

SIMMENTAL BREED PRODUCTION CHARACTERISTICS AND BREEDING GOALS

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Abstract

This paper presents the most important production results obtained for the population of Simmental breed raised in majority of the European countries which with a total population of about 9 million animals rates as the second biggest important cattle breed in Europe. Breeding goals from previous period were analysed along with newly defined breeding goals in some Simmental breed populations. Current mean values for milk yield of Simmental cows in standard lactation in the European countries range from 5500 to 7500 kg. Depending on the Simmental breed population in most countries a breeding goal set for first lactation cows is milk yield of 5500 or 6000 kg with 4.0% milk fat and 3.5% protein, while in cows who finished their third lactation required milk production is more than 7000 kg for Simmental breed, over 8000 kg for Simmental breed with share of Red and White Holstein genes and over 8500 kg for Montbeliard breed. A special emphasis is given on the prolonging of the duration of life and production span. During life span the demand is to produce minimum 30 000 kg milk/cow. This demand can be realised if functional traits in breeding goal participate with over 40 % with proper implementation of improvement programme. As for the traits that are significant for meat production, depending on the population, defined breeding goal for daily liveweight gain are values above 1500 g/day (i.e. 1400 g /day) for Simmental male bullcalves.

Key words: *breeding goals, production traits, Simmental breed*

Introduction

Since the second half of the XX century the Simmental breed has developed into a high producing breed with pronounced milk yield. In some European countries (Switzerland, Hungary, Czech Republic, Slovakia), a Simmental type for pronounced milk yield is developed and improved by Red Holstein breed. In the other European countries (Scandinavian countries, Great Britain) and almost all non-European countries Simmental breed is well-known and raised as fatening breed in system cow-calf, both in pure breed and in the programmes for dual and three breeds crossing with other cattle breeds. It is raised in various climate conditions and production systems and therefore represented in a significant degree in the Alpine region of Europe, where it originated, but it is also present in a significant degree in southeast Europe, Great Britain, Russia, China, North and South America, Southern Africa and other worldwide countries. Different sub-populations of Simmental breed have been created with different breeding goals. Nowadays in majority of the European countries the Simmental breed is mostly

raised in pure breed so that it possesses a high potential for expressing heterosis effect if crossed with dairy and specialised fattening breeds.

Total world population of Simmental breed in the last two years numbers about 41 million heads. Simmental breed in Europe with about 9 million heads ranks second in population size after the population of Holstein Friesian cattle. According to the data of some national associations of breeders of Simmental breed (www.asr-rind.de) number of Simmental breed cows in Europe is about 6 million. As for the European countries the most significant populations of Simmental breed are raised in Germany and Austria. According to the Simmental breeders societies and associations an absolutely largest population of Simmental cattle is in Germany of about 3450000 heads out of which 1130000 are cows. In Austria the share of Simmental breed is 76% in total cattle fund of the country what makes about 1500000 heads. Austria and Germany are main exporters of Simmental breeding animals. The important export category for European countries is mostly the pregnant heifers category. Besides this export category Austria and Germany were in the past and still are major exporters of Simmental bulls semen into all parts of the world. Besides good genetic potential for milk yield it is desirable that the animals have well developed body shape. For this reason the process of holstenisation of Simmental breed in Germany and especially in Austria was not of a larger scale.

In France, Montbeliard breed is the most important among all spotted cattle created on a basis of Simmental breed from Switzerland. This breed belongs to the dual production breeds of pronounced milk yield. Red and White Holstein Friesian breed participated in its creation. Montbeliard breed is today used as an improving breed for poorer performance populations of Simmental breed such as that of our country.

In Serbian cattle breed structure Simmental breed makes about 80 % total fund of cattle, Holstein-Friesian breed and Black and White improved by Holstein Friesian breed 12 to 13 % and crosses of Simmental with other breeds (Busha in the first place) make about 6 to 7%, while pure breeds of native breeds (Busha and Podolska breed) have in total less than 1000 heads. In milk production in Serbia Simmental breed plays a major role due to its abundance – size of population, while as regards the individual production performance per animal Holstein Friesian breed is by far higher dairy producing breed compared to Simmental breed. General trend in Serbia is to reduce the number of milk producers, particularly producers with smaller number of cows (1-3 cows), so that in the forthcoming period we can expect significant reduction in the number of farmers-households producing milk (Popović, 2008; Perišić et al., 2012).

Simmental breed milk yield

Milk yield of Simmental cows in some European countries is at the level of bovine milk yield in specialised dairy breeds. Besides high level achieved in previous period the milk yield is constantly increasing. About less than 10 years ago in controlled populations of Simmental breed, in the countries which had more significant share of Simmental genes, milk yield ranged from 5000 to 7000 kg (Table 1).

According to the data produced by Simmental breeders national associations (www.asr-rind.de; www.fleckvieh.at; <http://zar.at>), bovine milk yield in two most important populations of Simmental cattle (German Simmental, Austrian Simmental) is increasing and milk production mean values both in control animals and the animals in registered breeding stock are higher than 7000 kg in standard lactation.

Table 1. - *Simmental cows milk yield traits in some European countries 10 years ago*

Country	Year	Duration of lactation, days	Milk yield, kg	Fat content %	Yield of fat, kg	Protein content, %	Yield of protein, kg
Hungary	2004	293	5 023	3.99	201	3.43	175
Czech Republic	2006	294	6 162	4.08	252	3.46	213
Slovenia	2006	305	5023	4.17	209	3.29	165
Slovakia	2004	297	4 919	4.09	201	3.30	162
Switzerland (Fleckvieh)	2006	299	6 847	3.99	273	3.24	222
Switzerland (Simmental)	2006	297	5 681	3.88	220	3.30	187
Austria	2006	305	6 483	4.18	271	3.43	222
Norway	2004	266	5 229	4.15	217	3.35	175
Croatia	2006	305	4 459	4.07	181	3.35	149
Italy	2006	293	6 528	3.92	256	3.41	223
France (Montbeliard)	2006	296	6 907	3.91	270	3.46	239
Germany	2006	316	6 854	4.14	284	3.48	239
Poland	2006	-	4785	4.01	192	3.36	161

(www.Cattlenetwork.net)

Austrian Simmental cows milk yield is at the level of mean values for bovine milk yield of all breeds. These mean values include milk yield of Holstein Friesian cows represented in Austria by about 10 % of total number of cows under milk yield control, i.e. about 12.5% of total registered cows.

In Switzerland the milk yield of spotted cattle populations in the type of Simmental breed had no significantly increase compared to the milk yield 10 years ago. However, milk yields of bovine populations of Simmental section (5819 kg), Fleckvieh section (6741 kg) and Montbeliarde breed cows in Switzerland in 2012/2013 were still placed among the European highest dairy producers when speaking of Simmental breed.

Table 2. - *Simmental cows milk yield traits in 2012 in Germany*

Population	Number of lactations	Milk yield (305 days), kg	Fat content, %	Fat yield, kg	Protein content, %	Yield of protein, kg	
Fleckvieh, Control cows	885086	7107	4.11	292	3.48	247	
Fleckvieh, Cows in breeding stock	693 599	7439	4.14	308	3.50	260	
Fleckvieh, firstcalved	2012	245940	6481	4.13	267	3.46	225
	2002	239 900	5654	4.16	235	3.47	196

(www.asr-rind.de)

In Serbia in the regions of more intensive cattle production the bovine populations with pronounced milk yield are being raised and crossbreeding of Simmental breed with dairy breeds is quite common. In hilly-mountainous regions lower producing animals are being raised for the meat-milk production. According to selection reports milk yield of Simmental registered cows in Serbia is in the range of 4000 kg to 5500 kg milk in standard lactation depending on the lactation on order and breeding region.

Table 3. - *Simmental cows milk yield traits in 2013 and in preceding years in Austria*

Population	Number of lactations	Milk yield (305 days), kg	Fat content, %	Fat yield, kg	Protein content, %	Yield of protein, kg	Number of animals
Fleckvieh, Control cows, 2013	249030	7103	4.15	294	3.41	242	536
Average milk yield in all control bovine breeds in Austria per years							
2013	339032	7200	4.14	298	3.40	245	543
2012	337988	7148	4.14	296	3.41	244	540
2011	333191	6942	4.13	287	3.39	235	522
2010	328035	6841	4.12	282	3.38	231	513
Fleckvieh, Cows in breeding stock, 2013	240.745	7.141	4.15	296	3.41	244	540
Average milk yield in all bovine breeds in Austria per years							
2013	326176	7234	4.14	299	3.40	246	545
2012	326190	7177	4.14	297	3.41	245	542
2011	321700	6970	4.13	288	3.39	237	525
2010	316865	6867	4.12	283	3.38	232	515
Fleckvieh, Firstcalved of breeding stock, 2013	65766	6479	4.12	267	3.38	219	486
Average milk yield of firstcalved in breeding stock of all breeds in Austria per years							
2013	91290	6575	4.11	270	3.37	221	491
2012	91082	6516	4.11	268	3.39	221	489
2011	94928	6331	4.12	261	3.38	214	475
2010	92736	6235	4.11	256	3.36	209	465

(<http://zar.at>)

For the purpose of improving Simmental milk yield traits and fattenning traits in our country the improvement was implemented mostly by selection in pure breed. In addition there was an import of Simmental breeding animals from the countries that have high genetic potential individuals for milk production. Thus the animals were most often imported from Austria and Germany in which the mean milk production per cow for overall population in the last decade was from 6500 – 7000 kg milk with over 4 % milk fat. Since the milk yield traits are more rapidly enhanced by means of crossing our country followed the example of some European countries and in a considerable degree implemented the crossing of Simmental with Red Holstein and Montbeliard breeds. This

way enhances also the milking traits in a significant degree what is particularly important in intensive milk production and machine milking.

Table 4. - *Milk yield traits in Simmental cows in 2012/2013 in Switzerland*

Population	Number of lactations	Milk yield (305 days), kg	Fat content, %	Protein content, %
Simmental	15312	5819	3.93	3.32
Fleckvieh	41818	6741	4.05	3.26
Montbeliarde	5381	7388	3.77	3.32
Mean value for all control bovine breeds	167763	7389	4.05	3.26

(www.swissherdbook.ch)

In Serbia in the last three decades the crossbreeding of Simmental with higher dairy breeds (Montbeliard, Red and White Holstein Friesian breed) of different scope was implemented. The results thereof can be found in the research papers by Medić et al. (1983), Zečević (1986), Perišić (1998) and Perišić et al. (2002). The effects of crossing were monitored by Knežević et al. (1991) for populations in Croatia. These results indicate that cross-breeds compared to Simmental breed show somewhat earlier maturity, have higher milk production with lower content of milk fat and longer duration of lactation and service-period. The share of genes in Simmental dairy breeds should comply with breeding conditions in which improved animals realise their production, as well as with the market demands for milk production. Since in the European countries there is a trend of reducing the number of cows for milk production and increasing the population of bovine fattening breeds we should not, in our conditions, expect that holstenisation of Simmental breed will be of a larger scale in the forthcoming period, primarily due to current uncertain placement of milk and dairy products on the European market what reflects the situation in our dairy sector as well (Popović, 2008; Perišić et al., 2012).

Simmental as fattening breed

In Simmental breed, from its beginning until today, the improvement directions changed frequently although the endeavours to keep dual production could often be perceived with differences regarding the expressiveness of production traits (milk yield or fattening) all in accordance with the needs of the countries in which this same breed was bred for combined production. In the last several decades in non-European and some European countries Simmental breed is being raised exclusively for the purposes of specialised meat production by breeding in pure breed or by crossing with other breeds.

Simmental fattening breed is represented in Great Britain where this breed is crossed with dairy breeds in order to obtain crosses for fattening purposes. Simmental cattle in pure breed and for crossing with dairy breeds for the purpose of meat production is being bred in Ireland, Denmark and Sweden.

Due to its production traits and good acclimatisation abilities Simmental breed has spread to all continents and became one of the most significant world cattle breeds.

Besides spreading to the European Mediterranean countries Simmental has from the Alpine regions spread successfully to all continents. It is raised in a considerable degree also in South America where it is being crossed with American zebu (humped) cattle for the purpose of meat production by pasture fattening lasting for about two to three years. It is mostly crossed with larger format zebu cattle. Similar situation is in North America,

Australia and New Zealand, where Simmental breed is raised as specialised fattening breed. It is frequently crossed with fattening breeds of smaller format such as British fattening breeds with the aim to obtain cross-breeds which can be fattened to higher finishing weights compared to British breeds. The types of breeding used there are pasture cow-calf system and extensive fattening in fenced stables by use of forage feeds. It is raised also in southern and southwestern Africa, less in pure breed and more as hybrid breed Simbrah (Simmental x Braman).

Table 5. - *Performance test results on Simmental bullcalves fattening traits*

Country	Year	Mass at birth, kg	Mass with 200 days, kg	Mass with 365 days, kg	Liveweight gain in fattening, gr
Czech Republic	2006	39	284	531	1348
Slovenia	2006	45	276	-	-
Slovakia	2004	32	202	-	-
Serbia	2004	45	251	508	1254
Switzerland (Simmental)	2006	43	311	536	1469
Sweden	2006	48	342	610	1470
Austria	2006	44	285	445	1103
Norway	2004	44	340	568	1492
Ireland	2004	40	400	-	-
Great Britain	2004	41	422	600	1530
Germany	2006	41	286	525	1326
Denmark	2006	47	355	636	1614

(www.catilenetwork.net)

The results of Simmental young bulls performance test from earlier period (shown in Table 5), as well as more recent results of the test in the animals up to the one year of age are at the level of the results realised by specialised fattening breeds which belong to the group of terminal breeds.

In Germany in 2010 (www.asr-rind.de) in performance test which lasted from 112 to 350 day of age young Simmental bulls realised liveweight gain of 1365 g/day and an average liveweight daily gain of 1208 g/day. According to the same source, in the test conducted in 2011 which lasted up to the 423 day of age young bulls realised daily liveweight gain of 1325 g/day and achieved body mass of 601 kg at the end of test. In 2012, young bulls had body weight of 593 kg at the end of test which lasted 418 days and realised daily liveweight gain of 1322 g/day.

The results of test regarding fattening in Austria in 2013 (<http://zar.at>) confirm that Simmental breed in relation to all examined breeds had best results in the test which lasted up to the 365 days of age. Average daily liveweight gain in male animals was 1174.5 and in females 986.5 g/day. In specialised fattening breeds Sharolais realised liveweight gain of 1165 g/day in males and 987.5 g/day in females while Limousine realised daily liveweight gain of 1092.5 g/day in males and 950.9 g/day in females.

As a maternal basis, Simmental breed is used in specialised systems of meat production (system "cow-calf"), where the cross breedings with terminal fattening breeds (Sharolais, Limousine, Belgian Blue and White) are most oftenly carried out. Better milk yield of Simmental breed compared to cows of specialised fattening breeds has a positive effect on weight gains of calves in suckling period which lasts 6 months. Thus it often happens that

calves crosses have considerably greater body mass at weaning compared to pure breed calves when those pure breeds were crossed with Simmental.

In Serbia the crossings of Simmental and fattening breeds, primarily with Sharolais and Limousine (Perišić et al., 2006; Perišić, 2007; Perišić et al., 2008; Perišić et al., 2009) were conducted. The effects of crossing were in general positive in fattening and slaughter breeds what made possible for crossed bullcalves (Simmental x Sharolais; Simmental x Limousine) to be fattened to greater body masses in relation to the bullcalves of pure Simmental breed without compromising the quality of carcass or meat. Production was organised according to the cow-calf system and on most farms the production was conducted in stable conditions throughout the whole year. Such way of production and keeping (stable keeping, cow-calf system) could not be fully efficient primarily due to the transport of forage feeds to the stables throughout a whole year so that the farms gave up this kind of production. Better effects would certainly be achieved by organising this kind of production with use of pastures what would considerably reduce the costs of feeding.

Breeding goals for Simmental breed

Improving the production traits of Simmental breed can be realised by selection in pure breed and by use of crossing methods with other breeds. When breeding goals and programmes for Simmental breed in the European countries are in question we can observe that they differ from one another. It is certain that they must be reconciled with the needs of each country to meet the requirements of their markets for milk and meat. Selection goals depend in a great degree on the size of population of Simmental breed and its share in total cattle fund in a given country. The important factor which can influence the defining of production goals for Simmental cattle is also the participation of cattle dairy breeds in total cattle fund and their productivity. The higher the participation of specialised dairy breeds in some country, especially if their milk yield is high or showing the tendency of further rise can directly influence the reduction in Simmental cattle populations raised for combined production and influence the increase in populations grown in the "cow-calf" system.

Defined goals in previous period (2006) are also of the interest today, i.e. they are not fully realised yet. The importance of some traits in selection goals for Simmental breed in certain European countries is shown in Table 6. Functional traits have a great importance in selection goals and breeders programmes for Simmental breed populations which achieved a high average lactation milk production (Simmental breed in Germany, Austria, Switzerland...), so in the forthcoming period we can expect more improvement in functional traits (longevity, regular fertility, resistance to mastitis), and not striving to have further increase in milk yield.

In the countries that have highly producing populations of Simmental breed the attention is particularly being paid to the improvement of functional traits what might result in longer life span and higher life production (minimum 30000 kg per individual during life). For the sake of comparison the breeding goal for Holstein Friesian breed is life milk production of 40000 kg.

On the basis of many trials and analyses of performance results it has been determined that the increase of milk yield per cow is always connected with longer lactations. It has also been found out that a significant increase in profit per farm is the result of cows increased longevity.

Table 6. - *The importance of some traits (in %) in breeding goal for Simmental breed*

Country	Milk, %	Meat, %	Functional traits, %	Exterior, %
Hungary	60	40	0	0
Czech Republic	40	24	0	36
Slovenia	45	10	23	22
Slovakia	60	40	0	0
Serbia	50	50	0	0
Switzerland (Fleckvieh)	40	10	30	20
Switzerland (Simmental)	35	20	25	20
Romania	60	35	5	0
Poland	50	50	0	0
Austria	38	16	46	0
Croatia	50	50	0	0
Italy	44	24	12.5	19.5
France (Simmental)	51	-	31	18
France (Monbeliard)	50	-	37.5	12.5
Germany	38	16	46	0

(www.Cattlenetwork.net)

Breeding goals for Simmental breed in some European countries

Breeding goals for Simmental breed in most of the European countries which raise Simmental as dual production breed are generally defined in accordance with concrete situation in each state (as regards cattle breed structure, population milk yield) and by following the example of leading countries which raise Simmental as breed of combined production traits (Germany, Austria). Therefore in Austria the breeding goals (according to ZAR - Central working association of Austrian cattle breeders), defined in 2010 for Simmental breed directed for milk –meat production are:

- the importance of some groups of traits in breeding goal
(38 % milk, 16 % meat, 46 % functional traits),
- milk yield of cows in first lactation 6000kg,
- milk yield of cows in later lactations from 7000 kg to 9000 kg with 4.2% fat and 3.7% protein,
- cow body mass from 650 to 850 kg,
- body mass of bulls with finished growth from 1100 to 1300 kg,
- withers height 140-150 cm,
- bulls withers height 150 to 165 cm,
- first calving at 30 months,
- calving interval 365 days,
- cow production life longer than 3.8 years,
- daily liveweight gain of male bullcalves 1400g,

- daily liveweight gain of female bullcalves 1150 g,
- carcass quality: > 80% E class + U class,
- optimal marbling.

Similar demands regarding production and exterior traits are for German Simmental as well. A special emphasis is given to the increase of the duration of life and production span. During life span the requirement is to realise minimum 30000 kg milk/cow. By this requirement the emphasis is being given to functional traits which must participate with more than 40% in breeding goal with duly implementation of the improvement programme.

Along with the traits important for milk production in Germany a significant attention is being paid to improving the traits important in meat production when Simmental is bred in the cow-calf system. General preconditions required for the successful and economic meat production in cow-calf system, besides pronounced fattening traits of Simmental breed is regular fertility as well.

Breeding goals for Simmental populations directed at specialised meat production differ from breeding goals for the populations directed at combined production. Thus in Germany (www.asr-rind.de) the efforts are made to have animal age at first calving of 24 to 28 months, calving interval 365 days and calf mass at birth adequate for cow-calf system (females weight 39 kg, males weight 41 kg).

In Switzerland separate breeding goals have been defined for the sections of Simmental and Montbeliard breed.

Table 7. - *Breeding goals for some traits in cattle population in Switzerland*

Trait		Simmental (stand. 2014.)	Fleckvieh (stand. 2009.)	Montbeliarde (stand. 2009.)
Cow body height, cm		138-146	140 - 150	140 – 150
Cow body mass, kg		650 – 800	650 - 800	650 - 850
Bulls body height, cm		150 - 160	154 - 164	152 - 162
Bulls body mass, kg		>1200	>1200	>1200
Calving interval, days		365	365	365
Milk yield, kg	I lactation	5500	6000	6500
	II lactation	6500	7000	7500
	III lactation	7500	8000	8500
Milk fat content, %		4.00	4.00	4.00
Protein content, %		3.50	3.50	3.50
Weight gain of male bullcalves in fattenning, g/day		>1500	>1400	>1500

(www.swissherdbook.ch)

Breeding goal for Simmental breed in Serbia

On the basis of analysis of the size of Simmental breed in our country the conditions prevailing on the market have imposed that Simmental cattle breeding in forthcoming period will be predominantly in pure breed with less application of improvement crossing (lower share of genes of Red and White Holstein or Montbeliard breed).

For the purpose of improving the milk yield and fattening traits of Simmental breed in a greater part of Serbia the selection is conducted in pure breed. By application of artificial insemination, i.e. by wider use of insemination in overall population and by introducing the genes of more productive Simmental populations from some European countries (import of semen of elite bulls, import of breeding offspring), genetic potential of Simmental breed is being improved as a breed of combined purpose milk-meat production.

According to the Breeding Programme for Simmental breed in Serbia of 2010 breeding goal was defined in relation to up to then reached levels in production in majority of Simmental cattle populations in the European countries:

- Average milk production in standard lactation (305 days) of over 6 000 kg with 4.10% milk fat and 3.6% protein;
- Average milk flow of 2.0 kg/min minimum;
- Average daily liveweight gain higher than 1 300 g;
- Hot carcass percentage over 58.00%;
- Ridge and withers height in adult cows over 140 cm;
- Adult cow body mass over 650 kg;
- Age at first insemination from 16-17 months, and body mass over 400 kg;
- Age at first calving from 25-26 months;
- Calving interval 370 days maximum;
- Cow production life 7-8 years;
- Functional traits (udders, extremities);
- Milk quality (somatic cell count less than 250 000);
- Ridge and withers height in adult bulls over 155 cm;
- Adult bulls body mass over 1200 kg;
- Improved udders.

When the animals from breeding stocks are in question the crossing with other breeds is less applied. There are some limitations regarding the share of genes of other breeds in Simmental breed. For instance in Serbia in previous period it was allowed to have up to 12.5% of share of genes of Red and White Holstein Friesian breed while today this share of genes is up to 25% in accordance with the Breeding Programme for Simmental breed from 2010. The gene share of Simmental dairy cows should correspond to the breeding conditions in which improved animals realise their production as well as to the market demands for milk production.

The effects of Simmental cattle crossing, with the exception of the increase in milk production, are reflected also on the milking traits improvement. The results of numerous studies show that crosses compared with Simmental breed attain earlier maturity, have higher milk production with lower content of milk fat and only slightly poorer reproductive traits. The most important improvement in the appearance and structure of udders which can be perceived in the crosses of Simmental breed and Red and White Holstein is improved uniformity of the udders quarters and index, enlarged udder spaciousness, improved udders tightness and better tits shape and size.

Conclusion

Milk yield in Simmental cows in some European countries is at the level of milk yield of cows of specialised dairy breeds. Mean values for milk yield 10 years ago for Simmental breed population in the European countries were in the interval of 5000 to 7000 kg for standard lactation, while today they are in the interval of 5500 to 7500 kg. Milk yield, besides high level reached in previous period, is still rising.

Depending on the population of Simmental breed in most countries the production goal according to breeding goal for first lactation Simmental cows is 5500 or 6000 kg milk with 4.0% milk fat and 3.5% protein, while in cows after third lactation the required milk yield is higher than 7000 kg for Simmental breed, over 8000 kg for Simmental breed with the share of Red and White Holstein and over 8500 kg for Montbeliard cows. Special emphasis is given to increase of life and production cycle. During life span the required minimum realised is 30000 kg milk/cow. This requirement can be achieved by emphasis placed on functional traits which must participate with over 40% in breeding goal with proper implementation of improvement programme.

The traits important in meat production must be highlighted so that in higher producing populations of Simmental breed, daily liveweight gain of 1500 g/day for male bullcalves of Simmental breed and 1400 g/day for male bullcalves of Simmental breed with the share of genes of Red and White Holstein is set as breeding goal.

In Serbia the methods of improvement of Simmental breed must be designed in accordance with already existing genetic potential of each specific population, its purpose (registered breeding stocks, production breeding stocks), as well as market demands for bovine milk, dairy products and meat.

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References

1. Knežević L, Matić L, Barišić A, Rastija T 1991. Utjecaj križanja simentalske i crvene holštajn-frizijske pasmine goveda na njene osobine mlečnosti, reprodukcije i tjelesnih mjera. *Stočarstvo* 5-6, 141-145.
2. Medić D, Veselinović S, Petković Danica., Bodulić S 1991. Ispitivanje tovnih i klaničnih osobina meleza dobijenih ukrštanjem krava kombinovanog i mlečnog tipa sa bikovima tovnih rasa. *Biotehnologija u stočarstvu* 7, 1-2, 5-24.
3. Perišić P 1998. Reproaktivne i proizvodne osobine različitih genotipova krava simentalske rase. *Magistarska teza, Poljoprivredni fakultet, Beograd.*
4. Perišić P, Skalicki Z, Latinović D, Trifunović G, Bogdanović V 2002. Uticaj udela gena crvenog holštajna na reproduktivne i proizvodne osobine krava simentalske rase. *Biotehnologija u stočarstvu* 18, 5-6, 37-43.
5. Perišić P, Skalicki Z, Petrović MM, Bogdanović V 2006. Simentalska rasa i pravci njenog razvoja. *XVII Inovacije u stočarstvu, Biotehnologija u stočarstvu, 22 (poseban broj), 231-244.*

6. Perišić P 2007. "Reproduktivne i proizvodne osobine simentalске rase pri kombinovanom smeru proizvodnje i sistemu krava-tele", Doktorska disertacija, Poljoprivredni fakultet, Beograd-Zemun.
7. Perišić P, Skalicki Z, Petrović MM, Bogdanović V, Trifunović G 2008. Simentalска rasa u kombinovanoj i specijalizovanoj proizvodnji. *Biotehnologija u stočarstvu*, 24 (Posebno izdanje), 25-38.
8. Perišić P, Skalicki Z, Petrović MM, Bogdanović V, Ružić–Muslić Dragana 2009. Simmental cattle breed in different production systems. 9th International Symposium "Modern Trends in Livestock Production" Belgrade, 7-9 October 2009, *Biotechnology in Animal Husbandry*, 25 (5-6), Book 1, 315-326.
9. Perišić P, Skalicki Z, Bogdanović V 2012. Changes in the cattle sector in EU with possible effect on dairy and beef production in Serbia. *Proceedings of The first International Symposium on animal science (8-10th November, 2012)*, pp. 1-14.
10. Popovic I R 2008. Trendovi na svetskom tržištu mleka i uticaj na tržište Srbije. *Prehrambena industrija- mleko i proizvodi od mleka*. Vol 19, 1-2, 38-43.
11. Zečević B 1986. Ispitivanje uticaja ukrštanja domaćeg šarenog govečeta sa crvenim holštajnom na osobine mlečnosti i plodnosti. Magistarski rad, Poljoprivredni fakultet, Beograd.
12. Major breeding programme in cattle breeding – for Simmental breed (2010): Institute for Animal Husbandry, Belgrade- Zemun.
13. Reports on selection measures conducted in the territory of the Republic of Serbia for Simmental breed - Institute for Animal Husbandry – Belgrade-Zemun (2010).
14. www.Cattlenetwork.net (Cattle encyclopedia): date of visit: April 2014.
15. (www.asr-rind.de): date of visit: August 2014.
16. www.fleckvieh.at; date of visit: August 2014.
17. <http://zar.at> date of visit: August 2014.
18. (www.swissherdbook.ch) : date of visit: August 2014