

Serbian Podolian Cattle Breed

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Serbian Podolian (*Podolsko goveče* also named *Sivo-stepsko goveče* or *Podolac*) is one of the Balkan breeds belonging to the Podolian strain; it is reared in Serbian Republic and likewise other rustic breeds of this strain, is endangered of extinction and supported by protection plans.

Location

The breed is mainly spread in Vojvodina, the autonomous province in the north of the Republic of Serbia, which until 1918 belonged to Hungary. The province also includes Sylvania, currently divided between Serbia and Croatia, which gave its name to the Slavonian Sylvania Podolian breed of Croatia. In Vojvodina, which is considered the "home of Podolian", from the eighteenth century the breed was widespread as a draft animal in large estates.

Traits

The Serbian Podolian shows a great skill to adapt to extreme farming conditions, thanks to its great frugality, resistance to harsh climate, calving ease, great maternal attitude, high resistance to diseases such as tuberculosis, and marked compensatory growth that minimizes the damages due to periods of food shortage caused by adverse climatic events, but that in the past allowed it even to overcome political turmoil.

The great maternal attitude, expressed as ability to grow the calves until weaning in harsh conditions, should be meant also as a collective trait, as proved by the event described by the breeder Tružinski Szabolcs: when a Podolian cow had calved with minus 20° C, the other cows of the herd encircled the newborn calf, also pushing the straw of the litter around him, to keep him warm (*Crnobarac, 1999*).

Maybe among the ancestors of Serbian Podolian we can count the long-horned cattle represented in the small bronze heads of sixth-seventh century B.C.E. exposed in Belgrade Archaeological Museum, and the breed have had a long history as a draft animal, thanks to its hardy frame and its endurance to labour, coming from centuries of selection. Nevertheless it underwent a crisis in the second half of nineteenth century due to the reduced availability of pastures, many of which were ploughed in order to produce corn. In the twentieth century agricultural mechanization caused a massive replacement of this breed, especially with Simmental, imported in Serbia since 1899 (*Stoković*), which in the Balkans played a leading role in the disappearance of autochthonous breeds, and which now constitutes about 70% of Serbia cattle population (*Aleksić et al., 2009*).

Actually, like other Podolians, the breed had originally a triple purpose, being reared in very marginal areas, where even the additional income of meat and milk production was valuable to the family budget. Today this breed is raised for meat production, though it must remember its importance as a tourist attraction, in natural parks, such as Zasavica, near Sremska Mitrovica, but also in folk events, for example, Hungarian folk arts festival in Bačka Topola, where two pairs of Podolian oxen pulling a cart are performing.

Breeding

Podolian cattle were once bred in extremely extensive conditions, on pastures which were usually dry in July and August. Traditionally, after the harvest, the cattle was allowed

to graze on stubble until late autumn, but in winter they could only rely on hay and corn stalks, while supplements of grain were rarely given, only to cows suckling their calves or oxen before the start of working season. These harsh rearing conditions selected the traits of hardiness of this breed, perfectly fit to the Pannonian plain, being able to give productions even when improved breeds would not be able to grow.

Even today this breed is mainly reared at pasture, but some herds are raised in free stall, deep litter barns, with feed ration constant throughout the year, consisting above all in homegrown wheat straw given *ad libitum*. The straw which is not consumed works as a litter, and manure is mechanically removed once a year, at the end of winter. The thick layer of litter and its fermentation, which releases heat, help cattle to withstand the harsh winter temperatures. Cattle reared in outdoor stalls have at their disposal additional good quality feed (concentrates, alfalfa hay) in troughs sheltered by canopies.

The survival of the breed, despite the success of Simmental, is also due to the appeal of these animals: according to some breeders, Podolians inspire respect, for its strong temperament, compared to the Simmental, which may be boring, due to the excessive tranquility of the animals (*Stevanović et al., 1971*). In addition, its behavior is very similar to that of wild ungulates, as evidenced by the breeders of Deliblato dunes farm, which, in addition to the Podolians, also raise deers (*Stojanović, 2006*).

Productions

Currently the main product of this breed is meat, which looks dry, firm and dark, suitable for long moist heat cooking and for processed products, also thanks to the poor marbling, since fat is mainly laid down in the subcutaneous connective tissue in the abdominal cavity. In the past the peculiar aptitude of Podolian Syrmian cattle to lay down tallow was renowned (*Stojanović, 2006*). Dressing percentage of fattened young bulls is 52-55%, with peaks of 57%, while is 49% for culled bulls and 42% for culled cows (*Stojanović, 2006, 2012*). Feed conversion ratio and attitude to lay down fat in the muscle are low, anyway increasing with the age. The meat of bulls and steers has long since been recognized on the Austrian markets, like Vienna and Graz. The data on meat quality (color, water losses, tenderness, sensory evaluation) are in line with those of other rustic breeds of Podolian strain (*Stojanović, 2012*).

Serbian Podolian is a late-maturing breed: sires reach maturity at 30 months and are admitted to mating at 2.5-3 years (*Stojanović, 2009*), while dams are fertile at 24 months, the age at first heat varies from 494 to 1199 days, with an average of 893.54, equal to 29.78, months. The first calving occurs after reaching two years, *Stojanović (2006)* found an average of 39.2 months (1177.46 days), but it is not uncommon to find herds with first calving at four years. The great variability is due to the different farming conditions and especially to the season, given the significant difference in food quality between winter and summer. Indeed, the advent of the first oestrus is influenced by nutrition and therefore by the physical condition of heifers, as well as by temperature.

Fertility is high, approximately 85%, the average length of pregnancy is 284.03 days, with absolute values from 269 to 304 days, and the average calving interval is 362.23 days.

The breed has a great calving ease, not needing assistance, the percentage of born alive calves is 94.38%, miscarriages are 2.04% and stillborn calves are 3.57% (*Stojanović, 2006*). The average birth weight is 25-30 kg, in *Stojanovic (2009)* it was 30.44 kg for bull calves and 29.61 kg for cow calves. Average Daily Growth is 300 g/day and the animals reach 100-120 kg at 8 months, 140-160 kg at 12 months, and 350-450 kg at 3-4 years. Loose-housed young bulls slaughtered at an average age of 19 months have reached an

average weight of 445.91 kg (*Stojanović, 2012*). Serbian Podolian is a very long-lived breed, with a productive lifetime of 25 years, with a maximum of 30, while the oxen were used to work in the fields until the age of 15 years (*Stojanović, 2006*). The limit to longevity is mainly given by the loss of teeth, and therefore by the inability to adequately feed themselves.

The average milk production is 800-1,000 kg, consistent with that of other Podolian rustic breeds, with peaks of 3,000 kg; fat content is 3.8 to 4.9% (in average 4.24%), the mean protein content is 3.99%; lactations are on average 11, showing an average duration of 152 days (with a minimum of four months). The measured values on dairy production are not significantly different between primiparous and multiparous cows (*Stojanović, 2006*). Current values of milk production does not show improvement compared to the works of the previous decades, since there has been no selective initiative to improve the breed, because the efforts were rather focused on preventing its extinction.

Population

The sharp drop of Serbian Podolian population was due to factors common to other breeds: mechanization, spread of exotic breeds, in the specific case Simmental, depopulation of mountain areas for urbanization and abandonment of extensive cattle production in marginal areas, changes in market demand, wars, political turmoil and instability, lack or inadequacy of animal husbandry policies, loss of consumers awareness of the importance of local breeds, climate change, human and animals diseases.

The Podolian cattle population in Vojvodina decreased from 213,370 heads in 1911 to 6,822 in 1951. In 2004 it reached a minimum of 60 cows and five bulls, then increased to 250 in 2009, thanks to public support measures (*Stojanović et al., 2011*). A two-year suspension of such measures, now restored, resulted in a further decrease in the number of heads. In 2015 the herds were 12, holding 240 heads, including 16 bulls and 107 cows. The main herds of Serbian Podolian are Sabolč Tružinski farm in Bačka Topola, Zasavica Special Nature Reserve, near Sremska Mitrovica, Milenko Plavšić herd on Krčedinska Ada island, near Kovilj, and other smaller herds in Beška, Bela Crkva and Vršac.

Morphological traits

The coat is silver gray, darker in males over 3-4 years of age, often with black patches on the eyes (glasses) and black shades on the neck, sides of the head, withers and lower part of chest and thighs. The tail tuft and the hooves are black. In general, forequarters are darker than hindquarters, but a too dark hide is not appreciated, although it is not considered a flaw. On the contrary, entirely black head in bulls, white hairs in the tail tuft and skin depigmentation are not allowed, since they are considered a drift from the breed standard. The color also changes with the season, becoming darker in winter, when the hair looks thicker, longer and shaggy, while in summer is short and glossy. There are also some sporadic albino animals. As in other Podolian breeds the calves coat is fawn, although this is not considered a requirement, at the age of 2-3 months it begins to change color and at 4-6 months it is completely gray.

The shape and color of the horns are important features for the evaluation of specimens, therefore dehorning is not practiced. Horns are long, directed outwards and then forwards, with edges facing backwards; "leaf-shaped" horns are allowed but "goat-like" ones, directed upwards, are not. In bulls horns usually are 70-100 cm long, but in some specimens they reach 150 cm, and the distance between their tips is up to 2 meters; in cows horns usually are 60-70 cm long and in the oxen they can reach one meter; the base circumference can reach 30 cm. The horns' outer third is glossy black, the middle

part is white and proximal third is off-white; no greenish or yellowish shades are allowed; young animals' horns show reddish shades, until reaching the final color, at about four years of age (Stojanović, 2006).

The head tends to be long and narrow, well-proportioned to the body, with flat fronto-nasal profile, wide dark eyes, wide jaw, long neck, slightly muscular and rather narrow; sense of smell and hearing are well developed.

Forequarters are more developed than hindquarters, the chest is cylindrical, deep and long, topline regions are slightly muscled, the back is long and moderately broad, with long and narrow loins, and flat and rather long rump (Stojanović, 2006). The udder is small, covered with hair, with small and thin nipples and the tail is correctly set, of medium length and thickness and almost reaches the hock (Smilevski, 1974).

The limbs are longer than in other breeds of this strain, and are solid, with strong tendons, lean joints and tough hooves. The limb conformation is generally correct, but also knock-kneed forelimbs and sickle-hocked hindlimbs can be found. The posture is vigorous, with head held high, the step is long and the gait is fast (Stojanović et al., 2011).

The average weight of bulls is 800 kg, ranging from 600 to 900 kg, while cows' weight is 500 kg, with a range from 350 to 700 kg; the oxen's weight ranges from 550 to 650 kg. The withers height, according to various authors, varies from 130 to 145 cm for cows, 150 cm for bulls and 160 cm for oxen (Stojanović, 2006). The biometric measurements according to Stojanović (2009) are:

(cm)	average	heifers 1 year	heifers 1-2 years	steers	bulls
Withers height	126.02	105.15	117.90	105.00	126.50
Rump height	128.64	108.24	120.00	109.50	128.80
Trunk length	160.66	117.86	141.20	125.25	158.80
Chest width	41.92	30.33	34.20	30.50	46.80
Chest depth	67.19	49.86	56.50	52.75	68.50
Chest girth	189.08	141.29	159.90	142.00	194.30
Shin girth	19.25	15.17	17.10	14.25	21.30
Ischium width	13.19	10.38	10.50	9.00	13.00
Ileum width	45.34	29.76	37.10	28.75	44.80

Related breeds

Serbian Podolian is very similar to Slavonian Podolian, one of the two Podolian breeds reared in Croatia, so that Kugler's Rare Breeds and Varieties of the Balkan Atlas considers them as one breed. To confirm this, Ramljak et al. (2011), in order to improve Slavonian without altering its genetic identity, propose to crossbred it with Serbian and Hungarian Grey, which are identified as the only breeds closely related to Croatian cattle.

In the 60s some Serbian breeders quitted and sold their cattle to Croatian farms, helping to develop Slavonian Podolian, while other heads from the important farm of Rado Tisma were sold, when he died, to Hungarian breeders.

Before the breakup of Yugoslavia in the current six independent republics, the Slavonian and the Serbian dwarf variety Posavina or Gulja, widespread in Bosnia and now extinct (FAO), were grouped together under the name of Yugoslavian Steppe breed (Mason). According to Pirocchi (1906) Bosnian Posavina had "the same traits of Podolian cattle, as can be seen on the Apennines from Abruzzi to Calabria". Until 1993 the Kolubarska, a mixed Podolian breed was reported, created by crossbreeding with the local dwarf breed Busha, in the area of Mionica and Valjevo, in the upper basin of Kolubara

river, which had obviously a smaller size. The breed was created by the effort of Prince Miloš Obrenović that between 1820 and 1835, in Divčibare, on Maljen mountain, had its own "Breeding Center" (*Stojanović, 2006*).

Another crossbreed between Serbian Podolian and Busha was Spreča breed (also named *Sprečko goveče* or *Tuzla*), widespread in the north-east of Bosnia, with yellowish-grey coat (*Porter*) which is now extinct. Moreover Serbian Podolian contributed to the creation of the crossbred spotted Simmental-derived cattle, which constitutes about 25% of Serbian cattle (*Aleksić et al., 2009*).

Conservation

The protection programme, which has prevented the extinction of this breed, is managed since 2003 by the Ministry of Agriculture and Environmental Protection of the Republic of Serbia (*Lygda and Zjalić*), later Ministry of Agriculture, Forestry and Water Resources (*Stojanović, 2012*) and provides a first *in situ* protection, that is in the traditional distribution area of the breed. The programme is implemented with the support of breeders of endangered breeds, and the National Coordinator is Dr. Srdjan Stojanović, veterinary of the Ministry.

The Serbian Podolian Herd-book, like those of the other livestock breed in the country, is kept by the Faculty of Agriculture, University of Novi Sad, which also manages the mating programme. A breeders association has not yet been established.

Serbian Podolian breed was included in the Management and Development Plan of Zasavica Special Nature Reserve, funded by the Ministry of Economic Affairs, Agriculture and Innovation of the Netherlands, which began in 2009 and ended in 2011 with a conference in Sremska Mitrovica. The Plan applies the principles of management planning of Directive 92/43/EEC ("Habitats Directive").

Sremska Mitrovica movement for nature conservation started breeding Podolian cattle in 1998, the first specimens, a gift of Mionica ecologist Peca Petrović, were introduced in spring near a pond used for fishing; today on the 500 hectares of Valjevac meadows 80 heads graze in summer, providing a particularly tasty meat, typical trait of Podolian cattle, which is used locally to produce the typical Podolski goulash, a Hungarian style stew, influenced by the proximity to Hungary. In the same park donkey milk cheese is produced, defined by its producers as the world's most expensive cheese.

One of the ideas subject of studies in order to protect the rearing of this breed, and of Manguliza woolly pigs, making their breeding economically viable, is to protect their geographical origin, following the example of Hungarian Grey, protected by PDO (Protected Denomination of Origin). The application has not yet been submitted because the convenience of bearing the registration fees for obtaining the mark, is under evaluation, with the related collection of documents and submission of explanations, since it could not be balanced out by a higher price for meat, which for products coming from Zasavica is already guaranteed.

Another possible commercial incentive is the inclusion of the products from the breed in the organic farming network, which could be not difficult thanks to the widely extensive farming system, respectful of animal welfare, with a very low impact on the environment, especially when performed within protected natural areas.

It should be noted that the benefit for the environment of rustic breeds, including Serbian Podolian, is also preserving biodiversity and landscape diversity, since the suspension of grazing in some areas has caused the expansion of invasive plant species, often threatening the survival of small and isolated populations of rare plants, that may lead to the disappearance of unique habitats. The reactivation of grazing can be useful to

restrain invasive species and protect the rare ones.

An *ex situ* conservation programme, meaning outside the traditional area of diffusion, is also provided, with the creation of a gene bank; currently artificial insemination or cryopreservation of semen are not performed, which are instead implemented for Busha, the other Serbian native breed.

The conservation of native breeds endangered of extinction can also consider the contribution of sires of similar breeds, which in the case of Podolian are several, after having properly known genetic kinship and crossbreedings occurred in the past, with the tools currently provided by molecular genetics.

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Images in the published version of the article

- 104** Milenko Plavšić Podolian herd on Krčedinska Ada island.
- 106** Podolian cow of Sabolč Tružinski farm in Bačka Topola.
- 108** In Sabolč Tružinski farm in Bačka Topola, the animals are reared in free stall, on deep litter barns.
- 110** Bronze bovine heads of 6th-7th Century BCE - National Museum, Belgrade.