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Emergence of Regional Dairy Breeds

Livia Vidu and Stelian Baraitareanu

Abstract

This chapter covers the regional breeds in Europe of cattle, and buffalo that supply milk to the processing industry. Local breeds are evidence of the evolution of different species in different directions of breeding. The book chapter will give a brief description of the origin and cognition of different regional and local dairy breeds, the presentation of morphological and productive characters, as well as the perspective of rearing or conservation. The development of breeds in different directions of production was achieved under the impact of environmental factors, agricultural policies and market requirements. In this context, the factors will be analyzed in correlation with the spread of breeds in different regions, respectively countries.

Keywords: local breed, morphological aspects, origin of the breed, production, regional breed

1. Introduction

In this chapter we will try to present the regional breed groups (which are found in several neighbouring countries or in the same geographical area) important for milk production in south-eastern Europe. Dairy animals have provided food sources for humans since ancient times, as well as social means of subsistence. Humanity is currently going through a period of crisis caused by several factors, namely,

- climate change, declining water reserves and the fertile soil layer, which are causing food crises and even famines in some parts of the world;
- geopolitical changes, health crises and even wars generate delays or the impossibility of rhythmic food supply;
- the increase in the level of human well-being is followed by the increase in the consumption of food of animal origin and the use of cereals for the production of fuel.

In this context, milk is a staple food whose usefulness should not be forgotten, and dairy animals have their importance in food safety and security. The milk consumed by humans is produced by several species of animals (cow, buffalo, sheep, goat, camel, etc.), but it is recognized that cattle provides more than 90% of the world's milk.

Milk consumption has steadily increased from one century to another; currently a man consumes about 10,000 L of milk during lifetime.

This *white blood* has been used for its pleasant taste and therapeutic properties since ancient times. The nutritional value of milk is its ability to provide the necessary energy, plastic and bio-stimulating substances and to positively influence the health of the consumer. Today it is known that milk contains all the essential amino acids that the human body cannot synthesize, that it provides the necessary protein for children up to 6 years old and 50–60% of the necessary protein for young people up to the age of 20.

Statistics show that the world's population is currently growing by 80 million people a year, which should make us think and make us find other competitive sources of food. In this economic and social context, rethinking local or regional genetic resources is an important starting point in developing a food strategy.

The knowledge and quantification of the local genetic resources of the breeds with regional importance, perfectly adapted to the pedological and climatic conditions of the region, gives security and confidence for a sustainable future.

2. Regional breeds of dairy cattle

The main breeds of cattle were formed following a long process of evolution of the old local populations, under the influence of natural and artificial environmental factors. Going through the stages of agricultural development overlapped with the diversification of the productive skills of cattle with the specialization of production.

In the early eighteenth century, in Europe, began the process of gradual replacement of cattle breeds that had universal or multiple skills with specialized breeds for milk or meat. This trend appeared simultaneously with the industrial revolution, which generated large urban populations, involved in the production process, which also determined the change in the type of human diet, and consequently the need for larger quantities of milk and meat. At the same time, the draught force of animals began to be used less and less [1].

Later in the nineteenth century, the structure of the main modern breeds of today crystallized in Europe, such as the black-and-white spotted (Holstein, Friesian), white-spotted with red (Simmental), red (Danish red, Angler) and brown (Schwyz). As these breeds developed and penetrated most European countries, local breeds began to lose importance, their production became insufficient, they were used in crossbreeds to form new breeds, and over time some of them even disappeared. In 2007, around 20% of all breeds and animal populations worldwide were considered endangered, and in Europe around 130 breeds had already disappeared [2].

Regional or local breeds have emerged as a result of migrations that have taken place over the centuries from one country to another or from one region to another, along with the movements of the human population. Also, cattle were an important key of trade (currency exchange), they were used as ritual animals or transport. According to the FAO, there are 534 breeds of cattle in Europe, of which 464 are local or regional breeds [3].

In Western European countries, traditional products related to local breeds have been key points of the active breed conservation strategy. By promoting regional products, farmers have been encouraged to raise these breeds with low productivity.

Local breeds are defined as “breeds that occur only in one country”, while *Transboundary breeds* are “breeds that occur in more than one country”. Within this

group is identified—*Regional transboundary breeds*: transboundary breeds that occur only in one of the seven SoW-AnGR18 regions and *International transboundary breeds*: transboundary breeds that occur in more than one region [2, 3].

2.1 Red breed

The red breeds are a group of populations or breeds to which the local breeds have contributed, especially the grey steppe (Podolic cattle) and Angler and Danish Red breeds, which have appreciable qualities in the direction of milk production, but which lately are strongly competing with the spotted black and white breeds.

Geographical area. These populations or breeds are generally widespread in steppe areas or with drier climates in Bulgaria, Poland, Romania, the Republic of Moldova and Ukraine (Table 1). From a historical point of view, the formation period is in the second part of the nineteenth century, but for some, there are historical data even from the thirteenth century.

Morphological characterization. Body development is variable, wither height – 122–132 cm and body weight—350–450 kg, fine and rarely very robust, conforming to the morpho-productive type of dairy cattle. (Figure 1). The colour is uniform red, with shades from light red to cherry colour, often with light shades on the underside of the torso, the inside of the legs and in the earlobe, sometimes with white spots on the abdomen or udder. The apparent mucous membranes and hooves are grey-brown. The udder is well developed, globular in shape, glandular in consistency and relatively symmetrical [3, 4].

Productive characteristics. In general, the duration of lactation is short (250–300 days), with milk production between 2204 and 5033 kg of milk. The milk has a fat content of 3.8–4.2%. The age of the first calving is a variable, between 27 and 35 months. There are also breeds that, in addition to milk production, have also been exploited for meat, although the weight of calves at birth is 30–35 kg. Slaughter yield between 40 and 50%, depending on age and condition; very well fattened animals achieve a slaughter yield of 51–52%.

The future of breeds. In general, these breeds have a vulnerable or critical status, due to very small numbers, with a risk of extinction. Some red cattle populations have also disappeared because they are susceptible to bovine leukosis, as was the case of Red cattle of Dobrogea. Some countries have ongoing programmes to protect local race, benefiting conservation strategies in vivo and in vitro.

No	Country	Cattle breed name	Milk yield per lactation (kg milk /lactation)
1	Bulgaria	Balgarsko cherveno govedo (Bulgarian red cattle)	4000
2	Czech Republic	Ceska Cervinka (Czech red)	2204
3	Poland	Polska czerwona (Polish red)	4000
4	Republic of Moldova	Roşia de Stepă moldovenească (Moldavian red steppe)	3600
5	Romania	Roşia Dobrogeană (red cattle of Dobrogea)	3800
6	Ukraine	Ukrainian red dairy (Ukrainska chervona molochna)	5033
		Red steppe (Chervona Stepova)	3944

Table 1.
The red breeds of south-eastern Europe [2].



Figure 1.
Red steppe breed from Ukraine [2].

2.2 Pinzgau breeds

The Pinzgau breed was formed as a result of a successive process of crossbreeding and purebred breeding, which began around 800 BC, with the Celts bringing robust cattle to the Hohe Tauern area of present-day Salzburg [4, 5]. Cattle of Celtic origin were crossed over time with local red cattle, with Bern type imported from Switzerland, and after 1740 the population grew in purebred. Over time, some varieties or sub-breeds have been created, such as Pongau, which resembles the Pinzgau breed, but which is distinguished by the darker body colour and a more massive body development; Mölltal, widespread in Carinthia, whose body development is lower.

Geographical area. The animals of this breed were formed in the pedoclimatic conditions specific to the Austrian Alps, the lands of Salzburg, Tyrol and especially Pinzgau, hence the name of the breed. Studies have led to the idea that the breed comes from the old local populations, belonging to *Bos taurus brachycephalus* in the mountains and *Bos taurus primigenius* var. *Hani* in the plain area. Since 1820, the Pinzgau breed has been spread in all the provinces of the Austro-Hungarian Empire in the regions that now belong to Romania, Slovenia, the Czech Republic and Slovakia. At that time, it was the most widespread regional breed, adapted to the local natural environment (mountains, pastures, forests) [4–6].

Morphological characterization. Pinzgau animals have a harmonious conformation, good body development, wither height: 133–150 cm and body weight: 550–630 kg in cows and 1000 kg in bulls, differ depending on the area, altitude and technology used. The head is large, the neck short, the trunk short and deep. The legs are short and strong with hard hooves horn, which allows easy movement in mountainous areas. Pinzgau cattle were raised with horns, which is a distinct beauty, but they were also used for traction and then had yokes and harnesses. The colour is red, with a white stripe on the back and belly, tail and udder always white, head and legs always red and white rings around the legs (**Figure 2**).

Productive characteristics. The Pinzgau breed falls into the intermediate morphological type, has a good ability to capitalize on fodder from alpine pastures; it is very suitable for grazing. The first calving occurs at 31–32 months, being considered a late breed, with a production life between 5 and 7 years. A very important feature of this breed refers to the high content of k-casein in milk, which provides a better



Figure 2.
Pinzgauer breed from Austria [2].

efficiency of transformation of milk into cheese (**Table 2**). Calves at birth weigh between 31 and 36 kg. Pinzgau cows are good mothers and have a good milk yield, which ensures a high weight gain in calves. In most Pinzgau breeding countries, it is used for milk, but also for meat [4–6].

The future of breeds. In general, the number of Pinzgau cattle has decreased greatly, being a breed with a special state, in some countries, the status is even critical. In the future, purebred breeding is expected to happen on the current distribution areas, especially in the mountainous area of the Alps and the Carpathians, at altitudes of 400–1600 m.

2.3 Grey steppe breeds or Podolic cattle

The cattle from the grey steppe or Podolic cattle breeds group represent some of the oldest regional cattle, which comes from *Bos taurus primigenius* and was

No.	Country	Cattle breed name	Milk yield per lactation (kg milk / lactation)	Milk fat (%)	Milk protein (%)
1	Austria (Salzburg, Pinzgau; Upper Austria; Styria; Tyrol)	Pinzgauer	5300	3.92	3.25
2	Germany	Pinzgauer Doppelnutzung	5500	4	3.5
3	Italy (Province of Bolzano)	Pinzgauer	4000	4	—
4	Slovakia (North Slovakia regions)	Slovenský Pinzgauský	3900	3.9	3.3
5	Slovenia	Cikasto govedo	2500	4	3.6
6	Romania (Transylvania, Apuseni mountains)	Pinzgau de Transilvania	4173	3.88	3.25

Table 2.
The productive characteristics of the Pinzgau breed [2, 4, 5].

formed in the pedoclimatic conditions specific to the steppe area. Human intervention in the formation of these breeds is insignificant over the centuries undergoing little change in terms of morphological appearance and production skills.

Geographical area. Podolian or grey steppe cattle belong to the group of primigenius cattle, about the origin of which there are several theories. The first hypothesis of the origin of these breeds refers to the migratory peoples who brought the animals from the steppes of Central Asia over 1000 years ago, and then were subjected to a process of acclimatization. Another theory claims that this group of breeds appeared with the great migration in the fourth century, and other researchers consider the grey cavities appeared after domestication in the Carpathian Basin. Etymologically the term 'Podolic' comes from the Podolia region of Ukraine. During the 14th and 15th centuries, Podolic cattle were widespread in the Carpathian Basin and the Pannonian Plain, extending as far as Vojvodina. 100 years ago, the group of Podolian cattle was found in Ukraine, Romania and Hungary; later it spread to the Balkan countries (Bulgaria, Serbia) and to the south (Croatia, Greece, Italy) [2, 7].

Morphological characterization. Podolic breeds are characterized by a body development varying from weights of 480–850 kg and height at withers of 137–150 cm, animals are tall and leggy, have well-developed front part of body (lionic aspect inherited from wild ancestors) and thick skin (adaptation to cold winters). The udder is mainly rounded with glandular tissue in a small proportion. The conformation of the breed is robust, the body shape is rectangular and the limbs are strong and long with wide and strong joints. The colour is grey or silver-grey, with darker shades to bulls on the sides of the trunk and on the top. The nasal mirror, horns, tail tuft and hooves are dark or black. Calves at birth are reddish in colour (**Figure 3**) [8].

Productive characteristics. Podolic cattle has a morpho-productive type specific to breeds with universal production characteristics, of which the traction aptitude is unmatched by other modern breeds. It withstands long and difficult roads, withstands good weather conditions and has modest demands on maintenance conditions. It is a late breed in which the reproductive maturity is reached at 30–32 months, with the productive life of up to 11–13 years and even more (15–16 years) and fertility is very high (99–99%). Typically, milk production varies between 980 and 2950 kg and a fat content of 3.6–6%, but in very good conditions of maintenance it can achieve more, and the lively temperament (**Table 3**). Animals of Podolic breed are hardy animals with low nutritional requirements and good viability. Calves at birth are small in size; calves have a body weight of 20–38 kg at



Figure 3.
Grey steppe breed from Romania.

No	Country	Cattle breed name	Milk yield per lactation (kg milk/lactation)
1	Bulgaria (Regions of Plovdiv, Haskovo, Burgas, Smoljan, and Stara Zagora)	Iskarsko govedo	1900 (4.3% fat)
2	Italy (Basilicata, Calabria, Apugli, Campania)	Razza Podolica	1200 (4.29% fat)
3	Serbia (Vojvodina)	Podolsko govece Sivo-stepsko govece	980 (4.24% fat)
4	Hungary (Bocfölde, Western Hungary)	Hungarian grey	2100 (4.2% fat)
5	Romania	Sură de stepă (Moldova, Danube Delta)	2222 (4.4% fat)
6	Ukrain (Donetsk, Kyiv, Sumy, Kherson and Dnipropetrovsk regions)	Ukrainian grey	2950 (4.5% fat)

Table 3.
The productive characteristics of the grey steppe breed (Podolic cattle) [2].

birth, and in appropriate growth conditions, achieve an average daily growth rate of 0.7–0.8 kg and a body weight of 130–150 kg at the age of 6 months [1, 7, 8].

The future of breeds. Grey steppe breeds are distinguished by robustness, low requirements for feed rations and housing conditions; they are not sensitive to tuberculosis or leukosis, so they can be true genetic reserves for the future. Most breeds that are part of the Podolic cattle or grey steppe group have a very small number of animals, so it is necessary to implement in vivo conservation programmes or cryo-programmes. It is very suitable for growing on organic farms and for the recovery of milk in traditional products or with controlled origin, given that milk has special organoleptic qualities.

3. Regional dairy buffalo breeds

Of the total world milk production, buffalo milk is the second most important source, after cow’s milk. Most developed countries face an overproduction of cow’s milk, which is why some of them impose quantitative restrictions and qualitative requirements. Under these conditions, an important alternative source of milk is that obtained from buffaloes. World milk production has doubled in recent decades, and it is noteworthy that 12% of it is provided by buffaloes. India and Pakistan produce about 60 and 30% of total buffalo milk production respectively. Buffalo milk contributes to about 55 and 75% of total local production in India and Pakistan, respectively. In the NWF Province (NWFP) of Pakistan and elsewhere in the Indo-Pakistan sub-continent, buffalo farming is practiced on non-scientific lines. The major causes associated with the under-developed buffalo farms in Pakistan have been identified as:

- i. calf losses, irregular breeding, imbalanced feeding
- ii. ungainly loans and
- iii. a hostile marketing system.

These three causes at commercial buffalo herds lead to annual losses to the tune of US\$ 17.38 [9].

Buffalo milk products are obtained by specific processes in countries in the Caucasus, Asia, where the consumption of sour milk, butter and yogurt is very popular.

In Italy, the buffalo milk industry is highly developed due to the production of the well-known mozzarella cheese. Buffalo milk and dairy products have become very popular in many European countries, and buffalo milk production is now prevalent in countries that previously had no history of this production such as Germany, Ireland, the United Kingdom and even the United States.

Buffaloes adapt easily to environmental conditions, have low requirements for feeding and housing conditions, do not require special care for pathogens, and are resistant to disease. They are rustic animals and suitable for organic farming.

Geographical area. European buffalo breeds belong to the Mediterranean type and are widespread in countries such as Italy, Romania, Bulgaria, Turkey where specific (local) breeds are raised—Mediterranean breed (Italian, Romanian, Bulgarian, etc.). Mediterranean buffaloes come from *Bubalus bubalus*; in *Italy*, they were introduced by the Crusaders at the beginning of the thirteenth century. Improving production capacity was achieved in the twentieth century in the direction of milk production [10].

The Bulgarian Murrah breed comes from the local Mediterranean buffalo, which was crossed with the Murrah breed, imported from India. The formation of the breed by crossing practiced between the local buffaloes and the Murrah breed began in 1962. Thus, in 1962, imports of the Indian Murrah breed were made, which continued until 1975 [10–12].

The Romanian buffalo breed was approved in 1987 [1, 13], and had an increase during the period until 1990 (228,000 heads), after which the number decreased (10 times). Regarding the appearance of buffaloes on the territory of today's Romania, the following are the existing hypotheses (**Figure 4**):

- by the South, from Turkey, Greece and Bulgaria, being brought by the Turks, through the Balkan Peninsula from where they passed into Dobrogea and the Danube Plain;
- by the West, from Hungary, being brought by the Huns and spread by the Avars in the area of Transylvania.



Figure 4.
Romanian buffalo breed from Romania.

Morpho-productive characters	Average values		
	Romanian buffalo	Bulgarian buffalo	Italian buffalo
Body weight (kg)	490	530	650
Height at withers (cm)	132	138	140
Age at first calving (months)	43	37	32
Lactation period (days)	273	278	270
Average amount of milk per lactation (kg)	1960	1800	2175
%Fat	7.85	8	8.15
%Protein	4.39	4.55	4.65

Table 4.
The productive characteristics of the Buffalo breeds [2, 13].

Breeds characterization. The buffalo breed in Italy has superior performance to the breeds in Romania and Bulgaria, which proves the effort made by Italian farmers in modernizing breeding technologies and improving the breed. (**Table 4**). Compared to the average milk production of 1800–2200 kg and a fat content of 7–9% (**Table 4**) in Bulgaria, Italy and Romania, there are many herds with average productions of over 2000 kg, there are animals with productions of over 3000–4000 kg of milk, with an average fat content of up to 11%, aspects, which indicates the special genetic potential and the possibilities for future improvement of these populations [14–17].

4. Conclusion

Regional dairy breeds and regional transboundary breeds represent an invaluable genetic heritage, as they are the reservoir of genes for different types of production, perfectly adapted to climatic conditions, resistant to disease, even if productive performance is lower compared to breeds of universal importance. It is appreciated that milk obtained from animals of these breeds is suitable for obtaining specific or traditional products, so agricultural policies must encourage farmers to grow these breeds, thus achieving active conservation.

Conflict of interest

The authors declare no conflict of interest.

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