The development and breeding of Holstein cattle in the Czech Republic

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The development until 1945

First associations of breeders in Bohemia and Moravia were established on the basis of Agricultural Societies which were founded in Austria-Hungary in 1769. Within these associations, livestock cooperatives were established in 1890 which started and maintained herd books. There were more than 100 of them at that time. Later they were transferred under the Czech and Moravian Agricultural Board.

In the period from 1900 to 1918 the improvement of farm animal production was controlled by the Ministry of Tillage of Austria-Hungary and in different countries by agricultural boards whose role was mainly organizational and supportive. Their principal task was to provide the sires of particular breeds and pedigree values with the objective to prevent aimless mating, and also to provide expert and economic advisory services. These activities were funded by state and provincial subventions. Certifications of sires were introduced together with the establishment of breeding and mating stations. In 1905 the first performance recording associations were founded. The Act on the livestock improvement was issued in 1909. The conditions for fulfilment of the Act were secured by agricultural societies, cooperatives and associations which produced breeding animals, maintained herd books, organized exhibitions and prepared materials necessary for providing subsidies. After 1919 performance recording associations and herd books were integrated into regional associations of breeders functioning within the Provincial Association. Since the 1920s the development has been based on newly established research institutes of animal production in Prague and Brno. In 1924 Livestock Breeding Act was issued which imposed the use of certified sires only. The activities of associations have been gradually developed and in 1940 they culminated in the establishment of the Association of Farm Animal Breeders in Bohemia and Moravia. This association took over the responsibility for animal breeding and maintenance of herd books. All these activities were interrupted by the World War II. After the war, the functions of the association were restored and aimed at performance recording, maintenance of herd books, organization of sales markets and exhibitions and other important issues.

The original cattle breed on the territory of the CR was represented by brachycerous red cows. In the 19th century various cattle breeds and strains started to enter Bohemia and Moravia (mainly aristocracy and church owned estates) particularly from Austria-Hungary. From them dual purpose Simmental type breeds became the most widespread and at the beginning of the 20th century they formed the basis of future Czech Fleckvieh cattle. During the 1960s and 1970s this breed was improved at first by Ayrshire and later by Red Holstein sires with the objective to increase its milk production. At present more emphasis is put on the combined performance of this breed.

First information about Black and White cattle on the territory of the present CR are dated back to 1830. More imports were realized from 1870 to 1880 when the increased milk production was required. Total estimated numbers of Black and White Lowland cattle were 8,000 heads in 1931; 230 breeding bulls were used. In 1936 totally 30,027 milk recorded cows (from them

only 1,164, i.e. 3.9 % of Black and White) completed their lactations in Bohemia, Moravia and Silesia.

The breed was characterized by higher requirements in comparison with both the original cattle and the imported dual purpose cattle. At that time the traditional opinion was that such a breed was not suitable for our conditions due to its higher requirements, particularly concerning nutrition. It was mainly used in larger estates focused on milk production where better feeding conditions were available. In addition, appropriate conditions were not provided on smaller farms because cattle were frequently used as draught animals here. During the World War II the breed was almost eliminated.

The period of central management and planning

After the World War II the extent of performance recording secured by the association of breeders was temporarily reduced.
The first AI station was established in 1947 upon the initiative of farmers, Veterinary University and Agricultural Universities.
Extensive changes occurred after February 1948 when the state completely took over the control of animal breeding. The associations of breeders were dissolved. Control assistants and inspectors were transferred under the Ministry of Agriculture and regional authorities where they were often given more political than expert tasks. The Ministry also took over the maintenance of herd books and guaranteed a further development of the artificial insemination system which was included under the Central Office of State Farms. Agricultural cooperatives and state farms were established and in general the agriculture was violently collectivized.
In 1951 the Administration of Artificial Insemination Stations and its regional offices in different regions governing all the AI stations were founded under the Ministry. The regional offices established their branch offices for insemination technicians in different districts. Totally 189,000 cows (12.7 %) were included in the AI system. The insemination was partially used with the objective of herd improvement but the highest priority was given to increasing quantitative results of reproduction. It was due to the overall situation in the agriculture after the process of collectivization and also due to the centrally controlled elimination of various infections (TBC, BAB, venereal diseases) being in progress at that time. The insemination was also employed as a tool to obtain the data concerning cattle numbers as well as quality, which were considerably reduced after collectivization.

In 1952 the State Inspectorate for Farm Animal Breeding was established in Prague and Bratislava as a part of the Central Institute of Supervising and Testing in Agriculture governed by the Ministry of Agriculture. Since its initiation it has been closely collaborating with the Administration of AI Stations in organizing the system of AI and particularly in the development of mating plans and the establishment of fixed insemination and mating regional districts. Upon the decree of the government on the new system of breeding services issued in 1955, the system of performance recording and AI service were integrated into one institution. The Administration of AI Stations (established in 1951) and the State Inspectorate for Farm Animal Breeding were consolidated. A fast development of the new organization resulted from the connection of the performance recording system with the well elaborated system of the AI service. A state-wide structure was created with its head office in Prague and different regional and district offices whose task was to provide performance recording, AI and advisory services. Totally 1,245 thousands cows (85.6 %) were included in the AI system but only

75,000 cows were milk recorded. A total of 110 AI stations were under operation with 2,193 bulls.
In 1959 the Inspectorate of State Breeding Stations with 10,000 employees was transformed into the State Breeding Board, which in 1967 was transformed from the budget organization to the State Breeding Enterprise. At that time almost 1,300 thousand cows were included in the system of AI and 386,000 cows were milk recorded.
The State Breeding Enterprise was responsible for all decisive areas of breeding and reproduction in all species and breeds of farm animals. Among its activities belonged performance recording including milk samples analysis, maintenance of all AI stations and the AI service, operation of test stations for bulls, fattening performance test stations, laboratories of immunogenetics, and central processing of data coming from the system of performance recording, AI and genetic evaluation. The whole system was equipped with necessary facilities, laboratories including the research and training centre, agricultural enterprises etc. In addition, horse-breeding farms, stud farms and horse racing industry were also taken over by this organization. In 1967 two research institutes were transferred under the State Breeding Enterprise as well.

The costs of the organization were covered by the state until 1966 including the costs related to AI and performance recording. Later fixed prices were determined for performance recording and bulls used in natural breeding. The prices of AI units were differentiated according to the sire's quality and were the same for all customers.
The possibilities of breeders to influence the system of breeding were rather limited. Upon the initiation of breeders, the boards of breeders were established in 1968 but these were later changed into advisory bodies of directors of the state and regional breeding centres and subsequently ceased to exist. The only way how breeders could affect the breeding work was to participate in activities of selection commissions.
In this period a number of changes have also occurred in the system of performance recording. The system of data processing has been modified. In 1962 the system of punch cards was introduced and the computer-based data processing was initiated in 1967. The number of cows included in performance recording was quickly increasing and since 1985 more than 98 % of total cows have been recorded.

Important changes have also occurred in the system of AI. Its use for breeding purposes was considerably supported when in 1959 the method of freezing semen from top bulls in solid carbon dioxide was introduced. After 1965 the method of semen storage in liquid nitrogen was examined. The AI service has been exclusively using frozen semen since 1972. In the late 1960s the complex breeding programme was developed and the whole process of breeding and reproduction was based upon it.

The stock of semen ranging from 30 to 50 thousands units was produced from different bulls. The future use of a bull was determined on the basis of genetic evaluation results. Semen was stored and automatically registered in the central sperm bank in which 97 million units were stored in 1990.
Other advanced technologies were also introduced into practice in this period, namely embryo transfer, early pregnancy diagnostic methods, synchronization of oestrus in cows etc.

The development after 1989

After 1989 fundamental changes of the social system occurred and market principles were introduced. A number of processes took place like privatization, restitutions (return of the agricultural property to original owners), liberalization of food prices and transformation of organizations and institutions.
Associations of breeders were established upon the initiative of breeders in 1990. Their activities were formally validated by Breeding Act in 1991.
At that time there was a considerable effort to privatize the whole State Breeding Enterprise for the benefit of breeders. The realization of this plan, however, failed. The associations of breeders were only coming into existence and too weak. The system of regional offices securing AI and performance recording including AI stations was privatized by the method of voucher privatization. In 1992 totally 13 breeding companies (joint stock companies) were established and later they were followed by several private breeding companies. While some of them are focused on the whole area of cattle breeding and insemination, the other are only engaged in for instance semen imports. The associations of breeders made a proposal to privatize the centre of the State Breeding Enterprise including milk analysis laboratories, data processing centre with all databases, software and immunogenetic laboratory. The project was approved by the government and in 1966 the Czech-Moravian Association of Breeders Ltd. (CMAB) was established in which the Holstein Cattle Breeders Association, Czech Fleckvieh Breeders Association and Breeders Union owned shares of 45, 45 and 10 percent, respectively. In 2000 the CMAB was transformed to the joint stock company with the state share of 34 %. It was entrusted with the responsibility to operate the central register of animals according to the EU principles. The other associations of breeders (of pigs, sheep, goats and beef cattle) entered the CMAB as well.

Main activities of CMAB:
- Computing centre for central processing of national data from performance recording, AI and reproduction
- Estimation of breeding values for dairy cattle and pigs
- Operation of the central register of bovine animals according to the Regulation (EC) 1760/2000
- Milk analysis laboratories certified by ICAR, member of Interbull, member of ISAG
- Laboratories of immunogenetics (DNA genotyping of cattle, pigs, horses, sheep, goats, dogs, genetic disorders)
- Maintenance of herd books for dairy cattle breeds
- Operation of the central register of breeding bulls common for all breeds

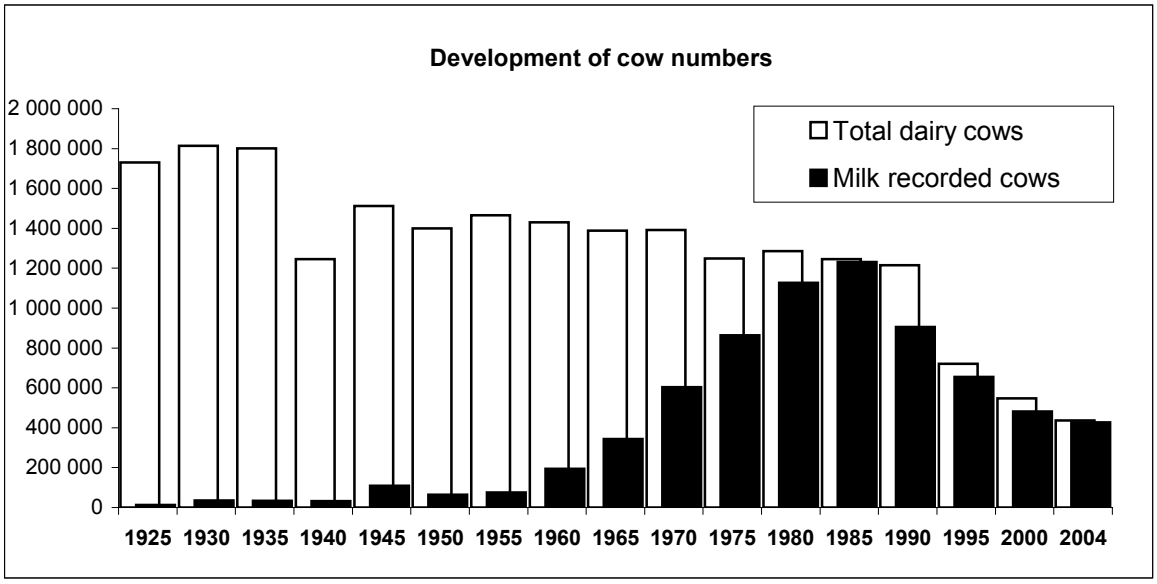
Holstein Cattle Breeders Association in the Czech Republic

Upon the initiative of breeders, the preparatory committee was set up in 1989 and in 1990 the Association of Black and White Cattle Breeders was established as a voluntary and non-profit organization. It became the first association of breeders in the CR. The objectives of the Association are the improvement of genetic quality, economic efficiency and competitiveness of herds and also the creation of the herd book and the efficient system of breeding complying with worldwide standards. It is funded by membership fees, charges for provided services (registration of animals in the herd book) and government subsidies. In 1991 the associations of breeders of other cattle breeds were established.
Historical development of the Association:

1990: Establishment of the Association, initial work on creation of the herd book system, updating the selection programme, the membership in the European Association taken over from the state breeding organization.
1993-1994: The system of herd book completed including the relevant software, supplementation of missing data concerning pedigree and performance in the system of performance recording, transferring records from files of the state organization based on new criteria including a thorough check of data.
2000: Upon the Breeding Decree the responsibility for development of breeding and herd books taken over by individual associations, the Association renamed as the Association of Holstein Cattle Breeders in CR.
2002: The herd book recognized by Holstein associations of breeders in the United States and Canada.

Performance recording

After 1989 the improvement of organization and technical equipment became an important task in order to meet all the standards of the ICAR. The CR has been a member of the ICAR since 1991. Since 2000 only the performance recording method A has been employed in the CR. The method is executed by assistants from authorised organizations. Until now 18 organizations have obtained the authorisation from the Ministry of Agriculture. Totally 96 % of cows are recorded at present. The method A4 is used for 98 % of them. The method B is not used any more in the CR.
After the liberalization of food prices, the increase of consumer's prices of milk and dairy products occurred. It resulted in a significant decrease of milk consumption which was reduced from 260 kg per capita in 1989 to 192 kg per capita in 2004. Since 1990 the number of cows has been steadily decreasing but the average milk production has been growing. In comparison with 1990, only 35 % of dairy cows are kept in the CR at present.
One agricultural enterprise with dairy cows in the CR involves, on the average, 1.6 herds. Most of these enterprises are cooperatives or stock companies with more than one herd. The number of cows per herd or enterprise increases every year. In the period from 1994 to 2004 the numbers of dairy cow enterprises and herds were reduced by 1,677 (46 %) and 7,351 (70 %), respectively, while the average number of recorded cows in one herd increased by 64 (47 %).
Approximately 82 % of cows are housed in stables with the capacity for 100 and more animals. Only 3.3 % of cows are housed in stables with the size to accommodate up to 50 animals.



Number of enterprises and herds with recorded dairy cows (all breeds)

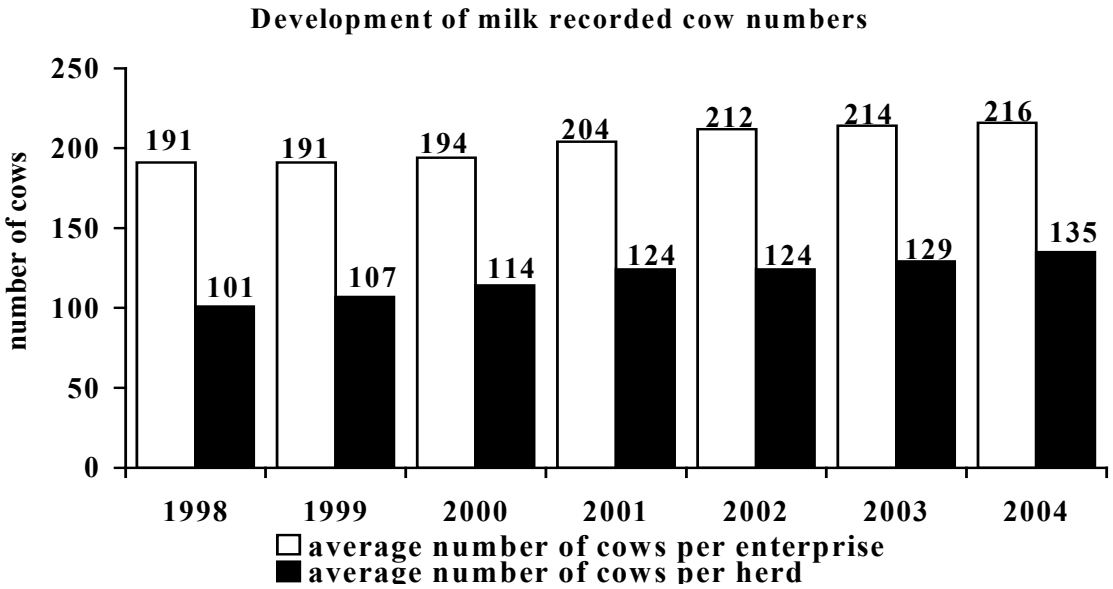
Year	Number of enterprises	Total number of recorded cows	Ø number of cows/enterprise	Number of recorded herds	Ø number of cows/herd
1994	3,649	741,033	203	10,497	71
1996	3,121	607,659	195	6,340	96
1998	2,743	524,780	191	5,213	101
2000	2,474	479,559	194	4,224	114
2002	2,179	460,948	212	3,715	124
2003	2,075	443,750	214	3,437	129
2004	**1,972**	**425,646**	**216**	**3,146**	**135**

Artificial insemination

The system of artificial insemination has also come through many changes after 1989. The privatization of regional offices of the State Breeding Enterprise resulted in establishment of 11 independent joint stock companies and, in addition, a number of new private AI companies were set up. Some farmers began to inseminate their cows themselves or through their employees. Many insemination technicians started to run their own businesses and made contracts with farmers and semen providers. The number of AI stations has decreased and at present only 12 are under operation. The proportion of inseminations with bulls from different breed groups is also changing:

First inseminations according to sire's breed in %:

Year	Total first inseminations	Proportion of different breed groups in %		
		Dual purpose br.	Dairy breeds	Beef breeds
1998	720,426	42.3	48.4	9.3
2000	651,233	41.3	48.1	10.6
2001	632,418	41.7	49.8	8.6
2002	610,636	40.4	51.6	8.0
2003	589,900	40.1	52.4	7.5
2004	569,082	40.0	53.7	6.3



The proportion of inseminated cows remains high – still over 95 %. However, in comparison with the period before 1989 there are considerably more naturally mated beef cows.
A number of companies representing foreign AI companies have also appeared on the market. Agricultural enterprises have nowadays the possibility to choose sires or embryos from virtually all over the world. The proportion of foreign sires used for first inseminations increased particularly in Red Holstein (70 %) but also in black and white Holstein (47.9 %) and Czech Fleckvieh (12 %).

After a temporary decrease, the number of embryo transfers is again increasing (all breeds):

Trait	**2001**	**2002**	**2003**
Number of flushed donors	1,036	1,321	1,073
Number of all produced embryos	9,265	12,187	10,495
from them - transferable	4,857	5,945	5,648
Total number of embryo transfers	4,930	5,901	5,920
from them: - fresh embryos in vivo	2,546	3,267	3,082
- fresh embryos in vitro	55	50	84
- frozen embryos in vivo	2,192	2,541	2,726
- frozen embryos in vitro	137	43	28

Black and White breed
The efforts to re-introduce Black and White cattle in the CR started after the World War II but further expansion was limited by insufficient farm conditions. More extensive imports were realized in the 1960s from Denmark, the Netherlands, Germany, and to a lesser extent from Canada. More than 19,000 heifers were imported at that time. In spite of the fact that the genetic value of purchased animals was not always high, their advantages in performance and production type were evident. In the following period the investments in animal breeding were, however, quite limited and as a consequence the imports were stopped. It is necessary to mention that the performance of the breed was heavily influenced by the environment. In many herds the improvement of the genetic level was not associated with the adequately enhanced herd management. The milk production of these herds was thus significantly lower than in advanced Holstein countries.
In 1980 there were 25,000 Black and White cows representing 1.83 % of cows in total. Their origin was mostly in Denmark (40 %), the German Democratic Republic (19 %), the Netherlands (14 %), Poland (14 %) and West Germany (8 %). The animals were particularly superior in milk production in comparison with the native breed while carcass characteristic were inferior. At that time mostly imported bulls were used (60 %) and only 40 % of bulls originated from the national breeding. From the imported bulls 60 % were from European populations (the Netherlands, Germany) and 40 % were the bulls from the overseas populations, mostly from Canada. Since 1975 the proportion of Holstein bulls has been increasing and since 1985 virtually only Holstein sires have been used. The creation of a national Black and White population based on imported pregnant heifers was not feasible due to lack of foreign currency and other political reasons. On the other hand the experience from the 1960s and 1970s clearly indicated the advantages of the breed and its future perspectives. The cows excelled in production, adaptability and durability. Based on experimental results it was decided that the crossbreeding between Black and White and the native Fleckvieh cattle would be applied. Two crossbreeding methods with different objectives and future use of crosses were selected:

a) A two-breed rotational crossbreeding programme between Czech Fleckvieh and Black and White breeds. The objective was to obtain crossbred animals of the combined type with a higher milk production and similar carcass characteristics in comparison with the native breed. Black and White bulls of the continental type were used. The F1 generation gave consistent results with the milk production 500 kg higher than in cows of the native breed. However, the subsequent generation with a higher proportion of Czech Fleckvieh was characterised by a reduced milk yield and a considerable variability of production and conformation traits depending on the breeding value of the used sire. This variability remained high even in the following generations with higher rates of Black and White. A modified method of crossbreeding resulting in crossbred cows with 75 % of Black and White which were subsequently mated with Czech Fleckvieh bulls was also examined. The results were not satisfying but the method provided the basis for later use of grading up applied in many herds. In 1980 totally 285,000 cows were included in both crossbreeding programmes.
b) Grading up programme. The objective of grading up was to develop the national Black and White population without high requirements for foreign currency. The programme started in 1973 with 23,000 cows and its application was quickly extended. It was planned to include totally about 110,000 cows in the grading up programme.

A political tendency was to favour the rotational programme as there were concerns for a reduced meat production. The per capita beef consumption 25 kg per year was considered an important indicator of standard of living. At that time no beef breeds were present in the CR. There were also fears that the newly introduced breed would be highly competitive for the native dual purpose breed. Cattle industry specialists as well as dairy farmers rather supported the grading up programme because its advantages were evident. The number of cows involved in the rotational crossbreeding programme gradually decreased and after 1989 this programme ceased to exist. Subsequently most of crossbred cows were only mated with Holstein bulls and in 1990 their number reached 310,000.

The development of Black and White (Holstein) population and the extent of crossbreds

Year	Dairy cows of all breeds	% of the number in 1990	Black and White Holstein		Crosses	
			Cows	%	Cows	%
1970	1,392,408		7,720	0.58	804	0.06
1975	1,248,629		18,644	1.41	58,250	4.43
1980	1,285,007		24,230	1.83	253,438	19.20
1985	1,245,622		35,523	2.79	205,216	16.11
1990	1,221,749	100.0	71,308	5.83	310,975	25.45
1995	667,973	50.7	80,274	12.18	170,876	25.58
1998	526,779	41.1	97,126	18.44	94,493	17.93
2000	481,162	39.4	107,892	22.42	90,076	18.72
2002	460,894	37.7	119,033	25.83	87,441	18.97
2004	426,281	34.9	126,386	29.65	77,232	18.11

Black and White purebred and crossbred cows were mainly housed in large-scale facilities in which 23 % of total cows were accommodated in the 1980s. The capacity of such stables exceeded 400 animals. At first a quarter of these stables were occupied by native Czech Fleckvieh cows but they were gradually replaced by Black and Whites. The milk yields of

crosses and Black and White cows from grading up were 491 and 752 kg higher, respectively, than yield of Czech Fleckvieh cows and no significant differences were observed in other traits.
After 1989 the breeding goal was changed in some Czech Fleckvieh herds originally included in the programme of genetic improvement by Red Holstein bulls and the programme of grading up based on exclusive use of Red Holstein sires was initiated.
Another wave of imports came in the period from 1991 to 1996 when more than 23,000 pregnant heifers were purchased in abroad with help of an important state support. The imported animals were of high genetic quality mainly from France, Germany and the Netherlands and made a basis for the development of many top herds.
The production of breeding bulls was limited by a small number of purebred cows. A number of herds were, in addition, excluded from the system of breeding due to a low level of management or incidence of diseases (IBR). The import of bulls from abroad was limited and highly variable in different years according to financial means available. Therefore the intensity of selection of breeding bulls included in the national evaluation was relatively low.
Since 1992 the Association has been involved in the system of selecting dams of sires. The requirements were considerably increased and were met by 25 cows only in 1992. The newly established breeding companies were mainly aimed at importing young sires and embryos. Dams of sires started to be selected on the basis of a complex selection index consisting of production, conformation and pedigree information, which was developed in the Research Institute of Animal Production in Prague. As sires of sons, top bulls from all over the world were used.
In 1983 the Black and White breed was officially recognized by central administrative bodies as one of the main breeds in the CR.

Survey of breeding goals since 1983:

1983
- Cows of combined production type suitable for large-scale housing facilities
- Milk production 5,500 kg milk, 3.9 % fat, 3.4 % protein
- Good fertility, easy calving, longevity
- Live weight daily gains of finished bulls 1-1.2 kg, dressing percentage 56.5-57.5 %
- Live weight 600 kg, 135 cm

1993
- Cows of dairy type, high milk production with reasonable content of milk components
- Milk production 7,000 kg milk, 3.9 % fat, 3.3 % protein
- Greater size, live weight 650 kg, 142 cm
- Emphasis on traits of udder, feet and legs and back

2000
- Cows of dairy type with efficient milk production
- Stress on functional traits – fertility, health, functional conformation
- Milk production 8,500-8,700 kg milk, 3.3 % protein
- Functional herd life 3.5 lactations
- Live weight 650-680 kg, 149-153 cm

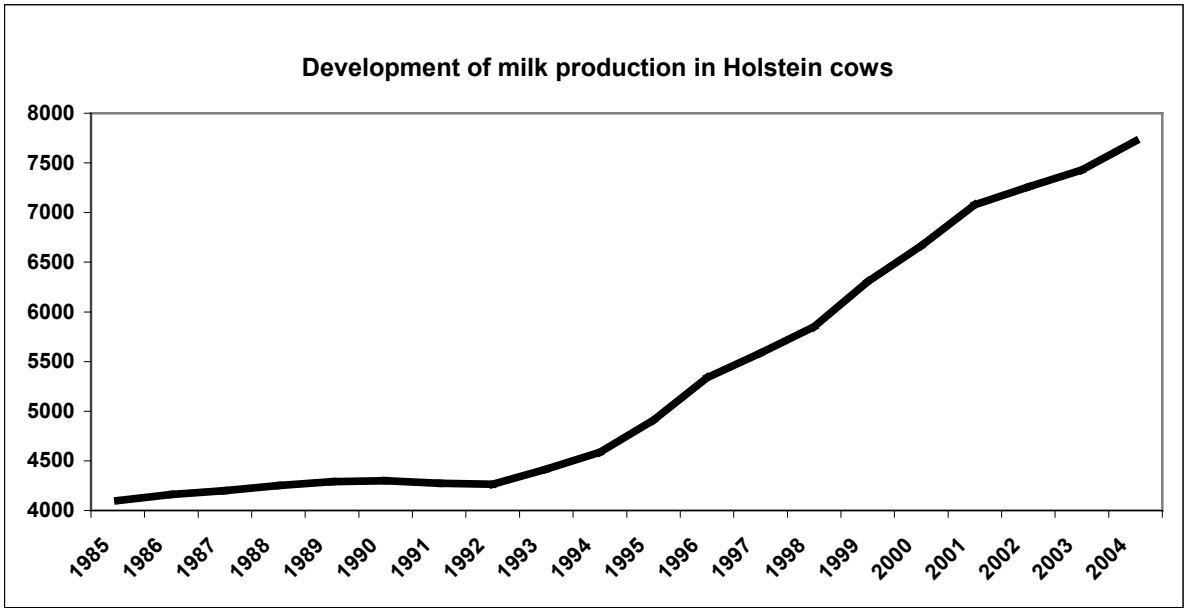
In the last decade considerable changes occurred in the system of housing, nutrition, welfare and management in general. Most of Holstein animals are loose-housed and fed TMR provided

by mobile feed mixers. High hygienic standards of milk production are strictly observed. In the period from 1994 to 2004 the average increase of milk yield was 300 kg each year.
Almost 95 % of total cows registered in the herd book are housed in stables with the capacity exceeding 70 animals while 63 % in stables for more than 200 animals.

Average results of Holstein herds registered in the herd book in 2004

Number of completed lactations	Number of herds	Total 305 days lactations	%	Milk kg	Fat kg	Prot. kg	Calving interval (days)
5 - 70	210	8,151	5.2	7,635	306	249	432
71 - 200	418	49,207	31.6	7,350	294	242	423
201 - 400	227	65,345	41.9	7,632	300	250	411
401 a více	66	33,256	21.3	8,199	316	267	408
Celkem	921	155,959	100.0	7,545	300	248	421

Milk production of Holstein cows (kg milk)



Genetic evaluation of animals

Breeding values have been estimated using the CC – test since the 1960s. In the 1970s the evaluation of fertility traits and milking speed was initiated. In the 1980s growth traits were also taken into account but at present they are not recorded in Black and White cattle anymore.
The BLUP method has been used for the evaluation of production traits since 1986 and for own fertility of bulls and their daughters since 1989. Breeding values of cows have been calculated using the sire model since 1990. The animal model has been used to evaluate production and conformation traits since 1995 and 1999, respectively. The CR is a member of Interbull and since 1995 it has been involved in the international evaluation of production traits and since 2004 in the evaluation of conformation.

The national evaluation system for production traits is currently moving from use of the Multiple Lactation Animal Model to the Test Day Model. In the Czech Republic the model marked ST-ML-RR-TD-BLUP-AM (Single Trait - Multiple Lactation - Random Regression - Test Day – BLUP - Animal Model) is used for production traits. Different traits like milk, fat and protein yields are thus evaluated in separate models. First three lactations are included in the evaluation. Within HTD (Herd-Test Day) data from at least three animals are required. Only lactations beginning from 1 January 1995 onwards are included. Information on all three evaluated traits (milk, fat and protein yield) are required for each test day. The relationship matrix is formed for 4 generations of progeny.
To evaluate type traits, the model ST-BLUP-AM (Single Trait – BLUP - Animal Model) is used. The data obtained since 1992 and from cows in their first lactations have been taken into account. The relationship matrix is formed for all animals in pedigree. However, soon it will be limited to only 4 generations.
The Grand Sire Model BLUP is used to evaluate fertility traits. Only data from the daughter progeny of sires and maternal grandsires are thus taken into account. Maternal fertility traits and the own fertility of bulls are evaluated in a single model. With regards to some fixed effects (interval from calving to conception, milk production in first 100 days of lactation and number of lactation), the evaluation is conducted in two models separately for conception rates of heifers and conception rates of cows. Only inseminations results from the first three lactations are taken into account as the conception rate in later lactations is highly affected by environmental factors. For the same reason only information on first three inseminations (and no re-inseminations) are included in evaluation.

Current status of Holstein cattle breeding in the CR

At present 11 AI organizations are involved in the system of Holstein cattle breeding in the CR. These joint stock companies and limited companies were mostly established on the basis of former regional offices of the State Breeding Enterprise. Natural persons own some of them while some are co-owned by farmers. The largest company was sold to a foreign breeding company last year.
Main activities of these companies:

- Production of sires
- Insemination of cows
- Performance recording (measurement of milk yield, collection of milk samples)
- Marketing semen and animals

Herd book

The Association is responsible for maintenance of the Holstein herd book in the CR. The Association also owns all the data recorded in the herd book. Only one herd book can be maintained for each breed in the CR (Breeding Decree, 2001). The herd book is under supervision of the breeding inspection, which is part of the Ministry of Agriculture.

The Association has 310 members – breeders of Holstein cows and breeding bulls. Fundamental decisions must be approved by the membership assembly, which is held once a year. The membership assembly elects a fifteen-member board consisting only of cow farmers and thus the influence of farmers on the process of decision-making is secured.

With respect to the fact that the Holstein population in the CR was formed on the basis of grading up, crossbred animals are also registered in the herd book. The herd book has two sections: main and preparatory. In the main section only the cows with at least 87.5 % of

Holstein breed are registered; their parents and grandparents are registered in the Holstein herd book in the CR or abroad. The preparatory section is designated for the cows with 50-87.5 % of Holstein breed. At present totally 95,500 cows are registered in the main section and 75,000 cows in the preparatory section of the herd book. Red Holsteins are represented by 10,500 animals. The average milk production of cows registered in the main section of the herd book in 2003/04 was 7,869 kg milk, 3.90 % fat, 307 kg fat, 3.24 % protein, 255 kg protein.

The herd book is technically operated by the CMAB. All data are stored in the computation centre of the CMAB together with performance, insemination and animal registration data including information concerning the movements of animals. All these data are filed in a single computer. The individual databases are interconnected and there are systems of internal data checks.
In the CR each cow is identified by a unique number common for the systems of registration, performance recording and herd book. Bulls used in AI or natural breeding are registered in the Central Registry of Sires which is integrated for all breeding bulls and breeds.
Calves are registered in the herd book automatically and the breeder is informed through the performance recording sheet. The animal remains registered unless the breeder reports the cancellation of registration. Accuracy of provided data is checked in several steps. Before registration in the herd book the pedigree of the calf is designed through the computer on the basis of its dam's information from performance recording and the AI system. If the pedigree of the calf is recognised, the information about its sire is taken from the database of the Central Registry of Sires. Pedigree recognition is based on checks of pregnancy length and intervals between inseminations or embryo transfers. If an error is encountered, the pedigree is not confirmed. All sires, bull dams and embryo donors must be genotyped. The pedigree of born calves is randomly checked. A list containing every 250th born calf is produced and these animals are checked by the inspection of the Ministry. Within this procedure, roughly 200 DNA analyses are carried out every year.

Linear scoring and conformation evaluation
Totally 19 linear traits (16 standard and 3 facultative traits – locomotion, bone quality and rear udder width) and 5 overall characteristics are evaluated by conformation classifiers. The total conformation index places the largest relative emphasis on udder (40 %) followed by feet and legs (20 %), overall body conformation (15 %), dairy character (15 %) and body capacity (10 %). The classifiers carry out the evaluation according to the recommendations of the WHFF and participate regularly in international meetings. The Association is also involved in organising workshops of classifiers from Slovakia, Hungary and the Czech Republic. These harmonisation meetings are particularly important for smaller countries. The number of evaluated animals is increasing every year. Totally 22 to 24 thousands of first-calves, mainly daughters of sampling bulls are annually evaluated by three conformation classifiers in the CR.

Breeding programme
The breeding programme is based on the existing potential of the current national Holstein population. It is therefore wide open and involves imports of embryos, animals and semen from North America and important European Holstein populations (mostly from Germany, the Netherlands, France and Italy). Imported pregnant heifers and embryos make an important selection basis for future bull dams and young test bulls. In the last decade the embryos of high genetic merit were imported each year; in some years this number even exceeded 500. Due to these imports the number of young bulls from the national breeding is gradually increasing.
In addition, bulls whose semen was imported from abroad are also tested. These bulls are involved in the joint test programmes carried out together with foreign AI organizations (from

EU and North America). Many of these bulls are only tested in the CR as they could not be transferred to the Czech AI stations due to existing veterinary limitations. To a lesser extent these bulls are included in programmes of mutual exchange of semen: Czech bulls are tested in abroad and foreign bulls are tested in the CR.
Most of the 11 AI organizations are focused on breeding of both main cattle breeds. More than 80 % of young bulls are tested by only four of them. In 2004 semen of young bull was used for 23 % of total inseminations. Their average pedigree value was 1,425 kg milk, 39 kg fat and 50 kg protein.

Number of tested bulls of different origin

Origin	1997	1998	1999	2000	2001	2002	2003	2004
Import of bull	57	38	42	48	39	15	5	13
Import of embryo	4	17	40	22	25	19	29	28
Import of semen	16	32	17	44	33	51	77	63
From national breeding	7	16	17	21	33	65	48	77
Total	84	103	116	135	130	150	159	181

Country of origin of young bulls' sires

North America	**EU countries**
65 % USA	8 % Germany
13 % Canada	7 % Netherlands
	4 % France
	4 % Italy

Country of origin of bull dams

Czech Republic	**North America**	**EU countries**
44 %	19 % USA	11 % Netherlands
	4 % Canada	9 % Germany
		8 % France
		5 % other

In 2004 the average breeding value of bull dams was 1,582 kg milk, 42 kg fat, 54 kg protein and the average classification score in the first lactation 83.2 points.

Most used sires of young bulls tested in 2004

DUTCH BOY	18	GARTER	15
MAGNA	13	MORTY	12
FORBIDDEN	11	CHAMPION	9
MANAT	9	MARSHALL	7

Besides bulls proven in the CR also bulls proven in abroad are used. The semen market in the CR is quite liberal. All important AI companies have their representatives in the CR. In some cases national breeding organizations represent foreign companies. From the total number of first inseminations with semen of proven bulls less than 50 % were carried out with semen of bulls proven in the CR. The proportion of bulls proven in the CR should gradually increase together with a growing quality of young bulls included in test.

Proportion of first inseminations with semen of bulls proven in different countries

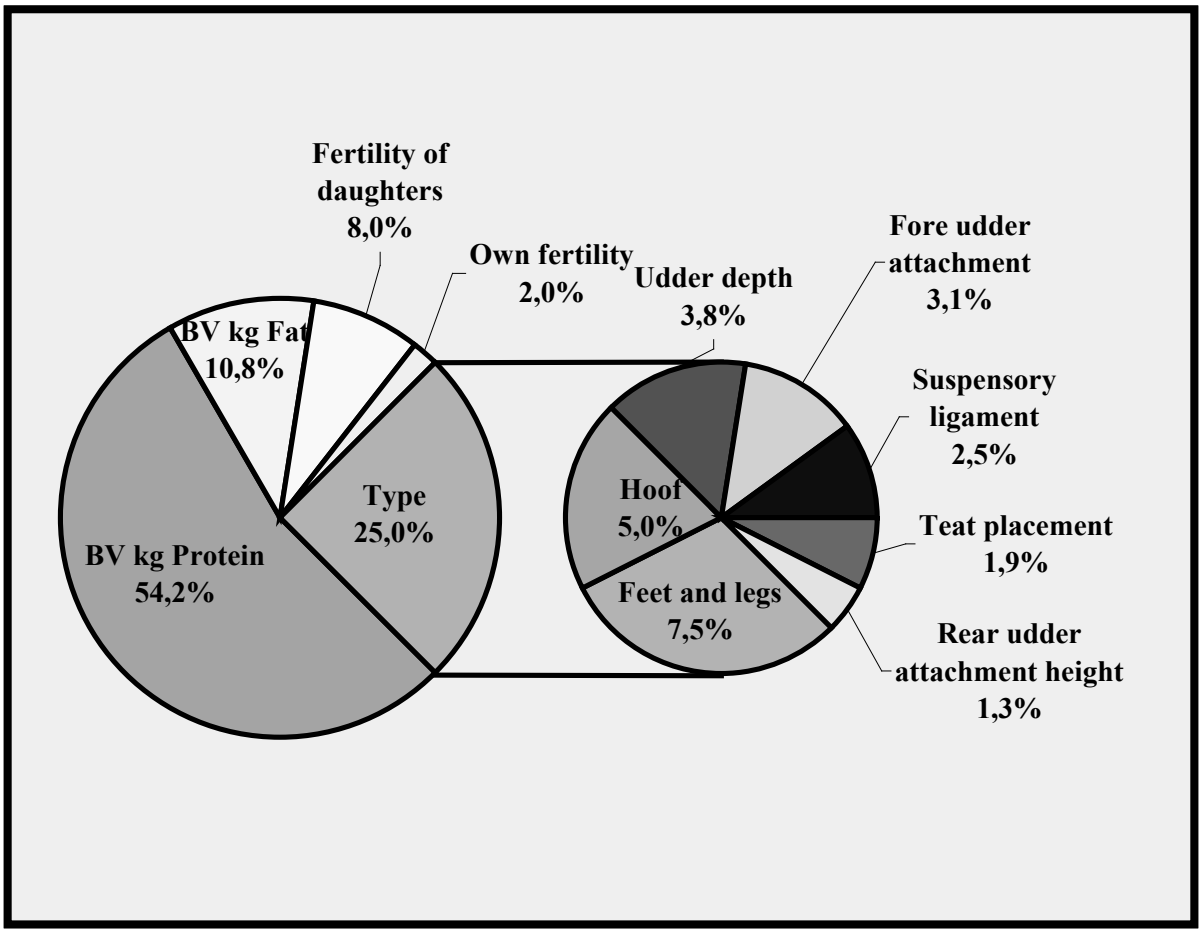
Country	1996	1998	2000	2002	2003	2004
CR	42.7	42.9	45.9	36.8	39.8	44.5
USA	24.6	24.7	22.1	36.4	34.0	27.9
France	8.5	10.4	13.4	7.2	5.1	6.4
Germany	14.0	9.8	4.9	5.3	8.5	5.7
Canada	3.7	5.6	6.0	5.0	3.5	7.0
Netherlands	3.6	3.6	4.8	4.9	4.5	4.4
Italy	-	0.8	1.7	2.0	1.7	2.0
Other	2.9	2.2	1.2	2.6	2.8	2.1

Total merit index

The changes in the Holstein cattle population over the last 10 to 15 years were quite extensive. Since 1990 the number of cows has dropped by 65 %, whole herds ceased to exist and milk prices were highly variable regardless of milk component contents. The main objective of farmers was to increase milk yield and to reduce the costs per litre. Under these conditions it was difficult to determine the economic weights of different traits and characteristics. Therefore breeding values were estimated separately for different traits. As the main selection criterion, breeding value for protein yield was used.

Total merit index (SIH) was introduced as routine practice in 2004. The relative emphasis for production, conformation and fertility (own and of daughters) was 65, 25 and 10 %, respectively.

Proportions of different traits included in SIH are shown in the following figure:



After 1989 and particularly after the joint to the EU, the CR acquired the opportunity to utilize the world's Holstein genetics. Holstein breeders took over the responsibility for running the herd book, improvement and development of the breed. These principles are embodied in the Breeding Decree which is currently being amended in harmony with the EU regulations.

One of the main tasks for near future is to increase the number of recorded traits required for efficient selection. One of them is somatic cell count as only less than a half of samples collected in the CR are analysed for SCC. The goal is to analyse most of the collected samples so that reliable breeding values could be estimated. It is also necessary to introduce an efficient system of recording calving difficulties, mastitis incidence and health problems.
The computing method of breeding values for longevity is currently prepared. It is necessary to mention that the data are available for quite a long period but they are biased by extensive culling due to the recent substantial reduction of total cow numbers. Further increasing of selection efficiency will require including the breeding values for functional traits in the total merit index.

The main objective of Holstein breeders in the CR is to improve their competitiveness in both the domestic and world market. It will require reaching a corresponding profitability of milk production and searching for further possibilities to reduce overall costs while maintaining high hygienic standards and labour productivity. Furthermore, it is necessary to seek for opportunities to get involved in the international market with breeding animals, embryos and semen within EU and also towards third countries.