Sliven Region), Malka Vereya (Stara Zagora Municipality), Zmeevo (Stara Zagora Municipality), Trakia University (Stara Zagora), Mustrak (Svilengrad Municipality, Haskovo Region), Cherven (Asenovgrad Municipality, Plovdiv Region), Krastava (Velingrad Municipality, Pazardzhik Region), Levochevo (Smolyan Municipality), Petrich (Blagoevgrad Region), Dalgi Del, G. Damyanovo Municipality Montana Region Skobelevo (Rodopi Municipality, Plovdiv Region).

The breeding sites where Galloway animals are kept in Bulgaria are mainly in mountainous and semi-mountainous areas, using extensive technologies with mainly pasture grass utilization. Thus, the cultivation of this breed does not require large financial investment for buildings, machinery and equipment.

As the animals spend most of the year on the pastures, they help to improve soil humus, soil fertility and pasture grassland.

The main breeding objective is to ensure the genetic progress of the breed in Bulgaria towards the production of high-quality low-cost veal, while ensuring good economic results for farmers. The basis for achieving the breeding objective is the imported livestock of high genetic potential from different European countries, from different lines and families of the breed. This genetic diversity will allow the selection to be carried out over a long period of time without the need for inbreeding (close kin mating).

The initial stage requires the creation of a nucleus of pure-bred animals of a very high genetic potential on the basis of the underlying main selection traits, with the aim of producing

estimated sires from which semen is obtained. The best sires of the breed will form the individual lines and will be used for pure-bred breeding and another part will be used for crossbreeding schemes with other breeds. Very good results are obtained when Galloway crosses with Aberdeen Angus, Bulgarian Black Cattle, Holstein Friesian Cattle, etc.

The second stage involves the first step of increasing the number of animals in the population which are entered in the herd-book – at least 1500-2000 pure-bred animals. The second step is to import genetic material - live animals (females, pregnant and non-pregnant heifers, sires); the import of semen (conventional and sexed); the import of embryos (conventional and sexed). It is important to carry out research and development in terms of: acclimatization, influence of the breed on the environment and climate change, control of the productive qualities, including reproduction, control of the quality of meat and its health characteristics. The permanent direction of breeding and improvement work is the selection of animals suitable for organic production of high-quality veal meat, beneficial for human health.

At the third stage, the breed is structured by creating lines and families, producing pure-bred bulls and heifers, including for export, production of semen from bulls in Bulgaria (conventional and sexed), production of embryos (conventional and sexed).

It is necessary to shape the overall breeding scheme of the breed on three levels: nucleus, reproductive part, and stock part. The nucleus and reproductive part include only pure-bred animals, and the stock part may include crossbreeds with other breeds with over 50% participation of the Galloway breed.

Table 5. *Recommended values of the main indicators for the Galloway breed*

	Indicator	Value
1.	Live weight of cows after third calving	550-650 kg.
2.	Live weight of bulls after three years of age	900-1100 kg.
3.	Live weight of bullocks at 24 months	700-800 kg.
4.	Live weight of heifers at insemination	360-380 kg.
5.	Live weight of calves at birth	30-35 kg.
6.	Live weight of calves at weaning	250-280 kg.
7.	Average daily gain during fattening	1.100-1.200 kg. on pasture grazing 1.300–1.500 kg. under intensive fattening
8.	Age of heifers at first calving	29-33 months
9.	Inter-calving period	365-375 days
10.	Ease of calving	99%
11.	Maternal instinct	Very high
12.	Temperament	Calm
13.	Longevity	15-18
14.	Legs and hooves	Very strong
15.	Carcass yield	54-56% on pasture grazing 56-60% under intensive fattening
16.	Meat marbling	High degree

The main indicators on which the selection activity should focus are:

- reproductive parameters (age of the first insemination, live weight at first insemination, inter-calving period in days, ease of calving);
- growth capacity (live weight of calves at birth, live weight of calves at weaning, average daily gain at fattening)
- carcass indicators (carcass yield, EUROP system carcass quality, short-chain fatty acid content)
- exterior characteristics (body length, withers and hip height, croup width, croup length, round width and depth, fore and hind limb posture, hoof angle, scrotum circumference) – performed at the age of 200 days and 365 days, in

accordance with Beef Improvement Federation standards.

When choosing selection indicators and their specific requirements/values, it should be borne in mind that three types are distinguished worldwide:

- primitive type -smaller, lower live weight (400-500 kg) and lower daily gain (0.800-0.900 kg), but extremely durable and unpretentious to the conditions of the environment and food;
- intermediate type – with higher live weight (550-650 kg), higher live weight of calves at calving and higher daily gain (1,100-1,300 kg);
- large type – these are significantly higher animals with a high live weight – in cows over 800 kg, and in bulls over 1300 kg and average daily gain of nearly 2.00 kg.

In Bulgaria, mainly animals of the intermediate type are imported, which makes it reasonable to propose values characterizing mainly this type.

The recommended values for these key indicators are presented in **Table 5.**

CONCLUSION

The achievement of the presented selection requirements is a guarantee for the good economic and financial performance of farms, as well as the satisfaction of consumers with high-quality beef and its sustainable production.

Based on all data about the Galloway breed and the author's personal experience, it can be argued that this breed is very suitable for rearing and breeding in Bulgaria.

In addition to the highlighted advantages such as easy adaptation and acclimatization, strong constitution, durability, longevity, very good absorption of roughages, the Galloway breed is also very suitable because the low investment and operating costs, its participation in short supply chains and its breeding method meet the requirements for a circular economy.

Of course, to activate the use of the breed Galloway a special targeted advertising campaign must promote the breed and its characteristics, and steps towards creating a brand should be made.

I recommend that the rearing of this breed be directed mainly in mountainous and semi-mountainous areas. It is also particularly important to target areas where diversification of agricultural production is needed, e.g. areas with increasingly limited tobacco production (Kardzhali, Smolyan, Blagoevgrad, etc.).

REFERENCES

1. Vasilev, G. (1996). Attempts to apply a cyclogram in the breeding of cattle in the meat field. *Zhivotnovadni nauki*, 7-8, 51-54 (Bg)
2. Gergovska, Z. (2005). Beef cattle breeding - an untapped opportunity from which we can make a good profit. Part 1 At the heart of the success are the good organization of the production cycle and the right choice of breed. *Zhivotnovadstvo plyus* 4, 26-29 (Bg)
3. Panayotova, M. (2005). An example of ecological beef cattle breeding - almost year-round free-range farming under natural conditions. *Zhivotnovadstvo plyus*, 4, 30-32 (Bg)
4. Mechanadzhiyski, Iv. (2008). State and opportunities for developing beef cattle breeding in Bulgaria. *Zhivotnovadstvo BG*,1, 18-19 (Bg)
5. Stoykov, P. (2009). Conditions for the establishment of beef cattle breeding. *Zemedelie plyus*, 7, 45-48 (Bg)
6. Darzhonov, Tr. (2013). Beef cattle breeding in some countries of the world. *Zhivotnovadstvo*, 2, 21-28 (Bg)
7. Nikolov, V. (2014). Technology of organic beef cattle breeding. *Zhivotnovadstvo BG*, 3, 41 (Bg)
8. MAF Agrostatistics, 2020 (Bg)
9. MAF, Agrarian Report 2020 (Bg)
10. Executive Agency for Selection and Reproduction in Animal Breeding, Breeds of farm animals in Bulgaria, Catalog 2017 (Bg)
11. Glowatzki-MullisM., Gaillard C., Wigger G., and Fries R. (1995). Microsatellite-basedparentage control in cattle. *Anim. Genet*., 26, 7-12
12. Heyen D. W., Beever J. E., Da Y., Evert R. E., Green C., Bates S. R. E., Ziegle J. S., and Lewin H. A. (1997). Exclusion probabilities of 22 bovine microsatellite markers in fluorescent multiplexes for semiautomated parentage testing. *Anim. Genet.*, 28, 21-27
13. Bredbacka P. and Koskinen M. T. (1999). Microsatellite panels proposed for parentage testing in cattle: In formativeness revealed in Finnish Ayrshire and Holstein-Friesian

populations. *Agric. Food Sci. Finland,* 8, 233-237
14. Schnabel R. D., Ward T. J., and Derr J. N. (2000). Validation of 15 microsatellites for parentage testing in North American bison, Bison bison and domestic cattle. *Anim. Genet*., 31, 360-366
15. Baumung R., Simianer H., and Hoffmann I. (2004). Genetic diversity studies in farm animals: a study. *J. Anim. Breed. Genet.,* 121, 361-373
16. Krawczak M. (1999). Informativity assessment for biallelic single nucleotide polymorphism. *Electrophore sis,* 20, 1676-1681
17. Kruglyak L. (1997). The use of a genetic map of biallelic markers in linkage studies. *Nat. Genet.,* 17, 21-24.
18. Landegren U., Nilsson M., and Kwok P.-Y. (1998). Reading bits of genetic information: Methods for single nucleotide polymorphism analysis. *Genome Res.* 8, 769-776.
19. Nielsen R. (2000). Estimation of population parameters and recombination rates from single nucleotide polymorphisms. *Genetics,* 154, 931-942.