THE KOREAN HANWOO BEEF CATTLE

Chan - Won Song
National Livestock Cooperatives Federation, ROK - Seoul, KOREA

SUMMARY

The Hanwoo cattle of Korea are probably one of the oldest autochthonous breeds in the world that are known to have populated a specific geographic region for over 2 000 years. They are also a unique case of a domestic animal genetic resource (DAGR) that after having followed the classical tendency of dangerously and rapidly decreasing numbers (I 740 000 in 1940 down to 393 000 in 1950) moved slowly back to near 2 000 000 in 1993, following an exemplary and voluntary conservation programme and a well organized national improvement scheme. This wellplanned selection scheme made it possible for the average live weight of Hanwoo cattle to nearly double their measure adult weight since the first in official controls were made in the early seventies: sires from 290 kg to 477 kg and cows from 246 kg to 309 kg in a more than 30 year period. This is a unique reference case of D.A.G.R. conservation, of domestic preservation, development, and economic use within the traditional production ten-ns and management conditions of a specific geo-cultural environment.

Key words: Indigenous Breeds, Cattle, Korea

RESUME

La race bovine coréenne Hanwoo est probablement une des races autochtones plus ancienne connue dans le monde, ayant peuplé une région géographique spécifique depuis plus de 2000 ans. De plus, c'est un des rares cas de ressources génétiques d'animaux domestiques (DAGR) qui, après avoir subit la tendance classique dune diminution rapide et dangereuse de sa population (I 740 000 en 1940, passés i 393 000 en 1950), ont augments lentement jusqu'A atteindre presque 2 000 000 d'exemplaires en 1993, suivant un programme de conservation adapts et volontaire et un schéma d'amélioration national bien organisé. Ce schéma de sélection bien planifié a permis d'augmenter la moyenne du poids de la race Hanwoo jusqu'au double du poids adulte dès les premiers contréles officiels effectués au début des années 70: les mdles sont passés de 290 kg à 477 kg et les femelles de 246 kg i 309 kg, dans une période de plus de 30 ans. Ceci est le seul exemple de conservation de DAGR de ressources domestiques, de développement et d'utilisation économique suivant les valeurs de production traditionnelles et de conduite dans un environnement géo-culturel spécifique.

Mots clés : Races locales, bovins, Corée

1.0 THE ORIGIN OF THE HANWOO

On the basis of the serological researches and the studies on the skull that shows the least

variation of the animal skeleton, the Hanwoo has been reported to originate from the cross between Bos primigenius and Bos Zebu. The crossing was assumed to have taken place in Northern China and outer Mongolia when Bos primigenius moved from the central Asia and Bos Zebu moved from the south.

The ancestors of the Hanwoo appear to have moved to the Korean peninsular in the New Stone Age when agriculture started. The excavated cattle bones among the relics buried in the I<imhae shell mound showed that the Hanwoo was raised in the Korean peninsular in B.C. I 00. It appears that the Hanwoo was regarded somewhat closely to the farmers because of its intimacy to the fanning and of the religious (Buddhism) influence, rather than as the animal producing the meat in ancient times. It can be noted from the historical records that the Hanwoo has been used as a fanning tool during the Sarnhan Dynasty of 2000 years ago, and the various records from Kokuryo, Baekjae and Shilla Dynasties to the end of Yi Dynasty (A.D. 1900) also indicate the importance of the Hanwoo for farming.

2.0 THE CHARACTERISTICS OF THE HANWOO

Unlike Westem'ers, most Korean cattle farmers still have the cow within their house fence,

feed it three meals daily, let it graze during the day, and take it into the barn for the night.

In ancient times, Hanwoo was mainly used for transportation as well as for farming, and when it became too old then people slaughtered it for beef Since A.D. I 00, with the introduction of Buddhism, killing had been prohibited, Hanwoo was, therefore, by no means, fed for meat. However, with the rapid industrial development over the past 20 years, it became less useful as a work animal, and the effort to convert its usage to meat production has begun. But its characteristics still make it viable for farming. They can be summarized as follows:

1. Coat color is brown
2. It is relatively gentle, wise, friendly, tameable, and easily approachable
3. Moves fast
4. Small-bodied and easily moves on steep hills
5. Has sharp sense of smell and consumes relatively small amount of feed
6. Good adaptability under the hot or cold weathers and strong resistance to disease, but not well adapted when raised in a group and weak resistance to disease recently introduced from the foreign countries
7. Slow maturity, but capable of producing a calf each year
8. Milk production is poor and weans calf at an early age
9. Although the body is strongly built, the body width is relatively narrow. The front quarter is well developed. However, since the hind quarter is not well developed, the amount of meat produced is somewhat small
10. Excellent flavour of meat and marbling but tough muscle fibre
11. Due to late marbling, good quality meat can only be produced after 18-24 months of age
12. Strong enough to work and to carry loads on its back
13. Excellent feed efficiency and rough feed can be used
14. Has a strong maternal love for calf

3.0 **HANWOO RAISING**

3.1 Barn

Except those who specialize in beef cattle farming, most of cow-calf farms have bams in their residential area or in the attached buildings, so that all the family members can take good care of Hanwoo.

3.2 Feed

Wild grass is fed in summer, and in winter such by-products of farming as straw, bean husk, sweet potato leaves or rice bran, etc. are fed.

3.3 Disease

Hardly any diseases can seriously attack the Hanwoo. Therefore, protective inoculation or disinfection is rarely required, and for group raising vermifuge or vaccination is occasionally given.

3.4 Management

Most non-commercial beef farms have Hanwoo within easy access and treat it affectionately. Hanwoo plays an important role occupying the time of the old people. They brush the cattle and cover its back with cloth to protect it from cold.

3.5 Changes in management method

A recent decrease of the labor force, ever increasing wages, high standards of education, and specialized livestock industry etc. have resulted in significant changes in cattle raising. In particular, the farmers who raise a large number of cattle have been continuously developing methods to reduce costs and improve productivity. In connection with an environmental protection campaign, commercial beef farmers have been forced to find a suitable way of disposing of the wastes.

3.6 Changes in number of Hanwoo

Koreans have always concentrated their efforts on increasing the number of cattle, valued by both the government and farmers.

In the year of 1940, 1 740 000 Hanwoo were raised across the South/North Korea, but in 1945, after the end of World War I, the number was decreased to 597 000 in South Korea (the statistics will refer to south Korea) due to the unstable post-war society, and in late 1950 when the Korean War began, there were only 393 000 Hanwoo left. Since there was an urgent need for the Hanwoo after the War, a law to protect the cattle was enforced.

The number of Hanwoo was on the increase reaching 1 313 000 in 1965 as a result of the stock fa@ng improvement plan started in 1953.

Along with the remarkable economical progress in the 1970's, the beef consumption grew and commercial beef farms increased in number. Korea imported 10 600 foreign beef cattle in 1978 to fulfil the need. The beef consumption per capita marked 3.OKg in 1979. In the late 1970's, the increased need for beef and decreased number of cattle brought about a huge importation. However during 1983-1985 beef consumption became dull, which resulted in a drastic drop in the price of beef .

The number of Hanwoo became 1 913 000 as of the end of June, 1992, and the national beef supply came down to 44%.

TABLE 1

The annual trend of the Hainioo raising in Soiith Korea

Year	'45	150	155	'60	165	170	175	180
Number in thousand	597	393	867	1,010	1,313	1,247	1,546	1,427
Households in thousand	-	-	774	893	1.15	1,102	1,277	997
Number per household			1.1	1.1	1.1	1.1	1.2	1.4
Year	'85	'86	'87	188	189	190	191	'92
Number in thousand	2.553	2.370	1,923	1,559	1,536	1,622	1,773	2,019
Households in thousand	1.048	991	854	702	654	620	601	585
Number per household	2.4	2.4	2.3	2.2	2.3	2.6	3.0	3.5

4.0 **MEAT QUALITY**

There has been limited research on Hanwoo meat quality. The industry has been dependent on over 75% of importation for concentrated feed.

The beef national supply rate was under 50%. This situation prevented the industry from working on meat quality, and the main concern was the feed efficiency.

It is, however, believed that the Hanwoo has the gene for high quality meat. As mentioned before, due to its late maturity, good meat can only be available after 18-24 months of age. With the GNP over US$ 5000 per capita, the public wanted high quality meat, and to be competitive internationally, thus having deep interests in high quality meat.

The carcass evaluation and grading system was introduced in July 1992, and is on the experimental stage.

According to the system, the yield grading is classified by 4 grades; A, B, C, and offgrade, and about 64% of the meat falls into grade B. The grading of meat quality, I st, 2nd, 3rd, and offgrade, is made according to marbling, meat color, fat color, texture, degree of maturity etc. For meat quality 53 % is 3rd, and 23% is 2nd, which resulted from early slaughter within 18 months. There is no doubt that the industry can improve the quality by means of good meat production.

It is well known that foreigners who visit Korea and Koreans alike prefer Hanwoo beef to imported beef. A constant improvement on raising methods will make Hanwoo beef competitive on the market. The largest supermarket in Japan, DAIEI, made an extensive research on Hanwoo and the results of the DAIEI research on Hanwoo are as follows:

1. Hanwoo had better marbling, more loin and tender loin than Waguyoo
2. Smaller decrease in weight between live body and carcass
3. Dressing percent was lower than Waguyoo but much higher than Holstein
4. The grade of C or better was 43.7 % which is higher than the Waguyoo's 37.8%
5. The lean meat percent was higher in Hanwoo than in Waguyoo.

As negative points, the research listed thick fat, short body length and weak rump.

TABLE 2

Carcasy yields by breeds (unit : Yo)

Breed	Live Body Weight or Yield				Carcass composition			
	Farm gate weight (A)	Slaughterhouse weight (B)	Carcass Yield Based on A	Carcass Yield Based on B	Lean meat (Boneless)	Fat	Bone	Others
Hanwoo	100	96.1	59.7	62.1	64.6	20.8	11.6	3.3
Waguyoo	100	95.3	59.9	63.0	63.6	22.4	10.0	2.8
Holstein	100	93.6	56.1	59.6	64.6	18.0	14.2	3.1

TABLE 3

Meat weight by breeds (Unit %)

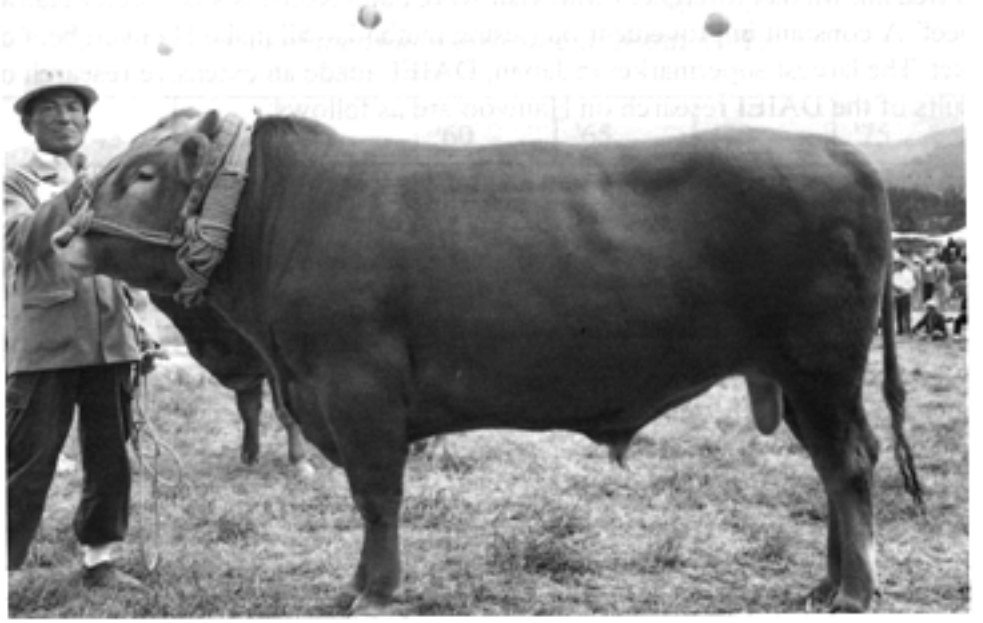
Breed	Chuck	Loin	Brisket	Rump	Tender Loin
Hanwoo	42.8	11.2	18.7	26.8	3.1
Waguyoo	38.2	11.1	19.9	28.3	2.5
Holstein	37.9	10.7	18.9	30.0	2.5

5.0 BREEDING PROGRAM AND OBJECTIVE

The Hanwoo beef is most liked by Korean people for its tenderness, flavor, taste etc. As beef cattle the productive performance of Hanwoo is relatively low compared to other breeds. Various efforts have been made to convert the Hanwoo from working cattle to beef cattle.

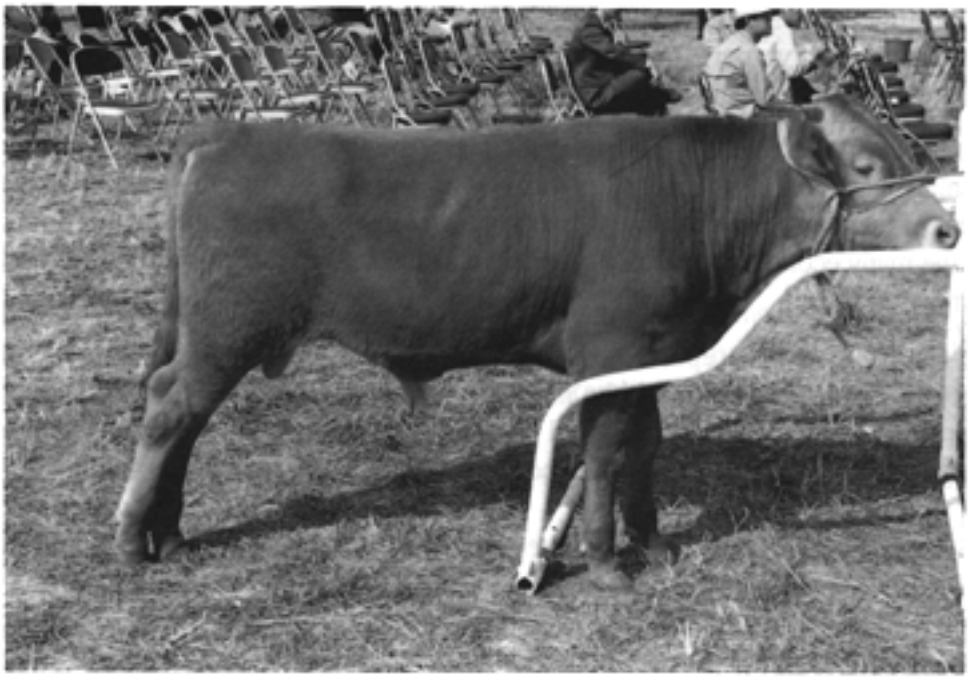
In the early 1970's, the improvement program for the Hanwoo was carried out on a relatively small scale, and it was not until mid - 1980 that the extensive breeding program for the improvement of the Hanwoo became systematically set up, utilizing testing, selection and planned mating. Of the many economic traits of Hanwoo, reproductive traits, growth rate and carcass traits are to be improved.

(1)Improvement on reproductive traits should bring about a high rate of pregnancy and early puberty, (2) improvement should be made for heavier weaning weight and rapid growth rate and (3) improvement on carcass traits should bring about higher dressing percent, higher lean meat percent, larger rib eye area, high marbling score and less backfat thickness.

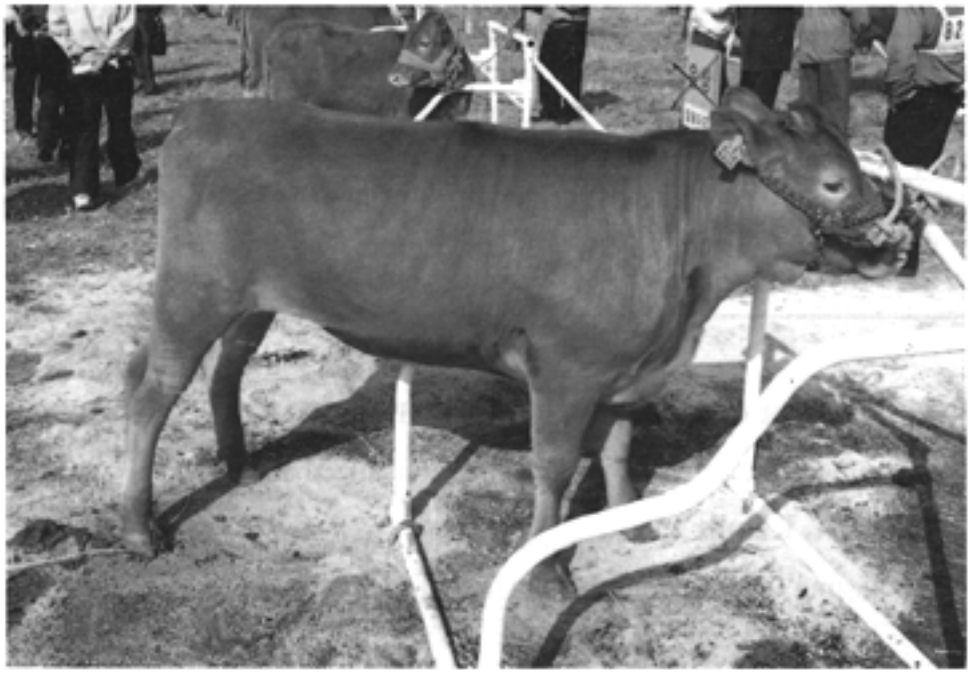


Hanwoo Bull (18 months)

Hanwoo Cow (3 years)



Hanwoo Calf (6 months male)



Hanwoo Calf (6 months female)

TABLE 4
Goal of the Hanwoo improi;ement

	Weight by Age (Kg)				Average Daily Gain (kg)	Carcass Yield (%)
	3 mo.	6 mo.	12 mo	18 mo		
Goal	110	200	380	550	1.0	62
Present	100	150	340	480	0.9	59

	Meat Yield (%)	Marbling Score (1-5)	Rib eye Area (cm)	Backfat Thicknes s (cm)	Conception Rate	Calvin Rate
Goal	79	5.0	80	1.3	95	93
Present	75	2.5	77	0.9	82	80

6.0 PROGRAM FOR CONSERVATION AND IMPROVEMENT OF THE HANWOO

The program for the above subject can be summarized as below.

6.1 Selection of A.I.Bulls

Progeny testing for selection of Hanwoo bulls for artificial insemination was initiated in 1983, and the proven bulls selected by the progeny test have been placed at the Korean Native Cattle Improvement Center (KNCIC) of the National Livestock Cooperatives Federation for artificial insemination. Of a total of 100 Hanwoo bulls at KNCIC at present, 78 head are proven bulls selected by the progeny test.

The candidates for the progeny test at KNCIC were selected by the performance tests conducted at the National Institute of Animal Breeding and 8 provincial Animal Breeding Stations. To conduct the progeny test, the KNCIC purchased the Hanwoo bulls which showed excellent performance at the performance tests of the National Institute and 8 provincial stations.

Before the initiation of the progeny test program for the genetic improvement of Hanwoo, the Hanwoo bulls for breeding were selected on the basis of growth rate performance and the visual evaluation ratings at the National Sire Evaluation Fairs held each year.

6.2 The Registration of Hanwoo

The Korea Livestock Improvement Association is the main authority for the registration of Hanwoo breeding stock. They keep records on the pedigree, performance and visual evaluation scores of Hanwoo breeding stock, and provide the training on the Hanwoo improvement, if necessary.

6.3 Artificial insemination

In 1962 the artificial insemination technology was brought in, and it has been actively used since 1968. In recent years, over 95% of cattle were born as a result of artificial insemination. KNCIC provides Hanwoo semen. In order to prevent any inbreeding depression possibly caused by artificial insemination, registration of bulls is a must. Various training programs on selection of bulls and mating systems have been available for livestock farmers and artificial insemination specialists. For cows which are not registered, they are providing suitable semen for various regions.

6.4. Work on Hanwoo Improvement Base

The work began in 1979 in order to convert Hanwoo from working cattle to beef cattle,and to keep Hanwoo's pure pedigree from unorderly crossing with imported beef cattle. The work started with 8 bases consisting of about 300 to 500 head respectively. Now it has 200 bases, and

there are in all about I 00 000 registered Hanwoo cows in the bases. Two to 6 year old females selected are registered and artificial insemination is made with pre-selected bulls.

The calves born by this method undergo another evaluation procedure, and the stock that have passed the test are eligible for another higher registration. By this way the fifth descendent of the first registered cattle has been born and improved as beef cattle. Calves from these bases are sold at a higher price than the other calves.

7.0 HANWOO SELECTION

The formation and the size of the testing herds is systematically related nationwide. Mating, testing, and selection made at each testing herd are explained in Table 6.

7.1 Matting of cattle for testing

7.1.1 Cows wich produce candidates for bull testing

Cows which produce young bulls for performance and progeny tests are fed at the Hanwoo improvement bases, Animal Breeding Institute, and KNCIC. The cows are mated with the new proven bulls which enter the KNCIC stud every year.

7.1.2 Cows used.for progeny testing

Cows which produce calf for progeny tests are fed at KNCIC and some Hanwoo improvement bases. Thirty to fifty cows are randomly mated with each candidate for proven bull in spring and fall each year.

7.2 Testing

7.2.1 Performance test

Male progenies produced by mating between proven bulls and cows which have high growth rate are selected and a performance test is conducted from 6 mo. to 12 mo. of age for average daily gain, weights at 180, 270 and 360 days, body measurements, feed efficiency, body conformation, quality of semen and physical health condition.

7.2.2 Progeny test

Progeny testing is performed for reproduction, growth rate and carcass traits to estimate genetic ability of proven bulls. Also, undesirable genetic traits are monitored for the pregnancy up to 22 mo. of age.

7.3 Selection of bull

7.3.1 Candidates for proven bulls

There are two ways to select the candidates for the proven bull. First, the records collected from the performance tests are analysed at the KNCIC twice a year, and the performance-tested bulls are ranked on the basis of the selection index including the body weight at 12 mo. of age, average daily gain and feed efficiency.

The highest ranking 30-32 bulls are then selected as the candidates for the progeny test among the performance-tested bulls which meet the requirements on visual evaluation scores (75 points or above) and semen examination. Second, the best 8 to 10 bulls are selected from the National Sire Evaluation Fair being held every year at each province.

7.3.2 Proven bulls

The data collected from the progenies of the tested bulls are statistically analysed to estimate the genetic parameters of the economically important traits after statistically adjusting for the differences in the environmental factors. Selection index value is calculated for each tested bull on the basis of the index which includes 6 month weight, 18 month weight, average daily gain, lean meat percent, rib eye area, backfat thickness and marbling score.

The twenty highest indexed bulls are then selected as the proven bulls among the progeny tested bulls which do not show any genetic defect in the offspring.

7.4 Performance test results

The average performances of the bulls selected as the candidates for the progeny test are shown in Table 5. The average 12 month body weight and average daily gain were somewhat higher after 1989.

The average performances of the bulls selected as the proven bulls on the basis of the results of the progeny test were somewhat improved after the 9th test. However, due to the relatively low intensity of selection among the progeny tested bulls, it was not possible to obtain large selection differentials for the economically important traits in the progeny test phase.

TABLE 5

Average performance of the bulls selected as the candidate for proven bull (unit.- kg)

Year	Weight at 12 mo.	Average Daily Gain
1983	357.6 ± 22.20	1.21 ± 0.10
1984	359.0 ± 23.94	1.11 ± 0.12
1985	355.7 ± 25.98	1.15 ± 0.09
1986	338.6 ± 32.15	1.13 ± 0.07
1987	362.9 ± 24.77	1.17 ± 0.08
1988	368.0 ± 25.76	1.15 ± 0.07
1989	401.3 ± 20.63	1.33 ± 0.05
1990	396.3 ± 34.25	1.31 ± 0.09
1991	392.2 ± 19.37	1.22 ± 0.09
1992	387.0 ± 24.80	1.37 ± 0.06

8.0 IMPROVEMENT TRENDS IN HANWOO

Distinct trends of improvement in Hanwoo can be found in the data obtained from the National Sire Evaluation Fair held each year as well as in the data from the nation-wide studies on Hanwoo based on the body weight measurements for 5,000 head of Hanwoo that have been conducted every three years since 1973, although this kind of data showing the improvement of Hanwoo are not numerous. Table 6 shows the improvement trends in the bodyweights of Hanwoo in the nationwide studies on Hanwoo.

Hanwoo Sire Evaluation Show

TABLE 6

Improvement trends in the body weights of Ham4,oo in the nationwide studies on Hanwoo

		Body Weight (kg)			
	Year	**3 mo.**	**6 mo.**	**12 mo.**	**18 mo.**
Cow	1921 a	67.3	97.8	150.5	195.0
	1974	83.2	127.8	190.7	245.9
	1977	83.1	130.8	194.0	250.8
	1980	85.5	130.2	203.1	165.2
	1993	88.9	144.2	214.0	274.5
	1986	88.5	146.0	219.7	272.2
	1989	86.3	143.8	240.4	294.7
	1992	89.2	144.2	242.3	308.7
Bull	1921 a	83.1	104.6	173.1	211.5
	1974	87.9	133.1	214.2	289.6
	1977	88.4	138.0	218.8	305.7
	1980	92.0	147.1	244.1	331.4
	1983	94.9	157.4	259.7	361.5
	1986	97.5	166.2	283.1	376.8
	1989	103.7	183.8	339.0	419.2
	1992	103.6	178.9	366.1	477.2

a: The figures for 1921 are the data obtained at the Livestock Experiment Station.