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CATTLE IN THE USSR

By B. V. Fandeyev

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FOREWORD

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CATTLE IN THE USSR

[Following is a translation of the Russian monograph entitled Krupnyy Rogatyy Skot (Cattle) by B. V. Fandeyev, Candidate of Agricultural Sciences, Second edition, Moscow, 1958, pages 3-279.]

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CHAPTER I

THE IMPORTANCE OF CATTLE IN THE ECONOMY

Milk, meat and raw material for light industry are obtained from cattle. Milk and the other products obtained from the processing of milk such as butter, cheese, cottage cheese, sour cream, clabber, cheese curds, etc., are very important sources of nutrition for human beings.

With proper breeding and improvements in feeding their cattle and storing milk, the better farms obtain from 4,000 to 6,000 kilograms of milk; and only 10 to 12% of the milk yield is used for feeding calves while the remainder goes for human consumption. The waste products resulting from the processing of milk are used for feeding hogs. Meat obtained from cattle plays a very important part in the meat production picture for the Soviet Union.

In the slaughtering of cattle, a large amount of by-products is obtained in addition to meat. These by-products are used fully in various branches of industry. Footwear, belts and other leather goods are obtained from the hides. The fat is used for feeding man and also in making soap and glycerine. The horns and hoofs go into the manufacturing of buttons, combs and other notions. The intestines are used in making sausages, and from the blood, sausages are made and albumin and blood meal are obtained. Glue, bone meal and meat bone meal are obtained from the bones. Paint brushes, scrubbing brushes and felt are obtained from the hairy covering. Many pharmaceutical preparations are manufactured from various glands of the slaughtered animal such as the thyroid glands, the pancreas, the pituitary glands, etc.

In order to obtain milk and meat, the cattle are fed large quantities of coarse fodder, rich fodder and pasture forage and also the waste products of the food industry (press, spent grain, molasses, etc.), i.e., the least expensive fodder.

The ability of cattle to transform the waste products of crop growing into valuable food products is of great importance in the organization of agricultural production and the establishment of the proper relationship between plant growing and livestock raising.

In some instances cattle (oxen) are used for pulling objects, chiefly for various internal farm transportation operations.

The greatest quantity of manure is obtained from cattle and this is one of the basic types of fertilizers used in plant raising.

Because of the fact that large amounts of varied products are obtained from them and because they become well acclimatized in various geographical zones, cattle are widely distributed throughout the whole world.

Cattle Raising in Pre-Revolutionary Russia and in the USSR

Under the conditions of Tsarist Russia, cattle raising was in an extremely neglected state.

The development of Capitalism in Russia and the penetration of commercial capital into the field of agriculture led to differentiation among the peasant farms and the formation of classes in the villages; the majority of the peasant farms were ruined and the prosperous kulak element concentrated large areas of agricultural land and much of the cattle in their hands. V. I. Lenin in his work "The Development of Capitalism in Russia" wrote: "The concentration of cattle is even greater than the concentration of sown area; it is evident that the prosperous peasants are joining capitalistic cattle raising and extensive capitalistic crop raising." (V. I. Lenin, *Razvitiye kapitalizma v Rossii* [The Development of Capitalism in Russia], Gospolitizdat, Moscow, 1951, page 58.)

In pre-revolutionary Russia, as a result of the indicated economic conditions and of frequent crop failures, the number of cattle varied sharply from year to year. It was only in a few regions that dairy farming developed and that a small increase in the number of cattle could be observed. This came as a result of the increased demand for dairy products and because of the availability of large areas of natural pasture lands and hay fields which provided the necessary fodder.

The chief measures which were employed at that time to improve the quality of the cattle involved the importing of breeding bulls from abroad and the formation of dairy cooperatives. The bulls which were imported from abroad went in small groups to some of the large farms of landlords and kulaks. This was done without taking into account the natural, climatic and economic conditions of the various parts of the country. As a consequence, the bulls of some foreign breeds became poorly acclimated and quickly lost their desirable qualities under these new conditions and often these bulls would be replaced by other bulls within two to three years.

The most successful development of dairy farming occurred in areas located along rivers such as the Northern Dvina, the Volga, the Vyatka, the Oka and others where there were fertile meadow lands and pastures which were inundated during floods. In these regions there developed such breeds of cattle as the Kholmogorsk, Yaroslavl, Istobensk, Red Humped and Yurino varieties. The presence of extensive pasture lands in Western Siberia facilitated the development in this region of livestock raising and the beginning of dairy farming. The development of beef cattle raising occurred in the southeastern part of Russia.

In the other regions of Russia livestock raising was on an extremely low level. The greater part of the peasant farms, because of their economically weak position, did not have the capability of improving it. Therefore under the conditions of Tsarist Russia, on the whole, the cattle were retarded and not very productive.

After the Great October Socialist Revolution the conditions for the development of livestock raising in our country changed sharply. In 1918, a decree was issued on livestock breeding. This decree established the basis for conducting planned measures designed to improve livestock raising. Since 1922 there has been a growth in the number of cattle. From this period cooperative dairy farming has involved the implementation of a series of measures designed to improve the conditions under which cattle are maintained and to raise their productivity as well as measures connected with the processing and marketing of milk. However, the activities of dairy cooperatives bore a limited character and affected only the members of its system.

The collectivization of the peasant farms and the transition to a Socialist form of managing the economy were a fundamental changing point in the development of agriculture in our country, including the development of livestock raising.

A decision of the Central Committee of the All-Union Communist Party [b] in 1934 was of great significance for the development of livestock raising. In accordance with the decision of the Plenum of the Central Committee, a state plan for the development of livestock raising was established, livestock farms were organized on each kolkhoz, and other measures were implemented including efforts to improve breeding practices.

Socialist competition which took place between kolkhozes, sovkhoses and the leaders in animal husbandry played an enormous role in the fulfillment of the plan for the development of animal husbandry and for raising the productivity of cattle.

Kolkhozes of the Lukhovitskiy Rayon of the Moscow Oblast were the initiators of the movement of leaders to obtain high yields of milk. The All-Union Agricultural Exhibit of 1939 to 1941 not only reflected the successes of the kolkhozes and sovkhoses in developing animal husbandry but also facilitated the spreading of the experience of leaders and the accomplishments of zootechnical science.

During the period of the Great Fatherland War the number of cattle decreased.

After the end of the war a law was passed "On the Five Year Plan for the Restoration and Development of the Economy of the USSR from 1946 to 1950." In this plan were included measures for the restoration and development of communal livestock raising. In the succeeding years the Party and Government adopted decisions in which were indicated measures which provided for the further strengthening of communal livestock raising, an increase in the total number of cattle, and the qualitative improvement of the cattle.

As a result of the great work of the kolkhozes and sovkhoses in restoring livestock raising in the post-war years, the number of cattle increased by 11.3 million head from July 1945 to July 1953.

The expansion of the kolkhozes facilitated the increase of the average size of cattle farms, made it possible to improve the organization of agricultural production, and provided the opportunity for

the introduction and wide implementation of mechanization of labor-consuming processes and thus raised labor productivity. After the expansion of the kolkhozes, the number of cattle on the farm "Proletarian Will" of the Stavropol' Kray grew, for example, to 1915 head, of which 700 were cows. The Kolkhoz "Organizer" of Arkhangel'sk Oblast has 650 cows.

Many kolkhozes, sovkhozes and leaders in livestock raising achieved genuine successes in raising the productivity of cattle. The kolkhoz "Twelfth October" of Kostroma Oblast increased the average yield of milk for its herd from 3,868 kilograms in 1940 to 5,012 kilograms in 1953.

The sovkhoz "Omskiy" of Omsk Oblast obtained 2,762 kilograms of milk per cow in 1940; in 1954 the average yield per cow for a herd of 500 cows was 5,366 kilograms of milk. On the sovkhoz "Nikonovskoye" of Moscow Oblast, the average yield of the cows increased from 3,264 kilograms to 6,450 kilograms of milk.

A. I. Smirnova, a milkmaid of the state breeding farm "Karavayevo" of Kostroma Oblast and twice a Hero of Socialist Labor, obtained from eight cows an average of 8,416 kilograms of milk per cow. O. Ye. Parshukova, a milkmaid of the sovkhoz "Istok" of Sverdlovsk Oblast, obtained an average of 7,580 kilograms of milk.

Several resolutions were of immense importance to the development of agriculture and, in particular, to the development of animal husbandry. They were resolutions of the September (1953), February-March (1954), June (1954) and January (1955) Plenums of the Central Committee of the CPSU. In them were indicated the immediate measures for increasing the yield of agricultural crops, for the fuller and more rational use of the land and machines, for the development of virgin and fallow lands, and for the increase in output of grain and of livestock products. Also of importance was the law on the further development of the kolkhoz structure and reorganization of the machine-tractor stations which was adopted at a session of the Supreme Soviet of the USSR (1958).

In 1958 the required deliveries and the payment in kind for the work of the MTS were eliminated and a new system was established as well as new prices and conditions for the delivery of agricultural products. The new system of deliveries will help in strengthening the kolkhoz structure.

The increased production of the products of livestock raising is intimately related to the rise of grain production which is the foundation of all agricultural production. Therefore, an important task is to further develop the grain economy so that by the end of the Seven Year Plan (1959-1965) the harvest of grain will have increased to a level of 10 to 11 billion poods per year.

The obtaining of such a quantity of grain will make it possible not only to satisfy the needs of the population for grain but also to allot more than four billion poods of grain as well as a substantial quantity of siftings, oil cake and combined fodders for use in livestock raising.

One of the means for increasing the production of grain in the country is the exploitation of virgin and fallow lands. In 1956 the kolkhozes and sovkhozes developed 35.5 million hectares of virgin and fallow lands and the sown area for the country comprised about 195 million hectares.

At the same time it is necessary to increase the production of juicy fodders, to expand the sowings and increase the yield of corn which is a valuable crop, and also to improve the condition of the meadows and pastures which will make it possible to increase the output of rough fodders.

The sowing of fodder crops on each kolkhoz and sovkhoz should completely satisfy the demands of livestock raising for fodder.

The new system of planning agricultural production which was introduced in 1955 is of great importance to the further raising of the level of agricultural production. Kolkhoz workers were given the right to work out themselves the plans for the development of their communal economy while taking into account the best utilization of the farm land and the problem of obtaining the greatest quantity of agricultural products from each 100 hectares of farm land. The output per 100 hectares of farm land is an index of the production record of the kolkhoz and sovkhoz.

In the forthcoming Seven Year Plan (1959-1965) an expanded program for the development of agriculture is planned. The output of milk, butter, meat, wool, eggs and other products of animal husbandry will increase considerably. The expansion in the production of meat will, for the next few years, be obtained chiefly through the development of hog raising. The relative position of pork in the meat balance of the country will grow considerably. A substantial reserve for increasing the production of meat will be by increasing the live weight and fatness of cattle.

The raising and keeping to an age of 1-1/2 to 2 years of all calves not intended to replenish the herds but rather for slaughtering also will make it possible to obtain an additional quantity of meat.

In order to increase the fatness and live weight of cattle intended to be slaughtered for meat, it is necessary beforehand to put the cattle to pasture for fattening or to put them on a fattening diet. In order that the pasture fattening will be conducted more effectively, special fattening herds should be designated on the kolkhozes and sovkhozes; also the cattle should be placed on a special fattening regime where they use, in the first place, the waste products of the food industry and juicy fodders.

In the past two to three years, as a result of improvements in feeding and keeping cattle, the average yield of milk from cows has increased by 30 to 80% in many republics, krais and oblasts. The average yield per cow on the kolkhozes in 1957 was 1,858 kilograms of milk, or 786 kilograms more than it had been in 1954. On the kolkhozes of Ryazan Oblast for 1957 the average yield was 3,200 kilograms of

milk; and for Tula Oblast it was 2,727 kilograms. On the sovkhoses an average of 2,700 kilograms has been obtained, and it is planned that the average by 1960 should be 3,100 kilograms of milk.

Milkmaids of many sovkhoses and kolkhozes obtained more than 6,000 kilograms of milk from each cow of their group. This included Ye. A. Demidenko (kolkhoz "Spike" of Kiev Oblast) with 8,738 kilograms, M. Kh. Savchenko (kolkhoz imeni Lenin of Suma Oblast) with 8,041 kilograms, and A. P. Ostrovskaya (kolkhoz imeni Seventeenth Party Conference of Vinnitsa Oblast) with 7,809 kilograms of milk from each cow.

During the period from 1953 to 1958, as is evident from the following table, the number of head of cattle increased.

Head of Cattle in the USSR (millions) at
the Beginning of the Year

	1941	1951	1953	1955	1957	1958
Total number of cattle	54.5	57.1	56.6	56.7	61.4	66.7
Number of cows	27.8	24.3	24.3	25.0	29.0	31.4

Based on the rich experience of leading kolkhozes and sovkhoses, the Central Committee of the CPSU found it possible to support the initiative of livestock workers who had promised to overtake the USA in the near future in the production of meat, milk, and butter per inhabitant of the country. In order to overtake the USA in the production of milk per inhabitant, it is necessary to achieve a substantial growth in the gross yield of milk.

The tempo of milk production in our country is higher than in the USA. During the period from 1950 to 1956, the gross production of milk in our country increased by 39% while production in the USA increased by 8%. The production of milk per inhabitant increased by 26% for the same period in the USSR while in the USA the figure dropped by 2%.

In order to overtake the USA in the production of meat per inhabitant, it is necessary to increase the production of it in the country to 20 to 21 million tons, i.e., to increase production by approximately 3.5 times. In order to obtain the indicated levels, it is necessary to obtain throughout the country as a whole a total of 141 centners of milk and 42 centners of meat (slaughter weight) or 67 centners of meat (live weight) per 100 hectares of farm land.

The basic means for increasing the production of milk and meat from cattle in our country are by increasing the number of head by improving the reproduction of the herd, by eliminating barrenness and losses, and also by preserving all offspring and utilizing the animals rationally.

At the same time it is necessary to increase sharply the number of cows per 100 hectares of agricultural land. In areas where dairy farming is developed (the central oblasts of the RSFSR, some oblasts of

the Ukraine, and in White Russia and the Baltic States) there should be 20 to 25 cows; in Georgia, Armenia, Azerbaydzhan and Moldavia there should be 15 to 20 cows per 100 hectares of agricultural land. In areas where sheep raising and beef cattle raising are developed, the number of dairy cows will be less.

Of considerable importance in fulfilling the tasks which have been imposed are the further strengthening of the fodder base, improving the feeding and maintenance of the animals, and raising the productivity and the live weight of the cattle.

The development of all the reserves which are available on each kolkhoz and each sovkhoz will make it possible to raise substantially the output of the products of livestock raising. The wide employment of mechanization will alleviate considerably the working conditions on the farms, will raise labor productivity and will lower the cost of the products.

Livestock workers on kolkhozes and sovkhozes who have entered socialist competitions have assumed the obligation of achieving, in the near future, the production of not less than 100 centners of meat and 400 centners of milk per 100 hectares of agricultural land.

Already in 1957 many kolkhozes had obtained from 70 to 100 centners of meat and from 280 to 420 centners of milk per 100 hectares of agricultural land. The kolkhoz imeni Karl Marx of Vinnitsa Oblast obtained 137 centners of meat and 397 centners of milk and the kolkhoz imeni Budennyi of Odessa Oblast obtained 120 centners of meat and 420 centners of milk per 100 hectares of agricultural land. Among them are the Latvian SSR with 444 centners, the Moscow Oblast with 525 centners, the Leningrad Oblast with 442 centners, the Kaliningrad Oblast with 395 centners, the Estonian SSR with 373 centners and the Ukrainian SSR with 300 centners.

The accomplishments of the leading farms as presented at the All-Union Agricultural Exhibit show graphically that socialist agriculture, embodying the leading techniques, has a great opportunity to make substantial progress and to develop all of its branches in all of their aspects.

Many kolkhozes, sovkhozes, livestock farms and outstanding livestock raisers were participants in the All-Union Agricultural Exhibit. The best farms displayed their outstanding animals at the exhibit. Such animals included the cow "Kamsa" of the Kostroma breed which had a yield of 12,005 kilograms of milk, the cow "Zozulya" of the Simmental breed with a yield of 12,761 kilograms of milk for 300 days of lactation, the cow "Kisa" of the Kostroma breed with a yield of 7,063 kilograms of milk for 300 days of her first lactation, the cow "Moroshka" of the Red Steppe breed with a yield of 12,426 kilograms of milk having a butter-fat content of 3.82 for 300 days of its third lactation, and many others.

The publicizing and the broad introduction into practice of the scientific achievements and experience of leading farms and of leading livestock raisers who participated in the All-Union Agricultural Exhibit

are of tremendous importance to the successful accomplishment of the tasks of raising the output of the products of livestock raising.

The Role of Russian and Soviet Scientists in the Development of Zootechnical Science

The development of Russian zootechnical science has always been based on the general biological laws of the unity of the organism of an animal and the surrounding environment and the influence of external conditions on the formation of the characteristics and attributes of the animal. The teachings of C. Darwin found numerous followers in our country and served as a foundation for work on many of theoretical problems in zootechnical science. The indicated principles of the unity of the organism of the animal and of the external environment were at the basis of our native zootechnical science, the further development of which was successfully continued by Soviet scientists in cooperation with the innovators of industry. A great contribution to the study of cattle raising in Russia and of its breed composition was the research on cattle which was conducted in 1883 under the leadership of Academician A. F. Middendorf (1815-1894) and with the participation of Professor N. P. Chirvinskiy (1848-1920).

In the succeeding years the study of the breeds of cattle was conducted under the leadership of Professor M. I. Pridorogin (1862-1923), Academician Ye. F. Liskun, and others. This research made it possible not only to uncover the story of the development of cattle in Russia but also to indicate the paths to follow in future work.

Professor M. I. Pridorogin expressed the idea that it was not advisable to repeat the type of animals of foreign breeds in crossing them with local cattle and that it was necessary to develop in the cross breeds the most valuable qualities which were characteristic of the local groups of cattle.

Professors Ye. A. Bogdanov (1872-1931) and P. N. Kuleshov (1854-1936) and Academician Ye. F. Liskun in their investigations touched on the problems of the origin of agricultural animals and also of certain breeds of cattle -- Kalmyk (Astrakhan) and Red Steppe. Academician Liskun developed a method of craniological research.

A great contribution in our native zootechnical science was the study of the exterior of animals as related to their type of productivity and the state of their health. The works of Professors P. N. Kuleshov, M. I. Pridorogin and Ye. F. Liskun in studying the characteristics of build of agricultural animals facilitated the correct analysis of the role and significance of an exterior evaluation of animals in breeding matters.

The differentiation of constitutional types among animals and their classification was the subject of works by Professor Kuleshov, Bogdanov and M. F. Ivanov (1871-1935). Academician Liskun worked out for the first time the problems involved in investigating the insides of animals.

The large number of experiments which were conducted by our scientists in studying the growth and development of animals, the raising of the young, the milking of cows, and the determination of meat qualities in native breeds served as the basis for further work in raising the productivity of cattle on the kolkhozes and sovkhozes.

Our scientists developed the theoretical basis for breeding work (Professor Kuleshov, Bogdanov, Ivanov, D. A. Kislovskiy and Academician Liskun) involving the basic theoretical ideas concerning the selection of breeding animals, the principles of developing a line, the problems of employing related animals in breeding and of selection, the methods of developing new breeds of agricultural animals and also the methods of breeding and rearing herds of cattle.

On the basis of the theoretical ideas which were worked out in the period from 1944 to 1951, workers of scientific institutions together with the innovators on the job accomplished work in developing new breeds of cattle (Kostroma, Lebedin, Alatau, Kurgan, Sychev, Kazakh whitehead) and also in perfecting a number of old native breeds (Kholmogorsk, Yaroslav, Red Steppe, etc.). Professor I. I. Ivanov was the first to work out a method of artificial insemination of farm animals which, thanks to his pupil, Academician V. K. Milovanov and others, has been an immense contribution to zootechnical science and has received wide usage not only in our country but also in many countries abroad.

Zootechnical science in our country is based on the teachings of I. V. Michurin which provide scientifically founded methods for the systematic changing of the organism of an animal through the action on it of external conditions with the goal of perfecting its breed and productive qualities.

In contrast to the proponents of the idealistic theory of Weismann-Morgan which denies the possibility of changing the hereditary traits of an animal through external conditions, I. V. Michurin established in his research that characteristics which an organism acquires during the process of life are transmitted to its progeny. Consequently, man can influence the change or development of inherited qualities in animals. Also of enormous importance to the development of zootechnical science are the teachings of Academician I. P. Pavlov concerning the role of external environment in connection with the function of the nervous system, concerning the possibility of the conversion of conditioned reflexes which an organism has acquired into unconditioned reflexes and concerning the decisive role of the central nervous system in regulating the physiological processes in the organism of an animal.

CHAPTER II

THE ORIGIN OF CATTLE

According to their zoological classification, cattle belong to the class of mammals, to the family of horned animals, to the genus of the ox (*Bos*) and to the species *Taurina*.

There are a number of other species of wild and domesticated animals which belong to the same genus as do cattle. This includes buffaloes, bison, wild oxen (European bison), Indian (Asiatic) oxen such as bantians, gayals and gaur and also zebu and the yaks.

Of these species of animals which are close in their origin to cattle, in the Soviet Union one can find buffaloes, zebu and yaks in a domesticated state.

Other species such as the bison, gayal, gaur and bantian are found in a rather limited area and occur only in the wild state although the gayal and bantian have been domesticated in some countries.

There were a large number of bison in North America as late as the Eighteenth Century, but at the present time they have been largely exterminated and now are found only in game preserves. Gaur, gayal and bantians are found in forested and damp areas of India and of some other Asiatic countries.

Zubr - wild oxen which are becoming extinct; there is still a small number of them found on the game preserve of the Belavezhskaia Virgin Forest Area. In recent years a few wild oxen have been released in the forest of the Priokskiy game preserve where there is now a small herd of wild oxen.

Buffaloes - (illustrations 1 and 2) are found extensively in the Azerbaydzhan and Georgian SSR's where they are kept as farm animals. In addition, buffaloes are raised in the Bulgarian, Rumanian and Hungarian People's Republics and in Greece, Italy and countries of Asia and Africa.

Buffaloes are well adjusted to life in a hot climate but are very sensitive to cold. Buffaloes are raised for milk and meat and also for agricultural and transportation work.

The milk production of female buffaloes is low; it amounts to 800 to 1,200 kilograms of milk having a high butterfat content of 7.2 to 9.5 grams. On the sovkhos "Dashvuz" in the Azerbaydzhan SSR the average yield from buffaloes is 1,212 kilograms of milk with a butterfat content of 8.8 grams. The annual yield from buffaloes which have been registered in the State Breeding Book is 1,543 kilograms of milk. The better buffaloes give 2,200 to 2,700 kilograms of milk per period of lactation. The buffalo, Durna 2, belonging to the kolkhoz "Red October" of Safaraliyevskiy Rayon of the Azerbaydzhan SSR, during the 300 days of its seventh period of lactation gave 2,432 kilograms of milk with a butterfat content of 9.3, or 226.1 kilograms of butterfat.

The calves are born with a live weight of 28 to 31 kilograms. The average live weight of the female buffaloes, depending on age, is 390 to 480 kilograms, although some of the animals reach 650 kilograms. Buffalo-sires weigh from 480 to 650 kilograms with a few reaching 820 kilograms. One of the valuable qualities of buffaloes is their resistance against the blood-parasite diseases to which cattle are susceptible in a number of regions of the Transcaucasus.

The color of buffaloes is black and dark brown although animals are encountered which have white markings on the head and extremities. The head is somewhat coarse with an elongated face and the horns are pointed to the rear. The animals have long legs, a sturdy frame and a deep and broad body. The hide is thick and tough.

Buffaloes are late-maturing animals; they reach their full development at 6 to 7 years; they live longer than cattle; female buffaloes produce offspring until an age of 20 to 23 years.

A differentiating feature of female buffaloes is the prolonged pregnancy period -- an average of 305 to 307 days. When buffaloes and cattle are crossed, no offspring result. The quality of buffalo meat is not high. When buffaloes are slaughtered, the yield is 40 to 49%; the meat is red in color and stringy. Buffaloes have great endurance; they feed well on pasture land; buffaloes can haul 860 kilograms.

Breeding work with buffaloes is being conducted on the breeding farms of the Kirovabad State Breeding Station of the Azerbaydzhan SSR.

Zebus are raised in the Azerbaydzhan SSR, in the republics of Central Asia, and in India, Japan, Turkey and some other countries of Asia.

Zebus (illustration 3) are characterized by the presence of a hump consisting of muscular tissue with layers of connecting tissue and fatty deposits. Zebus are small animals. At birth their calves weigh 15 to 16 kilograms. The average live weight for zebu cows is 220 to 250 kilograms with some animals attaining a weight of 350 kilograms. The cows yield 470 to 800 kilograms of milk with a butterfat content of 5.0 to 6.0. Zebus are used not only as dairy cattle but also for performing various agricultural tasks. A positive quality of zebus is their resistance to blood-parasite diseases.

The color of zebus is reddish with black spots. The head is long and light; the horns are mounted erectly; the body is short with a raised sacrum and a drooping behind; the musculature is weakly developed, the skeleton is fragile and the hide is thick and tough.

Zebus are late-maturing animals; the quality of their meat is not high; the slaughter yield is 40 to 48%; the meat is stringy.

By crossing zebus with cattle, zebu-like cattle are obtained which are wide-spread in the Uzbek and Turkmen SSR's. The yield from the zebu-like cattle reaches 2,500 kilograms of milk with a butterfat content of 4.2 to 4.5.

On the farm of the Scientific Research Institute "Askaniya-Nova," the live weight of hybrids obtained from crossing zebras with the Red Steppe breed is greater than 500 kilograms with a yield of 3,600 to 4,300 kilograms of milk having a butterfat content of 4.1 to 4.2. However, the quality of the meat from such hybrids is not good enough.

The Yak or Tibetan ox is raised in the mountains of the Gorno-Altay and Tuva Autonomous Oblasts, the Buryat-Mongolian ASSR and the Kirghiz SSR. In addition, there are large numbers of yaks in the Mongolian People's Republic and in Tibet.

The yak is a late-maturing animal; it is adapted to living under the severe conditions of high mountainous areas. It sustains itself the year around with whatever fodder is available. It is found both in the wild and in the domesticated state; however, the domesticated yak is considerably smaller than the wild yak (illustrations 4 and 5).

Yaks differ sharply in their build from cattle. They are compact animals with short legs, a short broad neck and a well-developed chest; the back is dropping and the behind is narrow and drooping. The hide is thick and is very heavily overgrown with hair which reaches 50 centimeters on the sides, belly and lower parts of the body. The skeleton is sturdy. The predominant color is dark brown or black.

The average live weight of the calves at birth is 13 kilograms; the cows are from 260 to 280 kilograms and the bulls are from 350 to 450 kilograms.

Yaks are good beasts of burden under mountainous conditions. They transport packs with loads of 100 to 120 kilograms. The milk of the female yak is distinguished by its high butterfat content of 6.5 to 7.5. The yield of the yaks when the calves are taken off early is 300 to 400 kilograms. The slaughter yield is 44 to 47%; the meat is stringy, dark and poorer in quality than the meat from cattle.

The period of pregnancy for yaks is somewhat shorter than for cows and amounts to 255 to 258 days. When crossing yaks with cattle, hybrid cows are obtained which are fertile, whereas the males are not capable of reproducing because of disruption of spermatogenesis.

As the tests of V. V. Ivanova at the Gorno-Altay Experimental Agricultural Station have shown, when the hybrid bulls are fed with fodders which stimulate spermatogenesis (fermented bran, bone flour, calcium phosphate), the quantity of sperm which is obtained is increased and the activity of the spermatozooids is increased. In order to overcome this condition where the hybrid bulls were unable to reproduce, they also tried the transplanting of the sex glands and the transfusion to the hybrids of blood from fertile cross-bred bulls which has given favorable results with regard to the quality of the sperm of the hybrid bulls.

Fertile hybrid bulls were obtained by crossing bulls of the fourth generation (with one-sixteenth yak blood) with hybrid cows of the first generation. Overcoming the infertility of the hybrids makes it possible

to use the yak more and more widely to create a new breed of cattle with good butterfat qualities and with the ability to withstand severe mountain conditions. Hybrids of yaks and cattle according to their development, live weight and productivity are significantly higher than yaks; they adapt themselves better to the lower mountainous regions; and their live weight is 50 to 80 kilograms greater than for the yaks. The yield of the hybrid cows amounts to 900 to 1,000 kilograms of milk with a butterfat content of 5.0. The quality of the meat is better for the hybrids than for the yaks and the slaughter weight reaches 55%.

The period of pregnancy is longer for the hybrid cows than for yaks, amounting to 268 to 275 days.

The origin of cattle goes back to deep antiquity. Much later, as it has been established by geological excavations, the taming and domestication of cattle began; however, only a very small number of species of all the wild animals which are all about man have been domesticated.

Professor P. N. Kuleshov, Professor Ye. A. Bogdanov, and also Academician Ye. F. Liskun and Professor S. N. Bogolyubskiy have made great contributions to the study of the origin of agricultural animals.

The study of the origin of cattle makes it possible to discover the changes which took place in the animals during the process of their taming and domestication.

Pieces of bones from the skeleton and from skulls of cattle have been uncovered in archeological excavations at the stopping places of ancient man; in addition, pictures of cattle have been found on various household vessels, tombs, statues, stones, etc., and these things all provide an idea of the body structure and appearance of the animals in ancient times.

The study of the origin and biological characteristics of cattle and of the wild representatives of the genus of oxen makes it possible to establish in what direction and to what degree the morphological features and physiological characteristics of the animals changed in the course of a long period of time. In addition, if one knows the origin of the animals, it is easier to distinguish the species which are most closely related to each other in their origin. The study of the evolution of cattle makes it possible to work more purposefully in improving the market qualities of the animals in accordance with the appropriate breeding practices.

At present it has been established that a substantial number of the modern breeds of cattle had their origin in the aurochs which until not too long ago were wide-spread throughout Europe and became extinct only in the Eighteenth Century. It is presumed that there were a number of varieties of aurochs.

The aurochs were more powerful and larger than the cattle of today; they were dark brown and black in color.

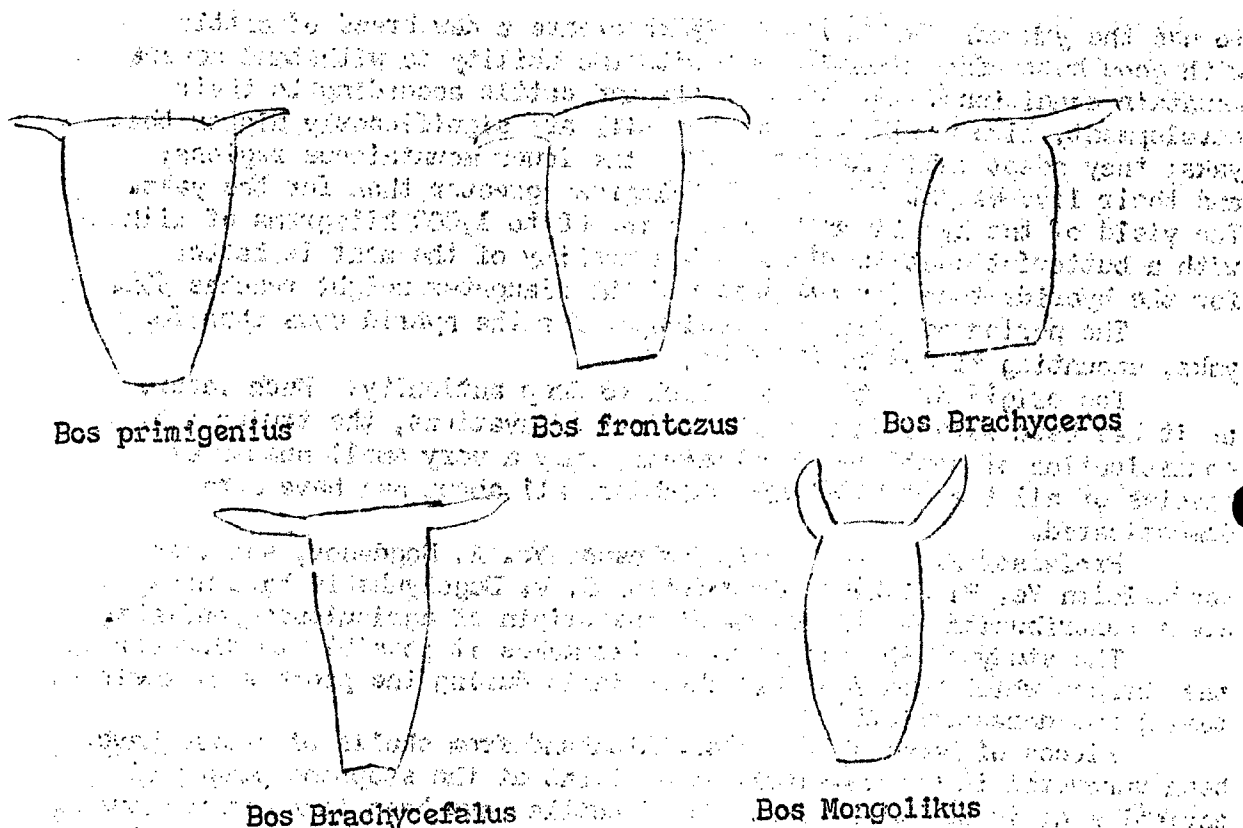


Figure 6. Skulls of Cattle of Various Craniological Types.

In order to clarify the problem of the origin of cattle, the craniological features and characteristics of the animals were studied. On the basis of this research, it was established that there are a number of clearly different craniological types which are related to the characteristics of formation of the animals under various natural conditions.

The fact that animals belong to the same craniological type is an indication of their common origin.

The following craniological types are recognized:

Bos primigenius. The skull is elongated and relatively narrow. The forehead is flat and in length is shorter than the facial part. The occipital ridge is straight; the bony projections of the horns come directly from the skull and not from any protuberances of the forehead bones. The greatest number of breeds belong to this craniological type. Among them are the Kholmogorsk, Yaroslav, Tagil, White-Headed Ukrainian, Gray Ukrainian, Red Steppe, East Friesian and other breeds.

Bos frontozus. The skull is characterized by a long wide forehead which is convex in the upper portion and concave between the eyes. The occipital ridge protrudes considerably; the horn projections are seated on protuberances of the forehead bones. Representatives of this type are the Simmental and Sychev breeds.

Bos brachyceros. The forehead portion of the skull is longer than the facial portion; it is wide and deeply concave between the eye sockets. The horns extend from the forehead bones; the occipital ridge has a protuberance in the middle and a depression at the top. This craniological type includes the Schwyz, Kostroma and Alatau breeds and Brown Carpathian cattle.

Bos brachycephalus. The skull has a shortened facial section; it is broad in line with the eye sockets and narrow where the temples occur. This type includes the Red Humped, Yurino, Kazakh Whitehead and Hereford breeds.

Bos mongolicus. The skull is long and narrow. It is raised in the occipital part. The profile of the skull is aquiline. The horns are curved almost in the same plane and have the form of a half moon. The forehead is somewhat concave between the eyes. The eye sockets protrude slightly. An example of this craniological type is the Kalmyk (Astrakhan) cattle.

Changes in the Biological Characteristic of Cattle Under the Influence of Domestication

Man began to tame and domesticate animals during the same period when he began to use meat as a food. Therefore, of those types of wild animals which surrounded man, the ones which underwent taming and domestication were those which gave man the greatest quantity of meat as food and those which he was able to catch.

The taming and domestication of cattle took place in a number of places in Asia and Europe, i.e., in different geographic zones, approximately eight to ten thousand years ago. Through the research of many scientists it has been established that the taming and domestication of animals in our country occurred in the areas of Central Asia, the southern part of the Ukraine, Povolzh'ye, Siberia and other places. The process of domestication continued for a long time and was conducted by various tribes and at different times.

In taming and domesticating animals, man began with the young animals which were easier for him to catch. As man kept these captured animals in captivity, he gradually began to select those breeds which were easier to tame, answered his domestic needs and were capable of multiplying in captivity.

Under the influence of captivity, cattle changed significantly with respect to outward appearance, the relationship of the parts of the body and the color as well as with respect to the structure of internal organs, the physiological functions, productivity, etc. Cattle became highly acclimated to being raised under different geographic and other conditions. Whereas the wild species which were related to cattle could be found only in certain geographic zones, domesticated cattle became widespread from the areas of the Far North to the equator.

By employing selection and creating certain conditions for maintaining the cattle, man controlled the changes which the animals were acquiring and developed those qualities and traits which were useful to him. The existence of a large number of breeds which differ in their productivity reflects the activity of man in transforming the wild species of cattle. In their domesticated state, cattle are considerably smaller in size than the wild varieties. At the same time, the build of the animals changed. When compared with the related wild species, cattle have a relatively more elongated body while at the same time being smaller in height and having great variations in build.

In the domesticated state, the animals are characterized by relatively lesser development of the skeleton than is the case with the wild species.

The coloring of cattle also changed. Whereas their wild ancestors in the past had uniform dark brown or black coloring, among those breeds of cattle which are being raised today there are animals with brown, black, red and gray coloring.

As a result of man's activities, domesticated cattle changed radically not only in outer appearance but also, which is very important, in some physiological features. Cattle have greater fertility and mature earlier. They also have higher milk and meat productivity in comparison with their related wild species. These qualities were acquired by cattle as a result of selection and culling by man over a long period of time and under different conditions. The development of high productivity for animals in the wild state not only was not dictated by any need but simply served no purpose and in a number of cases could have led to the extinction of the species.

Thus the development of the milk gland (udder) in the wild ancestors of cattle to the sizes of today as found in high-yield cows would have made movement and the use of pastures difficult and would have made them easy prey for wild animals.

Indications of the increased speed with which cattle mature in the domesticated state are the shortened period of pregnancy, the earlier appearance and replacement of teeth, the earlier closing of the cranial joint, etc.

At the same time that the period of pregnancy for cattle was shortened (on an average of 285 days), substantial changes also took place in the sexual cycle.

In contrast to their wild ancestors with whom the period of mating and of heat bore a seasonal character; today cattle have a periodic sexual cycle which is not connected with the time of the year. Cattle acquired the capacity for being fattened and for utilizing the fodder better. The quality of the meat also changed, and with the beef species there was an improved development of the muscle and adipose tissue and layers of fat formed between the muscle fibers.

The process of domestication exerted great influence on the nervous system of the animal. Through the work of Academician I. P. Pavlov it was established that the mutual communications of the organism of the animal with the surrounding external conditions is accomplished through the cortex of the brain. Under the new conditions of life the animals lost some earlier conditioned reflexes and acquired new ones.

As the functions of various organs and the organism of the animal changed, the structure of the internal organs also changed; in particular, this was true of the digestive organs, the milk gland and the sexual organs. The temperament of the animals also changed radically.

The Classification of Breeds According to Type of Productivity

The classification (groupings) of breeds can vary depending on the purpose of the classification and the traits and characteristics of the animals which are considered in its establishment. The basis of the most widely used and practical classification is the designation of the animals according to their productivity (dairy or meat). In addition, those breeds which have well-developed traits in connection with milk or meat productivity are also singled out.

All breeds of cattle which are raised in the USSR are divided into the following three groups:

1. Dairy breeds: Kholmogorsk, Tagil¹, Yaroslav, Istobensk, Brown Latvian, Red Steppe, Angeln, Red Danish, Red Polish, Red Estonian, White-Headed Ukrainian, Aulieatinsk, East Friesian and Black-Mottled cattle, Jersey, Siberian cattle, etc.

2. Combined breeds (dairy-meat and meat-dairy): Schwyz, Kostroma, Alatau, Lebzin, Red Humped, Yurin, Simmental, Sychev, Red Tambov, Gray Ukrainian, Bestuzhev, Short Horn and Kurgan.

3. Meat breeds: Kalmyk, Kazakh, Kazak-White Headed, Kazakh cattle, Hereford and Aberdeen Angus.

In placing the breeds of cattle in one or another group, it should be kept in mind that with the combined breeds it is possible through directed breeding work to strengthen the second type of productivity which could have been of lesser importance.

CHAPTER III

CONSTITUTION AND BODY STRUCTURE OF CATTLE

Constitution of Cattle

By the term constitution is meant the nature of the structure and vital activity of the organism of the animal as a whole which determines its reaction to the influence of the external environment and its type of productivity. The constitutional characteristics of animals depend on the interaction of heredity and external environment through the central nervous system; they are manifested not only in the external constitutional forms of the body but also in the structure of the internal organs as well as in the physiological processes which take place in the organism. These processes are related to the functioning of the organs involving internal secretion and, as with the organs, they are regulated by the central nervous system. The external structural forms of the animals are related to and interdependent with their physiological characteristics.

Several constitutional types can be singled out. Animals of different constitutional types have their own characteristics of build and also differ in their temperament. By temperament is meant the degree of excitation and reaction that the organism experiences with respect to external irritations. An evaluation of the constitution is made on the basis of the build and the skeletal strength of the animals, their endurance, their adaptability to the various conditions under which they may be raised, and also their capacity for producing the required product. The constitution of the animals must be evaluated in relation to the state of their health, the conditions under which they are raised and the level and nature of their productivity.

Our scientists, Professors P. N. Kuleshov and Ye. A. Bogdanov and Academicians M. F. Ivanov and Ye. F. Liskun, have made a great contribution in the scientific exploration of the problem of the types of constitutions, their relationship with the builds and types of productivity, and also the structure of the various tissues and organs of animals.

Basing their work on the variations in the structure and development of the different tissues and internal organs and also keeping in mind the characteristics of build of animals of different types of productivity, Professor P. N. Kuleshov identifies four types of constitutions: rugged, delicate, solid and flabby.

A rugged [grubyy] constitution is typical of late-maturing animals and is characterized by the presence of a rugged skeleton, a tough, thick hide with coarse hair, mildly developed subcutaneous connective and adipose tissue, and dense, bulky musculature. Professor P. N. Kuleshov considers that a rugged constitution is favorable for the development of working qualities in cattle; animals which have a rugged constitution have low productivity and fatten slowly.

A delicate [nezhnyy] constitution is characterized by the presence in the animals of a light skeleton, a thin, elastic hide, shiny hair and a small light head.

Highly productive meat and dairy cattle sometimes have a delicate constitution.

Overdevelopment in the direction of excessive frailty usually leads to lowered resistance of the organism of the animal, to unfavorable conditions of external environment, to greater demands with respect to the conditions of maintenance, and to lowered fertility.

A solid [plotnyy] constitution is characterized by a sturdy skeleton, well-developed musculature, and a tough, elastic hide. Animals of this constitutional type have well-developed blood, respiratory and digestive systems; the subcutaneous connective tissue is weakly developed. Professor P. N. Kuleshov considers that a solid constitution is desirable for dairy breeds of cattle.

A flabby [rykhlyy] constitution is characterized by a fine but strong skeleton and well-developed musculature and subcutaneous connective and adipose tissue. The hide is flabby and "dough-like" and is covered with soft, fine hair which has a tendency to curl. A flabby constitution is most favorable for manifesting those qualities associated with meat cattle, including the accumulation of fat.

Academician M. F. Ivanov added to this classification of constitutional types another type called a strong constitution. The possession by animals of a strong constitution is connected with a good state of health and hardiness which in turn facilitate the obtaining of high productivity.

A strong constitution in animals is characterized by a strong skeleton and a firm hide of moderate thickness. The definition of a strong constitution as given by M. F. Ivanov is very close to the description of a solid constitution by P. N. Kuleshov.

When speaking of constitutional types, it must be kept in mind that the individual characteristics of animals are very different; therefore, it is not always possible to single out animals whose characteristics and qualities correspond to a single constitutional type. Animals of combined breeds and most dairy cattle have characteristics of two constitutional types. Thus animals of the rugged or delicate types may also have some characteristics of a solid or flabby constitution.

In order to establish the constitutional characteristics of animals, much attention is devoted to studying the insides (details of the structure of internal organs). The study of the insides is conducted by means of histological, anatomical, chemical, and physiological studies.

The histological structure of the milk gland of cows as related to their type of productivity was studied for the first time in 1907 by Academician Ye. F. Liskun. He established the different relationship between the glandular and connecting tissue of the milk gland of animals

of different breeds. Dairy cattle have a relatively more developed milk gland; whereas, meat cattle have relatively more developed connecting tissue. The diameter of the alveoli in the milk gland of cows of the Yaroslav and Red Steppe breeds (dairy cattle) turned out to be considerably greater than in cows of the Gray Ukrainian breed (meat cattle).

By studying the relationship between the level of the blood pressure and the milk productivity of the cows, it was established that the higher the milk productivity of the animals the higher will be the venous pressure in the milk vein. Cows which have a higher daily yield of milk or are pregnant have a higher pulse rate and respiratory rate.

However, these studies do not provide an adequate foundation for practical control in establishing the constitutional type of animals; therefore the listing of animals according to constitutional type is based on the build, state of health and type of productivity.

Build of Cattle

In order to evaluate the build of cattle, both a visual evaluation and a measurement of the different parts of the body are conducted. By the characteristics of the build it is possible to judge as to the character and type of productivity of animals, their development, and the breed differences.

While it is not possible to judge by the build of dairy cattle as to their productivity (yield), with meat cattle it is possible by their structural forms to determine their meat qualities, the development of their musculature and the deposition of subcutaneous fat. The examination and evaluation of the build makes it possible to establish the existence of those deficiencies in build which hinder the development of high productivity in the animal.

The evaluation of the build is one of the indexes of the general evaluation of an animal. The general evaluation includes checks on the productivity, development, build and constitution and on the origin of the animal and the quality of its offspring.

An evaluation of animals using one of these indexes does not make it possible to judge as to the breeding and productive qualities and thus to conduct selection of the animals properly. An overall evaluation using all practical procedures gives a more complete picture of the quality of the animals and is one of the basic requirements for conducting breeding work with a herd.

A visual evaluation is conducted by means of an external examination of the animal. Attention is focussed on the various points (parts of the body) and on the general proportionality of the build of the animal, as related to the nature of its productivity, as well as on the strength of the skeleton and the state of health. An evaluation of the build by points makes it possible to establish the nature of the development and the deficiencies of this or that point and also the correlation of the various parts of the body of the animal to each other which is necessary when evaluating the organism of the animal as a whole.

The evaluation of the build of mature animals is conducted using a 100-point scale, while for calves older than six months a five-point scale is used. Directions on the use of the 100-point scale are given in the instructions on appraising.

In evaluating animals of different types of productivity and obtaining a general score for several points, various coefficients are employed using the same maximum five point evaluation for each point of the body. This difference in the general evaluation is caused by the unequal importance of the various points of meat and dairy cows.

The general point evaluation of the build of an animal is expressed as the sum of the scores received in evaluating the various points of the body which have been multiplied by the appropriate coefficients.

The following points are of the greatest importance: the head, neck, chest, withers, back and loins, croup, belly, udder, and limbs. In addition attention is paid to the state of the skin and the hair covering.

The evaluation of the build is conducted while keeping in mind the type of productivity and the characteristics of the breed of the animals because the requirements with respect to a given point may be different for different types of productivity and for different breeds (Tables 1, 2, 3, and 4).

TABLE 1

Auxilliary Instructions for Evaluating the Build and Constitution of Dairy and Dairy-meat Breeds of Cattle

Points of the build and the general development of the animal	For an evaluation of "5" the following is required:	A lower mark is given if the following deficiencies exist:
Points of the build		
Head and neck	A light head which is typical for the breed, A long, straight neck with fine folded skin	A heavy, over-developed bull's head (for a cow) or cow's head (for a bull), A short, coarse neck interrupted by a proboscis.
Chest	a) A broad chest without any narrowing or depressions below the shoulder blades. b) Ribs which are long, rounded and curved.	a) A narrow chest with a narrowing and depressions below the shoulder blades. b) Flat ribs.

TABLE 1 (continued)

Withers, back and loins	The withers are even and high. The back is wide, long and straight. The loins are broad, straight and flat.	Low, pointed withers. The back is narrow, short, sagging, humped. The loins are sagging, roof-shaped.
Middle part of the body	Well-developed in cows, bulky. The belly does not sag with bulls.	Weakly developed in cows. The belly sags with bulls.
Croup	a) Broad b) Long c) Straight d) Absence of a roof-shaped form	a) Awl shape b) Short c) Sagging d) Roof-shaped
Udder	Large; glandular with uniform development of the lobes; long-widely separated nipples	Small or sagging; fatty with uneven development of the lobes; with short, close, abnormally developed nipples
Fore legs and hind legs	Strong legs. Fore legs properly positioned. Hind legs properly positioned.	Knock-knees, bow-legs, elephantine positioning of the legs
General development	a) A well-developed animal (skeleton well-developed, strong, but not heavy and not over-developed; musculature well-developed throughout the whole body b) Proportionality of build as a whole and adherence to the indicated type of productivity. The type of breed is clearly apparent.	a) General underdevelopment (a fragile skeleton, an over-developed skeleton; musculature weakly developed). b) Non-proportionality of build and non-adherence to the indicated type of productivity. The type of breed is not clearly apparent.

TABLE 2

Scale No 1

Point Evaluation of Cattle of Dairy and Dairy-meat Breeds

Points of the build and general develop- ment	Description	Cows		Bulls	
		Maximum possible mark	Coef- ficient mark	Maximum possible mark	Coef- ficient mark
Points of the build					
Head and neck	Form, typicalness	5	1	5	1
Chest	a) Width and curve of the ribs	5	1	5	2
	b) Depth of the chest	5	1	5	1
Withers, back, loins	Width, length and levelness	5	2	5	3
Middle part of the body	Well developed in cows; the belly not sagging in bulls	5	2	5	1
Croup	a) Width	5	1	5	1
	b) Length	5	1	5	1
	c) Absence of a roof-shape appearance	5	1	5	1
	d) Absence of sagging	5	1	5	1
Udder	Development and form of the udder; position and form of the nipples	5	3	5	-
Forelegs, hind legs	Position of the legs, absence of	5	1	5	2
General Development	a) Development of the animal as a whole (development and strength of the skeleton, development of				10

TABLE 2 (continued)

the musculature		5	3	15	5	3	15
b) Proportionality of build as a whole, relationship to the type of productivity for the farm, and expression of the type of breed		5	2	10	5	3	15
Sum of marks		---	---	100	---	---	100
1) Proportionality of build as a whole		5	2	10	5	3	15
2) Relationship to the type of productivity for the farm		5	2	10	5	3	15
3) Expression of the type of breed		5	2	10	5	3	15
Sum of marks		---	---	100	---	---	100
1) Proportionality of build as a whole		5	2	10	5	3	15
2) Relationship to the type of productivity for the farm		5	2	10	5	3	15
3) Expression of the type of breed		5	2	10	5	3	15
Sum of marks		---	---	100	---	---	100
1) Proportionality of build as a whole		5	2	10	5	3	15
2) Relationship to the type of productivity for the farm		5	2	10	5	3	15
3) Expression of the type of breed		5	2	10	5	3	15
Sum of marks		---	---	100	---	---	100
1) Proportionality of build as a whole		5	2	10	5	3	15
2) Relationship to the type of productivity for the farm		5	2	10	5	3	15
3) Expression of the type of breed		5	2	10	5	3	15
Sum of marks		---	---	100	---	---	100

TABLE 3

**Auxilliary Instructions for Evaluating the Build and Constitution
of Meats and Meat-dairy breeds of Cattle**

<u>Points of the build and general develop- ment of the animal</u>	<u>For an evaluation of "5" the following is required:</u>	<u>A lower mark is given if the following deficiencies exist:</u>
Points of the build		
Head and neck	A light head which is typical for the breed; a neck which is short, broad and muscular	A heavy, coarse, untypical head; a neck which is narrow and interrupted
Chest	<p>a) Broad, muscular, with depressions below the shoulder blades; the fore shoulder and shoulder well-covered with musculature</p> <p>b) A deep chest, a broad brisket which extends forward of the line of the fore legs and has a well-developed dewlap</p> <p>c) Long, rounded, curved ribs which are well-covered with meat</p>	<p>a) Narrow, with depressions below the shoulder blades, weakly covered with musculature</p> <p>b) A shallow chest, narrow brisket, and a weakly developed dewlap</p> <p>c) Flat ribs which are lightly-covered with meat</p>
Middle part of the body	Well-developed in the cows, bulky; The belly does not sag with the bulls	Weakly developed in the cows; A sagging belly with the bulls
Withers, back, loins	<p>a) Low, broad withers</p> <p>b) Broad, straight (well filled out) back and loins</p>	<p>a) Sharp withers</p> <p>b) Back and loins are not broad, are poorly filled out; the back sags, is humped</p>
Rump	Long, straight, broad, well filled out with musculature, well positioned sciatic projections	Short, sagging, roof-shaped, poorly covered with musculature; awl shape

TABLE 3 (continued)

Hip	Full and meaty to the knee; the thigh full and meaty	The hip and thigh poorly covered with meat
Udder	Udder and nipples healthy and normally developed	The development of the udder and nipples is poor and irregular
Forelegs and hind-legs	Strong legs which are positioned far apart and properly and which have strong hoofs	The legs are not positioned properly and have weak hoofs
General Development	a) Excellent development of the animal as a whole	a) Under-development (fragile, under-developed skeleton, weakly developed musculature). The body is not deep or broad. The meat type is not strongly evident.
	b) Proportionality of build. Apparentness of the meat type. Type of breed is clearly evident.	b) Non-proportionality of build. Type of breed is only weakly apparent.

TABLE 4

Scale No 2

Point Evaluation of Cattle of Meat and Meat-Dairy Breeds

Points of the build and general develop- ment of the animal	Description	Point Evaluation			
		Cows		Bulls	
		Maximum possible ficient mark	Coef- ficient mark	Maximum possible ficient mark	Coef- ficient mark
I. Points of the build					
Head and neck	Form, typicalness	5	1	5	1
Chest	a) Width and curve of the ribs	5	1	5	2
	b) Depth of the chest	5	1	5	1
Withers, back, loins	Width, length, levelness, curvature of the ribs, amount of meat	5	3	15	3
Middle part of the body	Well developed in cows; the belly not sagging in bulls	5	2	10	1
Rump	Breadth, length, levelness, filled-out musculature	5	3	15	3
Hip	Filled-out musculature	5	2	10	2
Udder	Development of udder and nipples	5	1	5	-
Forelegs and hind- legs	Length, positioning, strength of hoofs	5	1	5	2
					10

iii

The head for dairy cattle is dryer and somewhat longer than for meat cattle. The head of bulls is wider and shorter than for cows. In evaluating a head, attention is devoted to its size and form and also to its relative development when compared with the whole body of the animal. A rough, heavy head is not desirable either with dairy or meat cattle because it is characteristic of animals having a rugged constitution. A long, narrow head with sharply-defined muscles, tendons and bony protuberances is found on animals which are overdeveloped in having an excessively delicate constitution.

The neck on dairy cattle is longer and narrower than with meat cattle. The bulls have a relatively shorter neck than do the cows.

The withers must be even and broad; with meat and meat-dairy cattle, the withers are wider and have better developed musculature than is the case with dairy cattle.

The chest (chest cage) is evaluated according to its development in depth and breadth. It is desirable to have a deep and broad chest for all animals regardless of their type of productivity. An external deficiency is a chest which is shallow and narrow with constrictions and depressions behind the shoulder blades.

The back and loins. It is desirable that animals of all breeds have a broad and flat line to their spine and loins. Sagging of the back which indicates a weakening of the skeleton is a deficiency of the build. Sagging to the back is encountered in old animals as a consequence of the weakening of the ligaments of the lumbar vertebrae. The sagging of the spine which sometimes can be observed in pregnant cows is of temporary nature. A back which is humped upward is called a carp-shaped back and is often found in animals which have been raised under poor conditions of feeding and maintenance. Usually the carp-shape is accompanied by a narrowness of the back. Meat cattle, because of the better development of their musculature, have a back and loins which are broader than is the case with dairy cattle.

The hind part of the body of all breeds of cattle should be long, flat and broad (Figure 7). A narrow pelvis which accompanies a narrow croup makes calving more difficult for cows, especially in the birth of large calves.

Animals which are raised under unsatisfactory conditions acquire a number of substantial deficiencies with respect to the structure of the hind part of the body. Fundamental deficiencies in structure of the croup are narrowness which is called awl-shape of the croup, sagging of the croup, tapering of the rump and a triangular shape to the croup when it is viewed from behind (Figures 8, 9 and 10).

These deficiencies in build are usually accompanied by a weakness of the rear extremities and inadequate development of musculature. At the same time the most valuable quality cuts of meat come from the hind part of the body; therefore, in evaluating meat and meat-dairy animals, attention is paid to deficiencies of the croup which lower the meat value.

The belly should not be sagging or very lean. When the belly sags, sometimes the back also sags. Cows with sagging bellies have poorer developed digestive organs.

The udder. In evaluating the udder attention is paid to the form, size and development of its parts and also to the form and size of the nipples.

In dairy and dairy-meat cattle, the size of the udder characterizes the development of the milk gland. Some highly productive cows from the breeding farm, "Karavaevo," of Kostroma Oblast have udders with a girth of 174 centimeters and a depth of 75 centimeters. An udder in which glandular tissue predominates is distinguished from an udder with developed connecting and adipose tissue. Prior to milking it is more strained and after milking it decreases markedly in size forming to the rear a number of lateral folds of skin which are called the reserve of the udder. The sharp decrease in size of the udder after milking is related to good development of the glandular tissue in the milk gland. After milking, the lower part of the udder becomes soft while in the upper part it is easy to feel the glandular tissue. An udder in which connecting adipose tissue predominates, changes very little in size after milking.

When examining the udder, attention is devoted to the thickness of the skin and also to the development of the venous vessels and the so-called milk walls. Thin skin with soft hair is characteristic of the udder of an animal with high milk productivity. Good development of the veins of the udder and also of the venous vessels which are located in the lower part of the belly of the animal and through which blood flows from the udder serves as an indicator that a considerable amount of blood is entering the milk gland. The nutritive substances of this blood are involved in the formation of milk.

It is most desirable to have a large cup-shaped udder located along the lower part of the belly with uniform development of the parts and widely separated nipples (Figure 11). An udder in which there is no uniform development of the right or left halves or of the various parts (Figure 12) or also which is sagging and has insufficiently developed front parts (goat's udder) is not desirable.

Atrophy of the various parts of the udder is a consequence of neglected mastitis. The nipples should be of average size (7 to 9 centimeters long) and cylindrical in form. Short nipples are inconvenient both in manual and mechanical milking. Also inconvenient and hence undesirable are long nipples which often are soft with weakly developed muscular fibers and therefore retain milk poorly; this also applies to strong development of the musculature as a result of which the milking is stiff.

Milk wells are small apertures in the abdominal wall which are located on both sides of the cartilage of the breastbone and through which the veins going from the udder enter the body cavity. The milk wells can be felt easily by pressing the skin with the fingers.

Fore and hind extremities. An examination of the positioning of the extremities of an animal is conducted from the front, side and rear. When the forelegs are properly positioned, they should be parallel and the hoofs should be straight. It is not desirable when the hoofs are pointed to the side or inwards because this makes the movement of the animals more difficult. A condition of knock-knees in the fore legs and also the improper positioning of the legs when the animal is examined from the side indicate weakness of the extremities. This is a deficiency in the structure of the legs. The hind legs should be positioned wide apart and should be parallel. A deficiency in the structure of the rear extremities is a closeness in the springing joints -- an X-shaped positioning of the legs, where the legs below the springing joint are pointed somewhat to the side. Such a positioning of the legs is a result of raising the cattle under improper conditions and is encountered in animals which have a narrow and sagging croup. Another irregular position is also undesirable; it involves the positioning of the rear legs slightly forward under the belly.

These deficiencies which are encountered most frequently indicate a weakness of the rear extremities.

Skin and hair. Dairy cattle have a thin, elastic, and at the same time very tough skin; meat and meat-dairy cattle have a soft and porous skin. The fineness of the hair depends on the skin: the thicker the skin, the coarser and thicker is the hair and vice versa.

The hair cover characterizes the state of health of the animals. Healthy animals have smooth shiny hair which is shed very quickly; whereas with animals which are sick or debilitated, the shedding of hair is drawn out.

Animals of different types of productivity have their own constitutional characteristics which establish the difference in type and build.

A visual evaluation of an animal based on its various points and considering it as a whole makes it possible to identify these characteristics; in general they are as follows.

Dairy cattle (Figure 14) are characterized by a somewhat elongated (mostly in the middle part) body, a lean, somewhat elongated head, a thin neck with shallow folds, a well-developed chest, a straight, level back, a large, deep belly, a broad and level croup, and strong, widely-spaced extremities. The skin is thin and easily moved; the udder is well-developed with wide-spaced nipples. With dairy cattle the musculature is weakly developed.

Meat cattle (Figure 15) are characterized by a compact build and rounded form which is a result of the good development of the muscles and connecting tissue; they have a small, short head, a short thick neck, a broad deep chest with a well-developed dewlap, a broad, even back, a long, broad croup, well-developed musculature and short, properly positioned extremities; the skin is porous and easily moved and is covered with fine dense hair.

Animals of combined dairy-meat or meat-dairy productivity (Figures 16 and 17), in most cases, have a predominance of the characteristics of one or the other type of productivity -- dairy or meat. Animals with a uniform development of the characteristics of two types are rarely encountered. As a result of this, the type of build tends to be that of either dairy or meat cattle. These tendencies depend on the breed characteristics of the animals, the direction of the breeding work, the conditions under which the animals are raised and maintained, and also the system of using the animals.

Noticeable divergencies from the most frequently encountered type of build can be observed not only in breeds of one type of productivity, but also in each breed; it is only in individual herds, where selection has been carried on for a long time by the same specialist, that it is possible to observe a similarity in the animals with respect to the type of build.

Measurement of the animals serves the purpose of making the evaluation more accurate and avoiding subjectivity in estimating the size of the various points of the animal. The measurement of the animals is performed with a measuring stick, a measuring tape, and special calipers and serves as a supplement to the visual evaluation.

The basic measurement in measuring cattle is the following:

1. Length of the head. The measurement is made with calipers from the middle of the occipital ridge to the nasal mirror.
2. Length of forehead. The measurement is made with calipers from the middle of the occipital ridge to a line connecting the inner corners of the eyes.
3. Greatest width of the forehead. The measurement is made with calipers between the furthest separated points of the eye sockets.
4. The height at the withers is the vertical distance from the highest point of the withers to the ground. The measurement is made with a measuring stick.
5. The height of the back is the vertical distance from the rear edge of the aristate appendix of the last spinal vertebra to the ground. The measurement is made with a measuring stick.
6. The height at the rump is the vertical distance from the highest point of the rump to the ground. It is measured with a measuring stick.
7. The depth of the chest is the distance from the withers to the breast bone along a vertical line passing through the rear corner of the shoulder blades; it is measured with a measuring stick.
8. The width of the chest behind the shoulder blades. It is measured at the widest part of the chest along a vertical line passing through the rear corner of the shoulder blade; it is measured with a measuring stick.
9. Width of the croup at the tops of the hip bones. It is measured with calipers at the greatest distance between the tops of the hip bones.

10. The width of the croup at the pelvis-hip joints is measured with calipers at the widest point.

11. The width of the croup at the sciatic protuberances. It is measured with calipers as the distance between the outer external projections of the sciatic protuberances.

12. The slant length of the body. The distance is from the extreme forward projection of the shoulder bone to the extreme rear projection of the sciatic protuberance. It is measured with a measuring stick and a measuring tape.

13. The slant length of the croup. It is measured with calipers from the extreme forward projection of the top of the hip bone to the extreme rear projection of the sciatic protuberance.

14. The girth of the chest behind the shoulder blades is measured with a measuring tape in a vertical plane passing through the rear point of the shoulder blades.

15. Girth of the metacarpus is measured with a measuring tape at the upper part of the metacarpus.

During measuring the animal is stood on a level place in such a manner that the front legs hide the rear legs and vice versa. Any movement by the animal or turning of its head affects the accuracy of the measurement.

The measurements of the animals are conducted as a supplement to the visual evaluation; also they are recorded in the farm and state breeding books.

Based on the relationship of the various measurements to each other, it is possible to establish indexes of the build of animals and the changes of the various points of the body with respect to age.

In addition, it is possible with the measurements of the slant length of the body and the girth of the chest behind the shoulder blades to determine the live weight.

Changes in build as related to the age of the animal. A characteristic of the development of the organism of an animal is the uneven growth of various organs and parts of the body during different periods of its life. During the embryonic period the bones of the extremities grow most rapidly. Therefore, the newly born calves, when compared with adult animals, have relatively longer legs, a short and narrow body, and a short broad head.

During the post-embryonic period of growth of the animals, the length of their legs increases relatively little; the size of the body, both in length and width, undergoes much more significant changes.

As a result of time of the growth of the various parts of the body, the type of build of animals changes noticeably with age. The body of the animal becomes relatively more elongated and the legs are in relation shorter. At the same time the size of the head also changes.

Changes of build of animals under the influence of the conditions of feeding and maintaining. The conditions under which animals are raised, especially the method of feeding the young, exert great influence on the formation and changes in the type of build of the animals.

When the conditions under which they are raised are good, the young grow rapidly and more quickly reach the final height and form of build which are characteristic of mature animals.

On the basis of his studies of the skeleton of sheep, Professor N. P. Chirvinskiy established that ordinary feeding from early life accelerates the formation of the different organs and tissues, and the period of development for the skeleton can be shortened by 1-1/2 to 2 times. When feeding is not sufficient, the normal relationship between the various parts of the body changes.

When the feeding is inadequate at a young age, the animals usually show a small growth and deficiencies in the build (girth behind the shoulder blades, weak skeleton, sagging back, etc.). When they are raised on liberal feeding norms, the animals mature more rapidly which is reflected in the forms of the build and in the development of the animals in width.

If the young of cattle are raised under poor conditions, the animals as adults will have underdeveloped body forms which they will retain throughout their whole lives.

Under normal conditions of feeding, an animal during the first year of life will grow relatively more quickly in height than in length and width. During the second year of life, the size of animal increases more rapidly in width and length than in height.

The type of feeding, i.e., the ratio of coarse, juicy and concentrated fodders (with respect to nutritiveness) in the ration influences the development of the internal organs and the forms of build of the animals.

Through the works of many Soviet scientific research institutions, it has been established that, when the young of cattle are fed a large amount of bulky (juicy and coarse) fodders, the animals have better developed digestive organs (larger weight and size of the stomach and intestinal tract) than do animals who have rations with a predominance of concentrated fodders.

Thus, the length of the thin section of the intestines increases by 2.5 to 3.5 meters and of the thick section by 0.5 to 1.3 meters. Animals which were fed bulky fodders while they were being raised have a relatively greater weight for the heart and kidneys, a more intensive exchange of substances and, when they mature, utilize the juicy and coarse fodders better.

At the same time, animals which were raised on an abundant diet of bulky fodders have a relatively longer body, are better developed in length in the rear third and have a deeper chest which is relatively not so wide.

The natural-geographic conditions (climate, relief, etc.) influence the formation of the type of build of cattle. However, the degree of their influence is dependent on and regulated by the farm conditions which are created for the animals.

The change in type of build of cattle as a result of planned breeding work with the creation of conditions which facilitate the development of certain qualities in animals and their retention by means of selection and culling can be observed in the Dutch breed. The old variety of cattle of this breed had clearly identifiable characteristics of dairy cattle. Modern Dutch cattle and also the East Friesian cattle, according to their type of build, can be listed with dairy-beef breeds.

At the present time, the Ukrainian Scientific Research Institute of Animal Husbandry is conducting work on changing the constitutional characteristics and on the developing of dairy traits in cattle of the Gray Ukrainian breed. Its aim is to obtain animals having beef-dairy productivity.

Color. By the color of animals we mean the coloring of the hair cover. The color is not related to the productivity of animals, but for a number of breeds it is a characteristic trait. The basic colors of cattle are black, white and red. Some breeds of cattle have very different combinations of these basic colors in addition to which they may occur in various degrees and to various intensities. The combination of black or red with white gives a mottled black or mottled red coat. Animals which have a mottled color have the red or black markings occurring in various fashions but primarily on the front and rear part of the body.

If the hairs of the basic colors are mixed and do not have a noticeable boundary between them, the animals can have a brown, gray or roan color.

White animals which do not have black or red markings on the head and ears are almost never encountered in our country among the breeds of cattle.

Conditions. By condition we mean the general state and degree of fatness of the cattle as related to their specific utilization. It is possible to identify stud, fattened, draught and exhibit conditions.

Animals in stud condition should be healthy, energetic and well fattened.

Animals in exhibit condition should be well fed, have a rounded build, have shiny hair; for breeding animals the requirement for exhibit and stud conditions are similar.

Animals in the fattened condition have a rounded form to the body, are not very mobile, are not energetic, and have a substantial layer of fat under their skin.

Animals in draught condition have clearly outlined muscles which are tough and without layers of fat. The degree of fatness is average or above average.

Determining the live weight is accomplished by weighing the animals in the morning on scales before feeding and drinking. In order to determine the weight more accurately, the animals are weighed two days in a row and the average weight is computed.

When no scales are available for determining the live weight, it is possible to measure the slant length of the body and the girth of the chest behind the shoulder blades and then, using these measures and a special table, the weight of the animal can be found (Table 5).

TABLE 5

Table for Determining Live Weight

Girth of the chest behind the shoulder blades (centimeters)	Oblique Length of the body (centimeters)										Live weight (in kilograms)									
	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
125	164	187	213	241	268	296	328	356	381	404	429	452	471	486	500	515	524	540	552	555
130	180	203	231	259	286	317	347	370	394	417	443	464	494	508	524	540	555	572	585	602
135	196	223	250	277	306	334	358	380	404	429	452	478	506	522	538	555	566	582	600	615
140	216	240	266	295	324	353	377	399	423	447	471	494	522	538	556	572	582	600	615	633
145	232	256	285	313	342	370	394	417	443	464	494	508	524	540	555	572	585	602	615	633
150	247	274	301	334	368	393	417	443	471	486	500	515	524	540	555	572	585	602	615	633
155	264	290	310	342	374	403	428	452	478	494	508	524	540	555	572	585	602	615	633	648
160	282	310	323	355	390	414	439	464	494	508	524	540	555	572	585	602	615	633	648	667
165	300	323	342	374	403	428	452	478	494	508	524	540	555	572	585	602	615	633	648	667
170	310	323	342	374	403	428	452	478	494	508	524	540	555	572	585	602	615	633	648	667
175	323	342	355	387	414	439	464	494	508	524	540	555	572	585	602	615	633	648	667	684
180	330	342	355	387	414	439	464	494	508	524	540	555	572	585	602	615	633	648	667	684
185	340	353	370	399	423	447	471	494	508	524	540	555	572	585	602	615	633	648	667	684
190	350	363	380	409	433	457	481	506	522	538	555	572	585	602	615	633	648	667	684	701
195	360	373	390	419	443	467	491	516	532	548	566	582	600	615	633	648	667	684	701	717
200	370	383	400	429	453	477	501	526	542	558	576	592	610	625	643	659	676	693	710	726
205	380	393	410	439	463	487	511	536	552	568	586	602	620	635	653	669	686	703	720	736
210	390	403	420	449	473	497	521	546	562	578	596	612	630	645	663	679	696	713	730	746
215	400	413	430	459	483	507	531	556	572	588	606	622	640	655	673	689	706	723	740	756
220	410	423	440	469	493	517	541	566	582	598	616	632	650	665	683	699	716	733	750	766
225	420	433	450	479	503	527	551	576	592	608	626	642	660	675	693	709	726	743	760	776
230	430	443	460	489	513	537	561	586	602	618	636	652	670	685	703	719	736	753	770	786

Determining age. The age of an animal is determined from the record of its birth which is kept at the farm. In the absence of such data, the age of cattle can be determined approximately by the horns and by the condition of the dental system (Figure 18).

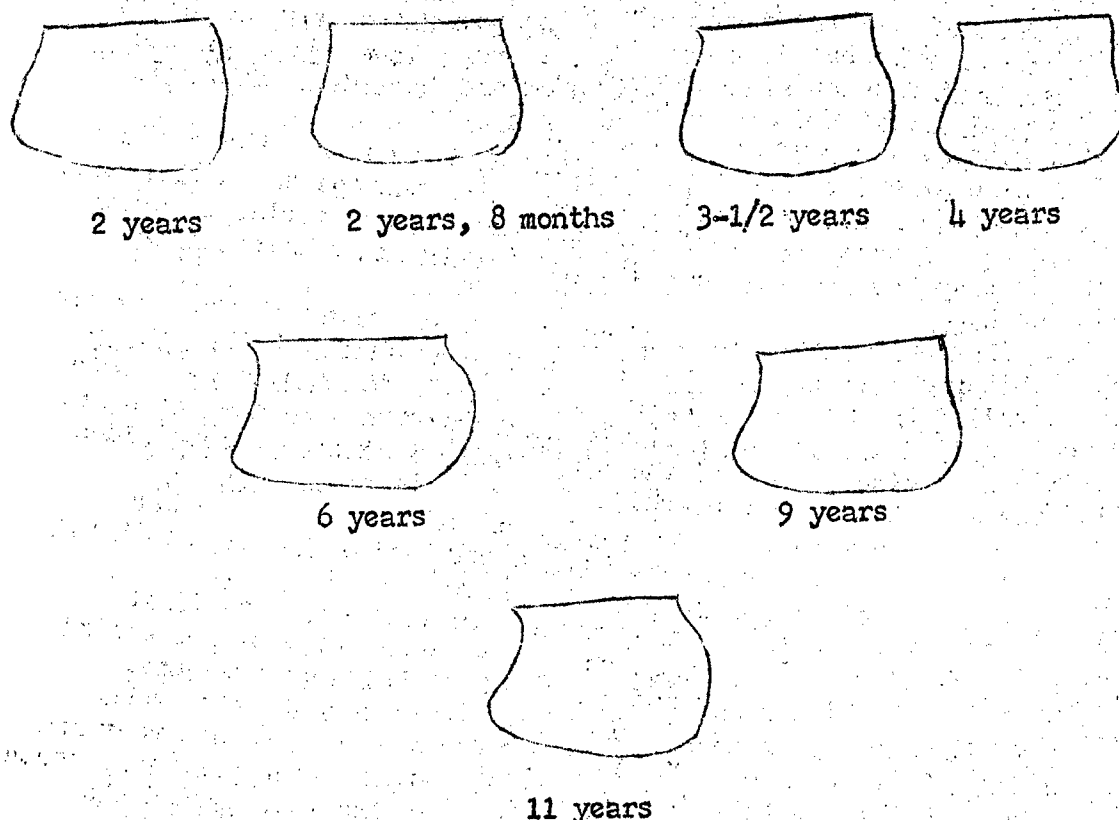


Figure 18. Change of the dental system of cattle according to age.

In determining the age of calves by their horns, the length of the horns is registered. Two-month old calves have horns 1 centimeter long. After this the horns grow about 1 centimeter per month until the age of 20 months. After the age of 20 months, the horns grow very slowly; therefore, it is impossible from this time on to establish the age of an animal. The length of the horns of cattle is measured along the external, long curvature from the beginning to the end.

The age of cows is determined by the number of rings on their horns after each calving. The appearance of the rings is related to the slower growth of the horns during the period of pregnancy as a consequence of which the ring depression is formed. The number of rings on the horns corresponds to the number of calvings. If the cow did not

calve during a given year, the distance between rings increases almost double which must be kept in mind when determining the age of the cows.

As the animal grows and develops, its dental system changes; therefore, in determining the age of cattle one can devote attention to the condition of the dental system as follows:

1) to the appearance and abrasion of the milk teeth; 2) to the replacement of the milk teeth by permanent teeth; 3) to the abrasion and change of form of the abraded surface of the permanent incisors.

An adult animal has 32 teeth. There are 8 incisors on the lower jaw and six molars on each side of the upper and lower jaw. On the upper jaw in place of the incisors there is a cylindrical thickening formed by the horny layer of the epithelium.

In view of the difficulty in examining the molars, their changes are not considered when attempting to establish the age of cattle. All the teeth, with the exception of the rear molars, are replaced; prior to the change they have the so-called milk teeth and afterwards the permanent teeth.

The milk teeth with their clearly evident collar at the base are noticeably whiter than the permanent teeth. The first middle pair of incisors is called the biters [Zatsepyl]; along side them on both sides are two teeth called the inner middle incisors; the next two teeth are the outer middle incisors; and the two extreme incisors on both sides are called the edge teeth [okraykil].

Calves are born with 2 to 3 pairs of milk teeth; the other incisors appear by the 14th to 20th day after birth. By one month all three pairs of first molars (pre-molars) have come through.

At the age of three to four months the calf cuts its first permanent pair of molars. By twelve months a good half of the dental surface containing the biters and inner middle incisors are gone.

At the age of one year to one year and two months the second pair of molars is cut. From one year and eight months to one year and ten months the first biters fall out; in their place the permanent teeth appear and are fully grown in by two years. During this period the third pair of permanent molars is acquired.

At the age of two years to two years and two months the first and second milk molars (pre-molars) fall out and are replaced by permanent teeth. At the age of two years and six months the inner middle milk incisors fall out and are replaced by permanent teeth which are fully grown by three years. The last milk molars are replaced by permanent molars. At three years to three years and three months the outer middle incisors fall out and are replaced by permanent teeth.

From three years and ten months to four years the milk edge teeth are exchanged for permanent teeth which stop growing by four years and six months.

When the permanent incisors appear, the abrasion of their enamel from the inner side of their upper part begins. By six years the contact surfaces of the biters and the inner middle teeth have been abraded to half.

By eight years the contact surface of the biters acquires a tetragonal form and the edge teeth and the outer middle teeth have their surfaces abraded to half.

By nine years the tetragonal form appears on the contact surface of the inner and outer middle teeth.

At ten years the incisors are shortened; the enamel on the edge teeth is being abraded.

At eleven years of age the surface which is being abraded has the appearance of a circle or a reverse oval. There are substantial gaps between the incisors. By 14 to 15 years the incisors have been almost completely eroded and only stumps of the teeth remain.

The time when the milk teeth are replaced by permanent teeth, their erosion and the appearance of this or that eroded surface to a considerable degree depends on the rate of maturing of the animals of the given breed, the type and quantity of their fodder, their preparation and their quality. Rapidly maturing cattle acquire their original and permanent teeth more quickly than do the more slowly maturing cattle.

CHAPTER IV

BASIC TYPES OF PRODUCTIVITY OF CATTLE

The basic products obtained from cattle are milk and meat. When the animals are slaughtered, besides meat, a number of raw materials for industry are obtained, including the hides for leather. Cattle supply a most valuable heavy raw material which is used in making shoes and other leather goods.

Milk is a most valuable food product because it contains in easily assimilated form all the nutritive substances which are essential for man's organism.

Highly productive cows furnish large quantities of milk and butterfat. For just one 300-day lactation the cow "Obedient II" of the Kostroma breed gave 14,115 kilograms of milk or 553 kilograms of butterfat; the cow "Sketch" of the same breed had a yield of 10,534 kilograms of milk or 492 kilograms of butterfat.

In producing milk and meat, cattle to a considerable extent utilize the least expensive juicy and rough fodders and also the waste products from the food industry.

Milk Productivity

The formation of milk takes place in the tissues of the milk gland and it is constituted from substances which come with the blood.

By the works of Academician I. P. Pavlov and his students, it has been established that the formation of milk in the milk gland of a cow and the milk section depend on the nervous system of the animal and are regulated by it.

In order to discover the role of the nervous system in the process of milk formation in goats, M. M. Mironov conducted an experiment in which he cut the nerves on the milk gland on one side of the udder and left the nerves on the other side untouched. The yield of milk from the side where he had operated was 30 to 40% less than from the other half of the udder.

The intensity of milk formation is not constant. The most intense period of milk formation is when the udder is first being filled; then gradually the process of milk formation slows down, but then it becomes more intense again during milking. Immediately after milking there is a period of rest for the milk gland and then the process of milk formation is renewed.

The milk productivity of cows depends on the conditions of raising, feeding, care and housing, the breed, the age of the cow, the age at the first calving and period of lactation, the state of fattening, the length of the non-milking period, the length of the period from calving to servicing, individual characteristics, and also on the correctness and sanitation of milking procedures.

Usually under farm conditions it is very difficult to establish the influence of each of these factors separately because it is possible that a whole series of factors can simultaneously exert various degrees on the milk productivity of cows. However, in order that the cows be milked properly, it is essential to know how the productivity of the animals changes depending on these various factors.

Feeding exerts decisive influence on the magnitude of the yield of cows. The experience of leading milkmaids shows that only by changing the conditions of feeding and housing, many kolkhozes and leading livestock raisers were able in the course of a year to raise the yield by 50 to 80%.

In 1956 on the kolkhoz "10 richchya Zhovtnya" of Cheringov Oblast the average yield of milk for herd increased by 1,135 kilograms during one year. The kolkhoz "Krasnyy putilovets" of Ryazan Oblast obtained an average of 4,721 kilograms of milk in 1956 or 1,682 kilograms of milk more per cow than in 1955.

The change in the average yield of milk for a herd on the state breeding farm "Karavayevo" as related to the level of feeding is portrayed in Figure 19 (by Professor A. V. Shaumyan).

Along with the overall quantity of fodder which the animals receive, also of great importance are the quality and variety of the fodder in order that the animals have a balanced diet especially insofar as proteins are concerned.

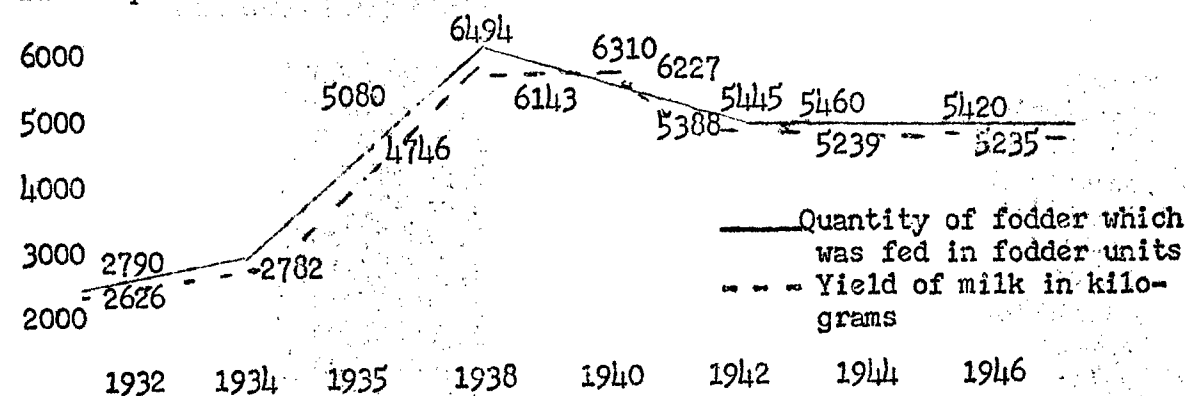


Figure 19. Change in average yield of cows with respect to the level of feeding on the State breeding farm "Karavayevo."

Supplying the needs of the animals for minerals and water has a positive effect on the amount of the yield.

Keeping the animals in cattle yards with a good drain system and with a ventilation system providing a constant change of air for the premises and having a ratio of lighted area of from 1:10 to 1:12 are conducive to an increase of milk productivity for the cows.

It is essential to turn the cows out each day for exercise during the winter period, being certain that they cover a distance of 2 to 3 kilometers at a slow pace. Such exercise, which creates an effect on

the physiological processes in the organism, acts favorably on the milk productivity of the animals. It is especially important that the animals spend time in the open on sunny days because vitamin D is formed in the organism of the animal as a result of the action of the sun's rays.

Regular cleaning of the animal, care of the skin and udder, and also the exact observance of an accepted daily schedule while in the cattle yard help to raise the productivity of the animals.

A disruption of the daily routine and ill-timed feeding, watering and also milking disturb the cows and, as a result, the process of milk formation is slowed and the yield of the cows is lowered.

The milk productivity of cows is related to the characteristics of their breed. Dairy and dairy-meat cows when well-fed and well-kept have higher yields and are more responsive during milking than are cows of beef-producing breeds.

In Table 6 there are given the average yields of cows of a number of breeds (according to the State Breed Book).

TABLE 6

Average Yields of Cows According to the
Data of the State Breed Book

Breed	Yield (in kilograms)
Kostroma	3,900-5,000
East Friesian	3,700-4,200
Shvitskaya	3,100-4,000
Kholmogorsk	3,000-4,000
Simmental ¹	3,100-3,700
Aulieatinsk	2,700-3,500
Yaroslav	2,600-3,200
Brown Latvian	3,100-3,900
Bestuzhev	2,900-3,300
Tagil ¹	2,700-3,500
Red Steppe	2,800-3,700
Red Humped	2,500-2,700

These average figures for different breeds are not constant. Among the breeds of dairy and dairy-meat cattle there are a great many cows with high yields which points to the possibility of milking cows from each breed.

Thus, with the Kostroma breed, the yields of the cows can exceed 14,000 kilograms of milk for a 300-day lactation; with the Lebedinsk, Red Steppe, Simmental¹ and East Friesian breeds the yield can surpass 12,000 kilograms; and for the Yaroslav and Tagil breeds the figure is more than 9,000 kilograms of milk.

The attributes and qualitative characteristics of animals are transmitted under certain conditions to their progeny. Therefore the basic role in building a herd on a kolkhos or sovkhoz is the selection and retention for breeding of the calves from the most productive parents.

Zootechnician S. I. Shteyman, a Hero of Socialist Labor, while working with the herd of the breeding sovkhoz "Karavayevo," used extensively the bulls Bogatyr⁸, Shango, Artist and others which themselves had been the offspring of highly productive cows and which sired highly productive daughters. According to the data of the breeding sovkhoz "Karavayevo," the daughters of record cows when they were raised properly tended to have somewhat higher yields than did the offspring of other cows.

Milk productivity of cows is intimately related both to the age and development of the animals at the time their first calving and to the number of lactations.

Premature servicing of heifers and their early calving have a negative effect on the development of the organism of the animal and on its productivity. Servicing of insufficiently developed heifers results in lower yields of milk for at least the first three lactations and sometimes for all the remaining lactations.

Therefore, when heifers are designated for servicing, it is essential that they be well developed and possess a live weight equal to 60 to 65% of the live weight of a grown cow of the same breed. The first calving of cows should be at an age of 27 to 30 months. If such is the case, the period of usefulness of the animals is extended; they produce more calves; and they yield a greater amount of milk for the entire period that they are on the farm. Servicing of well developed heifers does not affect their productivity neither after their first calving nor in succeeding years.

TABLE 7

Changes in the Yield of Milk and the Live Weight of Cows
for the First Lactation as Related to the Time of Calving
(according to Ye. A. Novikov)

Age of the cows at the time of the first calving (in months)	Average yield of milk per lactation (in kilograms)	Average butterfat content in the milk	Average live weight (kilograms)
25-27	2890	3.48	455
28-30	3419	3.49	487
31-33	3357	3.56	468
34-36	4026	3.42	506
37-42	3438	3.54	520

Cows which calved at an age of 25 to 30 months produced 12,940 kilograms of milk in seven years while those cows which calved at an age of 31 to 36 months yielded 11,605 kilograms of milk for the same period.

Late servicing of the heifers, i.e., after the age of 24 months, not only does not contribute to a future increase in yield, but can also lead to the appearance of barrenness because a greater percentage of reservicings is required with older heifers than with those aged from 18 to 20 months. Postponing the time of the first servicing has a negative effect on the building of the herd, increases the expenditures required for keeping the young, and decreases the amount of milk which it is possible to obtain from a cow for a number of years.

The experience of farms in Denmark, the German Democratic Republic, England and other countries also confirms the advisability of having the first servicing of heifers occur at an age of 16 to 22 months, depending on the breed characteristics and the development of the animals.

Age. Yields of cows vary with age. After their first and second calvings, cows usually have relatively lower yields than they do after their third and subsequent calvings. Under ordinary farm conditions the yields of the cows increase until about the fifth to seventh lactation after which there is a slight decline in milk productivity. This condition which is reflected in the average data from the farms is not unchangeable. Each animal has its own individual characteristics as a result of which many animals, where they are well-fed and well-kept, have high yields not only after five to seven calvings but also at the tenth and eleventh calvings. The experience in milking cows at the breeding sovkhos "Karavayevo," at the Vologod Livestock Testing Station, and on other farms shows that where the animals are raised and kept properly, it is possible after the first calving to obtain yields of 5,000 to 6,000 kilograms of milk. On many farms record yields are obtained not during just one lactation but rather during several lactations as is apparent from Table 8.

Thus, if the animals are well-kept and properly utilized, they retain their ability to give high yields until 12 to 18 years of age. Some cows such as Opytnitsa, Belka and others on the breeding sovkhos "Karavayevo" at an age of 18 years gave 20 to 22 kilograms of milk per day after calving.

Live weight. Cows with a relatively higher live weight than others of the same breed usually have higher productivity. This is explained by the fact that animals which are large and have a heavy live weight and a strong skeleton not only have well developed musculature and a well developed chest cavity but also they are better developed with respect to the organs connected with blood formation, respiration and digestion; this makes it possible for them to assimilate a larger quantity of fodder. Cows which have a strong build and are well developed can withstand more strain on their organism in producing milk. Cows which produce high yields of milk have all their vital

TABLE 8

Name of the cow	Lactation									
	1	2	3	4	5	6	7	8	9	10
Keta	4,999	7,050	8,282	7,727	9,774	7,974	9,525	10,490	9,766	12,003
Metel	6,470	7,310	9,013	8,523	8,951	8,224	8,284	8,588	7,704	5,116
Karina	3,976	6,040	6,901	6,375	6,696	6,218	6,229	7,010	6,016	7,181
Krasha I	2,669	3,626	5,194	6,402	7,242	6,111	7,340	8,039	7,278	6,135

processes, especially oxidation, taking place at a more intensive rate than is the case with cows which have lower yields. However, the maximum live weight of cows cannot serve as an index of their possible productivity. Cows which for their breed have a very high live weight generally have relatively moderate milk productivity. At the same time there are cows with a low live weight which have high yields. Therefore the best indicator of the relationship between the live weight of a cow and its milk productivity is the quantity of milk which is obtained from a cow for 300 days of lactation or per year for each 100 kilograms (or 1 kilogram) of its live weight. This index which is called the level of productivity makes it possible to judge as to the utilization of fodder and the strain on the organism of the animal during the period of lactation.

The quantity of milk obtained per 100 kilograms of live weight from the record cows of the All-Union Agricultural Exhibit is shown in Table 9 (according to A. P. Yurmaliat).

TABLE 9

Name of the cow	Breed	Live weight (in kilograms)	Yield for 300 days of lactation (kilograms)	Quantity of milk for 300 days of lactation per 100 kilograms of live weight (in kilograms)	Expenditure of fodder units per 1 kilogram of milk
Zozulya	Simmental ⁸	655	12,761	1,952	0.75
Medvedka	Simmental ⁸	800	7,534	942	0.97
Vaza	Black-spotted cattle	643	9,071	1,379	0.76
Eskadra	Cross between Tagil ¹ and East Friesian cattle	800	10,130	1,266	0.82
Fara	Istobensk	490	8,366	1,707	0.71

In selecting and evaluating cows it is essential to pay attention to their development and live weight.

The best development of an animal of a given breed can be established from the quantity of milk obtained per 100 kilograms of live weight when the animal has been well fed and well kept.

The change in the average weight and in the yield of cows of the breeding sovkhos "Karavayevo" is presented in the following table.

TABLE 10

Year	Average yield		Average light weight		Milk obtained per 100 kilograms of live weight of the cows (in kilograms)
	Kilograms	Percent	Kilograms	Percent	
1932	1,940	100	439	100	441
1940	6,310	325	649	148	972
1952	6,352	327	630	144	1,008

Along with the increase in the average yield of the cows of the breeding sovkhos "Karavayevo," there was also an increase in the live weight of the animals and in the yield of milk per 100 kilograms of live weight of the animals.

Lactation. The total amount of milk obtained from a cow during a lactation period depends on the degree to which the yield decreases from month to month; this can be shown graphically as a lactation curve.

When the cows are fed uniformly and properly, their yield increases during the first two months after calving and then it gradually decreases.

Cows which maintain a level lactation curve for several months, i.e., which have high yields not only in the first two months of lactation but also in the succeeding months, give a larger quantity of milk for the lactation period than do cows which have the same high daily yield but have a sharply decreased yield beginning three to five months after calving as shown in Figure 20.

The level nature of the lactation curve shows the capability of the cow to give much milk. When the animal is fed a balanced diet, this individual trait is quite constant and does not depend on the age of the cow. Therefore, when other characteristics are equal, it is important to keep those cows which have the most level lactation curve.

Preparation of the cows for calving. The extent of the milk productivity of cows depends also on their readiness for calving and on their timely handling. At the moment of calving the cows should be of medium fatness because in a number of cases where a cow has been highly fattened the calving has been made difficult as a result of a weakening of the labor pains and contractions. Highly fattened animals have displayed an atony of the womb, i.e., a weakening of its contractions as a consequence of which the afterbirth is delayed.

The length of the non-milking period is established depending on the general condition and fatness of the animal. The best time to end the regular routine for the cows and prepare them for calving is from 45 to 60 days before calving. For cows which are below the average

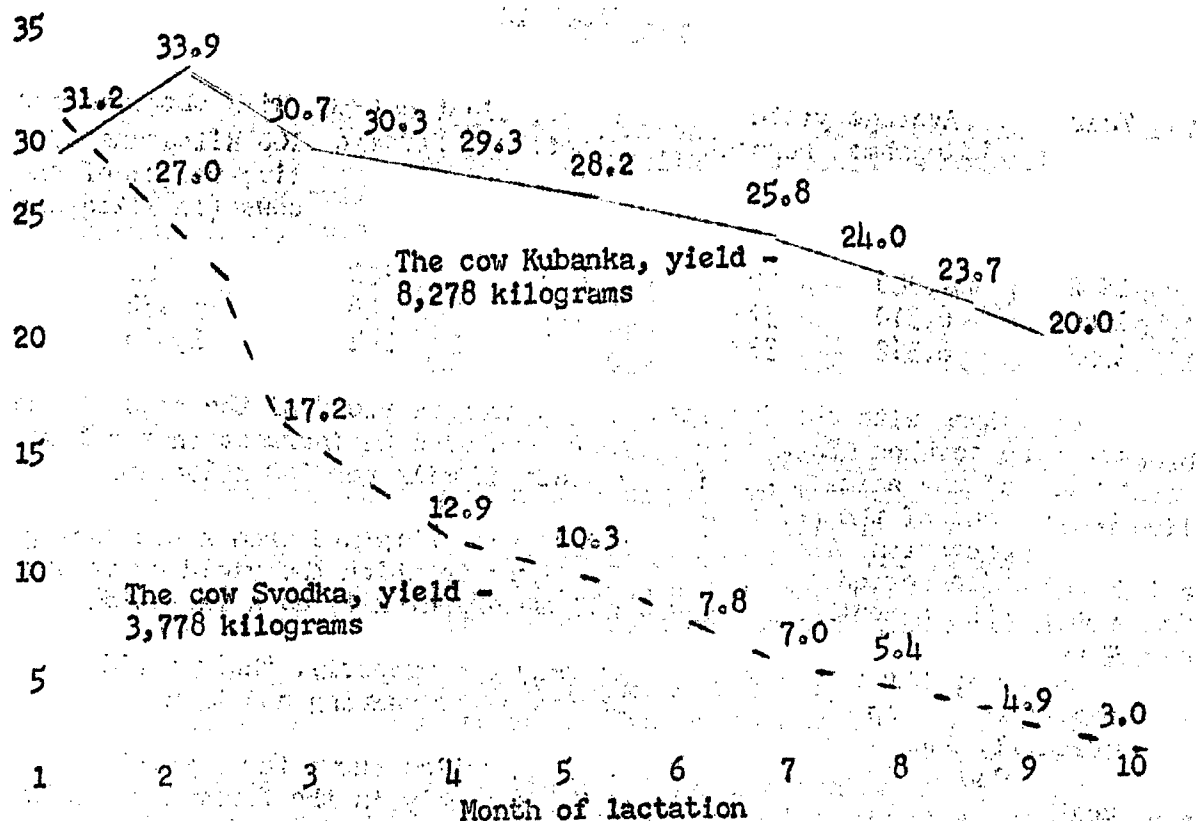


Figure 20. Average daily yield of the cows Kubanka and Svodka according to the month of lactation.

weight and for those cows which have calved for the first time and have had a high yield, the non-milking period is increased to 70 days. Curtailment of the non-milking period for below weight cows or increasing it to 100 days results in lower yields in the current or succeeding lactation.

The time for servicing cows after calving also has a bearing on the extent of the milk productivity because the onset of pregnancy and the growth of the embryo affect the magnitude of the yield. To increase the length of the period from calving till servicing increases somewhat the quantity of milk obtained during that lactation; however, it has unfavorable effects on general productivity: the number of calvings for the whole period during which the animal is used is decreased; and the total amount of milk obtained from the cow for the entire period during which it is used is less. In addition, if the period of heat is allowed to pass a number of times without interruption, the cow may become barren.

The best time for covering cows under normal conditions is during the first to second month after calving.

The time of calving affects the size of the yield only when the animals are fed unevenly during the different seasons of the year. If the animal is fed evenly and obtains all the required nutritive substances, the time (season) of calving has hardly any effect on the productivity of the cow.

Milking. Depending on the specific conditions of the farm and the size of the yield, either two-stage or three-stage milking may be employed. Frequent milking disturbs the cows, tires the nervous system and affects the functioning of the milk gland negatively because the animals are in need of rest while digesting their food.

The employment of two-stage milking of cows with an annual yield of up to 2,500 to 3,000 kilograms of milk, as the experience of a number of kolkhozes and sovkhozes and also of farms in foreign countries has shown, does not lower the yields of milk. At the same time, with proper organization of work on livestock farms, two-stage milking raises labor productivity and lowers the expenditure of worker's time for the production of one centner of milk product.

For the first one to two months after calving, those cows with the indicated yield are milked three times a day, and then they are milked twice a day.

When cows which have had their first calf are in the first half of their lactation, they also are milked three times. Cows with yields of more than 3,000 kilograms are milked four times a day for the first 20 to 30 days after calving; then they are milked three times a day until the halfway point of the lactation period at which time twice daily milking is instituted.

In establishing the frequency of milking, it is necessary to take into account the condition and development of the milk gland (the volume of the udder).

The intervals between milkings of cows with well-developed udders and which give high yields can be longer; therefore, it is possible to transfer them to a twice daily schedule of milking sooner after calving than is possible with cows which have the same daily yield but which have a weakly developed milk gland.

Factors influencing the size of the milk yield are the correctness of the milking techniques, cleanliness in milking and the use of massage on the udder at the beginning and the end of the milking.

One of the important elements of the organization of the work in a cattle yard is the strict observance of the daily routine and of working procedures.

On leading farms, not only is the established daily routine observed strictly, but the same is true of the sequence of caring for, feeding and milking the cows. The animals very quickly become accustomed to such a routine and are less disturbed; a disruption of an established work routine in a cattle yard causes a lowering of the yield.

Daily yields. The highest yield for a single day cannot serve as an index of the productivity of an animal for a lactation period, although it does reflect the ability of the animal to utilize the fodder which it

has received in order to produce a high yield. If the animal is fed properly, the highest yield for a single day will occur in the second month of lactation although it sometimes will also be at the end of the first or the beginning of the third month. The highest daily yield from the cow Vena of the Yaroslav breed was 82.15 kilograms of milk which was obtained on the fortieth day of lactation. However, the cow Vena gave only 8,000 kilograms of milk for the entire lactation.

With the highest daily yields of 50 to 60 kilograms of milk and a uniform lowering of the yields throughout the course of the lactation, as the experience of the breeding sovkhov "Karavayevo" has shown, the yields of the cows amount to 8,000 to 12,000 kilograms of milk.

Lifelong yields. The ability of cows to give high yields for not one but for a series of lactations is very important because high lifelong yields can be obtained only from animals which are completely healthy, which have strong constitutions, and which have well developed internal organs. Such animals utilize fodder better and also give a better return on it.

In this respect, the breeding sovkhov "Karavayevo" achieved considerable success based on a definite system of raising the young and providing for the adult animals. The breeding sovkhov obtained between 100 and 120.5 thousand kilograms of milk from ten cows over the entire period of their utilization; of these the cows Krasa and Opytnitsa were in the herd until the age of 20 to 22 years. Cows of other breeds also have high yields for 5 to 7 lactations as can be seen from Table 11.

TABLE 11

Name of the cow	Breed	Number of lactations	Yield for the indicated lactations (in kilograms)	Average yield for one lactation (in kilograms)
Groza	Kostroma	5	63,852	12,770
Astarta	Kholmogorski	7	55,246	7,892
Liya	Bestuzhev	7	45,984	6,569
Selektsiyz	East Friesian	6	44,791	7,465
Vakhanka	Red Tambov	6	39,785	6,631
Moroshka	Red Steppe	7	63,970	9,138

There are also cows abroad which have been recorded as having yielded over 100 thousand kilograms of milk for the total period of their utilization. In the USA the greatest lifelong yield of a cow is 113 thousand kilograms of milk; in England the figure is 121.2 thousand kilograms.

Planning Yields

In order to accomplish the proper milking of cows, a plan for obtaining milk from the individual cows with respect to the months of the year is prepared at the beginning of the farm year. In planning the yields of milk one takes into account all the possibilities available to the farm for increasing the production of milk per 100 hectares of agricultural land.

At the basis of the planning is the change of the yield of milk by the cows throughout the lactation. When the animals are well-fed and well-kept, the yields from the cows after calving increase until the second month and then gradually decline.

The plan for obtaining milk from the cows which are handled by one milkmaid or for the farm according to the months of the year is established while taking into account the time when the cow last calved, the periods for servicing and the age and breed characteristics of the animals. In addition, in preparing the plan for obtaining milk, it is necessary to know the feeding conditions and the productivity of the cows for the previous year and also their yield by month for the preceding lactation. The plan for milking takes into account the conditions for feeding and keeping cattle during the planned year as well as the qualifications of the milkmaids who will be handling the herd.

In calculating the planned yield for each month of lactation for cows which have different levels of productivity, it is possible to utilize the table which has been worked out by the All-Union Institute of Animal Husbandry (see Table 12).

This table was compiled while taking into account the change in yields according to the month of lactation while maintaining a proper balanced diet and makes it possible to determine approximate yields for cows for a given month of lactation or for 300 days.

Where cows have had record yields of milk, the change in yield of milk according to the month of lactation may not coincide with the data in this table. Therefore, in planning yields, one should consider the characteristics of the various animals and their ability to maintain high yields throughout the period of lactation.

If complete data on the yields for the previous year is not available or if the cows were not fed uniformly during the preceding lactation, the yield of a cow is calculated on the basis of the average daily yield for the month during which feeding was the best. In this case, one establishes during which month of lactation the highest average daily yield was obtained. According to this information and using Table 12, the possible yield for a year is determined. Thus, if a cow calved in January, had its greatest daily yield of 13.6 kilograms in April, i.e., in the fourth month of lactation, upon finding the closest number to the indicated daily yield (13.8 kilograms) for the same month of lactation in the table, one determines the possible yield for the cow (3,600 kilograms).

TABLE 12

Month of lactation										Yield for 300 milking days (in kilograms)
1	2	3	4	5	6	7	8	9	10	days of lactation
Average daily yields according to the month of lactation										
7.6	7.6	7.6	6.4	5.9	5.4	4.8	4.0	3.0	1.7	1,600
8.4	8.4	7.8	7.2	6.6	6.0	5.4	4.5	3.6	2.2	1,800
9.3	9.3	8.6	7.9	7.2	6.6	5.9	5.1	4.1	2.7	2,000
10.1	10.1	9.4	8.6	7.7	7.3	6.5	5.6	4.6	3.2	2,200
11.0	11.0	10.2	9.4	8.6	7.9	7.1	6.2	5.1	3.6	2,400
11.8	11.8	11.0	10.1	9.3	8.5	7.7	6.7	5.6	4.1	2,600
12.7	12.7	11.8	10.8	10.0	9.2	8.3	7.3	6.1	4.6	2,800
13.5	13.5	12.5	11.6	10.7	9.8	8.9	7.8	6.6	5.1	3,000
14.4	14.4	13.3	12.3	11.3	10.4	9.5	8.4	7.1	5.5	3,200
15.2	15.2	14.1	13.1	12.0	11.1	10.1	8.9	7.6	6.0	3,400
16.0	16.0	14.9	13.8	12.7	11.7	10.7	9.5	8.2	6.5	3,600
16.9	16.9	15.7	14.5	13.4	12.3	11.3	10.0	8.7	6.9	3,800
17.8	17.8	16.5	15.3	14.1	13.0	11.8	10.6	9.2	7.4	4,000
18.6	18.6	17.3	16.0	14.8	13.6	12.4	11.1	9.7	7.9	4,200
19.5	19.5	18.1	16.7	15.4	14.2	13.0	11.7	10.2	8.4	4,400
20.3	20.3	18.9	17.5	16.1	14.9	13.6	12.2	10.7	8.9	4,600
21.1	21.1	19.7	18.2	16.8	15.5	14.2	12.8	11.2	9.3	4,800
22.0	22.0	20.4	18.9	17.5	16.2	14.8	13.3	11.7	9.8	5,000
22.8	22.8	21.2	19.7	18.2	16.8	15.4	13.9	12.2	10.3	5,200
23.7	23.7	22.0	20.4	18.8	17.4	16.0	14.4	12.7	10.8	5,400
24.5	24.5	22.8	21.2	19.5	18.1	16.6	15.0	13.3	11.2	5,600
25.4	25.4	23.6	21.9	20.2	18.7	17.2	15.5	13.8	11.7	5,800
26.2	26.2	24.4	22.6	20.9	19.3	17.8	16.1	14.3	12.2	6,000
28.4	28.4	26.4	24.4	22.6	20.9	19.2	17.4	15.6	13.4	6,500
30.5	30.5	28.3	26.3	24.3	22.5	20.7	18.8	16.8	14.6	7,000
32.6	32.6	30.3	28.1	26.0	24.1	22.2	20.2	18.1	15.8	7,500
34.7	34.7	32.3	29.9	27.7	25.7	23.7	21.6	19.4	16.9	8,000

Such calculations have a relative character because they show a higher yield than is actually the case when the cattle are not fed uniformly.

Inasmuch as the milk productivity of cows changes with age, in planning the yield for the next year, appropriate corrections are made. Such corrective coefficients are established on the basis of the actual relationship of the yield of cows of different lactations for the given farm for the past year; the highest yield of cows of one age group is taken as 100%; most often such a yield comes between the fifth and seventh lactations. The yield of cows of other age groups is set as a percentage of the yield for the highest lactation. In planning the yield it is necessary to consider both the productivity of the cow for the past year and the possibility of an increased yield resulting from the age of the animal and better feeding conditions.

Based on the plan for obtaining milk from the individual cows, a plan is established for each milkmaid and for the farm as a whole.

Butterfat Content

The problem of raising the butterfat content is of great economic importance. To increase the content of fat in milk by only 0.1 grams for all the cows in our country would provide additional thousands of tons of butter because when one kilogram of butter is obtained from milk with high butterfat content, there is a requirement for less milk.

The butterfat content of milk depends on many factors: the breed and hereditary qualities of the animals, the conditions under which the animals are fed and kept, the care, the milking, and the period of lactation.

Some breeds of cattle tend to have high butterfat content; others have a relatively lower figure (Table 13).

TABLE 13

Content of Butterfat in Cow's Milk According
to the Data of the State Breed Book

Breed	Average	Variation
Red Humped	4.2-4.3	3.1-5.8
Tagel ²	4.1-4.2	3.1-5.4
Yaroslav	4.0-4.1	3.0-5.4
Brown Latvian	4.0-4.1	2.7-5.9
Bestuzhev	3.8-3.9	2.9-5.5
Simental ¹	3.7-3.9	2.9-5.5
Kostroma	3.8-3.9	3.1-5.0
Red Steppe	3.7-3.8	2.9-5.6
Aulieatin	3.7-3.8	2.9-5.5

TABLE 13 (continued)

Shvitskaya	3.6-3.7	2.9-5.8
Kholmogorsk	3.6-3.7	2.9-5.3
East Friesian	3.4-3.5	2.5-5.5

Note: The butterfat content of the milk is given in grams per 100 milliliters of milk.

A study of the problems of the butterfat content shows that the butterfat content of milk is one of the characteristics which are inherited and this may be from either the bull or the cow. According to the data of the first and second volumes of the State Breed Book for the Kostroma breed, it is shown that animals which come from cows which have had a butterfat content of 4.25 and higher had yields with a content of 3.99 to 4.50 grams of butterfat; where the cows had a butterfat content of 3.26 to 4.00 and the sires were the same bulls, the daughters had a butterfat content which varied from 3.24 to 4.03.

Insofar as the tendency to have high butterfat content is concerned, not only the parents of the given animal exert some influence but the same is true of the ancestors from the preceding generation, i.e., the mothers from the lines of both the father and mother. However, the influence of these ancestors is not so great as that of the immediate parents.

One of the basic ways of increasing the butterfat content is the systematic selection of animals in accordance with this characteristic and the use of bulls which come from parents who were noted for their tendency toward having high butterfat content.

As a result of the conduct of specially planned selection, it has been possible to increase the butterfat content not only on individual farms but also within certain breeds as a whole.

The average butterfat content for the herd on the kolkhoz "Red Collectivist" of Yaroslav Oblast increased during 17 years of work with the herd from 3.90 to 4.14 grams. At the same time the average yield for the herd of this kolkhoz increased from 2,300 kilograms to 4,568 kilograms of milk for the same period. The average butterfat content for the milk from cows of the Brown Latvian breed increased from 3.75 to 4.13 during 28 years of breeding work.

The average butterfat content for cows in the Netherlands increased from 3.25 to 3.65 grams during the period from 1907 to 1952. At the same time the yield increased from 2,300 to 3,750 kilograms of milk per cow. Also in Denmark positive results in raising the butterfat content of milk have been achieved through breeding work.

Work in raising the butterfat content gives positive results only when such measures as selection and the corresponding evaluation of the animals according to this principle are accompanied by a whole series of zootechnical measures so that the butterfat content depends

not only on the inherited characteristics of the animal but also on certain other conditions. The conditions of feeding and keeping the animals have an important role in changing the butterfat content of milk. The butterfat content of milk is raised when good hay, sugar beets, silage and protein-bearing fodders are introduced into the ration of cows. Uneven feeding and underfeeding of cows lower not only the yield but also the butterfat content of the milk. Thus, if the cows are underfed, the butterfat content of milk is lowered by 0.2 to 0.4. If the fodder rations are deficient in protein, not only is the butterfat content affected, but also the percentage composition of the other components of milk is lowered. A deficiency of minerals in the ration also has a negative effect on the quality of the milk. The addition of calcium and phosphorus when they are deficient in the ration helps to raise the butterfat content of the milk.

The proper preparation of the cows for calving, by insuring that the animals are well fed before calving, helps in obtaining milk which, during the succeeding lactation, will have a higher butterfat content.

High temperature or high humidity in the air during the summer or winter in the cattle yard has a negative effect on the physiological condition of the animals and on the content of butterfat in the milk. The most favorable temperature for keeping animals in a cattle yard is from 4 to 6 degrees [Centigrade].

A positive influence on the butterfat content is realized by taking the cows for daily walks of 2 to 3 kilometers at a slow pace when there is good weather in the winter. Such walks improve the general condition of the animal and vitalize the functioning of the organism as a whole. The resistance of the organism is increased; the feeds are assimilated better; the flow of blood is strengthened; and the nature of the exchange of substances is changed which in turn affects the butterfat content.

The correctness and the cleanliness of milking and the use of massage on the udder are of especial importance in raising the butterfat content of milk.

The first milk obtained at the beginning of milking contains the least amount of butterfat -- 1.0 to 2.0 grams; the next milk obtained has a higher butterfat content; while the milk which is obtained at the end of the milking contains 6 to 8 grams or more of butterfat.

Changes in the butterfat content of milk as the yield increases and as the animal grows older depend on the individual characteristics of the animal and this varies sharply with different cows. The existing opinion that young cows have the highest butterfat content for their milk and that the butterfat content decreases as the animals grow older is not adequately proven.

As their yield increases, some animals experience a lowering of the butterfat content while with others it remains about the same and with still others it increases slightly.

According to the data of Professor A. A. Solov'yev, 16 to 17% of cows of East Friesian and Ukrainian Whitehead breeds had higher butterfat content as their yield increased, while with 21 to 22% the butterfat content remained about the same while the yield of milk increased.

When proper feeding is employed and those zootechnical measures which have a positive effect on milk productivity and butterfat content are observed, the leading livestock raisers obtain high yields with a high butterfat content in their milk.

K. M. Loshchenova, a Hero of Socialist Labor and a milkmaid on the kolkhos imeni Stalin of Lukhovitskiy Rayon of Moscow Oblast, in two years increased the butterfat content of the milk from the cows of her group from an average of 3.55 to 3.89 and increased the yield by 6.5 kilograms.

Table 14 conveys a picture of the changes in yield and butterfat content for different cows.

The butterfat content changes throughout the course of a single lactation. The highest butterfat content in the milk occurs toward the end of the lactation.

At the beginning of lactation the butterfat content of the milk is usually the lowest. From 4 to 5 months after calving, the butterfat content of milk gradually increases with the figure during the fifth and sixth months being the approximate average for the whole lactation. The highest butterfat content occurs prior to the time milking is stopped.

In milking cows which have an even lactation curve, i.e., which have high yields during the fourth to seventh months of lactation, it is possible to obtain relatively more butterfat with a higher average butterfat content for the lactation.

The butterfat content of milk also changes throughout the course of the day. Milk which is obtained at the morning milking has a somewhat lower butterfat content than does milk which is obtained during the day or in the evening. The difference in the butterfat content between the morning and evening milkings is usually about 0.2 to 0.4 grams although with some animals it may reach 0.8 grams.

The intensity of the synthesis of fat during the night for a given unit of time is lower than during the day which is a result of the lowered metabolic rate during the night. The length of the intervals between milkings also influences the changeableness of the butterfat content of milk.

The butterfat content of milk is established through a monthly analysis which is conducted on the same days each month with samples being taken on two consecutive days.

In order to compute the average butterfat content of milk for 300 days or for a whole lactation, the butterfat index for each month is multiplied by the monthly yield; the resulting figures for all the months of lactation are added and the total is divided by the absolute yield for the same months of lactation.

TABLE 171

[illegible]

Beef Productivity

Beef comprises a substantial part of the meat balance of our country and is one of the most valuable foods for man. The nutritive value of beef is based on the proteins and fats which comprise the muscle and adipose tissue of the animal. The connecting tissue, gristle and bony tissue do not have high nutritive value, but in various ways they enter into the composition of the carcass: in slaughtering animals, depending on their fatness, the amount of muscle tissue together with the layers of connecting tissue and tendons varies from 51 to 63%; and the adipose tissue comprises from 2 to 14% of the weight of the carcass. Bony tissue amounts to about 20%.

The overall nutritiveness of meat is expressed in calories. The nutritive value of meat depends on a number of factors including how well the animals have been fed. The calorific value of meat varies from 1,200 calories for animals which have not been well-fed to 3,000 calories for animals which have been well-fed.

The meat of cattle is distinguished according to the age at time of slaughtering. When the animal is slaughtered at the age of 1-1/2 to 2 months, the meat is veal. When the animal is grown, it is beef.

TABLE 15

Chemical Composition of Meat as a Function of How Well
the Animal is Fed (in Percent)

Fatness	Protein	Fat	Water	Calorific value (in calories)
Fat	18.9	24.5	56.3	3,070
Medium	20.0	8.0	71.0	1,580
Thin	20.1	3.5	74.2	1,200

The meat qualities of animals change sharply depending on the breed to which the animals belong, their age, their fatness, the method of feeding them, their sex, and the conditions for feeding and keeping them. Beef cattle are characterized by rapid maturation and when slaughtered they give more high-quality meat than do dairy or dairy-beef cattle. The deposits of fat from the fattening of beef breeds occur not only under the skin and around the internal organs, but also within the muscle tissue; as a result of this, the fat deposits form layers between the muscles. Such meat has a higher calorific value and is considered to be best with respect to quality.

The best quality meat is obtained from the Kazakh Whitehead, Shorthorn, Hereford, Aberdeen-Angus, Kalmyk (Astrakhan) and Grey Ukrainian breeds and also from Kazakh cattle.

The proper raising of the young and feeding of the mature animals exert decisive influence in raising the meat productivity of cattle.

The experiments by Academician Ye. F. Liskun in establishing the meat qualities of Kalmyk and Kazakh cattle showed that, when the animals were raised on free feeding norms, the yield of meat at an age of 28 months was considerably higher than for castrated bulls of the same breed at an age of eight years (Table 16).

TABLE 16

Factor	Kalmyk Cattle		Kazakh Cattle	
	Test Group at an age of 28 months	Steers at an age of 8 years	Test Group at an age of 28 months	Steers at an age of 8 years
Live weight (in kilograms)	524.3	515.0	493.0	445.0
Output of meat and lard (in percent)	57.6	55.3	57.8	56.2
Weight of meat (in kilograms)	276.3	265.3	258.9	230.8
Weight of lard (in kilograms)	25.8	19.9	26.6	19.4
Weight of skin (in kilograms)	48.5	36.8	44.1	32.6

Intensive raising of the young followed by a fattening regime provide for the more rapid procurement of more and better quality meat.

The quality of the meat depends on the age of the animals. Young animals have meat which is more tender and moist than with adult animals. Old worn-out animals are put on a fattening regime because without preliminary fattening the meat obtained from them is of lower quality with less deposits of fat and a lower slaughtering weight.

The best quality meat is obtained by slaughtering young animals which have been raised on abundant diets and are slaughtered at an age of 18 to 20 months with a live weight of not less than 420 to 500 kilograms.

The castration of the animals has a positive effect on the quality of the meat. The meat of uncastrated bulls is coarser and more sinewy in comparison with the meat of castrated animals. Therefore, before bulls are fattened, they are first castrated. The best age to castrate bulls is from 6 to 10 months.

The factors in meat productivity of cattle are the slaughter weight and the slaughter yield and also the quality of the products obtained.

The slaughter weight is the weight of the carcass without the head, skin, extremities and internal organs. The ratio of the slaughter weight, expressed in percent, to the live weight of the animal before slaughtering is called the slaughter yield.

The breeds of beef and beef-dairy cattle and their cross-breeds are characterized by a higher slaughter yield after fattening which amounts to 65 to 70%. For dairy-beef cattle the figure is 60 to 62% and for dairy breeds it is 56%. On an average the slaughter yield for various breeds varies from 45 to 60% depending on how well the animal has been fed.

An indicator of the speed of maturation of the animals, i.e., their ability at an earlier age to achieve a high live weight through the depositing of muscle and adipose tissue with the least expenditure of fodder per unit of product, is the daily weight gain.

Depending on the degree of fatness of the animals which are to be slaughtered, the cows, oxen and calves which are older than three months are divided into three categories -- above average, average and below average. The fatness of the animals is determined by the development of the musculature, in particular on those parts of the body which give the best cuts of meat, from the form of the body, and from the deposits of subcutaneous fat. The deposits of fat are felt at the base of the tail, on the dewlap, in the area of the groin (round), on the sciatic protuberances, the tops of the hipbones and the last two ribs, and on castrated animals on the scrotum.

On animals of above average and average fatness, when feeling the above-mentioned places, one can detect the fat deposits and also any great mobility of the skin.

Animals of above average fatness have well-developed musculature, a form which is rounded, slightly noticeable shoulder blades, tops of hipbones and sciatic protuberances which are rounded, and thighs which are well covered; the awned appendices of the dorsal and lumbar vertebrae do not protrude; the deposits of subcutaneous fat can be felt well wherever there are deposits.

Animals of average fatness have musculature which is developed satisfactorily; the form of the body is somewhat sharp; the shoulder blades are obvious; the thighs are slightly drawn; the awned appendices of the dorsal and lumbar vertebrae, the sciatic protuberances and the tops of the hipbones protrude slightly. The deposits of subcutaneous fat can be felt at the base of the tail and on the sciatic protuberances; the groin, as with castrated bulls the scrotum, is lightly covered with fat.

Animals of below average fatness have unsatisfactorily developed musculature and an angular form; the shoulder blades are very apparent; the thigh is flat and drawn; the awned appendices of the dorsal and lumbar

vertebrae, the tops of the hipbones and the sciatic protuberances protrude noticeably; deposits of subcutaneous fat cannot be felt; with oxen the scrotum is drawn and wrinkled.

Animals which are of above average or average fatness give a greater yield at slaughtering than do animals of below average fatness.

In addition to meat, when cattle are slaughtered, they provide a hide, the quality of which depends on the age and live weight of the animal, the breed and the sex. Large, heavy, well-fattened animals provide a so-called heavy hide from which the soles of shoes are made. The weight of the hide, depending on the above-mentioned qualities and characteristics of the slaughtered animals, varies between 6 to 9% of the live weight of the animal. Heavy hides would be the hides of bulls with a weight of not less than 25 kilograms.

CHAPTER V

BREEDS OF CATTLE

Division of Breeds by Districts

The division (location) of breeds of cattle by districts throughout the various zones of the USSR has great economic importance and is one of the basic measures for improving the quality of cattle.

In the division of breeds of cattle by districts there is the aim of increasing the output of the products of livestock raising (milk, butter, cheese, meat, leather), of enlarging the reproduction of high quality pedigree cattle, and of raising the breeds more rationally while taking into account the best utilization of the natural and economic conditions and characteristics of the various regions.

Division by districts makes it possible to conduct planned zootechnical measures on the kolkhozes and sovkhozes in order to improve local cattle of low productivity. Such measures are intended to be implemented over a long period of time and are to cover large numbers of cattle. At the same time, the planned location of the breeds facilitates the conduct of measures to improve the quality of local unproductive cattle both at a more rapid tempo and in a definite direction.

Under the conditions of a capitalistic system of operating a farm, the raising of animals of a given breed and their location in various zones takes place spontaneously and in no way is it connected with the general problems of improving all the cattle throughout this country.

The location of breeds of cattle by oblasts, krays and republics provides for the fullest utilization of various breeds in the different zones of the USSR based on their pedigree value, their type of productivity and their constitutional characteristics.

At the present time the following four zones have been established.

1. A dairy zone which is characterized by a predominance of dairy (whole milk) and meat-dairy cattle. This zone includes a number of the oblasts of the northwestern and central parts of the Soviet Union (Leningrad, Moscow, Tula, Kaluga and other oblasts) and also Murmansk, Sverdlovsk and Stalino Oblasts.

The main breeds which are raised in this zone are the Black Mottled Cattle, Kostroma, Simmental¹, Schwyz, Sychev and other breeds.

2. A zone of dairy and dairy-meat cattle raising primarily for dairy products and including a number of oblasts in Western Siberia (Omsk, Tyumen¹, etc.) and in the North (Arkhangelsk, Vologoda, etc.) and including the Belorussian SSR, the Karelian ASSR and the union republics of the Baltic area.

In this zone the Kholmogorsk, Yaroslav and other breeds and also Black Mottled Cattle are raised.

3. A zone of dairy-meat cattle raising with emphasis on butter and cheese products and including regions of the Ukrainian and Moldavian SSR's, the republics of Transcaucasia and Central Asia and also areas of the central-chernozem zone, the Far East, Povolzh'ye, Krasnodar Kray, the Dagestan ASSR, etc.

The main breeds in this zone are the Simmental', Schwyz, Red Steppe and other breeds.

4. A zone of meat and meat-dairy cattle raising including the areas of the Stavropol Kray, Stalingrad and Astrakhan Oblasts, the Kalmyk ASSR and the Kazakh SSR. The breeds which are raised in this zone are the Kalmyk, Kazakh Whitehead, Red Steppe and other breeds.

In addition to breeding those breeds which produce results, it is also envisaged that local cattle which are well adapted to breeding in some regions of the country will be used.

In each zone the cattle which are bred are from a breed which has been selected for a type of productivity. Kolkhozes which have large land areas can breed two breeds of cattle of different types of productivity if they are kept separated. Some breeds of cattle such as Kholmogorsk, Simmental' and Black Mottled Cattle breeds are bred in 2 or 3 zones; other breeds are not very important and their breeding is limited to several areas of a given oblast.

Breeds of Dairy Cattle

Kholmogorsk Breed

The Kholmogorsk breed is one of the most highly productive breeds of cattle which are raised in our country.

Cattle of this breed were developed in the Kholmogorsk region in the present Arkhangel'sk Oblast. The presence of flood meadows and pastures located along the course of the Northern Dvina River and possessing good stands of grass which have large harvests of hay facilitated the establishment of better conditions for feeding and keeping cattle than existed in other areas.

The large demand for meat, butter and leather had considerable influence on the development of livestock raising in the Kholmogorsk region. The products of livestock raising were exported already in the Seventeenth and Eighteenth centuries not only for the internal markets but also abroad through the Arkhangel'sk port. As a consequence the cattle were noted over 200 years ago for their yield and their large size.

In the Eighteenth Century Kholmogorsk cattle were exported in large numbers from the Kholmogorsk region to the areas around St. Petersburg and Moscow and also to certain other areas. Inasmuch as the method of moving cattle during this period from the Kholmogorsk region was by driving them, the emphasis in breeding cattle was on obtaining healthy, strong, rugged animals which were capable of making the trek from Arkhangel'sk to St. Petersburg or some other town.

However, the trade in cattle had a negative effect on the status of Kholmogorsk cattle raising because the best breeding cows were selected for sale and their offspring were slaughtered in those places to which the cattle were exported. As a result, by the end of the last century Kholmogorsk cattle raising had declined. The measures which were undertaken under the conditions of Tsarist Russia could not effect a substantial qualitative improvement of Kholmogorsk cattle raising.

Among these measures was the importation in the Eighteenth and Nineteenth centuries of Dutch cattle into the Arkhangel'sk Guberniya for crossing with the local Kholmogorsk cattle.

The Dutch cattle came in small groups, were of low quality, and were distributed in lots of a few heads throughout the various rayons of the Arkhangel'sk Guberniya. In addition, they were not adapted to breeding under the severe conditions of the northern part of Russia. The peasants refused to breed their cows with the imported bulls and all their offspring were slaughtered or were sold outside the area if possible. As a result the Dutch cattle did not have a significant effect on the development of the cattle. From 1765 to 1898 a total of 62 bulls and 75 cows of the Dutch breed were brought into the Arkhangel'sk Guberniya.

After the Great October Socialist Revolution it was possible to undertake planned measures to improve the quality of Kholmogorsk cattle; this was especially true after the collectivization of agriculture. In 1934 the Kholmogorsk State Breeding Station was organized to serve the breeding farms of the Kholmogorsk, Arkhangel'sk, Yemetskiy and Primorskiy rayons.

The measures conducted by the State Breeding Station resulted in the improvement of the conditions of raising the young and in more proper feeding and care of the animals. Especial attention was devoted to selecting the animals according to their productivity and build and to obtaining bulls from the best cows to build up the breeding net. At the same time a record was organized of the origin and productivity of the animals.

Thanks to this directed breeding work many kolkhozes achieved significant successes in raising the productivity of Kholmogorsk cattle.

The planned realization of pedigree young not only made it possible to improve the quality of the cattle but also made it possible to sell a grand total of more than 90,000 young bulls and heifers from the breeding farms of the Kholmogorsk State Breeding Station to the kolkhozes of other rayons and oblasts.

At the present time the breeding of Kholmogorsk cattle and the improvement of local cattle by breeding with Kholmogorsk cattle is envisaged for kolkhozes and sovkhozes of 28 oblasts, krais and republics of the USSR. The greatest number of Kholmogorsk cattle -- outside of Arkhangel'sk Oblast -- are in the Moscow, Vologda, Leningrad, and Kirov Oblasts and in the Yakutsk, Tatar, Udmurt and Komi ASSR's.

Cattle of the Kholmogorsk breed in most cases have a dark mottled color although some animals are encountered which are black, red, red mottled and white with markings. In their external appearance the cattle are large with an elongated build and a strong skeleton. The middle part of the body is somewhat elongated; the animals are relatively tall; the legs are positioned properly; and the head is dry, light and of average size with a straight profile. The neck is average in length and is thin and folded. The chest is sufficiently deep but not broad and has a small dewlap. The back is straight and even; the rump is broad and somewhat raised. The croup is broad but with somewhat weakly developed musculature. The skin is thin and elastic. The udder is of average size and its component parts are evenly developed.

Kholmogorsk cattle are a clearly defined dairy breed (Figures 21 and 22).

The cows which are registered in the State Pedigree Book are characterized by the following average measurements (in centimeters):

Height of the withers	131.6
Depth of the chest	68.4
Width of chest	37.3
Width at the hips	51.3
Width at the Pelvis-hip joint	46.0
Oblique length of the body (according to a measuring stick)	160.2
Circumference of the chest behind the shoulder blades	182.2
Circumference of the metacarpus	18.5

Calves of the Kholmogorsk breed are born with a live weight of 33 to 40 kilograms. On farms which have better conditions for keeping the animals, the calves have a live weight of 42 to 45 kilograms.

When the calves are well-fed and well cared for, they weigh 180 to 200 kilograms at the age of six months and they have a good average daily weight gain. Thus V. Ye. Pekishava, a calf tender on the kolkhoz "New Life" of Kholmogorsk Rayon, has obtained an average daily weight gain of 800 to 820 grams while raising more than 600 calves to an age of 6 months. On the sovkhos "Forest Glades" of Moscow Oblast the average daily weight gain has been 750 to 850 grams; this is for the milk period during which the calves are fed a total of 420 kilograms of whole milk and 600 kilograms of skim milk. By the age of 12 months, if they have received an abundant diet, the young bulls weigh up to 400 kilograms and the heifers up to 320 kilograms. The live weight of Kholmogorsk cows is 480 to 540 kilograms and for bulls it is 900 to 1,000 kilograms; however, in individual cases the weights may be considerably higher. Thus, for example, the live weight of the cow Teka SKh-7440 was 870 kilograms after her third calving. For the cow Batalina SKh-8151 it was 685 kilograms after the first calving; and for the bull Harvest SKh-1087 it was 1,010 kilograms at the age of 3-1/2 years.

The meat qualities of Kholmogorsk cattle are not high. The yield of meat and lard at slaughtering is 45 to 50% for cows and 50 to 56% for bulls.

By improving the conditions of feeding and keeping the cattle, the dairy productivity of Kholmogorsk cattle is raised considerably.

On the kolkhoz "New Life" of Arkhangel'sk Oblast the average yield for the herd for 1951 was 4,438 kilograms, and in 1954 it was 4,948 kilograms of milk. The Kolkhoz "Fighter" of Bronnitskiy Rayon of Moscow Oblast obtained 4,677 kilograms of milk per forage cow. The breeding sovkhoses, "Kholmogorskiy" of Arkhangel'sk Oblast and "Forest Glades" of Moscow Oblast have obtained more than 4,500 to 5,000 kilograms of milk per cow for a number of years.

The average yield on breeding farms served by the Voskresenskiy Station on Pedigree Work of Moscow Oblast was 4,048 kilograms in 1957. Animals registered in the State Pedigree Book have an average yield, depending on their age, of 3,000 to 4,000 kilograms.

Exceptional successes in milking cows have been achieved by leading livestock raisers. Milkmaid N. I. Zhukova of the kolkhoz "Labor" of Voskresenskiy Rayon obtained an average of 6,184 kilograms of milk from the cows in her group. Milkmaid A. V. Korobova, a Hero of Socialist Labor (from the kolkhoz "Friendship" of Arkhangel'sk Oblast), obtained 6,008 kilograms of milk from a cow. Milkmaid P. Ya. Shagina of the breeding sovkhos "Kholmogorskiy" obtained 6,324 kilograms of milk from each of the 8 cows in her group.

The highest yields have been obtained from the cows Mal'ka-Kh 190 with a yield of 10,562 kilograms for 300 days of its fifth lactation and the cow Astarta SKh-1060 with a yield of 10,569 kilograms for 300 days of its seventh lactation.

Kholmogorsk cattle are among the breeds which do not have a high butterfat content. According to the data of the State Pedigree Book, the average butterfat content of the milk from Kholmogorsk cows is 3.6 to 3.7. However, there are individual cows which have a butterfat content of 5.3, and 20% of all the cows have a butterfat content of greater than 3.9.

The Kholmogorsk breed contains a number of related groups, lines and families.

Among the large number of groups and lines of Kholmogorsk cattle are the lines of the bulls Pole-Kh-48, Secret Kh-175, Captain Kh-59 and Mentor Kh-8 and the family of cows Foggy SKh-1333, Tenistra SKh-1357, etc.

Animals belonging to these related groups have become widely distributed on the breeding farms of Arkhangel'sk, Moscow, Kirov, Vologda, Ryazan and other oblasts and also on the kolkhozes and sovkhoses of the Komi, Tatar and Udmurt ASSR's.

Breeding work with the Kholmogorsk breed is being conducted on the breeding farms of kolkhozes of the Arkhangel'sk, Moscow, Vologda and other oblasts, in the Tatar and Komi ASSR's, and also on the breeding sovkhoses "Kholmogorskiy" and "Forest Glades."

Basic attention in working with the Kholmogorsk breed is being devoted to problems of raising butterfat content and improving the build of the animals.

Tagil Breed

The birthplace of the Tagil breed is the city of Nizhniy Tagil and the adjacent areas in the Sverdlovsk Oblast.

The formation of the Tagil breed was connected with the development of the metallurgical and other branches of industry in the Urals because the growth of the factory population caused an increased demand for livestock products.

The owners of the factories, in order to reduce the expense involved in supplying the workers with food products and to tie them to their factories, permitted the people to keep dairy cattle and to get hay from the valleys along the mountain rivers and in the forests. The interest of the population in raising the productivity of cattle helped to improve the conditions of feeding and keeping the animals.

In order to improve the local cattle, the factory owners, up until 1862, kept Kholmogorsk bulls in their factory stables; these bulls were used with the herds in the workers' villages. After the abolition of serfdom, the bulls were no longer kept in the factory stables. There is evidence that Kholmogorsk bulls and their hybrids were to be found in the herds of some workers' settlements until 1886.

In 1886 two sires of the Yaroslav breed were imported to Nizhniy Tagil and were used for a short time at a servicing point in Nizhniy Tagil; they did not have any effect on the productive and breeding qualities of Tagil cattle.

Beginning in 1900 there were periodic importations of small numbers of young bulls and heifers of the Dutch breed into the area of Tagil cattle raising.

In 1914 there were Dutch and Tagil bulls at the servicing points in Nizhniy Tagil; however, by 1918 all Dutch bulls had been removed from the servicing points.

In addition, Schwyz, Tyrol and other breeds of cattle were brought into the areas of Tagil cattle raising; however, crossing with these breeds has not improved Tagil cattle raising.

After the agricultural exhibit at Nizhniy Tagil in 1905 the Tagil breed received notoriety as a specific group of cattle with high productivity and butterfat content. From this time on, Tagil cattle began to be exported outside the limits of the Nizhniy Tagil area.

The systematic selection of cows with high yields and butterfat content together with the system of feeding and keeping the animals led to the establishment of a line of hardy animals with good productivity. Tagil cattle were exported to the areas of Western Siberia and even to the Far East.

Planned breeding work with the Tagil breed began only after the Great October Revolution. The organization in 1933 of the Nizhniy Tagil State Breeding Station and of breeding sovkhozes made it possible to increase the exports of pedigree calves, and as a result the area in which Tagil cattle are found has increased considerably. At the present time Tagil cattle are raised on the kolkhozes and sovkhozes of Sverdlovsk, Chelyabinsk, Perm, Tyumen¹, Tomsk, Kemerova, Omsk and Novosibirsk Oblasts, the Udmurt ASSR and the Krasnoyarsk Kray.

The color of the cattle varies. The predominant colors are black and black-mottled after which come red and red mottled. Animals are sometimes encountered which have white markings or other colors. Tagil cattle are of average size; they have a compact build and short, strong legs. The head is of average size and is dry. The neck is long and straight with folds. The body is somewhat elongated. The chest is sufficiently deep and of average width. The back, including the small of the back, is broad and flat. The udder is well developed. The skin is thick and elastic. Among the Tagil cattle are encountered animals with a narrow chest, a sagging, sloping croup and weakly developed musculature, especially in the hind third of the body.

The measurements of cows according to the data of the State Pedigree Book are as follows (in centimeters):

Height at the withers	126-127
Depth of the chest	66-67
Width of the chest	37-38
Oblique length of the body (measured with a measuring stick)	153-155
Circumference of the chest behind the shoulder blades	180-181
Circumference of the metacarpus	18

The calves are born with a live weight of 28 to 32 kilograms; by the age of six months, if conditions have been good, they weigh 160 to 170 kilograms.

The average live weight of cows is 440 to 480 kilograms. In the herds of the better sovkhozes and kolkhozes, the animals have a greater live weight. The average weight of cows on the kolkhoz imeni Raskova of Sverdlovsk Oblast is 485 kilograms; on the breeding sovkhoz "Zonal" it is 498 kilograms. Animals possessing the greatest live weight were the cows Marta YeT-46 which weighed 761 kilograms after its ninth calving and the cow Heron which weighed 764 kilograms.

The meat qualities of Tagil cattle are not high. The yield at slaughtering is 42 to 50%.

Tagil cattle are noted for their good milk productivity. The average yield of the cows which are registered in the State Pedigree Book is 2,700 to 3,500 kilograms. The breeding sovkhoz "Zonal" obtained on the average 3,974 kilograms of milk with a butterfat content of 4.18. Some cows of the Tagil breed have given higher yields.

The cow Marta YeT-46 which belongs to the breeding farm of the kolkhoz "Red Partisan" of Sverdlovsk Oblast gave 9,363 kilograms of milk with a butterfat content of 4.1 for 300 days of its eighth lactation. The cow Cloudberry from the kolkhoz imeni Il'ich of Petrokamenskiy Rayon produced 7,375 kilograms of milk for 300 days of its seventh lactation.

The Tagil breed is noted for its high butterfat content. The average figure for butterfat content is 4.1 to 4.25. In some instances butterfat contents of 5.0 to 5.4 have been noted. The average butterfat content per herd on the kolkhoz imeni "First of May" is 4.44; for the kolkhoz "Free Path" of Sverdlovsk Oblast the figure is 4.42.

The high butterfat content is also preserved in animals which have high yields. The Tagil cattle possess good health and reproductive ability to an age of 15 or 20 years. Bull sires are used for servicing till the age of 14 to 15.

The best herds of Tagil cattle are found on the breeding farms of the Kolkhozes of Nizniy Tagil and Petrokamenskiy Rayons and also on the breeding sovkhoses "Zonal" and "Tagil" of Sverdlovsk Oblast.

The Tagil breed includes a number of lines and families which are widely distributed throughout many farms. The best known are the lines of the bulls Rogue, Free, Canopy, Debatable and Dandy I and the families of the cows Marta and Mil'ka I.

Cattle of the Tagil breed are used for some crossbreeding with other breeds which have a lower butterfat content for their milk.

Yaroslav Breed

The Yaroslav breed was formed by improving the local cattle in the area of the present Yaroslav Oblast. The formation of the productive and breeding qualities of this breed took place under the influence of specific economic natural and feeding conditions.

The closeness to such large markets as Moscow and St. Petersburg increased the demand for the products of livestock raising and for live cattle. At the same time the presence of flood meadows along the flood plains of the Volga, Sheksna, Mologan and other rivers made it possible to provide more fodder for the cattle. With the development of butter and cheese processing, beginning with the Eighties of the last century, there was an increased demand for milk as well as higher requirements with regard to quality. In this connection, the conditions of feeding and keeping the cattle were improved and selection began to be practiced.

For a long time selection was based on color which helped to fix the characteristic black color of most of the animals of the breed. Animals of other colors, regardless of their high productivity, were very often rejected. Later attention was devoted to selecting the cows on the basis of milk productivity and butterfat content.

Planned breeding work with the Yaroslav breed began only after the Great October Revolution. At first the work in improving the Yaroslav cattle was performed by cooperative associations. In 1925 a State

Pedigree Book was begun for this breed, and in 1933 the Yaroslav State Breeding Station was organized. In the following years other state breeding stations were established in Vologoda (the Prishheksninskiy station), Kalinin (the Bezhetskiy station) and Yaroslav (the Rybinskiy station) oblasts.

Of great importance in improving the Yaroslav cattle and in spreading valuable pedigree calves were the breeding sovkhos "Uspenskaya Ferma," the sovkhos "Red October," and other farms. From the end of the Nineteenth Century, cattle of this breed began to spread beyond the limits of Yaroslav Guberniya. At the present time the breeding of Yaroslav cattle on the basis of planned regional distribution is envisaged for the kolkhozes and sovkhos of 22 oblasts, krays and republics including Yaroslav, Vologoda, Kostroma, Ivanovo, Kirov, Vladimir, Leningrad and Irkutsk oblasts, Krasnoyarsk Kray, the Byelorussian SSR, etc.

The build of Yaroslav cattle has the following characteristics: a light, dry head with an angular facial part; the animals have an angular build, a well-developed middle part of the body and a light, delicate skeleton.

The neck is long and thin with small folds of skin. The withers are high and sometimes narrow; the chest is not broad and has a slightly developed dewlap. There are animals which have a sagging back. The musculature is weakly developed. The skin is thin and elastic. The udder is well developed, mostly cup-shaped with properly positioned nipples. The capacity of the udder is good.

The animals have short legs and are sometimes knock-kneed or bow-legged. The hind part of the body is weakly developed. Animals are often encountered which have a short, narrow, sagging, sloping croup.

The basic color is black; the head is white with black markings around the eyes. The lower part of the body and the limbs and also the end of the tail are white. Some animals also are red with the above indicated markings.

As a result of the breeding work which has been conducted, the build of the Yaroslav cattle has improved noticeably and on many farms the animals almost have none of the above deficiencies. The height of the animals has increased; the development of the chest and the rear third of the body have improved.

The average measurements of the cows are (in centimeters):

Height at the withers	125
Depth of the chest	66
Width of the chest	34.6
Width at the hips	48.5
Oblique length of the body (measured with a measuring stick)	152
Circumference of the chest behind the shoulder blades	176.4
Circumference of the metacarpus	17

The calves are born with a live weight of 26 to 30 kilograms. When they are fed properly, the young attain a weight of 145 to 160 kilograms by the age of 12 months.

On the kolkhoz "Red Collectivist" of Yaroslav Oblast the average daily weight gain for calves up to the age of 6 months is 750 to 800 grams. The average weight of cows which have had three or more calvings, according to the data of the State Pedigree Book, is 480 kilograms, except that on the better breeding farms and sovkhozes it is 480 to 520 kilograms and more. The cow Rosa YaYa-12098 weighed 646 kilograms. The live weight of the bulls is 650 to 780 kilograms except that the better bulls may be considerably higher. The bull Greetings Ya-396 weighed 1,150 kilograms.

The Yaroslav cattle do not have high meat qualities; their yield at slaughtering is only 42 to 48%. However, the milk yield of the cattle is quite good.

The average yield of the cows is 2,500 to 3,000 kilograms. On leading farms the figure is higher. On the sovkhoz "Red October" 4,649 kilograms of milk are obtained per cow.

Milkmaid F. Ya. Shutova who is a Hero of Socialist Labor from the kolkhoz "Red Collectivist" obtained 5,073 kilograms of milk per cow of her group; and milkmaid B. M. Borisova from the kolkhoz "Gorshikh" obtained 5,104 kilograms per cow.

The highest yields were obtained from the cow Golden Ya-3305 (kolkhoz "Red Collectivist") which for its fourth lactation gave 9,267 kilograms of milk with a butterfat content of 4.15. For the entire period of its use the cow Golden gave 82,914 kilograms of milk with a butterfat content of 4.03 of 3313.2 kilograms of butterfat. The yield of the cow Sharovka YaYa-12177 (breeding sovkhoz "Uspenskaya ferma") for 300 days of its fourth lactation gave 8,017 kilograms of milk with a butterfat content of 4.12. The champion of the Yaroslav breed at the 1954 All-Union Agricultural Exhibit was the cow Boyarka YaYa-12483 (kolkhoz "Kolos" of Yaroslav Oblast); its yield for 300 days of its fifth lactation was 8,795 kilograms of milk with a butterfat content of 4.11; its live weight was 729 kilograms (Figure 25).

The record holder for highest daily yield is the cow Vena of the kolkhoz "Domshinskiy" of Chebsarskiy Rayon of Vologda Oblast; on the fortieth day of a lactation in 1941, milkmaid N. I. Gruzdeva obtained 82.15 kilograms of milk.

One of the valuable qualities of the Yaroslav breed is its high butterfat content. The average butterfat content on kolkhoz breeding farms of the zone is 4.0 to 4.2. In some cases a butterfat content as high as 5.4 has been noted.

The Yaroslav breed contains a number of lines and families. The lines of the bulls Fomka Ya-145, Priboy Ya-1131 and others have been evaluated highly. The greatest distribution has been achieved by the progeny of the cow Golden Ya-3305 through its grandson, the bull May IYa-158. The yields of the bull's twelve best daughters averaged 4,898 kilograms with a butterfat content of 4.13.

The granddaughter of Golden, the cow Camomile, had a yield of 8,127 kilograms for its fourth lactation with a butterfat content of 3.94.

Breeding work with Yaroslav cattle in the herds of the better sovkhoses and on the breeding farms of kolkhoses is being conducted with the aim of raising the milk productivity and the butterfat content of the milk, of increasing the live weight, and of improving the build of the animals.

Istobensk Breed

The Istobensk breed is a local breed which became widespread throughout a number of rayons of Kirov Oblast. In the formation of this breed first the Kholmogorsk cattle and then the Schwyz cattle had a limited role.

The formation of the Istobensk breed took place in the rayons located along the flood plains of the Vyatka River and of several of its tributaries. The presence in these rayons of flood meadows helped to provide good feeding conditions for the cattle. An important role in improving this local cattle was played by the butter-processing industry which began in the village of Istobensk in 1871.

In 1923 Yaroslav cattle were imported into the areas where Istobensk cattle were being raised, and in 1936 and 1937 the same was done with East Friesian cattle. However, the crossing with these breeds was of a limited nature and did not cause a noticeable improvement of the Istobensk breed.

In 1934 the Orichev State Breeding Station was organized. It conducts breeding work on the kolkhos breeding farms of the Orichev and Khalturin Rayons of Kirov Oblast.

The color of the Istobensk cattle is basically black and black mottled; a large percentage of the animals is also red and red mottled. Animals are sometimes encountered which have a white band along the line of the back and rump.

The head is light and elongated. The neck is thin with small folds. The middle part of the body is elongated. The skeleton is light and delicate. The chest is deep but narrow. The back is even and often narrow. The croup is often narrow, sagging and sloping. Sometimes animals are encountered which have knock-knees or bow legs.

The skin is thin and elastic; the musculature is weakly developed. The udder is small; it has a proper shape, but the nipples are sometimes close together.

The cattle are not tall. The cows which are registered in the State Pedigree Book have the following measurements (in centimeters):

Height at the withers	123.8
Oblique length of the body (measured with a measuring stick)	152.6
Width at the hips	49.3

Depth of the chest	66.2
Width of the chest	35.0
Circumference of the chest behind the shoulder blades	176.8
Circumference of the metacarpus	17.9

The live weight of the calves at birth is 26 to 30 kilograms. The live weight of cows is 410 to 460 kilograms; for mature bulls it is 620 to 700 kilograms. The better animals have a higher live weight. The cow Dochka weighed 600 kilograms at the age of 6 years. The live weight of the bull Frantic (kolkhoz "Leninist Spark") at the age of 7 was 1,050 kilograms.

The meat qualities of Istobensk cattle are not high. The slaughter yield when the animals are of average fatness is 42 to 45%.

The average yield of the cows according to the State Pedigree Book is 2,400 to 3,300 kilograms. The kolkhoz imeni Khalturin of Kirov Oblast obtained 3,281 kilograms of milk per cow. The yields of the better cows exceed 8,000 kilograms.

The cow Beluga KIO-64 from the kolkhoz "Leninist Spark" of Kirov Oblast gave 8,127 kilograms of milk with a butterfat content of 4.07 for 300 days of its sixth lactation. Its live weight was 515 kilograms.

The record holder for butterfat content at the All-Union Agricultural Exhibit of 1954 was the cow Fara (from the same kolkhoz); it had a yield of 8,366 kilograms of milk with a butterfat content of 4.98 for 300 days of its fourth lactation. The live weight of Fara was 490 kilograms (Figure 26).

Istobensk cattle are noted for their high butterfat content. The average butterfat content for the cows is 4.12 to 4.18 with fluctuations from 3.6 to 5.5.

The progeny of the bulls Moka and Miller have gained the widest distribution on the breeding farms of Kirov Oblast.

Breeding work is directed at raising the milk productivity and butterfat content, improving the build and increasing the live weight of the animals.

East Friesian Breed and Black Mottled Cattle

East Friesian cattle were developed in Germany by crossing local cattle with the Dutch breed. Dutch cattle are one of the oldest breeds of cattle in Europe.

The formation of Dutch cattle took place under favorable climatic and feeding conditions (the presence of good meadows and pastures) during a period when commerce in dairy products was developing and they were being exported from Holland to many countries.

Dutch cattle, because of their high milk productivity became widespread throughout many greatly different countries. Cattle of this breed already in the last century were exported to Russia, France, Sweden, Belgium; the USA, Canada, Japan and other countries. In breeding

Dutch cattle under different geographic conditions and economic conditions, the cattle acquired characteristic qualities and features which contributed to crossing with the local breeds. Therefore, the Black Mottled cattle which were raised in various countries, although they originated from the Dutch cattle, nevertheless differed in their build, butterfat content, meat qualities and milk productivity. In the USA, Canada and Japan the Black Mottled cattle of Dutch origin are known as Holstein Friesian cattle and in Sweden they are known as Swedish Black Mottled cattle. In the past the Dutch cattle according to their build belonged to the dairy type; now as a result of the breeding work which has been conducted over a long period the cattle have a good meat form.

The first groups of Dutch cattle began to arrive in Russia at the end of the Eighteenth and the beginning of the Nineteenth Centuries. However, in spite of the relatively large number of animals which were imported, they did not gain wide distribution, and by 1917 only small groups were located in the Western part of Russia and in Saratov Oblast. The Dutch cattle were used in developing the Aulieatinsk breed and the Black Mottled cattle of the Baltic Republics as well as to a limited degree in developing the Tagil breed and for cross breeding with the Kholmogorsk breed. Since 1930, East Friesian cattle have been imported into Vologoda, Omsk, Novosibirsk, Moscow, Leningrad and other oblasts for use in improving local unproductive cattle. In the initial period the improvement of the local cattle in the indicated zones was attempted through the use of absorptive cross breeding; then after there was a sharp drop in the butterfat content with hybrid cows of the third and fourth generations, inbreeding using hybrids of various generations was employed. At the present time there is a large number of hybrids of the East Friesian breed with a black mottled color on kolkhozes and sovkhoses of a number of oblasts in Siberia, the Ural, the central and northwestern parts of the USSR, and the Ukraine; they differ noticeably in their build from the purebred animals. Therefore, the black mottled cattle which are raised on the farms of the central parts of the USSR, the Urals, the Ukraine, in Siberia and in Byelorussia are identified as a separate breed called Black Mottled cattle. The East Friesian cattle which were imported in the post-war years were sent to the western and southwestern parts of the USSR where they are being bred at the present time.

The breeding of Black Mottled and East Friesian cattle is envisaged on the kolkhozes and sovkhoses of 47 oblasts, krays and republics including the Byelorussian SSR, Leningrad, Moscow, Vologoda, Novgorod, Bryansk and other oblasts and also some oblasts of the Ukraine and Siberia.

Animals of the East Friesian breed have a black mottled color. Some animals do have two white bands on the body in the area of the shoulder blades and the rump. The head is somewhat elongated and coarse. The neck is of average length with folds of skin. The withers are even and sufficiently wide. The line of the back is straight and wide. The croup is wide and straight.

The animals are large and develop in good proportion. The musculature is satisfactory. The legs are not long. The skeleton is strong. The chest is deep but sometimes not sufficiently wide. The udder usually is sufficiently large and extends forward along the belly. The capacity of the udder is large. The nipples are cylindrical in shape and evenly distributed. The skin is thin and dense and is covered with fine soft hair.

In contrast to the East Friesian breed, Black Mottled cattle generally have more of the appearance of dairy cattle; their form is somewhat angular; the musculature is more weakly developed; they have longer legs and are less developed in width.

The average measurements of the cows are (in centimeters):

Height at the withers	128-130
Depth of the chest	68-70
Width of the chest	40-42
Width at the hips	52-55
Oblique length of the body (measured with a measuring stick)	156-158
Circumference of the chest behind the shoulder blades	187-189.5
Circumference of the metacarpus	19

The live weight of the calves at birth is 36 to 42 kilograms. When they are raised properly, cattle of this breed normally mature early. The daily weight gain of the young until the age of 1 year is 600 to 800 grams, and at 12 months they weigh 280 to 340 kilograms. The live weight of the cows is 450 to 560 kilograms although the better ones weigh 700 to 800 kilograms and the cow Minka (kolkhoz "Red Dawn" of Lukhovitskiy Rayon of Moscow Oblast) weighed 800 kilograms at the age of 7 years and 8 months.

The average live weight of bulls is 850 to 950 kilograms. The bull Landysh (breeding sovkhos "Omsk" of Omsk Oblast) weighed 1,110 kilograms at the age of 6 years and the bull Abrek 739 (sovkhos "Istok" of Sverdlovsk Oblast) weighed 1,081 kilograms at 5 years of age.

The high live weight of the animals and their ability to be fattened at an early age are of great importance in using cattle of this breed for meat. Upon slaughtering the yield of meat from fattened animals is 53 to 60%.

Black Mottled and East Friesian cattle have become widely distributed and well-known because of their high milk productivity.

The productivity of cows which are registered in the State Pedigree Book is 3,700 to 4,200 kilograms. The average yield for a herd of Black Mottled cattle on the sovkhos "Nikonovskoye" of Moscow Oblast was 5,368 kilograms. On the breeding sovkhos "Omsk" of Omsk Oblast, 4,375 kilograms of milk were obtained per cow. Milkmaid Shilova from the breeding sovkhos "Vrachevy Gorki" of Moscow Oblast obtained an average of 7,047 kilograms of milk from each cow in her group; milkmaid Loshchenova from the kolkhoz imeni Stalin of Lukhovitskiy Rayon of

the same oblast obtained 6,392 kilograms of milk per cow. In milking the cows at the Vologoda Test Station for Livestock Raising, some cows such as Steppe, Muse and others gave over 7,000 kilograms of milk after their first calving.

The high yields of various cows have been obtained under widely varying conditions. For example, the cow Nature from the sovkhos "Antibekskiy" of Kemerovo Oblast gave 10,035 kilograms of milk for 300 days of its seventh lactation; the milk had a butterfat content of 3.4. On the breeding sovkhos "Dairy" of Vologoda Oblast, the cow Veronika gave 10,015 kilograms of milk for 300 days of its sixth lactation.

The champions of the Black Mottled cattle at the All-Union Agricultural Exhibit were the cows Vase MGM-1215 (sovkhos Gorki II of Moscow Oblast) with a yield of 9,388 kilograms of milk and a butterfat content of 3.6 for 300 days of its fifth lactation and Eskadra 138 (sovkhos "Istok" of Sverdlovsk Oblast) with a yield of 10,130 kilograms of milk with a butterfat content of 4.36 for 300 days of its fourth lactation.

With their high milk productivity the East Friesian and Black Mottled cattle have a low butterfat content. This important deficiency is the result of a lack of breeding work in raising butterfat content. At the present time the East Friesian and Black Mottled cattle are the breeds with the lowest butterfat content when compared with other breeds of cattle. On the breeding sovkhos "Dairy" the average butterfat content for the cows is 3.2 to 3.4. Higher butterfat content is characteristic of the Black Mottled cattle of Siberia and the Urals and is least characteristic of those in the central and western parts of the USSR.

Below is given the average productivity of cows on farms in various zones

	Average Yield (in kilograms)	Average Butter- fat Content
Sovkhos "Vrachevy Gorki," Moscow Oblast	4,409	3.5
Sovkhos "Proletarian," Ryazan Oblast	4,304	3.4
Sovkhos "Istok," Sverdlovsk Oblast	5,083	3.9
Farm of the Siberian Scientific Research Institute of Livestock Raising of Novosibirsk Oblast	5,180	3.6

Among the East Friesian and Black Mottled cattle there are cows which have high butterfat content. For example, the yield of the cow Merry Maker SVG-81 for its second lactation was 5,128 kilograms with a butterfat content of 4.4. The cow Young UG-9 gave 6,320 kilograms of milk with a butterfat content of 4.22 for its fourth lactation.

The progeny of the following bulls have attained the greatest distribution for the East Friesian breed: Anton 1293, Inder SG-12, Yunius SG-14, Rolland-Yan, etc.

The formation of Black Mottled cattle in various zones of our country took place while using breeding cows with various characteristics.

In cross breeding cattle of the East Friesian breed in Siberia, Siberian cattle were used; in some areas of the Urals, Tagil cattle were used; in the central part of the USSR, Local cattle, hybrids of Kholmogorsk cattle, and other breeds were used.

As a result of the characteristics of the starting breeds, the feeding conditions, the conditions under which the animals were kept, and differences in the breeding work, the Black Mottled cattle are as a whole not uniform; those raised in the Urals and in Siberia differ in butterfat content and type of build.

The main centers of breeding work with the breed are the breeding sovkhozes "Dairy" of Vologda Oblast, "Vrachevy Gorki" and "Nikonovskoye" of Moscow Oblast, "Borskaya Ferma" of Gor'kiy Oblast, the sovkhoz "Istek" of Sverdlovsk Oblast and also the breeding farms Lukhovitskiy (Moscow Oblast), Barabinskiy (Novosibirsk Oblast), Gatchinskiy (Leningrad Oblast), Dunayevetskiy (Khmel'nitskiy Oblast), and other stations for breeding work and state breeding stations. Especial attention in breeding work with Black Mottled cattle is devoted to the matter of raising the butterfat content of the milk.

In the Lithuanian, Latvian and Estonian SSR's, Black Mottled cattle are raised; they were developed by breeding hybrids obtained by cross breeding local cattle with Dutch and East Friesian cattle. The Black Mottled cattle in these republics have some characteristics which are similar to those of East Friesian cattle; however, they differ somewhat from the latter and among themselves in build and butterfat content. In connection with this the Black Mottled cattle of the Baltic republics are used to increase the butterfat content for herds of Black Mottled cattle of other zones.

Auliyeatinsk Breed

The Auliyeatinsk breed was developed in the Talasskiy Valley in the territory of the Kirghiz and Kazakh SSR's.

The beginning of the formation of this breed occurred toward the end of the last century when bulls of the Dutch breed began to be imported into the area of the Talasskiy valley for cross breeding with local Kazakh cattle. The hybrids which were obtained from this cross breeding were then inbred for a considerable length of time.

In 1936 and 1937 bulls of the East Friesian were brought into the area where the Auliatsinsk cattle were being raised in order to rejuvenate them. In some of the rayons of Dzhambul Oblast, the Auliatsinsk cattle were cross-bred to a limited extent with Simmental¹ cattle. The formation of this breed took place in the area of foothills with the summer pastures being at heights of 2,000 to 2,400 meters above sea level. The conditions under which the cattle were raised had a definite effect on the development of animals which were strong, hardy and well adapted to the conditions of the mountain pastures.

From the rayons of the Talasskiy Valley, the Auliatsinskiy cattle were exported to other rayons of the Kirghiz and Kazakh SSR's and also to the Usbek republic.

Cattle of the Auliatsinsk breed are of a dairy type; they are not tall, have an elongated body, and a fine but strong skeleton. The head is light and dry with an elongated facial part and a clearly defined occipital crest. The neck is average length, thin and with small folds in the skin. The back is sufficiently broad; the rump is somewhat raised. The chest is deep but not wide. The skin is dense and elastic. The udder is of average size with evenly developed sections. Animals are encountered which have narrow and sloping croups.

The color of the animals in most cases is black mottled or black. Part of the animals have a white body, black ears and black markings on the head. Some animals also are red mottled in color.

Cows which have had three or more calvings and are entered in the State Pedigree Book have the following measurements (in centimeters):

Height at the withers	126
Depth of the chest	67.1
Width of the chest	38.5
Width at the hips	50.4
Width at the Pelvis-hip joints	44.5
Oblique length of the body (measured with a measuring stick)	151.7
Circumference of the chest behind the shoulder blades	177.5
Circumference of the metacarpus	17.7

The live weight of the calves at birth is 30 to 34 kilograms. The average daily weight gain for the calves on the breeding farms of kolkhozes is 550 to 560 grams per head. Under good feeding conditions the young of the Auliatsinsk breed attain a live weight of 150 to 180 kilograms by the age of 6 months. Some calves have a weight gain of up to 1,000 grams per day.

The live weight of the cows is 380 to 460 kilograms. Animals which have higher weights are the cow Detail weighing 680 kilograms and the cow Fistlyun'ka which weighed 700 kilograms at the age of 8 years and 6 months.

The live weight of the bull sires is 700 to 800 kilograms. The bull Amur from the kolkhoz imeni Stalin of the Kirghiz SSR weighed 1,100 kilograms at the age of 6 years. The bull Shtar from the kolkhoz "Udarnik" weighed 950 kilograms at 4 years of age.

The meat qualities of Aulieatinsk cattle are satisfactory. In meadow fattening two year old castrated bulls without supplementary feedings of concentrated fodder, the average total weight gain for the 114 days was 100 kilograms while some gained 127 kilograms. The slaughter yield of these animals was 55 to 56%. The weight of the skin was 25 to 26 kilograms.

The yield of the cows, according to the data of the State Pedigree Book, averages from 2,700 to 3,500 kilograms of milk. High yields are obtained by the leading farms. On the kolkhoz "Victory" of the Kirghiz SSR an average of more than 3,000 kilograms of milk was obtained from cows which had had three or more calvings.

On the farm of the Kirghiz Scientific Research Institute of Livestock Raising, the record holding cow Nagrada 700 gave 8,086 kilograms of milk with a butterfat content of 3.05 for 300 days of its fifth lactation; the record holding cow Fistlyun'ka 654 gave 7,793 kilograms of milk with a butterfat content of 3.10 for the 300 days of its fifth lactation; the live weight of the cow was 634 kilograms.

The average butterfat content for cows registered in the State Pedigree Book is 3.7 to 3.8. On some farms there are cows which have high butterfat contents, such as the cow Babayka (kolkhoz imeni R. Luxemburg) which had a yield of 3,542 kilograms of milk with a butterfat content of 4.7. Similar high butterfat contents were recorded for the cow Sova (4.3) and its daughter Sonulya (4.5).

Breeding work with Aulieatinsk cattle is conducted on the breeding farms of kolkhozes and sovkhoses of the Kirghiz SSR and Kazakh SSR; it is done primarily with related groups from the bulls Shtar, Sokol, Oran, etc. The related group from the bull Shtar included the record cows Nagrada 700 and Fistlyun'ka 654.

The average yield of 31 daughters of Shtar during years when feeding conditions were difficult was 2,552 kilograms of milk with a butterfat content of 3.71. The progeny of other bulls such as Sokol and Orman are distinguished for their good productivity.

In breeding work with the Aulieatinsk breed, particular attention is devoted to increasing the butterfat content and to developing constitutionally strong and hardy animals which are capable of producing a large quantity of dairy products.

Whiteheaded Ukrainian Breed

The formation of the Whiteheaded Ukrainian breed began in the Nineteenth Century. The cattle of this breed were developed as a result of breeding hybrids obtained from crossing local cattle with the Groningen offshoot of Dutch cattle. Cattle of the Whiteheaded Ukrainian breed became widely distributed in a number of rayons of Kiev, Khmel'nitskiy, Zhitomir and Vinnitsa Oblasts.

Animals of this breed are characterized by a small, dry head, a somewhat elongated neck, an elongated body, a chest which is insufficiently developed in width, a light skeleton, and weakly developed musculature. The skin is thin and elastic.

The color is black and red; the animals have a white head and white markings on the lower part of the body. Some animals have marks around the eyes.

The average measurements of cows according to the State Pedigree Book are as follows (in centimeters):

Height at the withers	127
Depth of the chest	67.2
Width of the chest	39
Oblique length of the body	164.3
Circumference of the chest behind the shoulder blades	181
Circumference of the metacarpus	18.2

The live weight of the calves at birth is 30 to 34 kilograms. Under good feeding conditions the young attain a weight of 160 to 180 kilograms by the age of 6 months while having an average daily weight gain of 700 to 800 grams. The live weight of the cows is 400 to 450 kilograms although some animals reach 700 kilograms. The live weight of the bulls is from 700 to 800 grams; however, there are heavier animals too. The bull Dobryy (breeding sovkhos "Antoninskiy" of Khmel'nitskiy Oblast), for example, weighed 1,100 kilograms. The slaughter yield of fattened castrated bulls is 51 to 55%.

The average yields of the cows is 2,300 to 3,000 kilograms. On the breeding farms "Terezino" and "Antoninskiy", the average yields of the cows are over 4,000 to 4,500 kilograms. The cow Orbita gave 12,339 kilograms of milk with a butterfat content of 3.41 for its seventh lactation. The average butterfat content of the milk is 3.6 to 3.7 with fluctuations from 3.3 to 4.65.

The breeding work with Whiteheaded Ukrainian cattle has the purpose of increasing the milk productivity and butterfat content and also to improve the build of the animals. The work is conducted on the breeding farms of the Borodyanskiy Station for Breeding Work of Kiev Oblast and also on the breeding farm "Terezino" of Kiev Oblast, the breeding sovkhos "Antoninskiy" of Khmel'nitskiy Oblast, etc.

Red Steppe Breed

The formation of the Red Steppe breed took place in the second half of the Eighteenth Century, i.e., during the period when the southern part of the Ukraine was being resettled with people from other places. The cattle they brought were crossed with the local Red and Gray Ukrainian cattle. The hybrids which were obtained from the cross breeding were well adapted to the local climatic and feeding conditions.

At the end of the Eighteenth Century in the territory of the present Zaporozhe Oblast, settlers from Germany brought in Red East Friesian cattle which were used for cross breeding with the local cattle.

In the middle of the last century on some farms hybrids of the local cattle were cross bred with Kholmogorsk cattle. Considerably later, at the end of the Nineteenth and start of the Twentieth Centuries, Red Steppe cattle were crossed with cattle of the Dutch, Wilstermarsh, Angeln, Shorthorn, and other breeds which were brought in by the owners of the farms. The majority of these breeds did not have any significant effect on the development and formation of the Red Steppe breed. Some influence on the breed on the farms of the Odessa and Kherson guberniyas was caused by the Angeln and Wilstermarsh cattle.

The results of the investigation of the Red Steppe cattle which was conducted by Academician Ye. F. Liskun in 1911 constituted the basis for recognizing this group of cattle as an independent breed.

From the history of development of the Red Steppe breed it is evident that it was created through a complex process of cross breeding local cattle with cattle of other breeds.

Significant influence on the development of the productive qualities of the breed was created by the increased demand for dairy products, as a result of which the Red Steppe cattle quickly spread throughout the South of the Ukraine gradually squeezing out the Gray Ukrainian cattle.

Its adaptability to the conditions of the dry zone and the high productivity of the Red Steppe cattle contributed to its wide expansion over the past 40 years throughout many southern, steppe and dry areas of the USSR. From the Ukraine the Red Steppe cattle were exported to the North Caucasus and also to some regions of Siberia and other areas. At the present time the Red Steppe breed is the most numerous of the breeds of cattle in our country.

The breeding of Red Steppe cattle is envisaged on the kolkhozes and sovkhozes of 32 oblasts, krays and republics of the Soviet Union. A large number of these cattle are located in the southern part of the Ukraine, in Omsk, Orenburg, Rostov, and Stalingrad Oblasts, in the Stavropol and Krasnodar Krays, in Kazakhstan, the republics of Central Asia and Transcaucasia and in the Moldavian SSR. Up until 1917 there was no breeding work with the Red Steppe breed; only after the Great October Socialist Revolution was it possible to start work on improving the productive and breeding qualities of the breed.

In 1933, the Molochanskiy State Breeding Station in Zaporozhe Oblast and the Kushchevskiy Station in Krasnodar Kray began to operate. In the following years a number of other state breeding stations were organized in the areas where the breed was most heavily concentrated such as Stavropol Kray, Omsk, Orenburg, Rostov, Nikolayev and other oblasts.

As a result of improved conditions for keeping the animals and the organization of proper breeding work on the leading breeding farms of the kolkhozes and on the breeding sovkhozes, the milk productivity

and the live weight of the Red Steppe cattle increased and their build improved.

The color of the animals involves various shades of red, from light red to dark red. Some animals have white markings on the head and lower part of the body or legs. Much rarer is a red mottled color.

The Red Steppe cattle are of average size; they have a somewhat elongated body and a strong skeleton. The head is light and dry with an elongated facial part. The neck is long. The chest is deep. The back is even. The back third of the body is not sufficiently developed in length. The legs are strong and in most cases are properly positioned. The udder is well developed. The skin is thin and elastic. Of the most frequently encountered constitutional deficiencies found in Red Steppe cattle, the insufficient development in width of the chest and croup should be mentioned.

The average measurements of the cows are (in centimeters):

Height at the withers	126-128
Depth of the chest	67-69
Width of the chest	37-40
Circumference of the chest	175-180
Oblique length of the body (measured with a measuring stick)	151-154
Circumference of the metacarpus	17-19

The live weight of the calves at birth is 34 to 38 kilograms. Depending on the conditions of feeding and keeping the animals, the average daily weight gain for the calves varies between 700 to 900 grams although in some cases it exceeds 1,000 grams. At the age of 1 year the calves attain a weight of 280 to 330 kilograms.

The average live weight of the cows, according to the State Pedigree Book, is 480 to 500 kilograms. On sovkhozes and on breeding farms of kolkhozes, some cows reach a weight of 800 kilograms. The average weight of the bulls is 780 to 850 kilograms, although many weigh over 1,000 kilograms. For example, the bull Voyedylo from the breeding sovkhoz imeni K. Libknekt weighed 1,310 kilograms; and the bull Garol'd from the sovkhoz "Karagandinskiy" weighed 1,360 kilograms at the age of 6 years.

In meadow fattening young castrated bulls they average 650 to 750 grams of weight gain per day over the course of 6 months. The slaughter yield is 53%.

The average milk productivity of cows, according to the State Pedigree Book, varies from 2,800 to 3,700 kilograms. In recent years many kolkhozes and sovkhozes and leaders in livestock raising have obtained high milk yields. On the sovkhoz imeni Kirov of Zaporozhe Oblast the average yield per cow was 4,312 kilograms of milk. On the sovkhoz "Karagandinskiy" of Karaganda Oblast, the cow Moroshka, a champion of the All-Union Agricultural Exhibit, gave over 13,017 kilograms of milk with a butterfat content of 3.8 for the 322 days of its third lactation. On the same farm the cow Drama gave over 10,000 kilograms of milk.

The champion of the breed at the All-Union Agricultural Exhibit was the cow Kama ZAN-1106 (kolkhoz imeni Stalin of Zaporozhe Oblast) with a yield of 9,289 kilograms of milk with a butterfat content of 3.81 for the 295 days of its fourth lactation. The live weight of Kama was 565 kilograms.

With its good milk productivity, the Red Steppe cattle do not have sufficiently high butterfat content. Thus average butterfat content for the cows on the breeding farms of the kolkhozes of the Ukraine and the North Caucasus is 3.7 to 3.8. Some animals may have figures up to 4.8. For example, the cow Grunya from the kolkhoz "Iskra" of Lugan Oblast had a yield with a butterfat content of 4.8.

Depending on the area in which the Red Steppe cattle are raised, they have different butterfat contents which is explained by the various conditions of feeding and keeping the cattle and also the influence of the local cattle with which the Red Steppe cattle have been crossed.

At the breeding farms of the Molochanskiy Station for Breeding Work of Zaporozhe Oblast, 25.1% of the cows have butterfat contents above 3.9.

The existence of a group of cows which have high butterfat content indicates that it is possible through selection to improve the butterfat content for the breed.

There are several lines of bulls in the Red Steppe breed. The most widespread animals are those belonging to the lines of such outstanding sires as Pre'yev 357-N, Zlodey 459-H, Bents-Udaloy 463-N, Voyedylo DN-1, etc.

Breeding work with the Red Steppe breed is conducted for the purpose of increasing the milk productivity and butterfat content and to improve the build of the animals. It is being conducted on a number of breeding sovkhoses of the Ukrainian SSR's including: imeni Kirov, "Lyubomirovka," "Diktatura," and "Bol'shevik." Also it is being done on the sovkhoses of Omsk and Severo-Kazakhstan Oblasts and the Krasnodar Kray and on the breeding farms of the kolkhozes which are located in various zones in which these cattle are raised.

In order to improve the meat qualities of the Red Steppe breed, experiments are being conducted on the farm "Askaniya-Nova" of Kherson Oblast using introductory cross breeding with Shorthorn cattle.

Angeln Breed

The Angeln breed was developed on the Peninsula of Angeln in Germany by inbreeding local cattle. In the Nineteenth Century the Angeln cattle were imported into the Baltic area, the Leningrad Oblast and a few other areas of Russia. Cattle of this breed were used in developing the Brown Latvian cattle, the Red Estonian and Red Polish cattle and, in some areas, the Red Steppe cattle.

Angeln cattle are not of substantial importance in the breeding situation in our country, and their breeding is envisaged for only a few rayons of the Udmurt ASSR.

The color of the cattle is red of varying degrees of intensity. The cattle are not large. The calves are born with a live weight of 30 to 33 kilograms. The live weight for the cows is 400 to 450 kilograms and for the bulls it is 650 to 700 kilograms. Some cows reach a weight of 600 kilograms while some bulls reach 810 kilograms. Under good conditions of feeding and keeping, the yield of the cows is 3,000 to 3,500 kilograms of milk with an average butterfat content of 3.5 to 3.6.

Red Danish Breed

The Red Danish breed of cattle developed in Denmark by breeding hybrids obtained by crossing local cattle with Angeln cattle. Some minor role in the development of the Red Danish breed was also played by the Schleswig and Shorthorn cattle. Economic and natural conditions were of decisive importance in developing the productive qualities of the Red Danish breed. Red Danish cattle were imported into Russia from the end of the last century and were used in breeding with Brown Latvian, Red Estonian and Red Polish cattle. The cattle of this breed did not attain wide distribution throughout our country, and their breeding is envisaged for only a few areas of the Belorussian SSR and for a number of sovkhoses of the Novgorod and Kalinin Oblasts.

The color of the animals is red -- varying from dark red to light red. The Red Danish cattle are larger than the Angeln cattle and have a long deep body and a strong constitution. The live weight of the calves at birth is 30 to 35 kilograms; the weight of the cows is 450 to 500 kilograms, whereas for the bulls it is 700 to 800 kilograms. The average yield of the cows is 2,600 to 3,500 kilograms of milk. On the sovkhoses imeni Kalinin and "Vskhody" of Kalinin Oblast, the yields are from 3,500 to 4,200 kilograms of milk. Individual cows have given in excess of 8,000 kilograms of milk. The average butterfat content of the milk is 3.7 to 3.8.

Brown Latvian Breed

The Brown Latvian breed developed on the territory of the present Latvian SSR through a long process of breeding and selecting hybrids obtained by cross breeding local cattle first with Angeln and then with Red Danish cattle.

The demand for dairy products and the development of dairying exerted significant influence on the development of the productive qualities of the breed. Systematic selection of the animals according to milk productivity and butterfat content together with improved conditions of feeding and keeping the animals facilitated the development and fixation of high productivity. As a result of its high yields and high butterfat content, the cattle of this breed gained an exceptionally wide distribution on the kolkhoses and sovkhoses of the Latvian SSR where

they constitute more than 90% of the total number of cattle. In addition the breeding of the animals of the Brown Latvian breed is envisaged for some rayons of Pskov, Novgorod, and Leningrad Oblasts.

The Brown Latvian cattle are red in color. Some animals do have a chestnut or dark red color. The head, neck and legs usually have a dark shade which borders on black.

In most cases the animals have a strong constitution; their legs are not long and the musculature is weakly developed. The head is not large and has an elongated facial part. The back is level but somewhat raised toward the rump. The skeleton is light.

The average measurements of cows, according to the pedigree books, are as follows (in centimeters):

Height at the withers	126.7
Depth of the chest	67.4
Width of the chest	43.2
Oblique length of the body (measured with a measuring stick)	153.9
Circumference of the chest behind the shoulder blades	183.1
Circumference of the metacarpus	18.6

The live weight of the calves at birth is 30 to 32 kilograms. Under good feeding conditions the daily weight gain of the calves reaches 900 grams.

The live weight of the cows is 420 to 480 kilograms. The cows which are registered in the pedigree books have a live weight of 500 to 530 kilograms. The live weight of the bulls is 600 to 750 kilograms although some sires do attain weights of 1,000 kilograms. The meat qualities are not high. The slaughter yield for the cows is 45 to 48%.

The cows which are registered in the pedigree books have an average yield of 3,100 to 3,900 kilograms of milk. The cow Brunite (kolkhoz "Kopdarbiba," Latvian SSR), the champion of its breed at the 1954 All-Union Agricultural Exhibit, gave 3,468 kilograms of milk with a butterfat content of 3.93 for 300 days of its eight lactation. The live weight of the cow Brunite was 650 kilograms. The cow Tulpe LV-1152 gave 10,649 kilograms of milk with a butterfat content of 4.31.

Anna Rasa, a milkmaid of the kolkhoz "Uzvara" of Ventspils Rayon of the Latvian SSR obtained 3,215 kilograms of milk with a butterfat content of 3.88 per cow in her group in 1951; whereas in 1953 she obtained 6,054 kilograms with a butterfat content of 4.31.

The positive quality of the Brown Latvian cattle is the high butterfat content of its milk. The kolkhoz imeni Lenin of Val'miyerskiy Rayon of the Latvian SSR averaged 3,304 kilograms of milk with a butterfat content of 4.1 from a herd of 175 cows; the sovkhos "Lorupe" averaged 4,463 kilograms of milk.

The average butterfat content for the cows according to the pedigree books is 4.0 to 4.1. Some animals have butterfat contents of 5.0 to 5.9.

Work in raising the butterfat content for Brown Latvian cattle was conducted by the selection, first of all, of bulls from parents which have the highest butterfat contents. At the present time the breed contains lines of bulls and families of cows. The best lines of bulls are those of Kam-Bridrup-836, Gunar-Reks 608, etc.

Breeding work with the Brown Latvian breed is along the line of raising the yield, butterfat content and live weight of the animals. This work is conducted on the breeding farms of kolkhozes and also on the sovkhoses "Burtniyeki," "Lorupe" etc. of the Latvian SSR.

Red Estonian Breed

On the basis of its origin, the Red Estonian breed is related to the Brown Latvian breed. It was developed on the territory of the present Estonian SSR by means of breeding hybrids which had been obtained by cross breeding local cattle first with Angeln cattle and then beginning at the end of the Nineteenth Century with Red Danish cattle and in small numbers with Schleswig cattle. The formation of this breed took place under the influence of an increased demand for dairy products in connection with the development of dairying in these areas. Improved conditions of feeding and keeping the animals and the selection of animals on the basis of milk productivity and butterfat content had a positive effect on the development and fixation of the valuable qualities of animals of the Red Estonian breed. Cattle of this breed gained distribution chiefly in the area of the Estonian SSR but also in small numbers in the areas of Leningrad, Pskov and Novgorod Oblasts which are contiguous to the Estonian SSR.

The animals have red coloration of various degrees of intensity varying from light red to dark cherry. With the bulls the head, neck and legs are darker and border on being black. Red Estonian cattle have a light, dry head. The neck is long with small, insignificant folds. The line of the back is raised somewhat toward the rump. The withers are well developed. The rump is long and broad. The chest is comparatively deep, but not wide. The animals are somewhat elongated, not tall, and have adequately developed musculature and a well developed udder. The skin is thin and soft.

The cows have the following average measurements (in centimeters):

Height at the withers	126.1
Depth of the chest	68.3
Width of the chest	40.3
Oblique length of the body (measured with a measuring stick)	156.7
Circumference of the chest behind the shoulder blades	184.3
Circumference of the metacarpus	17.7

The live weight at birth of calves of the Red Estonian breed is 29 to 32 kilograms. At the age of 6 months they weigh 155 to 180 kilograms, and at the age of 12 months they weigh 270 to 320 kilograms.

The average daily weight gain for the calves up to the age of 1 year reaches 800 to 900 grams. The average live weight of cows is 420 to 480 kilograms, although on the better farms it is 550 to 580 kilograms. Some cows weigh up to 780 kilograms. The live weight of bulls is 650 to 800 kilograms. The bull Torre from the sovkhos "Uuzna" of the Estonian SSR weighed 900 kilograms at the age of 5-1/2 years. The meat qualities of the cattle are not high. The average slaughter yield for cows is 44 to 48% although for highly fattened animals it is 51 to 54%.

The average yield of the cows is 2,500 to 3,200 kilograms of milk. The sovkhos "Udeva" had an average yield of 5,782 kilograms of milk per cow, while for the sovkhos "Triygi" the figure was 5,160 kilograms. The cow Piimik 176 (sovkhos "Udeva") gave 8,017 kilograms of milk with a butterfat content of 4.15 for 300 days of lactation, and cow 152 gave 9,450 kilograms of milk with a butterfat content of 3.9.

The highest yield for a complete lactation period was obtained from cow 72 (sovkhos "Triygi"); its yield for the ninth lactation was 11,585 kilograms of milk with a butterfat content of 3.8. The live weight of the cow was 634 kilograms.

The average butterfat content for cows of the Red Estonian breed is 3.8 to 4.0. For some cows the butterfat content reaches 5.3.

Founders of the basic lines in the breed were the bulls Krist'yan 1427, Rooli 5525, Taat 3797, Kayus 3089, etc.

Work in perfecting the Red Estonian breed is being conducted on the sovkhoses "Udeva," "Uuzna," and others as well as on kolkhoz breeding farms of the Estonian SSR.

Red Polish Breed

The Red Polish breed was developed by improving the local cattle through the use of Angeln and Red Danish cattle. Red Polish cattle are distributed widely throughout the Polish Peoples Republic and also on the kolkhozes of Volyn and Ternopol' Oblasts. In their build and color these cattle resemble the Angeln breed. The animals are of average size. The live weight of the calves at birth is 28 to 32 kilograms; the weight of the cows is 370 to 420 kilograms; the weight of the bulls is 650 to 700 kilograms. The yield of the cows is 2,200 to 3,000 kilograms. The average butterfat content of the milk is 3.8 to 3.9 with fluctuations from 3.4 to 4.5.

Jersey Breed

The country of origin of the Jersey breed is the Island of Jersey which is located in the English Channel. The presence of favorable natural-geographic conditions, the mild maritime climate, and the fact that the animals were kept practically throughout the entire year in

pastures with rich vegetation had a positive effect on the development of high productivity for this breed. At the end of the Eighteenth Century it was forbidden to import animals of other breeds from the continent to the island, and from this time on the Jersey breed was distinguished by in-breeding. In 1833 a special society was organized for the improvement of the cattle on the Island of Jersey. Prolonged breeding of a relatively small group of cattle (10 to 13 thousand head) on a small island with selection and culling proceeding in a single direction facilitated the development of animals with clearly defined features of dairy cattle. Already by the end of the Eighteenth Century, Jersey cattle had become widespread throughout England and afterwards in Canada, USA, South America, Australia, New Zealand, South Africa and other countries. Of the European countries other than England, beginning in the Sixties of the last century, Jersey cattle were raised in Denmark and in our time in Albania. Cattle of this breed are used for cross breeding with other breeds of cattle with the purpose of raising butterfat content (in Germany, for example, they were used for improving butterfat content for Black Mottled Lowland cattle).

Jersey cattle are small. Their heads are small and light. The nose mirror is dark with a light ring. The animals have an elongated body, an angular shape, weakly developed musculature and a delicate skeleton. The back often has a slight sway. The base of the tail is slightly raised. The udder has good capacity, is well positioned along the belly, and has well separated nipples. The color is fawn or fawn-brown. Some animals do have white markings on the legs and lower part of the body. The head, neck and legs on bulls are dark in color.

The live weight of the calves at birth is 19 to 22 kilograms. The average weight of the cows is 360 to 440 kilograms; for the bulls it is 650 to 700 kilograms.

The yield of the cows is 2,500 to 3,000 kilograms. Some cows give up to 9 to 11 thousand kilograms of milk per lactation.

Jersey cattle are widely known for their high butterfat content. The average butterfat content for the cows is 5.2 to 5.5 and in some cases reaches 8.0.

At the end of the last century, Jersey cattle were imported in very small numbers into Russia; however no trace of these imports has remained.

In 1948 a Jersey bull was imported for the sovkhos "Krasnaya Poyma" of Moscow Oblast. From 1951 to 1955, 113 bulls and 202 heifers were received on sovkhoses of Moscow, Leningrad, Ryazan, and Novgorod Oblasts. On the sovkhos "Krasnaya Zarya" No 1 of Moscow Oblast, the average yield for Jersey cows was 2,952 kilograms of milk with a butterfat content of 6.08. The yield of the cow Alma (of the same sovkhos) for 300 days of its second lactation was 5,133 kilograms of milk with a butterfat content of 6.85. Some cows have butterfat contents of 7.06. The average weight of bull calves at birth on this sovkhos

is 20.9 kilograms while for heifer calves it is 18.4 kilograms. The live weight of cows which are calving for the first time is 300 to 400 kilograms. On a number of sovkhoses Jersey cattle are used for cross breeding with Black Mottled cattle.

Siberian Cattle

The breed of Siberian cattle refers to the large number of local cattle of Siberia which have small differences in productivity and build. These differences have resulted from the variety of climatic and feeding conditions of the various zones of Siberia and differences in origin of the local cattle of the Yakutsk and Buryat-Mongolian ASSR's and of Western Siberia. Thus, the formation of the local cattle in Western Siberia and in the Far East occurred through the use of cattle which were brought in by settlers from widely varied parts of Russia. Most of the cattle in the Buryat Mongolian and Yakutsk ASSR's until the Twenties of this century were not cross bred with other breeds.

Regardless of the considerable variety of Siberian cattle in various zones, the common characteristics of all the cattle are hardiness, adjustment to the severe conditions of Siberia and high butterfat content.

At the present time the inbreeding of Siberian cattle is envisaged for a number of rayons of Novosibirsk, Omsk, Tomsk, Tyumen, Irkutsk and other oblasti and krays of Siberia; in some rayons of the Yakutsk and Buryat-Mongolian ASSR's local Yakutsk and Buryat-Mongolian cattle are being bred.

In the greater part of the rayons of Siberia the improvement of the local cattle is being accomplished by cross breeding with Kholmogorsk, Tagil, East Friesian, Simmental' and Red Steppe cattle. Breeding work with hybrids obtained from such cross breeding should be directed at preserving the high butterfat content which is characteristic of the local cattle.

Siberian cattle are small with somewhat elongated bodies. The poor conditions of raising the young and feeding and keeping the mature animals during the time when the breed was developing in pre-Revolutionary Russia had a negative effect on the productive qualities and development of the animals. As a result the animals have deficiencies in build such as a narrow chest, a sagging rump, and awl-shaped rump, knock-knees, etc.

The average measurements of the cows are (in centimeters):

Height at the withers	114-117
Depth of the chest	61-62
Width of the chest	34-36
Oblique length of the body (measured with a measuring stick)	140-143
Circumference of the chest	158-169
Circumference of the metacarpus	15-17

The color of the animals may be red, red mottled, black, black mottled, brown or fawn of various shades.

The live weight of the calves at birth is 19 to 21 kilograms. By 18 months the calves attain a weight of 250 to 270 kilograms. The mature calves weigh 340 to 380 kilograms; the bulls weigh 450 to 520 kilograms. The meat qualities of Siberian cattle are low. The slaughter yield is 42 to 45%.

The average yield of the cows is 1,500 to 2,000 kilograms of milk; on sovkhozes the average yield is 2,500 to 3,000 kilograms. The cow Zolotaya 429 gave 6,448 kilograms of milk with a butterfat content of 4.3 for 290 days of lactation; the cows Gorbatka and Iskra gave over 5,000 kilograms of milk.

The butterfat content of the milk varies from 3.9 to 5.3 with an average figure of 4.15 to 4.20.

Breeds of Combined Dairy and Beef Cattle

Schwyz Breed

The place of origin of the Schwyz breed is the canton of Schwyz in Switzerland. Cattle of this breed were developed under conditions where they were kept in mountain pastures in the summertime and were fed well in the winter while at the same time selection and culling were employed. The system of breeding work and the conditions of keeping the animals led to the attainment of strong, hardy, highly productive dairy-meat animals.

Schwyz cattle were exported in substantial numbers to other countries of Europe including Italy, Germany, Czechoslovakia and Austria and also to the USA.

Schwyz cattle and also Algau cattle which were widely distributed in Bavaria (and are considered to be an offshoot of the Schwyz cattle) began to be imported into our country about 100 years ago. The best herds of Schwyz cattle were on the farms of the Moscow Agricultural Academy imeni Timiryazev and the Maynovskiy Agricultural School. In addition, there were also good herds of Schwyz cattle on the farms "Noskovo," "Tokarevo" and "Prechistoye" of Smolensk Oblast.

Schwyz cattle were shipped from the farm of the Moscow Agricultural Academy imeni Timiryazev to the present territory of Kostroma, Tula, Gorkiy and other oblasts and later to the Kirghiz and Kazakh SSR's. From the Maynovskiy farm the Schwyz cattle became widespread in the Ukraine. The Schwyz cattle which came from these farms as well as from farms of Smolensk Oblast and later from Tula Oblast were used chiefly for cross breeding with local cattle. The improvement of the local cattle by cross breeding with Schwyz cattle began to attain considerable scale after the organization of breeding farms. As a result, large numbers of hybrid cattle were produced in a number of oblasts which differed sharply from the Schwyz cattle in their appearance and characteristics.

As a result of the cross breeding the Schwyz cattle with local cattle and the breeding of the hybrids, the Alatau breed was formed in the Kirghiz and Kazakh SSR's and the Kostroma breed came into being in Kostroma Oblast.

At the present time the Schwyz breed and hybrids from it are distributed throughout 30 oblasts, krais and republics of our country. A large number of Schwyz cattle and hybrids are found on the sovkhozes and kolkhozes of Smolensk, Tula, Bryansk and Gor'kiy Oblasts, in the Mari ASSR, in parts of the North Caucasus, and in the republics of Central Asia and Transcaucasia.

The Schwyz cattle are brown in color with variations from light to dark. The nose mirror has a lead color; this characteristic of Schwyz cattle is rather well preserved in almost all the hybrids which are obtained when cross breeding with the Schwyz cattle. The head is short with a broad forehead. The horns are short and extend to the side and up. The body is somewhat elongated. The line of the back is even. The chest is deep and broad. The legs are well positioned and have well developed musculature. The skin is thin and dense. The udder is well developed and the milk veins are clearly defined.

The cows which are registered in the pedigree book have the following measurements (in centimeters):

Height at the withers	129.6
Depth of the chest	67.9
Width of the chest	42.4
Width of the hips	52.1
Width at the Pelvis-hip joint	46.9
Oblique length of the body (measured with a measuring stick)	156.7
Circumference of the chest behind the shoulder blades	187.6
Circumference of the metacarpus	19.9

The live weight of the cows at birth is 34 to 40 kilograms. At 6 months of age with good feeding conditions the calves reach a weight of 180 to 200 kilograms and by 1 year weigh 300 to 320 kilograms. The live weight of the cows is 450 to 520 kilograms and for bulls it is 770 to 880 kilograms; however, the better animals may weigh considerably more.

For example, the live weight of the cow Geronya from the kolkhoz "Borovkovo" of Tula Oblast was 711 kilograms (with a yield of 8,325 kilograms of milk with a butterfat content of 4.04 for 300 days of its fifth lactation). The cow Tamara (breeding sovkhoz "Tokarevo" of Smolensk Oblast) weighed 650 kilograms after its second calving. Many bulls (Martyn, Glokus, etc.) have live weights ranging from 1,100 to 1,150 kilograms.

The slaughter yield, depending on the fatness of the animals, varies from 48 to 58%.

Schwyz cattle are characterized by high milk productivity. The average yield of the cows according to the State Pedigree Book is 3,100 to 4,000 kilograms.

On the sovkhoz imeni Comintern of Smolensk the average yield for the herd was 5,135 kilograms and on the breeding sovkhoz "Pakhomovo" of Tula Oblast it was 4,744 kilograms of milk.

The highest yields were obtained from the cow L'vitsa from the breeding sovkhos "Shul'gino" of Tula Oblast. For 300 days of its fifth lactation the cow gave 10,214 kilograms of milk with a butterfat content of 3.45; the live weight of the cow was 670 kilograms. The cow Oshibka 99 (sovkhos "Comintern" of Smolensk Oblast) which was exhibited at the All-Union Agricultural Exhibit) gave 7,657 kilograms of milk with a butterfat content of 3.9 for 279 days of its fourth lactation.

The cow Ptichka from the kolkhoz imeni Chapayev (Gzhatskiy State Breeding Station) gave 6,285 kilograms of milk with a butterfat content of 3.8 for 300 days of its seventh lactation.

Schwyz cattle have average butterfat content; the butterfat content of the milk of the cows varies from 3.6 to 3.8; however, some of the animals have a figure of 4.7. On the breeding farms of the kolkhozes of the Bol'she-Murashkinskiy Rayon of Gor'kiy Oblast, the average butterfat content is 4.09. Some cows have good productivity together with high butterfat content. For example, the yield of the cow Legenda (kolkhoz "Luch" of Tula Oblast) had a yield of 7,508 kilograms of milk with a butterfat content of 4.7 for its fifth lactation. The live weight of the cow was 562 kilograms.

Breeding work aimed at raising the butterfat content and improving the milk productivity and build of the Schwyz cattle is being conducted on the breeding farms of kolkhozes of Tula, Smolensk, and Gor'kiy Oblasts and also on the sovkhos "Noskovo," "Tokarevo," "Comintern" (Smolensk Oblast), "Pakhomovo" (Tula Oblast), "Lariyskiy" (Armenian SSR) and other farms.

The descendants of the bulls Ervin, Lord and Labirint have gained the widest distribution on the farms of Tula Oblast. The average yield of the 29 daughters of the bull Ervin on the breeding sovkhos of Tula Oblast was 6,232 kilograms of milk; the average live weight of 46 of the bull's daughters was 597 kilograms. On the breeding sovkhos "Uropkiy" of Krasnodar Kray are the descendants of the bulls Ceylon and Nero; in Smolensk Oblast there are descendants of the bulls Kaiser, Yanach and others. The descendants of these bulls are characterized by high milk productivity and good live weight and build.

Kostroma Breed

The Kostroma breed which developed on the breeding sovkhos "Karavayevo" and on the breeding farms of the Kostroma State Breeding Station is the best breed of cattle in our country. Cattle of this breed were obtained by breeding hybrids obtained by crossing local cattle first with Aigau and then with Schwyz cattle.

The formation of the bulk of the improved cattle around the city of Kostroma took place in the second half of the last century. The development of buttermaking and cheese making and the availability of flood meadows located along the shores of the Volga and Kostromka Rivers influenced a qualitative improvement of the cattle on the peasant farms.

In order to improve their local cattle, the peasants used bulls from the former Nikloli-Babayevskiy monastery where there were cattle of the Algau breed.

Beginning in 1898, bulls of the Schwyz breed were periodically imported into some areas of Kostroma Oblast in order to improve the local cattle.

By 1925 the most valuable group of improved cattle was located in the village Samet¹ (the peasants of this village later joined in the kolkhoz "Twelfth October") where a cooperative society began from this time to conduct breeding work. However, large scale planned breeding work was begun after the organization in 1934 of the Kostroma State Breeding Station.

In building its herd, the sovkhos "Karavayevo" bought improved cattle from the surrounding settlements, including from the village of Samet¹. As a first measure they brought hybrids of various generations of Schwyz and Algau cattle with good milk-yield characteristics.

Until 1932 the herd was supplemented with sires from the Schwyz breed, and from then until 1939 in-breeding was practiced using bulls from the best cows. During this period the sovkhos acquired bulls which had great influence on the qualitative improvement of the herd. Among them was the bull Bogatyr² whose 33 daughters had an average yield of 6,681 kilograms of milk with a butterfat content of 3.74 for 300 days of lactation. The best daughter of this bull was the cow Poslushnitsa II which was a record winner at the 1939 All-Union Agricultural Exhibit. Its yield for 300 days of its sixth lactation was 14,115 kilograms of milk with a butterfat content of 3.92.

In 1939, bulls of the Schwyz breed were shipped to the sovkhos from other farms; however, they were used for only a short time.

Decisive influence on the formation of the Kostroma breed was exerted by the organization of a proper system of feeding, keeping and caring for the animals, by the system of raising the calves in unheated premises thereby insuring strong, healthy and hardy animals which are able to have high productivity, by cross breeding local cattle chiefly with Algau and Schwyz cattle, by building a large body of hybrid cattle on the kolkhoz farms and further working with the hybrids in order to develop their valuable features and qualities, and by the systematic selection and culling of the animals based on an assessment of their individual qualities.

The formation of the breed was completed by 1944; and by the end of 1944 it was recognized as an independent breed.

The work of developing the Kostroma breed was conducted by a group of workers of the breeding sovkhos "Karavayevo" under the leadership of Stalin Prize Laureate and Hero of Socialist Labor S. I. Shteyman and on kolkhoz breeding farms by livestock workers under the leadership of the former director of the Kostroma State Breeding Station, N. A. Gorskiy and of the chairman of the kolkhoz "Twelfth October," P. A. Malinina who is a Stalin Prize Laureate and a Hero of Socialist Labor.

As a result of their exceptionally high productivity, cattle of the Kostroma breed have become widely known throughout our country, and it is planned to raise them on kolkhozes and sovkhozes of 12 oblasts, krais and republics including Kostroma, Vladimir, Gor'kiy, Ivanovo and Yaroslav Oblasts, in the Belorussian and Georgian SSR's, etc.

The color of the animals on the breeding farm "Karavayevo" is chiefly gray or light brown. Many animals have a light yellow shade especially in the upper and middle parts of the body. On the kolkhoz breeding farms of Kostroma Oblast, cows with a light brown or brown color tend to predominate although some animals do have a dark brown color.

Cattle of the Kostroma breed are large, broad in build and have well-developed musculature. The head is of average size. The forehead is broad and there is a well-defined occipital crest which is slightly depressed in the middle part. The color of the hair around the eyes and nose is lighter. The neck is of average length and is broad. The chest is deep and sufficiently broad. The withers are long and broad. The middle part of the body is elongated; the hind part of the body is long and broad; the rump is slightly raised. The skeleton is strong; the legs are properly positioned and dry. The udder has large capacity and extends forward along the belly; the milk glands are sharply defined. The skin is dense and elastic and is covered with fine hair.

In comparison with the Schwyz breed, the Kostroma cattle have a narrower forehead, have better musculature, and are built more broadly.

Cows which are registered in the State Pedigree Book have the following average measurements (in centimeters):

Height at the withers	131-132
Height at the rump	135-136
Depth of the chest	68-69
Width of the chest	44-47
Width at the hips	52-53
Oblique length of the body (measured with a measuring stick)	153-157
Circumference of the chest behind the shoulder blades	185-190
Circumference of the metacarpus	19.5-20.5

The live weight of the calves at birth is 33 to 34 kilograms; on the breeding sovkhoz "Karavayevo" it is 40 to 52 kilograms and in some cases up to 58 kilograms. On the breeding sovkhoz "Karavayevo," the daily weight gain for the calves under the care of two-time Hero of Socialist Labor N. A. Smirnova was 912 to 1,035 grams per head; the calves received up to 400 kilograms of whole milk and over 1,000 kilograms of skim milk. By the age of 6 months the young of the Kostroma breed attain a weight of 170 to 230 kilograms while by 12 months they weigh 280 to 360 kilograms. The live weight of the cows is 500 to 580 kilograms. On the kolkhoz "Twelfth October" of Kostroma Rayon where there is one of the most valuable herds of Kostroma cattle, the average weight of the cows is 600 kilograms while best animals weigh up to 700

kilograms. On the breeding sovkhos "Karavayevo," the weight of some cows reaches 830 to 880 kilograms; and the cow Kantovka weighed 870 kilograms at the age of ten years.

The live weight of bulls over 5 years is 850 to 950 kilograms and in individual cases may exceed 1,000 kilograms. The bull Otrez 3177 (breeding sovkhos "Karavayevo"), champion of its breed at the All-Union Agricultural Exhibit of 1954, weighed 1,065 kilograms at the age of 4 years.

Kostroma cattle have good meat qualities. The weight gain of calves on a farm of the kolkhos "Twelfth October" during the meadow fattening period was up to 1,300 grams per head per day. The slaughter weight of cows of average fatness is 51 to 53%. On the breeding sovkhos "Karavayevo" the slaughter yield for highly fattened cows is 58 to 62%.

Cattle of the Kostroma breed are characterized by high milk productivity. The average yield of the cows which are registered in the State Pedigree Book is 3,900 to 5,000 kilograms of milk. Over the course of several years the sovkhos "Karavayevo" obtained an average of 5,500 to 6,400 kilograms of milk per cow. The cattle of the kolkhos breeding farms of Kostroma and other oblasti are noted for their good milk productivity. The herd of the kolkhos "Twelfth October" has an average of 5,012 kilograms of milk per cow.

The leading kolkhozes and sovkhozes obtain high yields while limiting expenditures of concentrated fodders. On the Kolkhos "Twelfth October," "Five Year Plan" and others, the practice of feeding the milking cows raw potatoes is widely employed; the daily ration for some cows consists of 30 to 40 kilograms. On the kolkhos "Karavayevo" exceptional success in milking some cows and in obtaining high yields for a number of lactations have been obtained.

The cow Groza gave 14,203 kilograms of milk for 300 days of its fifth lactation. At the All-Union Agricultural Exhibit of 1954, 28 cows from the breeding sovkhos "Karavayevo" were exhibited; their average yield was 7,125 kilograms for 300 days of lactation; their average live weight was 688 kilograms. The champion of the breed at the All-Union Agricultural Exhibit was the cow Kamsa which was born in 1945. Its yield for 300 days of its fifth lactation was 12,005 kilograms of milk with a butterfat content of 4.01.

The creation of constitutionally strong, hardy animals on the sovkhos "Karavayevo" made it possible to lengthen the period during which the cows are used. Some cows have given from 102 to 120 thousand kilograms of milk for the entire period of their use (until the age of 19 to 22). The cow Krasa gave 120,247 kilograms of milk for 13 lactations. This amounted to 5,050 kilograms of butterfat.

High results in milking cows have been achieved on the breeding farms of the kolkhozes of Kostroma Oblast.

On the kolkhos "Five Year Plan," the cow Pilotka gave 10,123 kilograms of milk for 300 days of its sixth lactation. The butterfat content was 3.93 for a total of 397.8 kilograms of butterfat.

The cow Volshebnytsa KTKS-303 (kolkhoz "Twelfth October") produced 9,019 kilograms of milk for 300 days of its fifth lactation. With a butterfat content of 4.22, this amounted to 380.6 kilograms of butterfat.

The average butterfat content for cows of the sovkhos "Karavayevo" is 3.72 to 3.77; on the breeding farms of the kolkhozes of Kostroma Oblast it is 3.9 to 3.94.

A large number of the cows have high butterfat content. Among them the cow Skhema (breeding sovkhos "Karavayevo") had a yield of 10,534 kilograms of milk with a butterfat content of 4.67 for its fifth lactation and the cow Kochka (from the sovkhos) had a butterfat content of 4.64. On the breeding farms of kolkhozes the record cows have had yields with butterfat content running from 4.5 to 5.0.

Lines and families have been developed in the Kostroma breed from the best animals. On the breeding sovkhos "Karavayevo", animals from the families of the cows Kometa, Poslusnitsa I and Simpatiya have become widely distributed. The bulls Artist and Shango left a large number of daughters on this sovkhos. Poglushnitsa I has been noted for its high productivity. The average yield of 30 some cows belonging to this family was 7,920 kilograms of milk with a butterfat content of 3.7. The average live weight of the cows was 659 kilograms.

The bull Salat has been highly rated in recent years. Its 26 daughters had an average yield of 5,236 kilograms of milk with a butterfat content of 4.06 for the first lactation. Among the bull's daughters was the recordholder of the sovkhos herd, the cow Skhvarka, which had a yield of 12,080 kilograms of milk and a butterfat content of 4.11 for its third lactation.

On the breeding farms of the kolkhozes the related group from the bull Kovyl¹ stands out. The yield of 50 daughters of this bull is 3,500 kilograms of milk with a butterfat content of 3.82. Also noteworthy are the related groups from the bulls Prut, Priz and others.

Breeding work with the Kostroma breed is being conducted on breeding farms of kolkhozes of Kostroma Oblast. The best herds are located on the kolkhozes "Twelfth October," "Five Year Plan" and others. In addition to the kolkhozes, the basic breeding center of the Kostroma breed is the breeding sovkhos "Karavayevo."

Lebedinsk Breed

The Lebedinsk breed of cattle was developed on the breeding farms which are served by the Lebedinsk Station for Breeding Work and on sovkhos of Semy Oblast through the prolonged breeding of hybrids obtained from cross breeding Gray Ukrainian cattle and Schwyz cattle.

In connection with the development of dairy farming, beginning in 1902 Schwyz bulls began to be imported into Lebedinsk Uyezd of Kharkov Guberniya; they were used at servicing points for cross breeding with Gray Ukrainian cattle. By 1912 there were already small groups of

hybrids in the peasant herds of Lebedinsk Uyezd which were noteworthy for their higher productivity and better build.

After 1917 the crossbreeding of local cattle with Schwyz cattle became more widespread; as a result a substantial number of improved Hybrid cattle came into being and the Lebedinsk breed developed from them. The formation of the breed occurred in areas which had good meadows and pasture lands which made it possible to improve the feeding of the cattle. In addition, in feeding the animals the waste products of the food industries which were located close by were used widely (this included pressings, distillery refuse, syrup, etc.).

With the organization in 1934 of the Lebedinsk State Breeding Station, the conditions for raising and keeping the animals improved. From this time on selection and culling were practiced in order to obtain animals which had high productivity, high butterfat content and strong constitutions. In 1951 this group of cattle was confirmed as a separate breed and was called the Lebedinsk breed.

The work in developing this new breed was conducted on kolkhoz breeding farms and on sovkhoses under the direction of Stalin Prize Laureates A. Ye. Yatsenko, Director of the Lebedinsk State Breeding Station G. A. Kirichenko, zootechnicians S. M. Gaydash, I. K. Zgurskiy, etc. Cattle of the Lebedinsk breed are of the dairy-meat type.

The breeding of Lebedinsk cattle is planned for 14 oblasts, krays and republics including the Ukraine, the Transcaucasian republics, Krasnodar and Stavropol Krays, and Saratov and Bryansk Oblasts.

Lebedinsk cattle are brown and gray brown in color with a darker color on the front part of the body and on the sides. Some animals have a light brown or dark brown color. The bull sires have a darker color than the cows.

The animals are large, proportionately built and have strong skeletons and well developed musculature. The head is of average size. The craniological characteristics and the direction of the horns are similar to those for Gray Ukrainian cattle. The nose mirror, the end of the tail and the hoofs are dark in color. The withers are broad and even. The back and small of the back are broad and level. The chest is deep and sufficiently broad. The hind part of the body is straight and well developed in width. Some animals have slightly apparent sloping and sagging of the croup. The legs are strong and well positioned. The udder is large with good development of the parts and properly positioned nipples. The milk veins are clearly defined. The skin is dense and is covered with fine hair.

According to their external build, animals of the Lebedinsk breed differ noticeably from Schwyz cattle. They bear a resemblance to Gray Ukrainian cattle in the structure of the head, the length and direction of the horns, and the size and development of the various parts of the body.

The cows with three or more calvings which have been registered in the State Pedigree Book have the following average measurements (in centimeters):

Height at the withers	131.4
Depth of the chest	66.5
Oblique length of the body (measured with a measuring stick)	157.2
Circumference of the metacarpus	19.7
Height at the rump	134.5
Width of the chest	43.1
Width at the pelvis-hip joint	44.3
Circumference of the chest behind the shoulder blades	187.5

Calves of the Lebedinsk breed are born with a live weight of 33 to 34 kilograms; at the age of 6 months and with proper feeding they reach a weight of 170 to 210 kilograms; during this period they have an average daily weight gain of 800 to 900 grams. Calf tender A. A. Panchenko, a Hero of Socialist Labor and a member of the Pivnenkovskiy Breeding Sovkhoz obtained an average daily weight gain of 1,112 grams per head from her group.

The live weight of cows is 480 to 550 kilograms. On some farms the average live weight of the cows is 610 to 630 kilograms and higher. The cow Gul'ka which belongs to the kolkhoz imeni Lenin of Lebedinskiy Rayon weighs 720 kilograms.

The average weight of the bulls at the age of 5 years or older is 850 to 950 kilograms. The bull Sokol 272 which belongs to the kolkhoz imeni Stalin of Lebedinsk Rayon of Sumy Oblast at the age of 7 years weighed 1,200 kilograms; and the bull Orlik (Chupakhovskiy Sovkhoz) weighed 1,150 kilograms at 5 years of age.

The Lebedinsk cattle have good meat qualities. The fattening of castrated young bulls on good natural pastures produces a daily weight gain of 900 grams and a slaughter yield of 54%. In 90 days of fattening on pressings, a group of castrated young bulls had an average total weight gain of 88 kilograms per head.

Along with their good meat qualities, Lebedinsk cattle have high milk productivity. At the 1939 All-Union Agricultural Exhibit the following record cows were exhibited: Lenta, Dora, Vita, Zina, Lenka and others; for 300 days of lactation they produced from 10 to 12 thousand kilograms of milk.

The cows which are registered in the State Pedigree Book have an average yield of 3,200 to 3,700 kilograms of milk. A high yield was obtained from the cow Zor'ka SUL-132 (kolkhoz imeni Lenin); for a 300 day lactation the cow gave 9,196 kilograms of milk with a butterfat content of 3.73. The yield of the cow Rezva 369 which was born in 1950 (from the same kolkhoz) and which was a champion at the All-Union Agricultural Exhibit in 1957 was 9,252 kilograms of milk with a butterfat content of 4.01 for 300 days of its third lactation. The live weight of the cow Rezva was 630 kilograms.

Lebedinskiy cattle have relatively good butterfat content. The average butterfat content for cows on the breeding farms of the kolkhozes of Sumy Oblast is 3.85; however, only about 30% of the cows have a

butterfat content greater than 4.0. Among the cows which are registered in the State Pedigree Book there are some animals which have an exceptionally high butterfat content such as the cow Galka SUL-1114; its yield for 271 days of its ninth lactation was 3782 kilograms of milk with a butterfat content of 5.06.

Breeding work with Lebedinsk cattle is concentrated on the breeding farms of the Lebedinsk Station for Breeding Work from which each year a large number of pedigree calves are shipped. The breeding work is also conducted on the sovkhoses of the Sumy Sugar Trust. Important related groups of Lebedinsk cattle have been created on the breeding farms of the kolkhozes and on the sovkhoses of the Pivnenkovskiy and Chupakhsovskiy Sugar Kombinati's.

The descendants of the bulls Askold, Krasnyy, Narzan, Minus, Druzhok and others have gained wide distribution on the kolkhozes of Sumy Oblast.

On Chupakhovskiy Sovkhoz there are 39 daughters and 33 granddaughters of the bull El'brus 160. The average yield for 13 of the daughters for their first lactation was 3,650 kilograms of milk with a butterfat content of 3.82. The descendants of the bulls Jasmine, Mercury and others on the Pivnenkovskiy Sovkhoz have high productivity.

In breeding work with this new breed, especial attention has been devoted to the problems of increasing butterfat content and developing constitutionally strong animals.

Alatau Breed

The Alatau breed was developed by inbreeding hybrids obtained from crossing the local cattle of the Kirghiz and Kazakh republics with the Schwyz breed.

The formation of this breed occurred in the foothills of Zailiyskiy Ala-Tau with the animals spending the summers in mountain pastures situated at elevations of 1,600 to 3,200 meters above sea level.

The beginning of the cross breeding of the local cattle with Schwyz cattle occurred about 1900. However, the extensive improvement of the local cattle with Schwyz cattle became possible only much later.

In 1924 the farm "Alamedin" was reorganized into a breeding sovkhos from which pedigree calves were sent to other farms. By 1935 there was already a large number of hybrids of the Schwyz breed on the kolkhoz farms and sovkhoses of the Kirghiz and Kazakh republics. After the organization in 1936 of the Kirghiz and Alma-Ata State Breeding Stations, the work in improving the local cattle became more extensive and assumed a planned character.

Cattle of the Alatau breed combine the characteristics of the starting breeds: the higher butterfat content, good meat qualities and hardiness of the local cattle and the abundant milk productivity, large size and build of the Schwyz breed.

The selection of animals in breeding is conducted on the basis of a group of characteristics; however, especial attention has been devoted to utilizing animals with strong constitutions and high butter-fat content without regard to breed purity.

Inasmuch as hybrids of the second and third generations approached most closely the desired type with respect to productivity and build, animals of these generations were used primarily for inbreeding.

In the herds of some farms animals of the Aulieatinsk were also used; and in the latest period introductory cross breeding with the Kostroma breed has been employed. Cattle of the Alatau breed are distributed on the sovkhoses and kolkhoses of some areas of the Kirghiz and Kazakh SSR's. In addition, it is planned to raise them in the Turkmen, Tadzhik and Uzbek republics.

The work in creating the Alatau breed was conducted by a group of livestock workers of kolkhoses and sovkhoses with the participation of Stalin Prize laureates F. A. Strel'nikova, P. I. Mel'nikov, P. N. Nikiforov, A. S. Vsyakikh, D. N. Pak and other specialists and scientific workers.

The Alatau cattle have a brown color of varying degrees of intensity. The animals have a compact build, a strong but not coarse skeleton and well-developed musculature. The head is of average size, somewhat elongated in the facial part and broad in the forehead. The chest is deep, but sometimes not sufficiently broad. The line of the back and of the small of the back in most cases is straight; the rump is slightly raised. The hind part of the body is broad but sometimes slightly tapered. The legs and hoofs are strong and straight. The udder is of average size, generally cup-shaped with cylindrical nipples and a good covering of soft hair.

Of the deficiencies in the build which are encountered in the animals, it is possible to mention a sagging or sloping croup and tightness behind the shoulder blades. The skin is thin and dense.

In comparison with the Schwyz cattle and other related breeds, the Alatau cattle are generally smaller in height and have a more compact build.

In contrast to the Schwyz cattle, they have a body which is slightly less developed in width and length with a relatively deep and round shape to the chest.

The average measurements of the cows are the following (in centimeters):

Height at the withers	128-130
Depth of the chest	65-68
Width of the chest	40-42
Oblique length of the body (measured with a measuring stick)	150-155
Circumference of the chest behind the shoulder blades	182-186
Circumference of the metacarpus	19-20

The live weight of the calves at birth is 32 to 38 kilograms; by 6 months of age the calves achieve a weight of 160 to 180 kilograms.

The live weight of cows is 430 to 520 kilograms. The average live weight of cows on the sovkhoses imeni Il'ich and "Alamedin" is 590 to 600 kilograms. Some cows weigh 750 to 880 kilograms.

The live weight of mature bulls is 700 to 900 kilograms. The bull Vitamin 355 which was born in 1949 (breeding sovkhos "Alamedin") weighed 1,280 kilograms.

The Alatau cattle have good meat qualities. In slaughtering rejected cows with a live weight of 570 kilograms, the slaughter yield is 54.2% and the weight of the skin is 35.6 kilograms.

Yields of cows according to the data of the State Pedigree Book are 3,200 to 3,800 kilograms of milk. On the breeding sovkhoses the average yield of cows is considerably higher. On the breeding sovkhos 5,196 kilograms of milk were obtained; on the breeding sovkhos imeni Il'ich 5,090 kilograms of milk per cow were obtained.

The best cows of the Alatau breed give over 8,000 kilograms of milk. The cow Berezhka gave 10,317 kilograms of milk with a butterfat content of 4.2. The yield of the cow Zabytaya 850 which was born in 1946 and which was exhibited at the All-Union Agricultural Exhibit was 6,567 kilograms of milk with a butterfat content of 3.8; its live weight was 684 kilograms.

Cattle of the Alatau breed are noted for their high butterfat content. The average butterfat content of the milk from cows on the breeding farms of the kolkhoses is 3.8 to 4.0. Some animals have a butterfat content of 4.5 to 4.8. The best herds of the Alatau breed are located on the breeding sovkhoses "Alamedin" and imeni Il'ich of the Kirghiz SSR, on the breeding sovkhos imeni Lenin of the Kazakh SSR and also on the breeding farms of kolkhoses of the Frunze and Alma-Ata Oblasts. On these farms there have been created related groups which have become widely distributed in the breed. It is possible to single out the related groups of the bulls Vulcan, Amur and also the families of Morena (yield of 7,454 kilograms with a butterfat content of 3.8 for the third lactation), Silachka, Soyka, and others.

Breeding work with the Alatau breed is directed at further raising the milk productivity and butterfat content for the cows, increasing the live weight of the animals and improving their build.

Simmental¹ Breed

The country of origin of the Simmental¹ breed is Switzerland. The presence of Alpine pastures with rich vegetation, the creation of good feeding conditions and also the exporting of dairy products aided in the development of cattle raising in Switzerland. Under the influence of these conditions the formation of the Simmental¹ breed took place. Cattle of this breed were exported to some European countries including to Russia. The centers for Simmental¹ cattle up to 1914 were in the territory of the present Smolensk, Saratov, Tambov, Ryazan, Voronezh and other oblasti and also in the Ukraine.

The greatest spread of the cattle of the Simmental¹ breed took place after the Great October Revolution and, in particular, after the organization of the kolkhozes.

The raising of Simmental¹ cattle and of hybrids from them as well as the use of this breed for cross breeding with local unproductive cattle is planned for 70 oblasts, krays and republics of our country including Saratov, Stalingrad, Tambov, Penza, Voronezh, Ryazan and other oblasts, in the Kazakh, Armenian and Georgian republics, in the Altay and Krasnoyarsk Krays and in the oblasts of Eastern Siberia.

This wide distribution of Simmental¹ cattle and of their hybrids is explained by their fine ability to become acclimatized, relatively high milk productivity and good meat and working qualities.

In various zones of the Soviet Union, because the Simmental¹ cattle have been affected by the specific local conditions of feeding and keeping the animals and also as a result of cross breeding with local cattle and planned selection, these cattle differ from the Simmental¹ cattle in other countries and in Switzerland.

The color of the cattle is pale yellow-mottled or pale yellow; in the second case the head and the extremities have a white color. Many animals have red mottled color.

Simmental¹ cattle belong to the group of larger cattle breeds. The cows which have been registered in the State Pedigree Book have the following average measurements (in centimeters):

Height at the withers	133.6
Depth of the chest	68.7
Width of the chest	42.7
Width at the hips	50.6
Oblique length of the body (measured with a measuring stick)	156.6
Circumference of the chest behind the shoulder blades	187.2
Circumference of the metacarpus	19.5

The animals have a strong constitution and a normal build. The head is not heavy, but it is long with a broad forehead and horns which extend sideways. The neck is of average size. On the bulls the dew-lap is well developed.

The withers, back and small of the back are flat and broad (some animals do have weak backs); the chest is deep and broad. The musculature is well developed. The skeleton is strong. The rump is sometimes slightly raised. The animals have long, strong, properly positioned legs. The skin is thick and not coarse with a rose color. The udder is large with widely positioned nipples. The milk veins are well defined.

The young of the Simmental¹ breed are born with a live weight of 35 to 42 kilograms; at the age of 6 months with proper conditions of raising they weigh 190 to 220 kilograms. The weight gain during this period is 900 to 950 kilograms per day. When young bulls are fed abundantly, they achieve a weight of 250 to 300 kilograms by the age of six months and a weight of 420 to 450 kilograms by the age of 1 year. The live weight of the cows is 550 to 620 kilograms.

The live weight of bull-sires is 850 to 1,000 kilograms. Some cows achieve a weight of 880 kilograms while bulls may go as high as 1,300 kilograms. The champion of the breed at the All-Union Agricultural Exhibit of 1957, the bull Moguchiy 1154 belonging to the kolkhoz of the Yelan'-Kolensovskiy Sugar Kombinat of Voronezh Oblast, weighed 1,264 kilograms at 4 years of age.

The Simmental¹ cattle have good meat qualities. According to the data of the Scientific Research Institute of Livestock Raising for the Wooded Steppe and the Forest Area of the USSR, the average daily weight gain for young castrated bulls on meadow fattening was 830 grams a day during the course of 140 days; when they were fattened with pressings, the daily weight gain was 792 grams. The yield of meat at slaughtering is 52 to 56% for Simmental¹ cattle.

The yield of the cows on breeding farms of the kolkhozes varies from 2,500 to 3,500 kilograms of milk. Many kolkhozes and sovkhoses have herds with considerably higher productivity. The breeding sovkhos imeni Lenin of Tambov Oblast obtained 4,262 kilograms of milk per cow; the breeding sovkhos "Trostyanets" of Chernigov Oblast obtained 4,915 kilograms.

Milkmaid P. N. Kovrova, twice a Hero of Socialist Labor, (from the kolkhoz "Foundation of Socialism" of Ryazan Oblast) obtained over 6,500 kilograms of milk from each cow.

One of the champions of the breed at the All-Union Agricultural Exhibit was the cow Zozulya (kolkhoz imeni Kirov of Chernigov Oblast); its yield for 300 days of its fourth lactation was 12,761 kilograms of milk with a butterfat content of 3.8. Zozulya's live weight was 655 kilograms.

The cow Kukla (kolkhoz imeni Mikoyan of Kiev Oblast) gave 10,955 kilograms with a butterfat content of 4.87 for 300 days of its seventh lactation.

The average butterfat content for cows of the Simmental¹ breed is 3.7 to 3.9. However, in various areas of our country, the butterfat content of the milk of Simmental¹ cows is different (according to the state breeding stations).

State Breeding Station
[Gosplemrassadnik]

Average butterfat content of the milk for all breeding farms

Izhevskiy (Ryazan Oblast)	3.80
Voronezhskiy (Voronezh Oblast)	3.86
Bolkhovskiy (Orlov Oblast)	4.03
Khorol'skiy (Primorskiy Kray)	4.14
Charyshskiy (Altay Kray)	4.16

The variations in butterfat content for animals of the Simmental¹ breed are very great -- from 3.0 to 5.8.

There is a large number of lines of bulls and families of cows which have developed in the Simmental¹ breed. Depending on the direction of the breeding work with the Simmental¹ cattle, descendents of various bulls and of highly productive cows have spread throughout various zones of the USSR.

The bulls Frants 212 and Lotos left numerous offspring on the breeding farms of the kolkhózes of Orlov Oblast. The best daughter of the bull Frants 212 -- the cow Zor¹ka -- gave 7,312 kilograms of milk with a butterfat content of 3.71 for 300 days of lactation.

On the breeding farms of the kolkhózes and sovkhózes of Chernigov Oblast, the related group from the bulls Bogatyr¹ and Mogar gained the widest distribution and now numbers 1,500 cows. The champion for milk yield at the All-Union Agricultural Exhibit the cow Zozulya, belongs to this group.

In Penza Oblast the descendents of the bull Mikel¹ have gained wide distribution while in Stalingrad Oblast the bulls Voskovoy and Zhivoy occupy the same position. In addition, in many oblast krays and republics a large number of bull-sires have been brought in from the Sychev State Breeding Station.

The main centers of the breeding work in perfecting the Simmental¹ breed are the breeding farms of the 20 state breeding stations and of the stations for breeding work located in widely differing zones of the USSR and also the following breeding sovkhózes: imeni Lenin (Tambov Oblast), imeni Seventeenth Party Congress (Orlov Oblast), "Borodinskiy" (Krasnoyarsk Kray), "Kon¹kolodeznyy" (Voronezh Oblast), "Trostyanets" (Chernigov Oblast), etc.

The breeding work with the Simmental¹ breed is directed toward further increasing the milk productivity and butterfat content and also toward obtaining animals which are better adapted to local breeding conditions.

Sychev Breed

The Sychev breed was developed on the kolkhózes and sovkhózes of Smolensk Oblast through prolonged breeding work with hybrids obtained by crossing local cattle with Simmental¹ cattle.

The improvement of the local cattle of Smolensk Oblast through the use of the Simmental¹ breed began already in the second half of the last century; however, it was only after the Great October Revolution that it became possible to begin a broad planned program of breeding work with this improved group of cattle.

The formation of the Sychev breed took place under conditions of improved feeding and keeping with the systematic selection of the most productive animals. The work of creating the Sychev breed was carried on with the participation of Stalin Prize laureates O. D. Vende, L. V. Fertisova, N. G. Grigor¹yev, K. F. Petukhov, and others was completed in 1950. The breeding of cattle of the Sychev breed is planned for 28

oblasts including Smolensk, Bryansk, Kalinin, Kaluga, Ryazan, Kemerovo and other oblasts and also several krais and republics.

The dominant color of the Sychev cattle is pale yellow with a white head and lower part of the body or it is pale yellow mottled. Many animals have a red or red mottled color of various degrees of intensity. Animals of this breed characteristically have a strong build, a long well-developed body, and relatively long legs. The head is of average size with a broad forehead. The withers are broad and even. The back and small of the back are straight and broad. The croup is long and broad and straight. The skeleton is strong. The musculature is adequately developed. The skin is elastic and dense. The udder has good capacity and often has more developed rear sections. The nipples are large of cylindrical shape; the milk veins are well defined.

The Sychev cattle differ from the Simmental¹ cattle which are raised in the USSR in their greater height and more elongated body and also in their dry physical shape.

The Sychev cattle are physically one of the largest breeds of cattle. Cows which have had three or more calvings have the following average measurements (in centimeters):

Height at the withers	134
Depth of the chest	67
Width of the chest	42
Width at the hips	53
Oblique length of the body (measured with a measuring stick)	153
Circumference of the chest behind the shoulder blades	185
Circumference of the metacarpus	20

The young of the Sychev breed are born with a live weight of 35 to 42 kilograms. At ages up to 6 months the average daily weight gain of the calves is 800 to 900 grams.

Hero of Socialist Labor A. A. Reshchina, a calf tender of the kolkhoz "Forward to Socialism" of Smolensk Oblast, obtained an average daily weight gain of 1,299 grams per head for a group of 63 calves. At the age of six months the young of the Sychev breed weighed 170 to 200 kilograms.

The average weight of the cows varies between 480 to 580 kilograms. On many breeding sovkhoses and kolikhoz breeding farms there are herds with animals of the Sychev breed which have considerably higher live weights. The average weight of cows with three or more calvings on the kolkhoz "Pereklichka" of Smolensk Oblast is 622 kilograms; on the kolkhoz "Stakhanovets" of the same oblast it is 620 kilograms. Of the same order are the live weights of the cows on the sovkhoses "Sychevka," "Dugino" and "Varaksino" of Smolensk Oblast.

The live weight of many cows exceeds 800 kilograms. For example, the cow Roza 66 from the kolkhoz "Iskra" of the Sychev Rayon had a live weight of 882 kilograms and the cow Gessenskaya (breeding

sovkhoz "Dugino") weighed 896 kilograms. Bull-sires also have high live weights. The bull Raphael weighed 1,325 kilograms at the age of 3 years and 9 months. The bull Vakhter 4333 (kolkhoz "Stalinist Five Year Plan" of Smolensk Oblast weighed 1,158 kilograms at the age of 7 years.

With pasture fattening of castrated bulls, their weight gain reaches 800 to 1,000 grams per head per day. The slaughter yield, depending on the degree of fatness varies between 50 and 56%.

The average yield of cows of the Sychev breed is 2,500 to 3,200 kilograms. On some sovkhozes and kolkozoes the figures for milk yields are considerably higher.

The average yield of the cows from the herd of the kolkhoz "Five Year Plan" of Smolensk Oblast was 4,017 kilograms of milk. The kolkhoz imeni Stalin obtained an average yield of 4,202 kilograms of milk and the breeding sovkhoz "Sychevka" obtained 4,030 kilograms of milk per cow. P. N. Gorshkova, the best milkmaid on the breeding sovkhoz "Dugino" obtained 6,759 kilograms of milk, and Ye. I. Smirnova, a milkmaid on the kolkhoz "Forward to Socialism," obtained 5,360 kilograms of milk from each cow in her group. The best cows of the Sychev breed give over 8,000 kilograms of milk.

On the breeding sovkhoz "Dugino" the cow Mara 353 gave 8,307 kilograms of milk for 300 days of its third lactation. The yield of the cow Atlantida 119 (breeding sovkhoz "Sychevka") which was exhibited at the All-Union Agricultural Exhibit gave 7,190 kilograms of milk with a butterfat content of 3.9 for 300 days of its fifth lactation.

Cattle of the Sychev breed have average butterfat content. The variation of the butterfat content of the milk of cows on the breeding farms of kolkhozes of Smolensk Oblast is from 3.3 to 4.6. On some farms the cows are noted for their high butterfat content. The average butterfat content of the milk for the herd of the kolkhoz "Stakhanovets" is 4.09. Somewhat lower is the butterfat content for cows on sovkhozes where the average figure is 3.6 to 3.7.

During the past 30 years about 100,000 head of pedigree young have been shipped from Smolensk Oblast to widely different areas of the Soviet Union. The animals which were supplied from the breeding farms of the kolkhozes and sovkhozes of Smolensk Oblast were used widely for improving local unproductive cattle in Voronezh, Orlov, Tambov, Saratov, Stalingrad and other oblasts as well as in a number of areas in Siberia.

There is a large number of related groups from bulls and families from cows in the Sychev breed. A relatively high evaluation for milk productivity has been given to the descendents of the bulls Viktor r.139, Orlean r.128, Ralph r.130 and others. The descendents of the bull Orlean r.128 have not only high milk productivity but also good meat formations.

The family of the cow Tayna is widely known. One of its sons, the bull Teodor, was champion at the 1939 All-Union Agricultural Exhibit.

The best cows from the family of Nimfa were the cows Ira, Modistka and Rimfa. The granddaughter of the cow Nimfa, the cow Zhemchuzhina, gave 7,356 kilograms of milk with a butterfat content of 3.88 for 300 days of its fourth lactation. Descendents of the cow Nimfa are on the breeding farm of the kolkhoz "Stakhanovets."

Breeding work with the Sychev breed is directed at raising the milk productivity and butterfat content for the cows and also at improving the build of the animals.

Bestuzhev Breed

The beginning of the formation of Bestuzhev cattle occurred toward the end of the Eighteenth Century in the village Rep'yevka b. of Syzranskiy Uyezd of Simbirskiy Guberniya where S. P. Bestuzhev cross-bred local cattle with Shorthorn cattle.

In 1813 in an effort to obtain animals with high milk and meat qualities imported cattle of the Dutch breed which he crossed with hybrids from the Shorthorn cattle. In the next phase the hybrids were crossed with Simmental^o, Kholmogorsk and Aberdeen-Angus breeds.

Thus the Bestuzhev cattle developed from complex cross breeding involving the use of several breeds of cattle. At the beginning of this century bulls of the Wilstermarsh and Shorthorn breeds were used in some herds of the Bestuzhev breed.

In contrast to the Kholmogorsk, Istobansk, Red Humped and Yaroslavl breeds, the formation of which occurred in areas with rich flood meadows, the Bestuzhev breed was established under conditions involving the extensive use of field crops with lack of adequate pasture lands. The predominance of barn fodders in the rations of the cows and the uneven feeding of the animals during periods of drought in the Povolzh'ye affected the development of the productive qualities of the breed.

Beginning with the second half of the last century the Bestuzhev breed began gradually to spread among the peasant farms.

Bestuzhev cattle gained wide notoriety after the All-Russian Exhibit of 1869 at which a group of animals from Syzranskiy Uyezd of Simbirskiy Guberniya was exhibited.

Cattle of the Bestuzhev breed are distributed throughout the territory of the present Tatar and Bashkir ASSR's and Ulyanovsk and Kuybyshev Oblasts as well as in parts of Penza, Saratov and Orenburg Oblasts where at the present time there are highly productive herds of this breed on the kolkhozes and sovkhozes.

Until 1917 breeding work with the Bestuzhev breed was conducted in the herd of the Annenkovskiy Experimental Station of Simbirskiy Guberniya where in 1909 a station was organized for raising young pedigree bulls. In 1926 dairy cooperatives were organized in the areas where Bestuzhev cattle were raised and in 1934 the Syzranskiy State Breeding Station was established.

In the succeeding years the Bashkir (Bashkir ASSR), Kuybyshev (Tatar ASSR) and Novospasskiy (Ul'yanovsk Oblast) State Breeding Stations were established, and they played an important role in improving the pedigree and productive qualities of the breed.

The animals have a red color of varying degrees of intensity. Some animals have white markings located in most cases on the lower part of the body.

Generally the Bestuzhev cattle are of average size. The middle part of the body is somewhat elongated. The musculature is satisfactorily developed. The head is dry and light. The nose mirror is dark. The neck is of average length and thickness and the folds in the skin are small. The withers are of average height and are broad. The back and small of the back are flat and sufficiently broad. The rear part of the body is somewhat raised with the tail being located very high. The chest is deep and rounded and of average width. The tail is long and rather thick. The legs are strong and positioned wide apart. The udder is of average size and often is cup-shaped with a large base. The nipples are of average length and are spread wide apart. The skin of the udder is thin, elastic and covered with long, thick, soft hair.

Cows of the Bestuzhev breed have the following average measurements (in centimeters):

Height at the withers	128
Depth of the chest	67
Width of the chest	40
Oblique length of the body (measured with a measuring stick)	151
Circumference of the chest behind the shoulder blades	180
Circumference of the metacarpus	18

The young are born with a live weight of 31 to 36 kilograms; on the sovkhozes the young attain a weight of 150 to 170 kilograms by the age of 6 months.

On the breeding sovkhoz "Kanash" of Kuybyshev Oblast the average daily weight gain for the calves up to the age of 6 months is 750 to 900 grams. The live weight of cows which are registered in the State Pedigree Book is 420 to 500 kilograms. For some animals it is higher. The cow Pechal', for example, weighed 817 kilograms at the age of 5 years and ten months.

The live weight of the bulls is 780 to 880 kilograms. The bull Naryv weighed 1,175 kilograms at the age of 10 years, and the bull Buket 632 (farm of the Annerkovskiy Agricultural Test Station) weighed 1,194 kilograms.

Bestuzhev cattle have good meat qualities. The yield at slaughter after meadow fattening reaches 58%.

The average yield of the cows is 2,500 to 2,700 kilograms; however on some farms it is considerably higher. On the sovkhoz "Kanash" 5,023 kilograms of milk per cow were obtained.

The cows Liya (breeding sovkhos "Kim" of the Tatar ASSR) with a yield of 10,007 kilograms of milk for its fourth lactation and Basnya (sovkhos "Kanash" of Kuybyshev Oblast) with a yield of 10,386 kilograms and a butterfat content of 3.7 had the highest yields.

The average butterfat content is 3.7 to 3.9. A great many cows have a butterfat content for their milk of over 4.0 and some cows attain a figure of 5.0.

In the Bestuzhev breed there is a number of lines and families. The descendants of the bull Napoleon I and his sons Nazhdak, Neruch, Mishka I, Lom, Azon and others have become the most widely distributed.

Breeding with the Bestuzhev breed is being conducted on the breeding farms of kolkhozes at Ul'yanovsk and Kuybyshev Oblasts, the Baskir and Tatar ASSR's and also on the following sovkhos: "Kim" of the Tatar ASSR, "Kanash" of Kuybyshev Oblast, imeni Sakko and Vantsetti and the farm of the Annenkovskiy Test Station of Ul'yanovsk Oblast.

Red Tambov Breed

The Red Tambov breed was formed by means of complex reproductive cross breeding. In forming this breed first Pashkov and then later Tyrol cattle were used with the local cattle of Tambov Oblast.

Much later the local cattle which had been improved by cross breeding with Tyrol cattle were cross bred with Simmental¹ cattle. The hybrids obtained from this cross breeding were inbred over a long period of time.

Of decisive importance in the formation of the Red Tambov breed were the economic, natural and feeding conditions of the areas in which the animals were raised. The presence of considerable waste products from the raising of crops and of the products of processing plants such as malt grains and siftings contributed to the creation of fine conditions for feeding. In the selection of the cattle, the goal was the obtaining of strong, hardy, relatively rapidly maturing animals which would assimilate fodder well and at the same time have good milk productivity.

The Red Tambov cattle are distributed throughout a number of rayons of Tambov Oblast. Animals of this breed are large and well built with strong constitutions. The head is light and short. The neck is short. The withers are broad and even. The body is broad and deep. The rear third of the body is well developed in length and width. The back including the small of the back is flat and broad. The rump is slightly raised. The chest is deep but not too well developed in width. The legs are strong and properly positioned. The skin is thin and dense. The musculature is well developed. The udder is of average size with widely positioned nipples. The color is red of various shades. Some animals have white markings on the lower part of the body and on the legs.

The cows which have been registered in the State Pedigree Book have the following measurements (in centimeters):

Height at the withers	132.3
Depth of the chest	70.8
Width of the chest	41.6
Width at the hips	54.0
Oblique length of the body (measured with a measuring stick)	163.9
Circumference of the chest behind the shoulder blades	189
Circumference of the metacarpus	19

The strong constitution and good health of the animals of this breed makes possible the use of the animals for a long period. Highly productive cows of the Red Tambov breed are used until 16 to 17 years of age while the bulls are used until they are 12 to 15.

The calves are born with a live weight of 33 to 38 kilograms. The average daily weight gain of the cows on the kolkhoz imeni Lenin of Kirsanovskiy Rayon of Tambov Oblast was 700 to 850 grams over a period of 6 months. At the age of 6 months the young weigh 170 to 180 kilograms, and at the age of 1 year they weigh 300 to 320 kilograms. Some calves attain a daily weight gain of 1,100 grams.

The live weight of the cows on the kolkhozes is 440 to 500 kilograms. The cows which are registered in the State Pedigree Book and have had 3 or more calvings average 560 kilograms. On the kolkhoz imeni Lenin of Tambov Oblast where there is one of the best herds of Red Tambov cattle, some of the animals reach a weight of 730 kilograms. The live weight of bulls of 5 years or older is 850 to 1,000 kilograms. Cattle of the Red Tambov breed have good meat qualities. Fattened oxen attain a weight of 1,100 to 1,250 kilograms. The yield of meat from meadow fattened cows is 54%; the yield of intestinal fat is 7 to 8%. The meat is noted for its good taste and high calorific content.

Steers of the Red Tambov breed are used in transport and agricultural work.

The average yield of cows of the Red Tambov breed, according to the data of the State Pedigree Book, is 4,397 kilograms of milk with variations from 2,700 to 7,820 kilograms. The yield of the cow Vakhanka (training farm imeni Kalinin) was 7,820 kilograms with a butterfat content of 3.71 for 300 days of its seventh lactation; the cow Krasavka (kolkhoz imeni Lenin) gave 6,650 kilograms with a butterfat content of 4.81 for 300 days of its fourth lactation.

One of the positive qualities of the Red Tambov breed is good butterfat content. The average butterfat content of the milk of cows on the breeding farms of kolkhozes of Tambov Oblast is 3.97; for the herd of the kolkhoz imeni Lenin it is 3.9 to 3.95. The cow Milka 134 gave 4,991 kilograms of milk with a butterfat content of 5.31 for its seventh lactation the cow Tavrida 152 gave 5,114 kilograms of milk with a butterfat content of 4.9 for its sixth lactation.

The best herds of the Red Tambov breed are found on the kolkhoz imeni Lenin and on the training farm imeni Kalinin of Michurin Rayon of Tambov Oblast. A number of related groups and families have been established on the breeding farms of the kolkhozes of Tambov Oblast. On the kolkhoz imeni Lenin the descendants of the bull Glukhar^o are very numerous. The average yield of 24 daughters from this bull was 4,896 kilograms of milk with a butterfat content of 3.92. The cows from the bull Tsvetok (through its son Lyutik) had a yield of 4,645 kilograms of milk with a butterfat content of 3.83. The average live weight of the cows is 606 kilograms.

The main goal of the breeding work with this breed is the further increasing of the milk productivity and butterfat content of the cattle.

In order to regenerate the blood and create new lines and families in the breed, introductory cross breeding using the Red Humped breed is being employed on some farms of Tambov Oblast.

Red Humped Breed

The place of origin of the Red Humped breed is the village of Bogorodskoye of Gor'kiy Oblast. This breed was obtained through the breeding of hybrids obtained by crossing local and Tyrol cattle. The Tyrol cattle were imported into the present Gor'kiy and Vladimir Oblasts during the first half of the Nineteenth Century.

The formation of the cattle of the Red Humped breed took place under conditions where a leather industry was developing in the village of Bogorodskoye and also in connection with an increased demand for raw hides and for the products of livestock raising.

At the same time, the presence of good fodder lands in the areas along the flood plains of the Oka, Klyaz'ma and Volga Rivers where the Red Humped cattle were being raised helped in developing the milk and meat productivity of the animals.

The cattle of this breed have high butterfat content. They have spread throughout Vladimir, Gor'kiy and Ivanovo Oblasts. In addition, the breeding of Red Humped cattle is envisaged for a number of areas in the Mordvin, Chuvash and Mari autonomous republics.

The color of the animals is red and dark red. Animals are encountered which have white markings on the udder and a white color to the end of the tail. The bulls are darker than the cows. The head is short and wide. The forehead is wide and flat and even in length with the facial part. The nose mirror has a pink or yellow pink color. The neck in most animals is short and of average thickness with a well developed dewlap. The withers are broad and short. The back including the small of the back is straight although some animals do have a sway back. The chest is deep and broad. The croup is of average length but sometimes droops; it is sufficiently broad and has a tail which is mounted very high.

The animals have a rounded, elongated body on comparatively short but strong legs. The legs may be knock-kneed or low-legged which are the deficiencies of the legs which are encountered most frequently. The skin is dense and elastic. The udder is of average size usually with uniform development of the parts although there are animals in which the front parts of the udder are weakly developed. The nipples are of average size; in many animals they have a conical form and are somewhat close together.

The cattle of this breed are small with strong, light skeletons and satisfactory development of the musculature.

The measurements of the cows according to the State Pedigree Book are the following (in centimeters):

Height at the withers	115-118
Depth of the chest	61-63
Width of the chest	36-40
Oblique length of the body (measured with a measuring stick)	144-146
Circumference of the chest	163-170
Circumference of the metacarpus	16

The young of the Red Humped breed are born with a live weight of 23 to 28 kilograms. On the breeding sovkhos "Bogorodskoye" of Gor'kiy Oblast the calves weigh 150 to 165 kilograms at the age of 6 months and 245 to 275 kilograms at the age of 1 year.

The live weight of the cows is 390 to 440 kilograms; some cows reach a weight of 600 to 640 kilograms. The weight of the bulls is 600 to 700 kilograms. The bull Bantik of the breeding sovkhos imeni Voykova of Vladimir Oblast weighed 988 kilograms at the age of 7 years, and the bull Lev O104 (kolkhoz imeni Stalin of Gor'kiy Oblast) weighed 835 kilograms.

The Red Humped cattle have good meat qualities. The average daily weight gain in meadow fattening steers at 2 years of age reaches 1 kilogram per day. The slaughter yield for fattened animals is 51 to 55%.

The yield of cows of the Red Humped breed is 2,300 to 2,700 kilograms. On the kolkhoz "Peasant" of Bogorodskiy Rayon of Gor'kiy Oblast an average of 4,332 kilograms of milk was obtained, and on the kolkhoz "For a New Life" of the same oblast the yield was 4,118 kilograms of milk per cow.

The cow Roza 214 gave 8,007 kilograms of milk with a butterfat content of 4.37 for 300 days of its eighth lactation; the live weight of the cow was 500 kilograms. The cow Blondinka 1009 from the kolkhoz "Iskra" of Gor'kiy Oblast produced 7,032 kilograms of milk with a butterfat content of 4.2 for 300 days of its fifth lactation. The live weight of the cow was 452 kilograms.

An especially important quality of the cattle of the Red Humped breed is the high butterfat content of the milk.

The average butterfat content of the milk of the cows which are registered in the State Breeding Book is 4.26 to 4.29. With some animals the figure is as high as 5.8 to 6.0.

The best herds of the Red Humped breed are located on the breeding farms of the kolkhozes of Gor'kiy and Vladimir Oblasts and also on the breeding sovkhoz "Bogorodskiy" of Gor'kiy Oblast and the breeding sovkhoz imeni Voykov of Vladimir Oblast.

The cattle of this breed are used on a number of sovkhozes for introductory cross breeding with the purpose of raising the butterfat content for East Friesian cattle.

Yurino Breed

The Yurino breed received its name from the village of Yurino in the former Vasil'surskiy Uyezd of Nizhegorodskoy Guberniya.

In its origin this breed in the initial period of its formation had much in common with the Red Humped breed. Landowner Sheremet'yev who received the village of Yurino in 1812 moved part of the peasants from the village of Bogorodskoye to Yurino together with their cattle. In the middle of the last century local cattle which had been improved by crossing with Tyrol cattle began to be received in Yurino from Bogorodskoye. Then Sheremet'yev began to import Tyrol cattle to Yurino. The bulls which were obtained by crossing the local cattle with Tyrol cattle were used with the herds from the surrounding small villages. In the Eighties of the last century a dairy industry began to develop in the area of formation of the Yurino breed. From this time on it became the practice to import Schwyz cattle which were cross bred with the local cattle until 1903. At this time inbreeding of the Yurino cattle was begun. In addition to the Schwyz cattle, other breeds including the Dutch and Kholmogorsk breeds were imported into the area in small numbers; however, the cross breeding with these cattle was of sporadic nature and did not affect the formation of the Yurino breed.

A positive influence on the development of the productive qualities of the breed was exerted by the favorable feeding conditions resulting from the presence in the area of flood meadows along the Volga, Sura and Vetluga Rivers.

Planned breeding work with the Yurino breed began after 1917. In 1933 the Gornomariyskiy State Breeding Station of the Mari ASSR was organized and was followed later by the Vorotynskiy State Breeding Station of Gor'kiy Oblast. The raising of Yurino cattle is envisaged for a number of rayons of Gor'kiy Oblast and the Mari ASSR.

Yurino cattle are not uniform in their build and color. The animals may be brown or red with shades of varying intensity.

The animals have a light head with a shortened facial part. The neck is of average length with a moderately developed dewlap. The cattle are not large. They have a deep and somewhat elongated body. The chest is deep, but not sufficiently wide. Among the deficiencies

which are encountered, it is possible to mention narrowness behind the shoulder blades, sway in the back and flaws in the hind part of the body (sagging or sloping croup, etc.). The skeleton is light. The musculature is not sufficiently developed. The udder is not large but is uniformly developed.

The average measurements of cows are as follows (in centimeters):

Height at the withers	121
Depth of the chest	64
Width of the chest	35.5
Oblique length of the body (measured with a measuring stick)	149
Circumference of the chest behind the shoulder blades	172
Circumference of the metacarpus	17.5

The live weight of the calves at birth is 23 to 28 kilograms; at 6 months it is 140 to 160 kilograms. With proper practices, leading livestock raisers obtain an average daily weight gain of 750 to 800 grams for calves up to the age of 6 months.

The average live weight of cows is 380 to 460 kilograms. On the kolkhoz "First of May" of Gor'kiy Oblast the weight of cows of 5 years or older averages 460 kilograms. The cow Maya MYu-147 weighing 702 kilograms had the greatest live weight. The live weight of the bulls is 600 to 700 kilograms. The bull Fiolet MYu-65 weighed 919 kilograms at 7 years of age. The slaughter yield for the cows is 45 to 50%.

The average yield of the cows on the breeding farms is 2,300 to 2,800 kilograms of milk. The best cows give up to 6,500 kilograms of milk. The cow Kovyehka 721 gave 5,613 kilograms of milk with a butterfat content of 4.05 for 300 days of its fourth lactation.

The Yurino cattle have high butterfat content for their milk. The average figure for cows on breeding farms is 4.1 to 4.2 with variations from 3.8 to 5.88. At the present time the breed contains a number of related groups including those from the bulls Mishka, Lizun GYu-19 and Baron RPK-5.

Kurgan Breed

The Kurgan breed was developed by cross breeding local Siberian cattle first with Tagil, Kholmogorsk, Simmental¹ and a few other breeds and then cross breeding the improved cattle, beginning in the Twentieth Century, with Shorthorn cattle.

The work of developing this new breed was conducted on the Kurgan Breeding Sovkhoz and on the breeding farms of the Kurgan State Breeding Station.

As a result of prolonged inbreeding of hybrids together with appropriate selection and culling and established conditions of feeding and keeping the animals, a large body of cattle of this new breed were created.

The cattle of the new breed became distributed throughout most of the rayons of Kurgan Oblast and in a number of rayons of Kurgan Oblast and in a number of rayons of Tyumen and Chelyabinsk Oblasts.

The color of the animals is dark red and red mottled. The chest is broad and deep. The body is well-developed. The back is straight and even. The skeleton is strong.

The cows with 3 or more calvings which have been entered in the State Pedigree Book have the following average measurements (in centimeters):

Height at the withers	129.7
Depth of the chest	69.8
Width of the chest	44.8
Oblique length of the body (measured with a measuring stick)	154.5
Circumference of the chest behind the shoulder blades	189.1
Circumference of the metacarpus	19.2

The live weight of the young at birth averages 30 to 32 kilograms. The average daily weight gain for calves up to 6 months of age equals 750 to 800 grams, and for some animals it is up to 1,000 grams. Calf tender P. Baganova from the kolkhoz "Bolshevik" of Chashinskiy Rayon of Kurgan Oblast had an average daily weight gain of 910 grams per head for a group of 26 calves.

At the age of 6 months the young weigh 160 to 180 kilograms, and at the age of 12 months they weigh 260 to 300 kilograms. The average weight of the cows is 460 to 520 kilograms. On the kolkhozes and sovkhozes there is a large number of cows with a live weight of 550 kilograms and higher. The cow Greza, for example, weighed 700 kilograms, and the cow Obshivka weighed 720 kilograms.

The live weight of bull-sires aged 5 years and older averages 830 to 880 kilograms. The bull Tarpan from the breeding sovkhoz "Kurganskiy" weighed 1,037 kilograms and the bull "Ogon" from the herd of the kolkhoz "First of May" weighed 1,100 kilograms.

Cattle of the Kurgan breed have good meat qualities. With meadow fattening the animals have achieved an average daily weight gain of 900 grams per head for a period of 100 to 120 days. On the breeding sovkhoz "Kurganskiy" the yield of meat and fat in slaughtering young steers at the age of 2 years after meadow fattening was 61.4% with 53.8% meat and 7.6% fat. Along with their good meat qualities the Kurgan cattle also have good milk productivity. The average yield of cows which are registered in the State Pedigree Book is 2,588 to 3,656 kilograms. Milkmaid P. Chegayeva of the kolkhoz "First of May" of Kurgan Oblast was awarded the Order of Lenin; over the course of a number of years she obtained an average of over 4,500 kilograms of milk from the cows of her group.

The cow Zenitsa from the same kolkhoz gave 7,265 kilograms of milk with a butterfat content of 3.92 for 300 days of lactation. The cow Lineyka produced 6,905 kilograms of milk with a butterfat content of 4.1.

The butterfat content of the milk of cows from the herds of many kolkhozes is 4.0 and higher. The average butterfat content for the herd of the kolkhoz "Iskra" is 4.03; for the herd of the kolkhoz "Fourteenth October" it is 4.09; and for the kolkhoz "Pobeda" it is 4.24.

The average butterfat content for cows which are registered in the State Pedigree Book is 4.01. The best figures for butterfat content belong to the cows Zmeyka (5.3) and Leya KBKU-72 (4.8).

Of the related groups and families, the descendants of the cow Plutovka 16 have gained the widest distribution. The average yield of 65 cows belonging to this family was 3,248 kilograms of milk with an average butterfat content of 3.94. The average live weight of the cows was 537 kilograms.

24 daughters of the bull Ogon' have been registered in the State Pedigree Book and have an average yield of 3,769 kilograms of milk with a butterfat content of 4.05 per 300 days of lactation.

Breeding work with the Kurgan cattle is being conducted on the breeding farms of kolkhozes, on the breeding sovkhos "Kurganskiy," on the sovkhos "Vargashinskiy" and on other farms of Kurgan Oblast.

The raising of Kurgan cattle is planned for kolkhozes and sovkhos of Kurgan, Tyumen and Chelyabinsk Oblasts.

Gray Ukrainian Breed

The Gray Steppe cattle which became widespread throughout the southern part of Europe are closest in origin to the auroch. In various countries and under different climatic, feeding and managing conditions and as a result of selection and culling, the Gray Steppe cattle acquired certain differences so that a number of breeds, including the Gray Ukrainian breed, have developed from them.

In Italy the Gray Steppe cattle are known as Chiana and Romagno cattle and in Hungarian Peoples Republic they are called Hungarian cattle. In addition, Gray Steppe cattle are found in Spain and France and in the Bulgarian and Rumanian Peoples Republics.

The formation of the Gray Ukrainian breed took place in an area in the south of the Ukraine which to a considerable extent influenced the nature and direction of development of the productivity of the animals. In raising cattle of this breed the goal was pursued for a long time (up to 1917) of obtaining work animals which would also have good meat qualities. No attention was paid to developing the milk productivity of the animals. Therefore, with the increased demand for dairy products, toward the end of the last century the Red Steppe breed began to squeeze out the Gray Ukrainian cattle.

Settlers brought Gray Ukrainian cattle from the Ukraine to a number of rayons of the North Caucasus.

Cattle of the Gray Ukrainian breed are large with a well-developed skeleton and musculature. The head is slightly elongated, broad at the forehead and narrow in the facial part. The horns are long and have a

characteristic bend. The neck is of average length. The dewlap is well developed. The chest is deep but not sufficiently broad. The withers are high. The back is flat and long. The rump is slightly raised. The animal has long legs. The skin, thanks to its thickness and density, is a very important raw material for industry.

The color of the animals is gray or light gray. On the bulls the color of the legs, neck, chest and lower part of the body is darker than on the cows.

The cows which are registered in the State Pedigree Book have the following average measurements (in centimeters):

Height at the withers	132
Depth of the chest	69
Width of the chest	41
Width at the hips	51
Oblique length of the body (measured with a measuring stick)	169
Circumference of the chest behind the shoulder blades	186
Circumference of the metacarpus	18.8

The calves weigh 29 to 33 kilograms at birth. With good feeding conditions the young reach a weight of 160 to 220 kilograms by the age of 6 months and have a daily weight gain of up to 1,200 grams per day. The average live weight of cows on the kolkhozes is 520 to 550 kilograms. Some animals have greater weights. For example, the cow Bel'ka 182 (breeding sovkhos "Polivanovka" of Dnepropetrovsk Oblast) weighed 825 kilograms. Young cows which had not yet calved (farm of the Scientific Research Institute for the Wooded Steppe and Forest Districts of the Ukrainian SSR) averaged about 600 kilograms at the age of 32 months.

The live weight of the bulls is 800 to 900 kilograms. The bull Kozel from the breeding sovkhos "Polivanovka" weighed 1,254 kilograms, and the bull Landysh weighed 1,116 kilograms at 6 years of age.

Oxen of the Gray Ukrainian breed are noted for their good work qualities.

The meat qualities of this breed are very high. Oxen when fattened for 3 to 5 months on the waste products of the sugar industry gain an average of 1,200 to 1,300 grams per day and when fattened weigh 1,100 to 1,200 kilograms. The slaughter yield of the animals is 54 to 61% with the yield of fat reaching 10% with respect to the meat. Some fattened animals give about 70 kilograms of intestinal fat. The meat of Gray Ukrainian cattle is of high quality.

The hide which is obtained from the oxen weighs 50 to 54 kilograms and is suitable for the best quality heavy bottom leather.

Cattle of the Gray Ukrainian breed have low milk productivity but high butterfat content.

On the best sovkhoses and also on such kolkhozes as imeni Budennyi, "Road to Culture" and others, the average yield of the cows of the herds reaches 2,300 to 2,700 kilograms. The cow Mazukha gave

4,601 kilograms of milk. On the breeding sovkhos "Polivanovka," the cow Yalow³ gave 5,301 kilograms of milk with a butterfat content of 4.07.

The average butterfat content for cows on the breeding farms of the Gradizhskiy Station for Breeding Work of Poltava Oblast is 4.4 to 4.6.

At the present time there exist related groups from the bulls Malyuk, Petushok U-191, Shamrin and a few others.

The main centers for raising Gray Ukrainian cattle are the breeding farms of the kolkhozes of Poltava Oblast and the breeding sovkhos "Polivanovka" of Dnepropetrovsk Oblast where work is being conducted in raising the milk productivity of the cattle. In addition, good herds of Gray Ukrainian cattle are located on the farm of the Institute of Livestock Raising for the Wooded Steppe and Forest Districts of the Ukrainian SSR, and in the North Caucasus.

The raising of cattle of the Gray Ukrainian breed is planned for 6 oblasts including Rostov, Poltava and Khar'kov Oblasts.

Shorthorn Breed

The Shorthorn breed was developed in England by improving the local cattle from the valley of the Tees River. The Shorthorn breed contains two types of animals: meat-dairy and meat cattle.

Cattle of this breed were exported from England to North and South America, Australia, New Zealand and several other European countries where they were used to a considerable degree to improve the meat qualities of the local cattle.

Shorthorn cattle came to Russia about the middle of the last century; however, prior to 1900 the number of cattle imported into Russia was very insignificant and the cattle of this breed did not produce a qualitative improvement on cattle raising in Russia.

Shorthorn cattle were used to a limited extent in the development of the Bestuzhev breed. After 1900 the number of Shorthorn cattle imported into Russia increased somewhat. A small group of Shorthorn cattle were imported into Rossoshanskiy Uyezd of Voronezh Gubernia and also to Kurgan Okrug of Western Siberia and to the North Caucasus.

The improvement of the local cattle by the Shorthorn cattle went very slowly and only in Kurgan Okrug was a large number of hybrids formed. With these hybrids work began in 1934 toward the creation of the new Kurgan breed.

From 1928 to 1933, 1,002 head of Shorthorn cattle were imported from England and Uruguay for sovkhoses of the North Caucasus, Orenburg and Stalingrad Oblasts and the Bashkir ASSR for cross breeding with local cattle. At the same time Shorthorn cattle were received on kolkhozes of Voronezh and Rostov Oblasts. In 1933 the Ol'khovatskiy State Breeding Station of Voronezh Oblast was organized.

At the present time the raising of cattle of this breed is planned for kolkhozes and sovkhoses of Voronezh, Rostov, and Orenburg Oblasts partially for Tyumen Oblast and also the Bashkir ASSR and for the sovkhoses of Stavropol Kray.

The color of the animals is red of various shades. Some animals are white. In addition, a great many animals have a red-roan color.

The animals have a compact build with a deep broad body and short legs. Both front and hind parts of the body are well developed as is the musculature. The head is small, light and short with a broad forehead. The neck is thick and short and merges gradually into the body. The chest is deep and broad with a brisket which extends forward. The back including the small of the back is flat and broad. The legs are thin and strong and properly positioned. The skin is elastic and loose and is covered with soft hair.

The udder in the meat-dairy variety is well developed with a large base and uniform development of the parts.

The cows which are registered in the State Pedigree Book have the following measurements (in centimeters):

Height at the withers	129
Depth of the chest	69.9
Width of the chest	43.4
Width at the hips	55.8
Oblique length of the body (measured with a measuring stick)	155.5
Circumference of the chest behind the shoulder blades	195
Circumference of the metacarpus	19.6

The live weight of the calves at birth is 27 to 30 kilograms. By 6 months they reach a weight of 170 to 190 kilograms, and by 12 months they weigh 270 to 320 kilograms. The daily weight gain of the calves to 5 months of age reaches 1,040 grams. The average live weight of cows according to the State Pedigree Book is 480 to 570 kilograms. Some cows weigh 680 kilograms.

The weight of bull-sires is 800 to 900 kilograms. The bull Zakat of "Sal'skiy" breeding sovkhos was 1,250 kilograms at the age of 5 years.

Cattle of the Shorthorn breed have a high weight gain when fattened in the pasture or by hand and have a meat yield of 58 to 63%. Hybrids of Shorthorn and Kalmyk cattle have good meat qualities and have an average daily weight gain of up to 1 kilogram for meadow fattening.

According to the State Pedigree Book, the yield of Shorthorn meat-dairy cattle is 2,700 to 3,250 kilograms of milk. The yield from the best cows on the "Sal'skiy" breeding sovkhos is higher. For example, the cow Volga RA-286 gave 6,202 kilograms of milk with a butterfat content of 3.42 for 300 days of its second lactation. On the sovkhos "Tselinskiy" of Rostov Oblast, the cow Cheresnya 3348,

which was exhibited at the All-Union Agricultural Exhibit, produced 4,754 kilograms of milk with a butterfat content of 3.82 for 300 days of its first lactation; the live weight of the cow was 527 kilograms.

The average butterfat content of the milk of cows which are registered in the State Pedigree Book is 3.8 to 3.9. The butterfat content for some cows, for example, for the cow Giza RA-107, is 4.91.

On the breeding sovkhos "Sal'skiy" and on the breeding farms of the kolkhozes of Rostov Oblast, the descendants of the bulls Varyag, Yenot, Kristall and others are widely distributed; they are characterized by good body forms and relatively good milk productivity. On the breeding farms of the kolkhozes of Voronezh Oblast there is a large number of animals belonging to the related groups from the bulls Chudesnyy, Samson and Kit.

The leading farms in the raising of Shorthorn cattle are the breeding sovkhos "Sal'skiy" and the sovkhos "Tselinskiy" of Rostov Oblast and also the breeding farms of Orenburg, Voronezh and other oblasts.

Breeds of Beef Cattle

Hereford Breed

The Hereford breed is one of the best breeds of beef cattle. It was developed in England as a result of a prolonged process of selection and culling involving local cattle together with improvement of the conditions of feeding and keeping the animals. During the last century Hereford cattle were exported from England to North America, Uruguay, Argentina, Australia and South Africa. From 1928 to 1932, 1,507 head of Hereford cattle were imported into the USSR from England and Uruguay. The imported animals were sent to sovkhos in the Kazakh SSR and in Rostov, Stalingrad, Saratov, Orenburg and a few other oblasts and krais where they were used for cross breeding with Kalmyk and Kazakh (Kirghiz) cattle. The hybrids which were obtained from this cross breeding provided the basis for developing a new Kazakh Whitehead breed of cattle.

The color of the animals is red of various shades with a white head and white markings on the back of the neck, the dewlap, the lower part of the belly, the legs and the tail.

Hereford cattle have the body forms which are characteristic of beef cattle. These include a deep, rounded, short body on short, strong legs. The head is small, wide and has rather long horns. The nose mirror has a pink color. The neck is short and wide. The brisket extends far forward. The back is short, broad and level. The croup is broad, straight and long with well-developed musculature. The skin is elastic and loose and is covered with fine, soft hair. The udder is weakly developed. The Hereford cattle are shorter in height than the Shorthorn cattle.

The calves are born with a live weight of 28 to 34 kilograms. By 18 months they weigh 400 to 450 kilograms. The cows weigh 490 to 580 kilograms while the bulls weigh 800 to 850 kilograms. The weight of some cows reaches 720 kilograms while that of bulls may be 1,100 kilograms.

Hereford cattle have exceptionally good meat qualities. The slaughter yield of fattened animals is 65 to 68% and the meat is rated high for flavor.

The average yields of the cows are not high -- 1200 to 1400 kilograms of milk with a butterfat content of 3.9 to 4.0. The best cows give up to 2,500 kilograms of milk.

The Hereford cattle do not have any great importance for breeding in the USSR. It is planned to raise the animals on the sovkhoses of Rostov Oblast and Stavropol' Kray.

Aberdeen-Angus Breed

The Aberdeen-Angus breed was developed in England from where the cattle were exported to North and South America, Australia, and other countries. They were imported into Russia in very small numbers and no trace of their use remained. In 1932 a small group of animals were brought in to sovkhoses of Stalingrad Oblast and to the Sal'skiy Experimental Station for Livestock Raising (Rostov Oblast). On the sovkhoses the Aberdeen-Angus cattle were used for cross breeding with the Kalmyk breed. The hybrids obtained from such cross breeding are noted for their good qualities, early maturation and adaptability to local conditions. Animals of the Aberdeen-Angus breed have a black color, are hornless, have short legs and a compact body. The head is light; the neck is short and muscular. The chest is broad and deep. The ribs are rounded. The back is broad and level. The croup is long and broad. The musculature is well developed. The skin is thin and loose. The live weight of the calves at birth is 24 to 27 kilograms. The cows weigh 520 to 600 kilograms and the bulls weigh 800 to 900 kilograms.

Aberdeen-Angus cattle mature very rapidly and have good meat qualities. The milk productivity of Aberdeen-Angus cattle is low -- 1,200 to 1,500 kilograms with a butterfat content of 4.0 to 4.5. At the Sal'skiy Experimental Station for Livestock Raising some cows have produced 2,500 kilograms of milk.

Kalmyk (Astrakhan) Breed

The appearance of Kalmyk cattle in the southeastern part of our country occurred toward the beginning of the Seventeenth Century when some Mongol tribes migrated from Dzungaria to the lower reaches of the Volga River and brought cattle of this breed with them.

The formation of the Kalmyk breed occurred under nomadic conditions where the animals were kept at pasture throughout the year, i.e., with abundant feeding in the spring and early summer and with

lack of fodder in the winter. Ice cover on the ground and snowstorms wiped out a large number of the animals. Under such conditions the nomad-cattlemen kept for the winter only the strongest, healthiest and hardest animals which could successfully withstand the severe winter conditions.

Under the influence of these conditions of cattle raising and through the selection which was practiced, the Kalmyk cattle acquired definite qualities and traits. The cattle of this breed possess a strong constitution of a severe continental climate. At the same time the severe conditions under which the breed developed had a negative effect on the development of the milk productivity and the body forms of the animals.

Before 1917 almost nothing was done to improve the Kalmyk cattle. After the Great October Socialist Revolution breeding herds were established at the sovkhos "Stavropol'-Kavkazskiy," at the stud farm imeni Budenny, and on other farms.

In 1935, two state breeding stations were established -- one at the town of Elist in the Kalmyk ASSR and the Temirskiy Station in Aktyubinsk Oblast.

At the present time the raising of Kalmyk cattle is planned in the Kalmyk ASSR, in Astrakhan, Rostov and Stalingrad Oblasts, in Stavropol' Kray and also for the sovkhoses in the Dagestan ASSR. There is a small number of Kalmyk cattle in the Uzbek SSR.

The color of Kalmyk cattle is red of various shades and red mottled. Many animals have white heads, bellies and legs. A peculiarity of this breed is the absence of an occipital crest. The forehead is short and the horns are located in almost the same plane with the forehead in the form of a half-moon. The facial portion of the head is elongated and has an aquiline profile.

Cattle of this breed are of average size with a compact build and short, strong, properly positioned legs. The neck is short and muscular. The chest is deep and has a well developed brisket. The withers are broad. The line of the back including the small of the back is flat and broad. The rump is slightly raised. The hind part of the body has well developed musculature. The skin is loose and is covered with thick, soft hair.

The cows have the following average measurements (in centimeters):

Height at the withers	127
Depth of the chest	70
Width of the chest	42
Oblique length of the body (measured with a measuring stick)	155
Circumference of the chest	188
Circumference of the metacarpus	19

The calves have a live weight of 23 to 26 kilograms; at 6 months with proper feeding they weigh 160 to 180 kilograms with a daily weight gain of 850 to 950 grams. The live weight of the cows is 450 to 520

kilograms. Bull-sires weigh 700 to 750 kilograms. Some cows achieve a weight of 680 kilograms while the bulls sometimes reach 1,020 kilograms. Kalmyk cattle have very good meat qualities. They fatten quickly with hand feeding and show a good weight gain in pasture fattening.

According to the data of Academician Ye. F. Liskun, steers weighed 280 kilograms at the age of 1 year and at the age of 25 months some of them weighed 600 kilograms.

When the animals are slaughtered after pasture fattening, the slaughter yield is 55 to 62% while the weight of the hide is 8 to 9%.

The meat has high calorific content and good flavor. The fat which is acquired in hand or pasture fattening is deposited between the muscles, thus giving the so-called marble effect.

Kalmyk cattle have low milk productivity. The average yield of the cows is 1,300 to 1,500 kilograms although some cows do produce up to 4,000 kilograms. The butterfat content of the milk varies from 3.9 to 5.2.

Oxen are used for tractive power in transport and agricultural work.

The main goals of the breeding work with this breed are to develop the meat qualities of the animals, increase the rapidity with which they mature and raise their live weight.

Hybrids obtained from crossing Kalmyk cattle with Hereford cattle were used in forming the new Kazakh Whitehead breed.

Kazakh (Kirghiz) Cattle

Kazakh (Kirghiz) cattle are an ancient group of local cattle which became widely distributed in the territory of the present Kirghiz and Kazakh republics and spread to some extent to the Uzbek republic.

The formation of the Kazakh cattle took place under the same nomadic conditions as for the Kalmyk cattle. Therefore, there are some similarities between the two. Kazakh cattle utilize pastures well; they are hardy; and they put on fat well. At the same time they are more varied in their build and color. These variations in the Kazakh cattle resulted from sharp differences in feeding with various other breeds. Therefore the cattle of the northern part of the Kazakh SSR differ considerably from cattle from the southern part of the republic.

Prior to 1917, there was absolutely no breeding work done with the Kazakh (Kirghiz) cattle. Starting in 1929 and 1930 cross breeding of these cattle with other breeds was begun. In the central and western parts of Kazakhstan the hybrids which were obtained by crossing Kazakh cattle with Herefords were used in creating the new Kazakh Whitehead breed.

In order to obtain an improved group of cattle, at the present time the Kazakh (Kirghiz) cattle are being cross-bred with Schwyz, Simmental¹ and Red Steppe cattle. Only in those areas where the best Kazakh cattle are located is it planned to raise them with cross breeding with other breeds.

Kazakh cattle are small, compact, short-legged and have a relatively deep chest.

The color of the cattle is most varied. It can be black, black mottled, red or red mottled; some animals have a brown or tiger color.

The average measurements (in centimeters) of the cows are:

Height at the withers 115-118

Depth of the chest 59-67

Oblique length of the body (measured with a measuring stick) 130-141

Circumference of the chest behind the shoulder blades 160-171

Circumference of the metacarpus 15-17

The live weight of the cows at birth is 20 to 24 kilograms. The cows, depending on how they are raised and kept, weigh 300 to 370 kilograms with the best ones weighing up to 430 kilograms. The weight of the bulls is 450 to 550 kilograms and sometimes up to 650 kilograms.

Kazakh cattle do well in pasture and have very good meat qualities. With intensive upbringing, steers achieve a weight of 440 kilograms by the age of 2 years and have a slaughter yield of 55 to 60%.

The yield of the cows is 1,200 to 1,400 kilograms of milk with a butterfat content of 4.2 to 4.5. The best cows give from 2,500 to 3,000 kilograms and some cows have a butterfat content as high as 5.6.

Kazakh Whitehead Breed

The Kazakh Whitehead breed is a new breed of cattle which was developed in the Kazakh SSR by inbreeding hybrids obtained from crossing Kazakh and Kalmyk cattle with Herefords. Decisive influence on the formation of the breed was exerted by the selection and culling which were directed at developing in the animals the positive qualities of the original breeds and by the system of raising and keeping the animals. The work of creating the Kazakh Whitehead breed was conducted by a large group of livestock workers under the leadership of the Stalin Prize laureates M. F. Gordiyenko, B. M. Musin, K. A. Akopyan and others. The extensive employment of artificial insemination on the sovkhoses made it possible to build a large group of the new cattle in a short period and to spread the breed throughout the farms of the northwestern and central part of the Kazakh SSR. In 1950 this large mass of cattle was recognized as a separate breed.

In addition to the Kazakh SSR, it is planned to raise cattle of this breed in certain rayons of Saratov, Stalingrad and Orenburg Oblasts.

The cattle of the new breed have good fertility and are well adapted to the local conditions of keeping cattle. They have a strong constitution and high meat productivity. In breeding the Kazakh Whitehead breed, most farms have tried to develop them as beef cattle; however, on the sovkhoses "Chalobay" and "Karagandinskiy" attention was directed toward developing a beef-dairy type of productivity.

Animals of the Kazakh Whitehead breed have a red or dark red color with a white head and white markings on the lower part of the body and the legs.

The head is of average size. The forehead is broad. The horns are large and are directed to the side, forward, and up. The neck is thick and short. There is a well developed brisket. The chest is deep and broad. The withers are wide and level and merge imperceptibly into the line of the back. The back including the small of the back is broad and flat. The croup is straight, broad and well covered with muscle. The skin is thin and loose. The animals have a compact build with both the front and rear parts of the body being well developed. The legs are short. The skeleton is light and strong. The musculature is well developed.

Cows of the Kazakh Whitehead breed have the following average measurements (in centimeters):

Height at the withers	123
Depth of the chest	73
Width of the chest	42
Width at the hips	52
Oblique length of the body (measured with a measuring stick)	150
Circumference of the chest behind the shoulder blades	187
Circumference of the metacarpus	19

The live weight of the calves at birth is 27 to 30 kilograms. By 6 months the heifer-calves attain a weight of 160 to 170 kilograms and the bull-calves weigh 190 to 200 kilograms. At the age of 18 months the young weigh 340 to 450 kilograms. The live weight of the cows is 500 to 560 kilograms; however, individual cows weigh considerably more. For example, the cow Susanna from the Ankatinskiy breeding sovkhos weighed 776 kilograms and the cow Gitara weighed 703 kilograms.

The average live weight of the bulls is 750 to 850 kilograms. The champion of the Kazakh Whitehead breed at the All-Union Agricultural Exhibit, the bull Gordyy Tank 2044 (from the sovkhos "Karagandinskiy"), weighed 1,065 kilograms at 5 years of age.

Kazakh Whitehead cattle mature quickly and do very well in pasture. When being fattened on natural pastures without supplementary feeding, steers have a weight gain of 800 to 900 grams per day. With the intensive hand fattening of bull-calves on the sovkhos "Karagandinskiy," they attain a weight of 540 kilograms by the age of 18 months. The slaughter weight of the cows (after pasture fattening) is 52 to 58%; for

steers it is 55 to 62%. The meat has a high calorific content and good flavor. The weight of the hide is 6.5 to 7.5% of the live weight of the animal.

The average yield of cows of the Kazakh Whitehead breed, according to the data of the State Pedigree Book, is 2,000 to 2,300 kilograms of milk. On the sovkhos "Karagandinskiy" of Karaganda Oblast the yield of many cows is higher. For example, the cow Naperstyanka gave 6,038 kilograms of milk with a butterfat content of 4.2 for its second lactation, and the total yield for its first 3 lactations was 18,615 kilograms of milk. The cow Kartinka gave 6,684 kilograms of milk with a butterfat content of 4.0. The champion of the All-Union Agricultural Exhibit, the cow Maga 2174 (from the same sovkhos), gave 5,060 kilograms of milk with a butterfat content of 4.0 for 245 days of its fourth lactation.

The average butterfat content of the milk varies from 3.8 to 4.0, but for some cows it may reach 4.8.

Among the many related groups in the breed, the most important are the descendants of the bulls Landysh and Yakor' from the breeding sovkhos "Chalobay" and also the descendants of the cows Vassa, Gazel' and others.

Breeding work with the Kazakh Whitehead breed is being conducted on many farms including the breeding sovkhoses "Chalobay" of Semi-palatinsk Oblast, "Ankatskiy" of Zapadno-Kazakh Oblast, "Karagandinskiy" of Karaganda Oblast and others.

The main purpose of the breeding work is the further development of the meat qualities of the cattle.

CHAPTER VI

BREEDING WORK

The purpose of breeding work is the continuous improvement of the quality of the animals in order to obtain more and better quality meat and dairy products with the least expenditure of fodder. By breeding work is meant the system of procedural and zootechnical measures which provide for increased productivity and improved inherited qualities in cattle. Such measures include the raising of the animals, the system of feeding, housing and caring, and the methods of selecting, culling and breeding cattle.

The basis of breeding work is the teaching of I. V. Michurin in which the living organism and the external conditions which surround it are examined together. The observed variability in the living organism is caused by conditions of external environment, i.e., by the conditions of feeding and housing. In contrast to the formal genetic theory of the immutability of inherited characteristics, I. V. Michurin has established that the characteristics and traits which are acquired by an organism during the course of its life are inherited under favorable conditions. These changes in heredity can be fixed in the progeny by selection and culling.

The productivity of cattle can be improved by raising the level of breeding work.

Breeding work is conducted on each livestock farm of a kolkhoz or sovkhaz. However, depending on whether or not the farm is a breeding farm, the form of the breeding work, even where there is a common purpose, may vary somewhat. On commodity farms of kolkhozes and sovkhazes where they have the task of breeding highly productive animals with strong constitutions and which are well adapted to the conditions of the farm, in order to improve the quality of the herd and raise its productivity they improve the conditions of raising, feeding and housing the cattle. The animals which have the best productivity are used for a longer period; their young are used to replenish the herd; and the servicing group is manned with sires which are of higher quality than the maternal herd.

The breeding farms of kolkhozes and sovkhazes, together with the task of improving their own herds, also have the task of raising pedigree calves for other farms. Such pedigree calves should possess the definite characteristics which are identified with the given breed of cattle and which they are supposed, under the appropriate conditions, to transmit in the future to their progeny.

In order to establish a large number of pedigree cattle on all breeding farms and some commodity farms in the zones where pedigree cattle are bred, pure breeding or assimilative crossbreeding are employed.

The qualitative improvement of cattle on breeding farms is conducted on the basis of a study of the individual characteristics of the animals, their productivity, how soon they mature, their strength of constitution, their origin, the productivity of their ancestors and also the quality of their progeny. On breeding farms where cattle are being bred they take into account the features and characteristics of animals of various lines and families.

Methods of Breeding

In breeding cattle, pure breeding and cross breeding are employed. In pure breeding, animals of the same breed are paired; in cross breeding, animals of different breeds are paired. Both of these methods of breeding are related to each other and have the same purpose -- raising the productivity of the animals.

Pure Breeding

Pure breeding is employed in order to obtain highly productive animals of a certain breed with a stable, unchanging heredity.

This is the basic method of perfecting breeds of cattle.

Pure breeding of animals within a breed is of great importance in establishing a mass of pedigree cattle and for their qualitative improvement. Within each breed, pure breeding is always conducted because without it the breed could neither exist nor develop.

Pure breeding is employed not only on breeding farms but also on many commodity farms of kolkhozes and sovkhoses. Pure breeding of Kholmogorsk cattle is employed, for example, in most of the rayons of Arkhangelsk Oblast, of Yaroslavl cattle -- in Yaroslavl Oblast, of Red Steppe cattle -- in a number of oblasts of the Ukraine and in North Caucasus. As a result of the improvement of local cattle and the breeding of pure bred cattle, the number of pedigree cattle on the kolkhozes of the USSR has increased considerably.

In working with a breed of cattle, breeding by lines is practiced.

A line is a group of highly productive pedigree animals which are descended from an outstanding ancestor and are similar in constitution and productivity.

In each breed, separate lines of bulls and also families of cows are singled out. Each line is a part of a breed, but it has a certain characteristic which distinguishes it from other lines. These characteristics in most cases involve a difference in butterfat content and type of build.

Some individual differences in productivity and build occur within a line. Therefore, it is necessary to practice careful selection and culling in order to obtain animals which have the definite characteristics which are peculiar to the given line.

The existence within a breed of several lines which differ in their characteristics increases the chances of perfecting the breed. The more extensive is the breed and the greater is the zone in which it is bred, the greater will be its number of lines and families.

The purpose of breeding by lines is to raise the quality of the animals of a given related group through selection, culling and the appropriate conditions of management with the use of outstanding animals belonging to this line.

Breeding by lines with directed selection and culling and also maintaining the animals under good conditions are the most dependable methods of developing and fixing high productivity in the progeny.

Work with a line begins with the selection of an outstanding sire and the obtaining of progeny from him. Bulls which come from cows which have high productivity and have a large number of progeny are selected to begin a line. Thus the ancestor of one of the lines of the Kholmogorsk breed was the bull Polyus SKh-48, the son of the record cow Mal'ka Kh-390; the ancestor of a line of the East Friesian breed was the bull Anton 1293; etc.

The basic condition for successful work with a line is the regular evaluation of all the sires of the given line with respect to their progeny.

In working with a line, in the initial stages of its formation close or moderate family pairing is employed. By this means there is an accumulation and development of the positive characteristics of the ancestor of the line.

After obtaining several generations of animals in this one line, interline breeding is practiced where animals of one breed are paired with animals of another breed. Interline breeding makes it possible to avoid the harmful consequences of family pairing and helps to increase the vitality of the animals and the establishment of new and more highly productive lines.

A family is the progeny of some outstanding cow. If there are outstanding sires in this family, lines are then established from the family.

Work with families of cows on the breeding sovkhov "Karavayevo" is the basis of the breeding work with the herd. On this breeding sovkhov the families of the cows Belyana, Simpatiya, Poslushnitsa and others have undergone the widest distribution.

The family of the cow Simpatiya on the breeding sovkhov "Karavayevo" contains a large number of animals; 58 offspring of this cow had an average yield for a 300 day lactation of 6,943 kilograms with a butterfat content of 3.9. Cows of the family of Poslushnitsa had an average yield of 7,920 kilograms with a butterfat content of 3.7. In the Kholmogorsk breed the families of the cows Tumannaya SKh-1357 and others are known.

Cross Breeding

Cross breeding is one of the basic methods of rapidly improving local unproductive cattle.

In cross breeding one obtains animals which have high variability in their characteristics and attributes, are not stable, and have a confused heredity; however, they also have greater vitality and higher productivity. Cross breeding makes it possible to change the heredity of the animals while the development and fixation of various attributes and characteristics in the hybrids depends on the system of raising, feeding and keeping the animals and also on selection and culling. Depending on the conditions under which the hybrids are to be created, their characteristics and attributes will differ. The hybrids may acquire new characteristics and attributes or they may acquire some of the characteristics of both parents or they may gain characteristics which are similar to those of only one of the parents. Thus, if in crossing local unproductive cattle with some better breed the conditions of feeding and keeping the animals do not meet the requirements of the better breed, the hybrids will have characteristics which are similar to those of the local cattle.

Hybrids which are obtained by crossing local cattle with animals of some imported breed become better adapted to the conditions of feeding and keeping in the given zone than is the case with pure bred cattle.

The results of cross breeding depend on the correctness with which the local and the improving breeds are selected. The selection of breeds for cross breeding is determined by the economic problems of improving the local cattle and raising their productivity. At the same time it is necessary to consider the biological characteristics of the breeds which are being crossed, their origin, the zone in which they are being bred, and the conditions of feeding and keeping the animals.

In zootechnical practice the following methods of cross breeding are recognized: assimilative [poglotitel'noye], reproductive, introductive, commercial and alternating. The utilization of any of these methods of cross breeding depends on the concrete conditions and purpose of the farm.

Assimilative cross breeding is the basic method of cross breeding which is used in increasing the number of pedigree cattle. With assimilative cross breeding the cows of the local herds are paired with pure bred bulls of the highly productive improving breed. The hybrids of the first generation, and then of each new succeeding generation of hybrids, are paired with pure bred bulls until animals are obtained which are similar in their build and productive qualities to the improving breed.

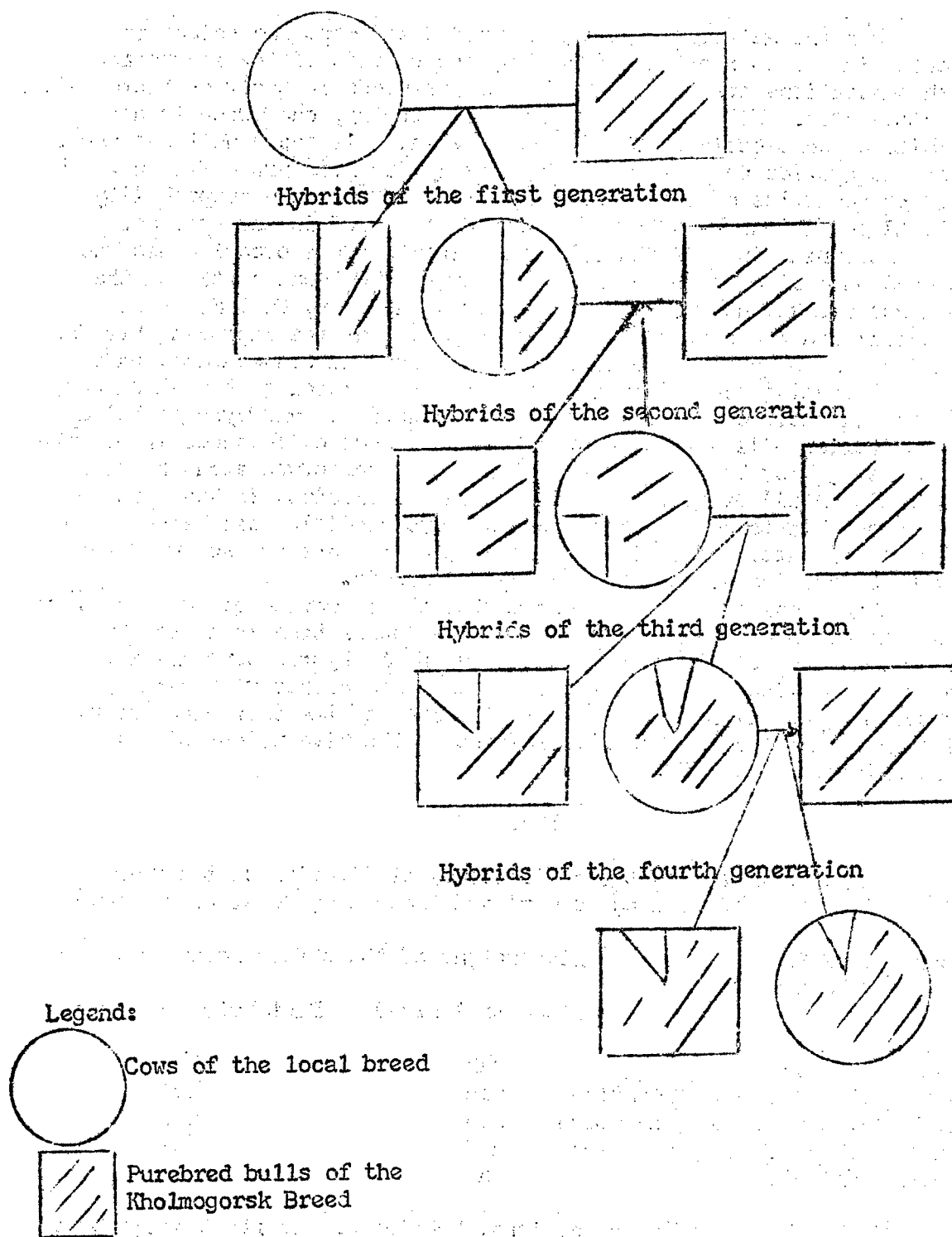


Figure 63. Diagram of the employment of assimilative cross breeding.

When the animals are properly raised and kept and selection proceeds in the appropriate direction, the hybrids of the fourth and fifth generations are very close to the purebreds in their characteristics and attributes. With assimilative cross breeding, one breed is not assimilated completely by the other, especially if the conditions under which the hybrids and the pure bred animals are bred are different. The positive qualities of the local cattle -- endurance and adaptability to local conditions -- must be preserved and fixed in the hybrids.

Beginning in 1929 and 1930 assimilative cross breeding has been employed on a wide scale in order to improve the local cattle on the sovkhoses and kolkhoses. The Kholmogorsk, Yaroslav, East Friesian, Simmental¹ and other breeds have been employed as the improving breeds. When the same breed is used in different zones and consequently under different feeding conditions and with groups of local cattle which vary somewhat in their characteristics, the productivity and type of build of the hybrids will not be identical. Thus, some differences in butter-fat content, body build and live weight can be observed among hybrids of the Simmental¹ breed which are bred in the Ukraine, in Kuybyshev and Stalingrad Oblasts and in Siberia. The same condition can be observed as the local cattle in various zones of the USSR are crossed with the East Friesian, Red Steppe and Kholmogorsk breeds.

When local cattle are crossed with the improving breeds, the live weight at birth of the hybrids of the first generation is 15 to 20% higher than that of the local cattle. When the hybrid cows are fed properly, the live weight of their calves comes closer with each succeeding generation to the weight of calves of the improving breed. The same change takes place with respect to the live weight of the adult animals (Table 17).

TABLE 17

Change in live weight (in kilograms) of Siberian cattle when assimilative crossbreeding is employed (according to A. V. Khramov)

Groups of cattle according to pedigree	Live weight of the cattle being improved	
	Simmental ¹ breed	East Friesian breed
Siberian cattle	342	346
Hybrids of the first generation	416	402
Hybrids of the second generation	445	437
Hybrids of the third generation	492	505
Purebred animals	540	520

With proper feeding conditions, hybrids of the first generation differ sharply from the local cattle with respect to milk productivity and body build. Hybrids of the second and third generations, when they

are kept and raised properly, attain the level of productivity of purebred animals and sometimes even surpass them in measurements.

In crossbreeding local cattle which have good butterfat content with a breed which has a lower butterfat content, the hybrids of each succeeding generation approach the butterfat level of the breed with the lower butterfat content.

TABLE 18

Change in butterfat content in Siberian cattle
when assimilative crossbreeding is employed

Groups of cattle by pedigree	Under improvement		
	Kholmogorsk breed	Simmental ¹ breed	East Friesian breed
Siberian	4.62	4.23	4.18
Hybrids of first generation	4.50	4.10	3.91
Hybrids of second generation	4.26	4.03	3.76
Hybrids of third generation	3.90	3.89	3.63
Purebreds	3.80	3.80	3.50

Thus, when the adult animals are kept and raised properly, a number of the characteristics (type of build, milk productivity and live weight) of the hybrids tend to grow closer with each new generation to those of the purebred animals. At the same time the high butterfat content of the milk which is characteristic of the local cattle decreases gradually.

It is necessary through selection and culling to preserve in the hybrids a somewhat higher butterfat content than is possessed by the purebreds.

Reproductive crossbreeding is the basic method of establishing new breeds of farm animals by combining and further developing the valuable qualities of the initial breeds. This method can be employed also to improve the cattle on kolkhoz commodity farms.

The greatest majority of the breeds of cattle which have been established in our country have resulted from reproductive crossbreeding. The method of reproductive crossbreeding has been employed in developing the Bestuzhev, Red Steppe, Tagil, Kostroma, Lebedin, Alatau, Sychev, Kurgan and other breeds.

Reproductive crossbreeding may be simple, where two breeds are used, or complex, where three or more breeds are used, as was the case, for example, with the Red Steppe and Bestuzhev breeds.

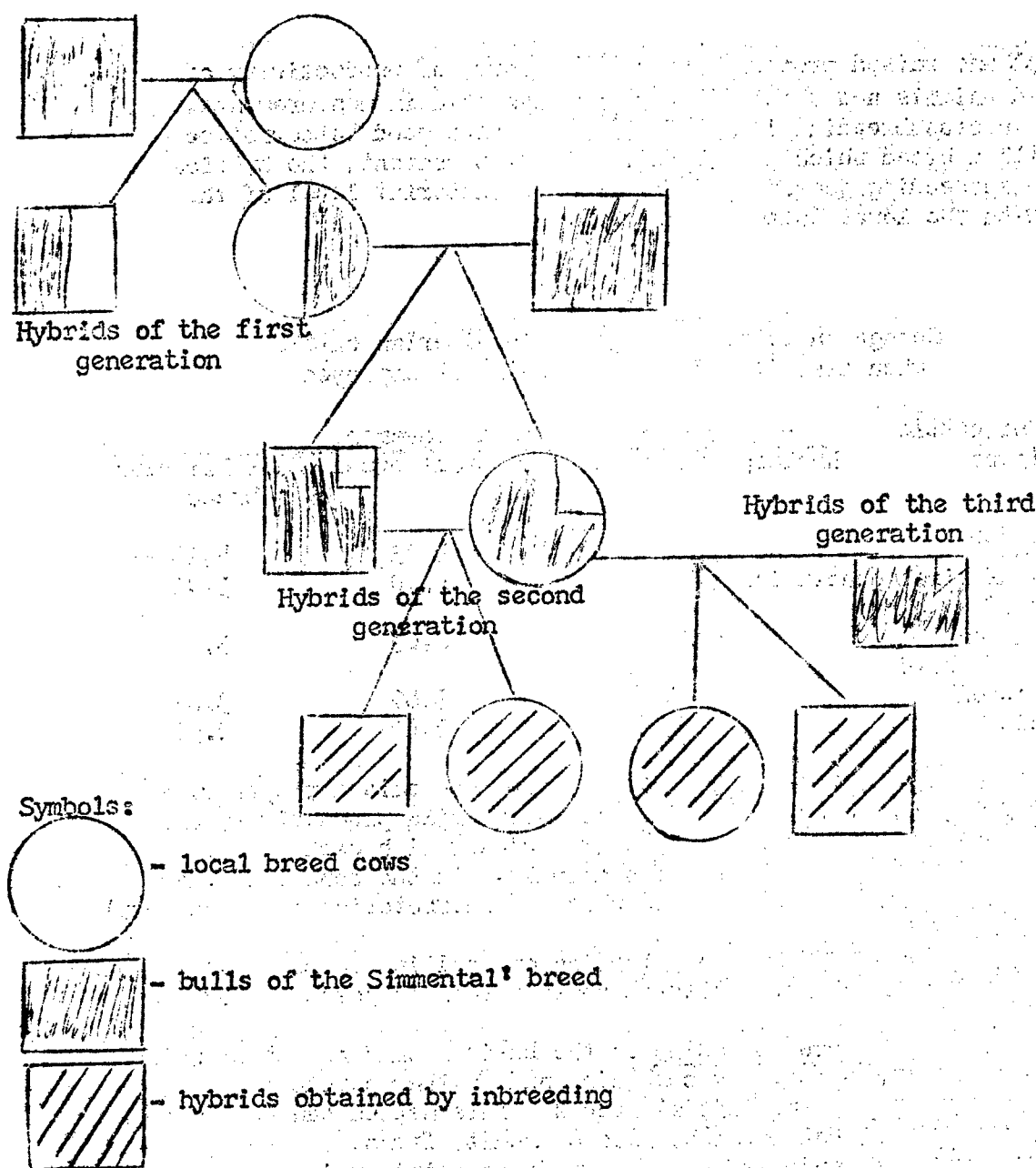


Figure 64. Chart showing the employment of simple reproductive crossbreeding.

Reproductive crossbreeding involves crossing among themselves the hybrids which are obtained from crossing two or three breeds; this begins with the first, second, third and sometimes with the fourth generation; in other words the hybrids are inbred.

In developing new breeds by reproductive crossbreeding, the problem is to obtain hybrids which have the characteristics and attributes of both or of the several initial breeds and to develop

these characteristics further. The utilization of the hybrids of any particular generation for inbreeding depends on their qualities and how closely they correspond to the desired type. In crossbreeding animals of some highly productive breed with local cattle which are well adapted to the local conditions, it is not necessary to try to obtain hybrids of the fourth and fifth generations by assimilative crossbreeding because in such a case the hybrids may lose a number of the positive characteristics of the local cattle. Thus, in creating the Kazakh Whitehead and Alatau breeds, hybrids of the second and third generations, and to some extent of the first generation, were used.

If it is intended to obtain animals which most closely resemble the improving breed or if one of the initial breeds has low productivity, inbreeding of the first two generations may not be wise because the animals may not have the desired milk productivity or live weight and they may be late-maturing. In this case, the inbreeding begins with the third and fourth generations. In developing the Sychev and Lebedin breeds of cattle hybrids of the third, fourth and even the fifth generations were used.

In creating new breeds by reproductive crossbreeding, exceptionally great importance is attached to the selection for crossbreeding of those breeds which would have the characteristics and attributes which are desired in the new breed, the establishment of those conditions of feeding and keeping the animals which would facilitate the development of high productivity and good pedigree qualities, the selection and culling of the animals based on the desired characteristics, and the establishment of lines and families for which the outstanding hybrids would be used.

Introductive crossbreeding (adding blood) is employed when it is necessary to improve certain attributes and characteristics of a breed while preserving the basic type and its other qualities. In this case it is possible to improve insufficiently developed qualities of the breed by a one-time crossbreeding with another breed which has higher performance with respect to these qualities; this can also be done more effectively and quickly than in purebreeding.

In introductive crossbreeding, the bulls of one breed are used with the maternal herd of the other breed which is the breed which is being improved. Hybrid cows of the first generation are paired with bulls of the breed which is being improved. The resulting hybrids of the second generation are again paired with bulls of the same breed. The effectiveness of employing this method of crossbreeding depends on the direction of the selection and culling of the animals together with a consideration of the development and fixation in the animals of the desired characteristics. Of no less importance is the picking of the animals which are used for introductive crossbreeding; the conditions under which the animals are raised and fed are also vitally important. Beginning with the third generation, the hybrids approximate the purebred animals of the basic breed which is being improved (Figure 65).

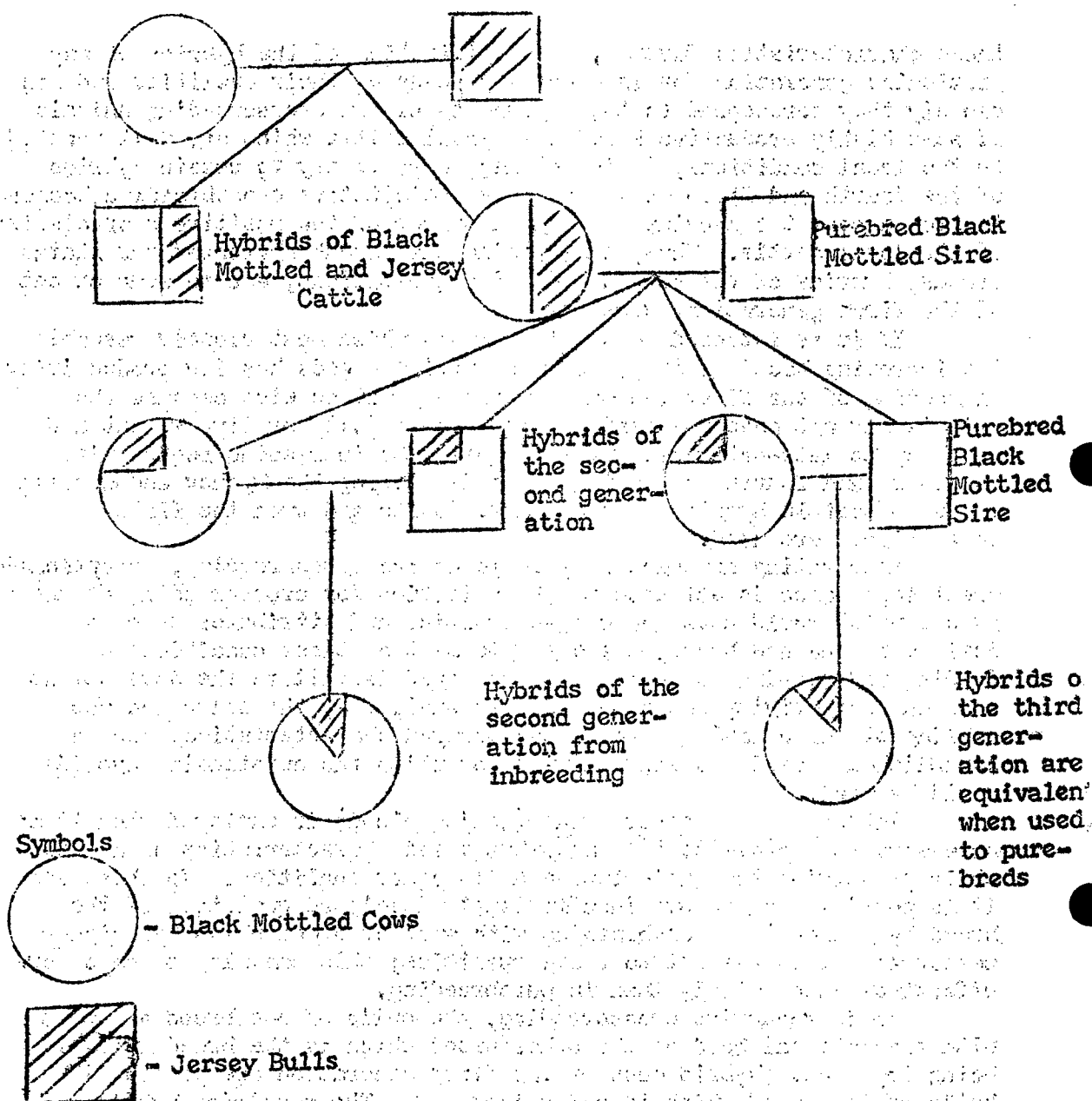


Figure 65. Chart showing introductive crossbreeding.

Introductive crossbreeding can be conducted in a different manner when the hybrid bulls of the first or second generations, depending on their quality and the purpose of the crossbreeding, are paired with cows of the improving (basic) breed and the progeny from them are inbred.

In order to raise the milk productivity and improve the body build of Yaroslav, Istobensk, and Kholmogorsk cattle, introductive crossbreeding using East Friesian cattle was employed. This increased

the milk yield and improved the build of the animals but led to a lowering of their butterfat content. The result of the employment of introductive crossbreeding on the breeding sovkhos "Red October" of Yaroslavl Oblast are given in Table 19.

TABLE 19

Productivity of cows on the breeding sovkhos "Red October"
(according to the data of N. P. Gerchikov)

Pedigree	Number of cows	Average yield (in kilograms)	Butterfat Content	Average live weight (in kilograms)
Yaroslavl	30	4,455	3.85	509
Hybrids of East Friesian and Yaroslavl cattle of the first generation	18	5,266	3.71	524
Hybrids of the second generation of the Yaroslavl breed	14	4,931	3.63	520

Positive results in raising the butterfat content for cows of the East Friesian breed were obtained by using introductive crossbreeding with the Red Humped breed on the sovkhos "Doctor's Hills" of Moscow Oblast. Hybrids of East Friesian and Red Humped cattle had average milk productivity and good build; their butterfat content was 0.5 to 0.6 higher than for cows of the East Friesian breed.

During recent years a number of sovkhoses in the central part of the USSR have employed introductive crossbreeding with Jersey bulls in order to increase the butterfat content of East Friesian and Black mottled cattle. Hybrids of the first generation of this cross have a butterfat content which is 0.6 to 0.8 higher than East Friesian and Black mottled cows with a lower yield. The live weight of the hybrids is lower and they have a number of deficiencies of their points such as one would expect of Jersey cattle.

The use of the Jersey breed to raise butterfat content in cattle has been employed in other countries. According to the data of the scientific research institutes of the German Democratic Republic, hybrids of the second generation of Black Mottled callow cattle, i.e., those having one quarter Jersey blood, were best with respect to their body build, yield of milk and butterfat content.

Introductive cross breeding, as a method of quickly perfecting a breed, can be employed in working with the East Friesian, Istobensk, Red Steppe and Gray Ukrainian breeds.

Commercial crossbreeding. Commercial crossbreeding is employed in beef livestock raising in order to obtain first generation hybrids and for fattening and subsequent slaughtering for meat. The employment of this method is based on the fact that the hybrids, especially the first generation, have higher productivity and utilize fodder better.

One of the conditions for effective employment of commercial crossbreeding is the utilization of purebred animals of two breeds.

In commercial crossbreeding, the young hybrid heifers of the first generation are left on the farm; the young bulls are castrated and put out to fatten in order to obtain the greatest amount of meat from them.

Commercial crossbreeding gives good results when the animals which are to be slaughtered are fed abundantly.

For commercial crossbreeding, it is the practice to employ Shorthorn and Kalmyts cattle or Kazakh Whitehead and Kalmyk cattle or other meat breeds.

Alternating crossbreeding makes it possible to obtain animals for utilization herds. In alternating crossbreeding, two or several breeds are used.

In two-breed alternating crossbreeding, the hybrids of the first generation are crossed with purebred bulls of one of the initial breeds, and the hybrids of the second generation are crossed with bulls of the other initial breed. This crossbreeding of the hybrids with bulls of first one and then the other initial breed is repeated in succeeding generations. In those cases where alternating crossbreeding employs several breeds of cattle, in the pairing with the hybrids the bulls of each breed are used in turn.

The biological essence of alternating crossbreeding is the fact that it makes it possible to obtain animals with unstable heredity and varied qualities. Alternating crossbreeding is not widely used in livestock raising.

In breeding the hybrids obtained from alternating crossbreeding, it is possible by inbreeding to create new breeds of cattle.

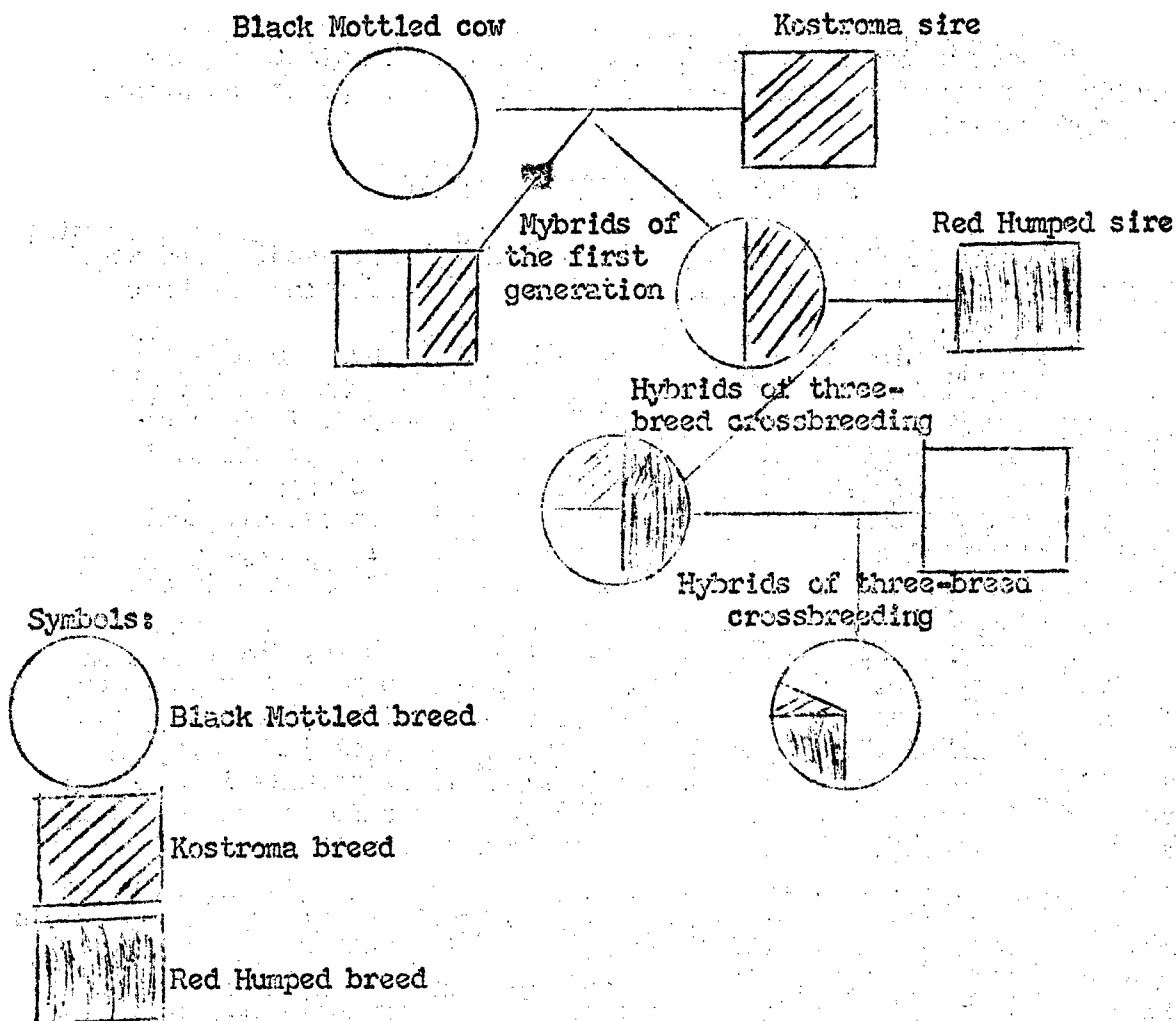


Figure 66. Chart showing the employment of three-breed alternating crossbreeding.

Hybridization

As distinguished from crossbreeding, hybridization means the pairing of animals which belong to different species, for example, pairing cattle with yaks or zebu.

Hybridization is one of the means of improving the existing species of livestock. Hybridization of cattle with yaks is practiced in Kirghiziya and in the Altay Kray. The male progeny of yaks and cattle are not fertile in the first generation. The hybrids are very hardy and have higher milk productivity than yaks, while having a butterfat content of 5.0 and higher.

In Azerbaydzhan and the republics of Central Asia there are hybrids of cattle and zebu which are noted for their great resistance to pyroplasmosis.

Selection and Pedigree Culling

Selection and culling together with the proper feeding and keeping of the cattle are the most important aspects in perfecting the breeds of farm animals.

When selection is employed with a herd, the best animals are left to reproduce and the animals which do not meet the requirements of breeding work are separated from the herd with their further use depending on the conditions of the farm. Selection is practiced in order to obtain animals with the desired breeding and production qualities; at the same time those conditions which facilitate their development are also created. In selection it should be kept in mind that the poor quality of animals is often the result of unsatisfactory feeding and care.

The higher the level of productivity of the herd, the more important is the role of selection. Therefore, the proper evaluation of the productive and breeding qualities of the animals, together with a consideration of their special features, is of great importance in selection. The selection and the evaluation of the animals is conducted on the basis of a series of criteria. The animals are selected based on their origin and individual attributes as well as on the quality of their progeny.

The selection of the young cattle is based on information as to their origin, i.e., as to the productivity of the mother and the mother's father as well as of more distant ancestors, and on the facts concerning the development of the animal, its live weight, body build and outward resemblance to the prototype of the breed. In evaluating the young as to their origin, the same principles apply as for the sires. In selecting the young, attention is paid to the absence of those physical deficiencies connected with the underdevelopment of the animal (narrowness of body, disproportionate development, flaws in the croup and extremities). On breeding farms the line or family to which the young belong is also taken into account.

The selection and evaluation of cows is conducted (while considering the conditions of their feeding) on the basis of milk productivity, live weight, build and constitution, reproductive ability of the cows and return on fodder. Especial attention is devoted to selecting cows which have a high milk yield which in turn has a high butterfat content. In selecting the animals on the basis of various attributes, consideration is given to the health of the animals because the period during which animals can be used is less if they are sick or have a weak constitution. In addition, it is impossible to obtain high yields and good offspring from such animals.

For the selection of cows, attention is paid to the extent which the animal resembles the desired type (based on productivity, as meat or dairy), the absence of any flaws in its build which would be a result of the underdevelopment of the animal (a narrow, shallow chest, a sagging back, etc.), and also on the condition and development of the udder.

On the breeding sovkhos "Karavayevo," S. I. Shteyman considers, in addition to these above characteristics, the nature of the lactation curve and retains those animals which have a more level lactation curve in the herd.

It is more correct to evaluate the cows on the basis of two to three lactations which took place under conditions of good feeding and management rather than base this evaluation on the first lactation alone. Many record cows have had a low yield for their first lactation and then in later years gave eight to ten thousand kilograms of milk. The yield of the cow Zozulya of the Simmental² breed from the kolkhos imeni Kirov of Chernigov Oblast gave 293 kilograms for the 130 days of its first lactation; for the 286 days of its third lactation, it gave 5,842 kilograms, and for the 300 days of its fourth lactation, it gave 12,761 kilograms of milk. On farms where the evaluation and selection are based on the figures of the first two lactations, a somewhat larger number of first time heifers is left.

When selecting for butterfat content, this figure is acquired over several lactations because an evaluation of butterfat content based on a single lactation may not be accurate.

The breeding qualities of the animals are established by evaluating their progeny, in this case with respect to the yield, butterfat content, build, health and other characteristics of their daughters.

The selection of animals of meat breeds is based on the live weight, speed of maturation and return on fodder, and build and development of the meat parts. Attention is devoted to degree which the meat type is apparent and the absence of deficiencies of build which lower the meat qualities of the animals. Such deficiencies are narrowness of body, weak development of the musculature, a long narrow head, long legs, etc.

The selection and evaluation of bulls takes in the origin, build, live weight, reproductive ability and the quality of the progeny. Because bulls are selected at a young age when they do not yet have daughters who have lactated, fundamental attention is given to their origin. In evaluating a bull with respect to its origin, it is necessary to consider not only the productivity of the mother of the bull and the mother of its father, but also the performance of its ancestors to at least two generations. If the bull has outstanding ancestors, this increases the possibility of obtaining good quality progeny from it.

In evaluating the origin of the bull more exactly, it is necessary to consider the productivity of its mother and of its father's mother for not just one lactation but for all known lactations. In order to increase the butterfat content of the herd, it is necessary to select bulls from the cows which give large yields of milk and which maintain high butterfat content throughout a number of lactations.

The bulls must have a strong constitution, good development, a well defined male type, a strong powerful but not coarse skeleton, a well developed chest and middle part of the body, and well formed legs. For breeding purposes one cannot permit animals with imperfect bodies and which are underdeveloped.

In selecting bulls for breeding farms according to their origin it is necessary to consider the productivity and other qualities of the cows which come from the same animals as the given sire. In addition, attention is devoted to the line or family to which the bulls belong. The final evaluation is based on the productivity and development of the daughters; the evaluation of the bull based on its progeny should be conducted as early as possible in order to mark its further use on the farm.

The evaluation of the quality of the progeny is possible only when the animals are fed properly with fodder which will make possible the obtaining of high productivity for the daughters as well as for the whole herd of the farm. If the animals of the herd are not fed sufficiently, it is not possible to evaluate the bull properly.

The evaluation of the progeny is conducted by comparing the productivity, live weight and build of the daughters of the bull with the corresponding figures for their mothers. In this case the influence of the parents on the quality of the progeny is considered.

On the basis of the comparison of the productivity figures of the daughters and mothers for the same lactation, the quality of the bull is judged. If the daughters have higher milk productivity and butterfat content than their mothers, such a bull is of value to the herd.

TABLE 20

Evaluation of the bull Mogar based on its progeny on the breeding sovkhos "Trostyaneys" (according to D. I. Startsev)

Degree of Kindred	Number of Head	Yield for 300 days of lactation	Live weight
Daughters	42	4,732	637
Mothers	42	3,138	584
Difference in favor of the daughters		+594	+53

In evaluating bulls by their progeny by this method it is necessary that the mothers and daughters be raised and milked under similar conditions of feeding and keeping which provide for high productivity. In the absence of similar conditions, such an evaluation of the bulls by progeny is not employed.

If the feeding conditions for the mothers and daughters were different, the evaluation of the bull is conducted by comparing the productivity of its daughters and the daughters of other bulls from the same herd. The comparison of the productivity of the daughters of the various bulls is conducted for the same lactation and the same year. In such an evaluation, cows which come from various mothers are included in a single group and the influence of the mothers on the progeny is not considered.

The evaluation of a bull can also be conducted by comparing the productivity figures of its daughters with the average figures for the cows of the herd of the same age.

In evaluating bulls by their progeny one is not limited to the average figures on the productivity of the daughters but can at the same time consider the data for the best animals.

The evaluation of the bulls by progeny is conducted on each farm while taking into account the quality of the cows with which they are paired. The same bull, given the conditions of one farm and being coupled with a certain group of cows, may produce progeny of high quality; whereas, under different farm conditions and with a different maternal herd, he may produce offspring of lower productivity. Therefore, the evaluation of the sire of a group of cows for a given farm need not correspond with his evaluation when under other farm conditions.

In connection with this evaluation by progeny, the breeding qualities of the daughters, depending on their subsequent productivity, should be checked.

Culling the animals involves the selecting and pairing of animals in order to obtain progeny with higher productivity than their parents had.

Two types of culling are distinguished: uniform culling and mixed culling. In uniform culling, animals which have similar or uniform characteristics and belong to the same domestic type are paired. Uniform culling is used to intensify and fix in the progeny the valuable qualities of the parents. Prolonged uniform culling makes it possible to obtain animals which are similar in their productivity and type of build. In mixed culling, animals which vary somewhat in origin, productivity, type of build and other characteristics are crossed. Mixed culling helps to increase the variability of characteristics and the vitality of the progeny. In mixed culling it is possible to combine the desirable characteristics of the mating pair so that they may be fixed later through uniform culling.

Culling is conducted on the basis of an overall evaluation of the animals and must meet the aims of the breeding work for the given farm. In the breeding herds of sovkhozes and kolkhozes, culling should facilitate not only the raising of productivity but also the obtaining of animals with stable heredity. Improper culling when employing related pairing leads to a lowering of the vitality of the animals.

In culling there is envisaged the complete utilization of especially outstanding animals. The breeding importance of animals is determined by the steadiness with which they transmit their qualities to their progeny. But not all animals possess this ability nor is it held to equal degree. Some animals, although they belong to the same highly productive lines, nevertheless transmit their characteristics to the progeny poorly. One must not pair animals which have the same deficiencies, especially in build, because these characteristics will be intensified in the progeny.

After conducting the selection of the animals, a servicing plan is prepared which envisages the culling of bulls and cows. The culling of the cows for the bulls is conducted so that the sires will be of higher quality than the maternal herd.

Related Breeding

Related breeding is employed both in pure breeding and in some forms of cross breeding. The purpose of employing related breeding is to intensify and fix the valuable qualities of animals which are being paired in their progeny.

Adherents of the formal genetic theory of Weismann-Morgan without any basis speak of the harmlessness and "neutrality" of related breeding. The lowering of vitality and fertility of the animals in the breeding of close relatives they explain as heredity defects of the parent pairs. Actually, in pairing related animals there occurs a union of sexual cells which are similar in the heredity basis; this narrows the heredity in the progeny and leads to a lowering of fertility, an increase in mortality for the animals, and abnormal deviations during the uterine period of development. The negative consequences of related breeding are observed in cases where it is employed without a definite purpose, without a system and without keeping the animals properly which, in the final analysis, is reflected in their productivity (Table 21).

TABLE 21

Average productivity figures for progeny of the
bull Bayan of the Kholmogorsk breed

Characteristic	Second generation cows obtained by	
	Related pairing	Unrelated pairing
Yield (in kilograms)	3,492	4,619
Butterfat content	3.42	3.57
Live weight (in kilograms)	512	510

Under the conditions of directed breeding work, related breeding is an effective means of fixing the desired qualities of animals. It is employed wide but in varying degrees in creating new breeds of cattle and developing lines. A large number of outstanding animals have been obtained as a result of related pairings as, for example, the cows Vita and Mayka (Lebedinsk State Breeding Station) which gave yields of ten to twelve thousand kilograms. In order to fix high butterfat content, on the breeding sovkhos Karavayevo the progeny of the bull Salat were paired among themselves.

Depending on the degree of kinship of the paired animals, related breeding is broken down into closely related, moderately related and distantly related breeding. In closely related breeding, animals of the first and second degrees of direct and lateral kinship (I-II; I-III; II-II) are paired. In moderately related breeding, animals which have one common ancestor in the third or fourth degree (III-III; III-IV, etc.) are paired; in distantly related breeding, animals which have a more distant degree of kinship (V-V; V-VI) are paired.

In order to avoid the harmful consequences of related breeding, it is essential to select only strong, healthy animals for pairing. Animals which are to be used in related breeding should be raised under somewhat different conditions which are based on the differences in the sexual cells of the animals.

In raising animals which have been obtained through related breeding, good feeding and maintenance are very important; also very important is the elimination of animals with lowered vitality, weakened constitutions and low productivity.

On kolkhozes commodity farms, the bulls are periodically exchanged between farms in order to avoid the harmful consequences of related breeding. On breeding sovkhos and on kolkhoz breeding farms, related breeding is employed according to the plan for breeding work of the farm.

Appraising [Bonitirovka]

The appraising of cattle is very important in improving breeding work on kolkhozes and sovkhos. The purpose of appraising is to establish the productive qualities and also the breeding value of the

animals. Based on the results of the appraisal, i.e., the evaluation of the animals on a number of characteristics including productivity, build, constitution, origin and progeny, the further purpose of the animals and the sequence of their utilization are established.

The appraisal of the cattle is conducted annually in accordance with the special instructions of the Ministry of Agriculture of the USSR for the herds of all sovkhoses and for the breeding farms of kolkhoses. In the zone of operation of state stations for breeding work, the cattle of the kolkhoz commodity farms are appraised. In addition, all sires and all young bulls which are raised for augmenting the herd or for sale are appraised annually on all kolkhoses and sovkhoses.

Based on the results of the appraisal, the entire herd of cattle of a breeding farm of a kolkhoz or sovkhos is broken down by classes. The animals which are picked as belonging to the best class are designated for breeding work. Those animals which are less valuable for breeding work are separated into a production group. The third group consists of those animals which are not suited for breeding work and they are marked for fattening.

A zootechnician from the state station for breeding work or from the kolkhoz conducts the appraisal of the cattle on the breeding farms of kolkhoses; on sovkhoses this is handled by the zootechnician of the sovkhos with the participation of the veterinary workers, the managers of the livestock farms of kolkhoses, or the directors of the farms of sovkhoses. In addition, experienced milkmaids, calf tenders and other leading workers of the livestock farms participated in the work of appraising.

Before the appraisal, it is necessary to accomplish preparatory measures on each livestock farm of a kolkhoz or sovkhos. First of all, it is necessary to calculate the yield and average butterfat content for the cows; then it is necessary to determine the state of health and the breeding use of each animal, the quantity of fodder which has been fed and the productivity of the animals during the period of their best feeding.

The veterinary processing of the cattle and the check of the individual numbers of the animals should be completed before the appraisal. If it is necessary, the lost or unclear numbers are restored. At the same time the animals are weighed and their live weight is entered on an appraisal list.

The schedule for conducting the appraisal is compiled for the different herds and farms while taking into account the observance of the appropriate veterinary-sanitary requirements.

In conducting the appraisal, the appraisal commission inspects the cows, bulls and all the calves which are over six months on the farm or sovkhos, establishes the breed to which the animals belong and determines their class. Calves under six months are not appraised. The breed of the animals is established on the basis of pedigree and breeding books, breeding certificates, appraisal lists for previous years and other documents which confirm the origin and breeding of

the animals. In the appraisal, purebred animals, hybrids, and local improved cattle are distinguished. The solution of the problem of listing the individual animals by breed under one or another group is handled in accordance with the instructions for appraising.

Depending on their productivity and breeding qualities, all the animals which are being appraised are listed under the following classes: elite-record, elite, first class, and second class. For the listing of the animals according to productivity and live weight under the first class and the calves according to weight under all classes, minimum requirements which are established for the animals of each separate breed are given in an appendix to the special instructions on appraising.

The requirements for listing beef animals under the first class are somewhat different from the figures for dairy and dairy-beef breeds.

On the basis of the available data of the control or daily record of the yield of the cows and the monthly determination of butterfat content the productivity is established for each animal for the first 300 days of the last completed lactation or, if the length of lactation was less than 300 days, for the entire lactation.

In establishing the class of the cows according to productivity, the lactation, during which the highest yield and butterfat content were obtained, is used. The class of the animal according to weight is determined for the same lactation as for the yield.

In order to class animals as elite-record, elite and second class, they must meet the productivity and live weight requirements given in Table 22 (as a percent of the figures for first class).

TABLE 22

Class	For dairy and dairy-beef breeds		For beef breeds According to live weight
	According to milk yield	According to live weight	
Elite-record	200	115	120
Elite	150	105	110
Second	75	85	85

With the bottle method of raising calves of meat breeds (Hereford, Kazakh Whitehead, Aberdeen Angus, Shorthorn, Gray Ukrainian, etc.) the figure for productivity of cows is the live weight of eight month calves, i.e., from the time of weaning.

For cows to be classed as elite-record, elite and first class, the live weight of their calves should be not less than first class and for them to be listed as second class, their calves should be not less than second class.

In addition to the classification according to productivity and live weight, cows are also classed according to build and constitution.

The evaluation of the build and constitution of bull-sires and cows of breeding herds is based on a 100-point scale according to a special appendix to the instructions on appraising. In order to class cows according to build and constitution, they must have the following point scores (Table 23).

TABLE 23

For listing according to class	For dairy and dairy-beef breeds	For beef breeds
Elite-record	80	85
Elite	75	80
First	70	75
Second	65	70

On the basis of the class of the cows according to milk productivity and butterfat content, live weight, and build, an overall class for an animal is established; the class according to milk productivity is lowered by one class if the evaluation of the animals according to live weight or build is lower by two classes.

The overall class of bulls is based on live weight, build and constitution, origin and progeny.

Of great importance in classifying bull-sires is the correct determination of their class by origin which is established according to the class of their parents. In the absence of information on the class of the parents according to overall characteristics, the class of the mother of the bull is established on the basis of its yield and butterfat content and for the father of the bull according to the class of the father's mother.

In establishing the class of an adult bull, the productivity and development of its daughters under established feeding conditions are considered. If the daughters of a bull have a productivity which is significantly higher than the productivity of their mothers or contemporaries or of the herd as a whole, the class of the bull which is based on other characteristics (live weight, origin and build) can be raised by one class.

Young cattle over six months are appraised according to origin (by the class of their parents), live weight, build, constitution and adherence to the breed pattern.

The evaluation of the young cattle according to build is on a five point system.

The overall class is established depending on the class based on origin and live weight and considering the evaluation for build.

After the appraisal has been completed, a record is made, and on the basis of the appraisal, measures for further breeding work with the herd of the kolkhoz breed farm or sovkhov are developed.

The steps of the appraisal and also the indicated measures are discussed at the production meetings of workers of the livestock farm and by the manager of the kolkhoz. The measures which are worked out on the basis of the results of the appraisal cover: the plan for raising the young and feeding the adult animals as coordinated with the planned productivity; the plan for building the herd with pedigree cattle, the buying and selling of breeding animals, the times for replacing animals of low productivity with those of high productivity, and also, if necessary, the times for exchanging sires between the farms of kolkhozes and sovkhovs; and the plan for veterinary measures for the forthcoming year to prevent illness among the cattle and to stamp out any existing illness.

At the same time, based on the results of the appraisal, a plan for servicing the cows is prepared; the basic methods of culling the animals which will produce offspring of high quality are outlined. Data on animals which meet the requirements for registration in the State Pedigree Book is forwarded after the appraisal to the oblast and kray farm boards.

In addition, on the basis of the results of the appraisal, it is possible to uncover deficiencies in the organization and conduct of production and zootechnical calculations on the farm or sovkhov and to establish a system of reckoning which will provide for the proper determination of the productivity and origin of the animals.

Marking and Confering of Names

Marking makes it possible to conduct an individual accounting of the cattle on the farm and also to conduct the selection and culling of the animals.

The marking is carried out in such a manner that it will be possible quickly and easily to determine the name and the inventory number of the animal. The following methods of marking are employed: 1) tattooing, 2) plucking, 3) branding on the horns, 4) metallic rings (pins), 5) shaving the hair, 6) marking with paint. The last two methods are employed when marking the animals for a short period of time (before slaughtering or driving cattle) because the hair (at the shaving site) will quickly grow back and the shaved mark will disappear or the painted mark will rub off.

The tattooing is performed with special tattooing irons on which there are numbers and letters made of sharp pins.

With the tattooing irons the skin on the inner side of the ear is pierced. A dye is rubbed in at the site of the tattooing using a dye such as Dutch soot, indigo, ocher or red lead triturated in alcohol. This method of marking is not used especially in cattle raising because with the dark color of the hair on the ears and the extent to which the ears are overgrown it is difficult to read the numbers.

Marking by plucking on the ears is performed according to a special key. Each pluck indicates a conventional number.

At the present time the following single key is used: a pluck on the upper edge of the left ear stands for the number 10; one on the lower edge of the left ear stands for the number 30; a pluck at the corner of the left ear indicates the number 200; a round hole in the middle of the left ear stands for 800; a round pluck closer to the edge of the ear is 2000, a pluck on the upper edge of the right ear is 1; one on the lower edge is 3; a pluck at the corner of the right ear stands for 100; a round hole in the middle of the ear is 1000; a round pluck near to the edge of the ear is 1000. This method of marking has a number of advantages. With this method it is easy to mark the animals and to distinguish the numbers. However, it does have some deficiencies. It is difficult to use large numbers because there is not enough room to make the plucks, and with cattle the plucks along the edge of the ear often become overgrown with hair which may make the plucks difficult to identify.

When the animals are marked by branding the horns, the number is preserved for a long time and as it begins to fade it can also be restored.

Marking with metallic ear rings (pins) makes it possible to use any number. The ear marks or rings are made of non-oxidizing metal and with the use of special pincers are affixed to the edge of the ear. The metallic marks are in the form of plates or round pins.

When the animals are being pastured in the woods, the metallic marks are sometimes lost and must be replaced.

The numbering of the animals is from 1 to 9999. Animals from the same farms must not have identical numbers. If there are several cattle farms on the overall farm, the numbering of the cattle on the first farm goes from 1 to 1999, on the second farm from 2000 to 3999, etc.

When calves are born, they should be given short, simple names which do not coincide with public-political terms or names of nationalities and people. Animals on the same farm should not be given identical names.

On some farms all the calves which are born in the course of a given year are given names which begin with the same letter of the alphabet. The following year they are given names which begin with the next letter of the alphabet, for example, the letter A would be used the first year and B would be used the second year. On other farms the calves are given names which begin with the first letter of the names of their mothers.

It is necessary to prepare in advance a list of names for the calves of the next year. If on the overall farm there are several smaller farms, each smaller farm should be given a list with definite names for the young bulls and heifers.

Organizational Forms of Breeding Work

All measures with respect to pedigree questions are conducted by a net of state breeding units (GPR), breeding farms and sovkhoses and also by state stations for pedigree work and artificial insemination. While the general task is the same -- to improve the productivity and the breed qualities of farm animals -- the methods employed on various farms will be different.

State breeding units were organized in the period from 1930 to 1934. They conduct pedigree work in those areas where pedigree cattle are most wide spread.

Much work was done to increase the number of pedigree cattle and to improve their quality. On the breeding farms in the area of the state breeding units, a number of new breeds of cattle were created. In connection with the tasks of improving the quality of the cattle and of obtaining the widespread use of artificial insemination, on the base of some state breeding units and the farms of scientific institutions there were organized state stations for breeding work.

The state stations for breeding work serve the farms of an established zone. Their tasks include the perfecting of the pedigree and productive qualities of the animals, the creation of new lines and families, the organization of artificial insemination work, raising the young on the kolkhoz breeding farms, and culling the pedigree sires and establishing them at the artificial insemination points.

The state stations for breeding work conduct their work according to a plan which has been compiled in coordination with the kolkhozes and sovkhoses. At the government stations for breeding work, the required number of bull-sires is kept on hand. Their sperm is delivered on request directly to livestock farms or to artificial insemination points on kolkhozes or sovkhoses. The stations render practical assistance to the farms in organization of the proper care of the pedigree young and in distributing them among the kolkhozes and sovkhoses, in conducting pedigree registration on livestock farms and at artificial insemination points, and in preparing the data for recording the animals in the pedigree books.

The state stations summarize the results and experience from employing artificial insemination, conduct an evaluation of the sires based on the quality of their progeny, prepare catalogues, bulletins and posters for publishing, and prepare cadres for the kolkhoz and sovkhos artificial insemination points.

The state stations are under the corresponding oblast and kray boards or the ministries of agriculture.

Artificial insemination stations are organized under scientific research institutions, rayon veterinary hospitals and also in connection with state stud farms. They conduct work in improving the breed and productivity qualities of animals through the correct utilization of

sires using artificial insemination. The artificial insemination states, together with specialists from the sovkhoses and kolkhoses, compile a plan for serving their zone, maintain the necessary number of pedigree sires, organize the obtaining and delivery of the sperm to the livestock farms, render assistance in conducting the artificial insemination of animals, keep a record of the resulting progeny and their care, and introduce into practice the accomplishments of science and the experience of leading individuals.

Breeding sovkhoses. The first breeding sovkhoses were created in 1918; then a large number of breeding sovkhoses was organized from 1928 to 1930. At the present time they contain the better part of the purebred cattle in our country. Breeding sovkhoses conduct work in perfecting the breed and productive qualities of cattle, in raising pedigree young for kolkhoses and sovkhoses, and also in supplying the artificial insemination stations with sires. As a result of the scientific research which has been conducted on the better breeding sovkhoses and on the breeding farms of sovkhoses, new breeds of cattle, including the Kostroma, Sychev, Kurgan and Alatau breeds, were created.

Some breed sovkhoses and kolkhose breeding farms which have better quality herds and which have influenced the development of breeds have been designated as state breeding farms. Pedigree offspring raised on these breeding farms go, first of all, to supply the herds of breeding sovkhoses and kolkhoz breeding farms as well as to the servicing net of the state stations for breeding work and for artificial insemination.

All the breeding work on state breeding farms and sovkhoses and also at the state stations for breeding work is conducted according to a definite plan directed at improving the breed and productive qualities of the cattle. The work is conducted by means of selection and culling, creating new lines and families, organizing the proper feeding and care of the animals, and checking the sires according to the quality of their progeny.

State Pedigree Books

The state pedigree books constitute a system for recording the breed and productive qualities and also the origin of the best representatives of a given breed of cattle.

The purpose of having pedigree books is the perfection of the breeds of cattle by locating, registering and recording the most highly productive animals and of the organization of the correct and most effective utilization. The use of pedigree books is one of the measures conducted in our country in connection with breeding work.

The information entered in the state pedigree books covers the origin and productivity and also the location of pedigree animals by sovkhos or kolkhoz and oblast, kray and republic. Thanks to the use of the pedigree books, it is possible to follow the history of the formation

and perfection of breeds of cattle and to observe the methods of culling which were employed. By using the data of the pedigree books, it is possible to establish the quality and productivity of both the animals which are registered in the books and their closest ancestors and the existence of blood ties between animals of the same breed which are located on different farms and under different breeding conditions.

The information on the best animals which is entered in the pedigree books is used in evaluating the breeding qualities of the sires, in conducting selection, and in preparing plans for breeding work on farms.

The use of pedigree books facilitates the control of the quality and of the distribution of sires on the farms and thus makes it possible to avoid the occurrence of related breeding on kolkhoz farms and on sovkhozes.

The animals which are registered in the pedigree books are both the purebred bulls and cows and the hybrids which have a productivity not lower than the established requirements. Also entered is the data on their origin and the kolkhozes, sovkhozes or other farms to which they belong.

The State Pedigree Book (GPK) is maintained by the kray (oblast) boards or by the Ministry of Agriculture for the various breeds of cattle; it consists of two sections: in the first section the purebreds are registered; in the second section the hybrids are registered.

In order to be entered in the GPK, the animals must have productivity and live weight figures and a build evaluation which are not lower than the requirements for an appraisal of first class. At the same time they are given a number which, together with the stamp of the GPK, is marked on the left ear or is branded on the left horn.

The zootechnicians of a farm, after there has been an appraisal, submit the data on the animals which are to be registered in the GPK to the oblast or kray board or to the Ministry of Agriculture for the issuance of an order.

The numbering of the animals which are registered in the GPK is conducted separately for each breed while within a breed it is handled separately for sires and for cows. Together with the GPK, in the Ministry of Agriculture of the USSR there is a book for highly productive cattle in which animals which give a yield which is twice as large as the requirement for an appraisal of first class are entered. The information in the GPK is processed each year and the results are published periodically. The information serves as a guide in working out various measures in breeding work with cattle.

Shows [Vyvodki] and Exhibits

Shows are held in the zones where pedigree cattle are most widespread for the showing and selection of pedigree calves and also to display the experience of leading cattleraisers in rearing calves. Sometimes

the showings of the young are conducted together with showings of the bulls which sired them which makes it possible to judge as to the quality of the bulls.

Shows are arranged on kolkhozes which have breeding farms. At the shows which last one day, both the young of the kolkhoz farms and from the cows of the kolkhoz workers are displayed.

The preparations for conducting a show are handled by the specialists of the kolkhoz or sovkhov.

All of the young which are selected for the showing should pass a veterinary-sanitary inspection. A special commission handles the evaluation and selection of the best animals and also decides the question of the subsequent purpose, use and contractual arrangements for the young.

At the shows it is possible to give out certificates and premiums to the calf-tenders who have obtained the best results in preserving and raising the young.

Exhibits are organized for the extensive showing of the finest accomplishments of the kolkhozes and sovkhovs in developing livestock raising and increasing the productivity of cattle and also for the propagandizing and popularizing of the methods of work of these farms and of these leading livestock raisers.

In addition, at an exhibit the visitors become acquainted with the accomplishments of the agricultural scientific research institutions and with the mechanization of labor-consuming processes in animal husbandry.

Exhibits according to size may be called all-union, republic, oblast (krai) and rayon exhibits.

The All-Union Exhibit of the Economy is, at the present time, in continuous operation. At it the immense experience of the accomplishments of socialist agriculture is summarized, and the methods of work of leading livestock raisers are shown graphically.

Oblast and republic exhibits are usually not specialized and the accomplishments of all branches of agriculture are demonstrated at them.

Rayon exhibits which last one to two days should involve the participation of all the sovkhovs and kolkhozes of the rayon. At the exhibit the best animals from each kolkhoz and sovkhov, the products of livestock raising which have been developed in the rayon, new types of fodder crops and various feeds are demonstrated. Data on the production activity of the farms, the methods of work of leading workers and their accomplishments are presented in the form of diagrams, posters and photographs. Pictures of leading agricultural workers are hung here. At the exhibit machines are demonstrated which show the mechanical preparation of fodder, care for the animals and also mechanical milking.

An exhibit committee is established to organize and conduct the rayon exhibit; it establishes the plan and the place for conducting the exhibit and the plan for popularizing the accomplishments of leading

workers; it also performs the task of acquainting all the livestock workers of the rayon with the displays at the exhibit. On this basis the exhibit will contribute to the broadening of socialist competition between kolkhozes, sovkhozes, brigades and leading farm workers.

The exhibit committee forms a commission of experts to select the animals for the exhibit, organizes the required veterinary processing of the cattle, checks the information as to productivity and breeding use and also establishes what the conditions of feeding and keeping have been for the selected animals.

Before the opening of the exhibit, the commission conducts an experts appraisal on the basis of the information on productivity and of an actual inspection of the animals. Those animals which are most outstanding in productivity and build are picked as the best exhibits. The results of the expert's appraisal are entered in tables in which appears information on the productivity and origin of the display animals. Individual kolkhozes, sovkhozes, farms, brigades and leading workers may receive diplomas, honorary certificates and cash premiums for their accomplishments in developing livestock raising.

The exhibit committee picks guides and organizes lectures by the specialists of the sovkhozes and kolkhozes and also by leading livestock workers on their methods of work.

It is necessary through the press to publicize the time and place of the exhibit, its results and also the methods of work of leading workers.

Planning Breeding Work

On breeding farms the work with cattle is conducted according to a plan which covers three to five years.

Plans for breeding work are compiled based on the general plan for the development of animal husbandry throughout the economy.

In the introductory part of the plan brief comments are made on the history of the herd, its ratings for milk productivity, build, live weight, state of health and conditions of feeding and keeping the animals as well as the condition of the fodder base on the farm. In this part of the plan, the methods which were used previously in breeding the herd are indicated.

The plan examines the number of cattle for each year and the structure of the herd, measures to improve the breed and class composition of the herd, a system of building and refining the herd, and also measures for raising and selling pedigree young.

The plan must reflect an increase in the production of dairy products per 100 hectares of farm land and an increase in the butterfat content of the milk and the live weight of the animals with respect to their age.

In working out these figures they start with the measures which are planned for the economy to improve the conditions of feeding and keeping cattle over the next few years, the biological characteristics

of the animals of a given breed, and the experience of leading farms and leading livestock workers in raising the productivity of cattle.

The plan covers the selection and culling of the animals with an indication as to the qualitative norms for the basic characteristics involved in selection by year for the desired type of animal. At the same time a plan is prepared for the distribution and utilization of bulls of various blood groups in the herds of the different farms; lists are prepared containing those animals which when paired will furnish needed new sires; and a plan for utilizing animals of different lines and families is compiled.

Based on the intended figures for weight gain and considering the characteristics of the breed, tables are prepared for raising the young and for fodder rations for the adult cattle in coordination with the planned productivity.

As a precaution, the plan includes measures for ridding the herd of any infectious diseases.

CHAPTER VII

BREEDING PROCEDURES

Sexual maturity for animals of different breeds occurs at various times depending on the earliness of maturation and the conditions of raising, feeding and keeping the animals. Proper and well-balanced feeding, i.e., feeding the young with fodders which contain all the substances which are essential to the growth of the organism, accelerates the onset of sexual maturity.

Usually bull-calves acquire the ability to mate at an age of six to eight months while with heifer-calves the first heat occurs at an age of eight to ten months. However, it is not until much later that the bull-calves and heifers are brought together to mate. Early mating of bull-calves and heifer calves retards their normal development; in addition, with the heifer-calves early mating has a negative effect on their later productivity. Therefore, beginning at an age of five to six months the bull-calves and heifer-calves should be kept apart from each other and should be put to pasture separately.

At the same time, if the heifer-calves are brought to mate at too late an age, there can be a negative effect on their fertility, and in many cases this can lead to unnecessary expenditures in keeping the young on the farm.

Because of these facts, the heifer-calves are first brought to mate at an age of 18 to 20 months if they are well-developed and if their live weight comprises not less than 60 to 65% of the weight of full-grown animals. The bull-calves are first allowed to mate at an age of one and a half years if they are normally developed and well fattened.

During the first year in which the bull-calves are used, they are assigned to mate with 15 to 25 cows. Using the bull-calves to the full extent of their capabilities has a negative effect on their health and leads to premature loss of sexual activeness.

The period of heat (desire) in cows usually occurs between the 19th and 24th day after calving; and if the cow is not fecundated during the first period of heat after calving, the period of heat normally is repeated every three weeks.

If the bull is brought on at the wrong time, the result can be barrenness in the cows; therefore, knowing when the calving took place and having calculated the approximate time when the period of heat occurs, it is necessary to follow carefully the condition of the cow in order not to miss the period for mating.

For cows the period of heat continues for an average of 17 to 24 hours and sometimes reaches 36 hours. The occurrence of the period of heat in cows and heifers is determined from the conduct of the animals and from the condition of the sexual organs. When the desire occurs, the animals become restless, moo frequently, lose their appetites and

have a lower yield of milk, and jump on other cows when they are let out to walk. During the period of heat it is possible to observe a swelling and reddening of the exterior portions of the sexual organs and a secretion of mucus. These signs are not always readily apparent. During the stall period when the animals are not fattened sufficiently, the signs of the period of heat are not so strong. It is necessary to observe the condition of the animals and regularly to let the cows out for exercise because it is during exercise that it is possible to detect and separate from the remainder those cows which are in heat. After fecundation the sexual cycle is not renewed.

Mating. Mating can be either free or controlled; in addition, artificial insemination of cows is also employed. With free mating the bull is released into the herd where he finds those cows which are in heat and services them. In free mating the bull may cover the same cow several times while the cow is in heat.

As a result of a large number of coverings which are absolutely unnecessary to fecundate any given cow, the bull quickly becomes worn out and the period of his usefulness for the farm is curtailed. With free mating, one bull services 30 to 40 cows. With this method of mating it is possible to have traumatic injuries to the small cows, especially if large bulls are used with the herd.

Free mating does not make it possible to determine the sire of the young and to conduct selection of the animals. In addition, one cannot regulate the time for covering cows and for calving; and if one cow in the herd becomes sick, the infection can be transmitted by the bull to the other animals.

Controlled mating has substantial advantages when compared with free mating. The bulls which are used in controlled mating, although they are kept in the common cattleyard, are not allowed out in the pasture or for exercise with the cows. Mating takes place in an enclosure where there is a special mating stand made of strong material; the diameter of the posts should be not less than 18 centimeters and for the longitudinal beams it should be not less than 10 to 12 centimeters.

For mating, the bulls are led with sticks which are hooked on to their nose rings to the cows which have been positioned in the mating stands.

When controlled mating is used, it is possible to plan the times for servicing and for calving on the farm and to use the bulls more rationally as well as conducting better breeding work. With controlled mating, the number of cows assigned to one bull is increased to 80 to 120 head; regardless of this, the length of time during which the bulls can be utilized is increased because with controlled mating the bull does not perform superfluous coverings on the same cow as does happen with free mating. The fecundation rate of the cows is increased if the bull covers the cows twice (the second covering occurring ten to fifteen minutes after the first).

Artificial insemination makes it possible to utilize the most valuable sires both more extensively and over a longer period of time and to acquire from them a large number of progenies. Therefore, by using artificial insemination a farm can more quickly improve the quality of its herd as well as raise the productivity of the herd.

In one covering a bull discharges from 4 to 5 cubic centimeters of semen while some sires discharge up to ten cubic centimeters; with this amount of semen it is possible to inseminate up to ten to twenty cows. In a year it is possible with the semen from a single bull to inseminate 250 to 400 cows while experienced technician-inseminators who utilize the bull properly throughout the year and who dilute the semen are able to inseminate up to 3,000 to 4,000 cows.

The planning of mating and calving. A mating plan is drawn up in order to provide for the timely servicing of the cows and for regulating the calvings as well as for the correct selection of the cows for the sires. Depending on the predicted number of calvings, an approximate mating plan is established for each month. At the same time it is designated which cows are to be serviced by which bulls.

In compiling the mating plan, the times for the cows to calve throughout the year are noted, taking into accounting the concrete features and conditions of the farm.

Regular calvings, where the number of calvings is approximately the same each month, are of especial importance for farms which are situated near urban areas and which supply cities and industrial centers with whole milk.

The change in the calving time for the cows and the transition to year around calving so as to have a regular output of milk throughout the year should take place gradually. In order to accomplish this, the first step is to change by one to two months the times for servicing the heifers; also the cows are serviced not during the first but during the second or third time they are in heat after calving. The seasonal occurrence of calving results in the obtaining of a large number of calves during two to three months of the year. This increases the need for stalls for the calves while during the remainder of the year the stalls are not utilized fully; it also creates an uneven workload for the workers involved in livestock raising and complicates the work of dairy plants.

Determining whether a cow is with calf. The surest way of determining whether a cow is with calf is by rectal examination of the womb through the rectum on the thirty-fifth to fortieth day after mating. All animals which have not been in heat by one and a half to two months after mating are given a rectal examination.

From the fifth to sixth month of pregnancy, the fetus can be felt through the stomach wall. In order to do this the cow is checked in the morning before feeding. One presses with the palm of the hand against the wall of the stomach at a point somewhat to the right of the groin. By increasing and relaxing the pressure one can feel the movement of the fetus.

The average length of time that a cow is with calf is 285 days with variations from 240 to 320 days.

Barrenness of cows results in great losses because it means that each year the farms do not receive a large number of calves which in turn retards the growth of the herd of cattle and which decreases the output of dairy products. If twenty percent of the cows are barren, the farms obtain one-fifth smaller gross yields of milk.

The reasons for barrenness vary; however, two groups of reasons can be identified: congenital and acquired sterility.

The causes of barrenness in the first case are the improper structure of the sexual organs and cryptorchism (underdevelopment of the seminal glands of the bull). Congenital sterility is encountered rarely; in this case it is impossible to eliminate sterility in cows.

In the majority of cases, barrenness is a consequence of deficiencies in keeping, feeding and using the animals.

Thus barrenness may occur as a result of exhaustion of the animals or obesity, premature mating of cows, overworking the bull in free mating, and improper care of the cows and bulls during the winter period.

Not only are cows which have not been fecundated in the first to second year (such cows are usually very few in number) considered to be barren, but also those cows with which the period between calvings is extremely long. In order to avoid barrenness because of the lack of timely covering, it is necessary to observe the cows to determine when they are in heat.

The struggle against barrenness centers on the elimination of those things which cause it. Poor conditions for housing and caring for the cattle are reflected in the physiological activity and in the peculiarities of the organism of the animal and ultimately lead to disruptions in the sexual cycle. In such cases the time when the period of heat appears is delayed.

Maintaining the animals in bright spacious premises with good ventilation and also regular cleaning of the cows help to decrease the incidence of barrenness.

Periodic checks on the quality of the semen of the bulls are essential if the causes of barrenness in the cows are to be determined.

The highest percentage of barren cows occurs when free mating is employed.

Many leaders in livestock raising obtain one calf each year per cow. The kolkhozes of Voskresenskiy Rayon of Moscow Oblast in 1956 obtained 97 calves per hundred cows and heifers present at the start of the year; the kolkhoz imeni Gor'kiy of the same oblast obtained 100 calves per 100 cows.

The duration of utilization of breeding animals depends on the conditions under which they are kept. When the bulls and cows are maintained properly, the terms of the utilization for breeding are lengthened substantially. The average length of time that cows are used is ten to twelve years while for bulls it is eight to ten years.

On the kolkhoz imeni Lenin of Kirsanovskiy Rayon of Tambov Oblast and on other leading farms, sires are used up to the age of fourteen to fifteen years. The experience of the sovkhos "Karavayevo" of Kostroma Oblast shows that the system of raising and maintaining animals as conducted on this farm facilitates the maintenance by the cows of their ability to give high yields of milk over the course of many years. For a number of cows this ability was preserved to an age of 22 years.

In several foreign countries there are recorded instances where cows have been utilized for longer periods of time. In the German Democratic Republic there was a cow, Europe 1351, of the Harz breed which in 24 years of use produced 21 calves and was still giving milk in her twenty-fifth year. In studying longevity in animals, in Hungary a cow was being studied which at the age of 31 years was still being milked. The offspring from an old cow usually is of lower quality than the offspring from a young cow.

Structure of the Herd

The proper structure of the herd, i.e., the ratio of animals of different sexes and age groups, expressed in percentage, is very important to the rapid reproduction of cattle on the farm.

The structure of the herd is determined by the economic and natural peculiarities and features of the area in which the farm is located and also by its purpose (breeding or commercial).

Depending on the concrete conditions of the farm, the plan for developing livestock raising, the composition by age of the herd, and the periods for selling breeding stock and carrying out selection, the ratio of sex and age groups may vary.

On cattle farms, cows should constitute 35 to 60% of the herd depending on the type of cattle raising (beef or dairy). It is necessary for each 100 hectares of land to have from 15 to 25 cows depending on the peculiarities of the various zones of our country.

For farms which are located near urban areas the structure of a typical herd may be as follows: bull-sires -- 2%, cows -- 60%, heifers -- 8 to 10%, calves from 1 to 2 years -- 12 to 15% and calves under one year -- 18 to 22%.

On livestock farms with beef cattle there should be a high percent of bull-calves in the herd with such calves being intended for fattening.

The number of heifers and heifer-calves selected for rebuilding the herd of calf-producing cows should be somewhat larger than the number of cows which are not usable in order that the better animals may be selected for rebuilding the herd.

For extensive building of the herd, the number of heifers and heifer-calves is raised to 25 to 30% of the total number of cows.

Based on the structure which has been selected for the herd, the turnover for the herd is established, i.e., calculations are made concerning the dynamics of the cattle of each sex and age group during

the course of the year, quarter or month. In speaking of the turnover of the herd, there is envisaged the transition from one age group to another, gains, losses and other changes in composition of the herd. The number of head of cattle on the farm at the end of the year should be in harmony with the plan and the established structure of the herd. Data on the dynamics of the herd during the course of the year are used as the basis in computing the fodder balance, planning output, etc.

CHAPTER VIII

FEEDING AND KEEPING CATTLE

Under the influence of external conditions and breeding work the type of build of the animals, their inherited characteristics and their productivity change.

In breeding farm animals, the conditions of their management and feeding are established by man; therefore the influence and effect of these factors on the development of inheritance and productivity qualities can be regulated.

Keeping the cattle in good light and dry premises has a favorable effect on the milk productivity of cows. Typical cattle yards not only meet modern zootechnical requirements for keeping the animals; but with their indoor equipment it is possible to mechanize all the basic operations involved in caring for the cattle, thus improving the conditions of the organization of work on the farm.

The basic animal-sanitary indices for typical cattle yards are the following: temperature -- $+4$, $+6$ degrees; ratio of the area of the windows to the area of the floor -- 1:10 or 1:12; system of ventilation -- an intake-exhaust system providing normal humidity in the cattle yard.

A higher air temperature in the cattle yard (higher than 8-10 degrees) causes an increase in the respiratory and pulse rates of the animals. A low air temperature in the cattle yard (within the limits of the norm) retards the development of microbes and the formation of harmful gases.

High humidity in the cattle yard has an unfavorable effect on the condition of the animals. When both the temperature and the humidity in the cattle yard are high, the animals perspire and their respiratory and pulse rates increase. High humidity together with low air temperature in the premises intensifies the cooling of the organism and can cause colds in the animals because the resistance of the organism is weakened. The relative humidity in the cattle barn should be 80 to 85%. Higher humidity can be detected from the appearance of dampness in the corners, on the ceiling and on the walls.

The sewerage is so arranged that there will be an outlet from the manure-urine channels; the outlet flows downward to a liquid container located outside the cattle barn.

In model cattle barns it is intended to have automatic watering and mechanical milking with the bringing of fodder and the carrying off of manure also being mechanized.

The cattle in a model cattle barn are quartered in two rows with their heads toward the windows; in four-row barns they are in four rows. Each animal should be given its own place to which it will quickly become accustomed.

All the cows which are served by one milkmaid are placed together in a row which simplifies the problem of caring for them. Over the stall of each cow a board is mounted on which is given the cow's name, productivity, age, date of calving and date of servicing. In addition, on breeding farms the boards also indicate the origin of the animal and its class.

In order to decrease the expenditure of labor in caring for dairy cattle, on farms in some foreign countries (USA, England, France and others) the cattle are kept in a group in a light shelter without being tied.

The southern side of these structures faces onto an exercise yard and does not have a wall. It is protected from snow drifts and the wind by a low-hanging roof over the entrance; at night a mat is hung there. The cows are milked and are fed with concentrated fodder in another heated structure where the milking assemblies are set up.

With such a system of keeping the animals, the hay is fed at a covered hay repository; ensilage is fed directly from ground-level ensilage devices or is transported into the structure on conveyor belts. The cattle are kept in an area with a thick layer of straw on the floor; manure is taken from the premises once or twice a year. In the Soviet Union, the practice of keeping the cattle in quarters without being tied is conducted on farms which raise beef cattle and also, as an experiment, in dairy farming (kolkhoz imeni Twentieth Party Congress, Kantsevskiy Rayon, Moscow Oblast).

When cattle are kept in premises without tiedowns, it is possible to house 15 to 20% more cattle than with tiedowns.

All tasks in a cattle barn should be performed according to a firmly established schedule. The introduction of a given schedule is related to the system of organization of labor on the livestock farm. Any disruption of the established daily routine has a negative effect on the condition of the animals, disturbs them, and, in the final analysis, causes a lowering of their productivity.

The organization of work in a cattle barn is on a single or double shift basis. With a single shift system, all the necessary tasks in caring for the cattle are performed by the same livestock workers; during the course of the day they have one or two breaks. With a double system of organizing the work in a cattle barn, each group of cows is handled by two milkmaids who serve the group. One has the morning shift and the other has the evening shift. Thus all the work in the cattle barn is performed by two shifts of milkmaids working eight hours each.

During her shift each milkmaid serves a group of 18 to 24 cows. This system of labor organization which is employed when the basic processes on the livestock farm are mechanized improves the working conditions of the milkmaids, makes possible a better system of keeping and milking the cows, and helps to establish more permanent cadres and to encourage their participation in the communal life of the kolkhoz.

With a single shift system, the work schedule in the cattle barn changes depending on the number of milkings and feedings.

On many farms the cows are fed and milked the same number of times. Thus, with a three-time system of milking, the cows are fed three times. As a result of this there is an increased rest period for the animals as well as an increase in the time for digesting the fodder.

In Table 24 there is given a work schedule for a cattle barn during the winter with three milkings of the cows.

A sample work schedule for use during the winter in a cattle barn with the cows being milked twice daily is given in Table 25.

With such a system cows which give high yields, cows which have just calved, and cows which have calved for the first time are milked three times a day.

TABLE 24

<u>Name of the task</u>	<u>Beginning and end</u>	<u>Duration</u>
First milking	0400 - 0530	1 hr 30 min
Feeding and watering	0530 - 0615	45 min
Cleaning the premises and the cows	0615 - 0745	1 hr 30 min
Rest period	0745 - 1000	2 hr 15 min
Exercise for the cows	1000 - 1200	2 hr
Second milking	1200 - 1330	1 hr 30 min
Feeding and watering	1330 - 1415	45 min
Rest period	1415 - 1900	4 hr 45 min
Third milking	1900 - 2030	1 hr 30 min
Feeding and watering	2030 - 2100	30 min
Night rest period	2115 - 0400	7 hr 45 min

TABLE 25

<u>Name of the task</u>	<u>Beginning and end</u>	<u>Duration</u>
Preparation for milking and milking the cows	0500 - 0630	1 hr 30 min
Feeding the cows	0630 - 0730	1 hr
Cleaning the cows and the premises	0730 - 0830	1 hr
Break	0830 - 1100	2 hr 30 min
Milking cows which are highly productive or which have calved recently	1100 - 1200	1 hr
Walking the cows	1200 - 1400	2 hr
Break	1400 - 1600	2 hr

TABLE 25 (continued)

Preparation for milking and milking the cows	1600 - 1730	1 hr 30 min
Cleaning the premises	1730 - 1815	45 min
Feeding the cows and preparing the fodder for the next day	1815 - 2000	1 hr 45 min

Both with the two-shift and single-shift work systems, the internals (except at night) between milkings and feedings are approximately the same. A somewhat different schedule and sequence of work exist under the so-called double-interval daily schedule which has been developed at the experimental farm of the Kostroma Agricultural Institute.

With such a daily schedule the work of caring for the animals is accomplished during two periods of four hours duration in the morning and in the evening. In the morning the milkmaids begin work at 0400 and continue until 0800. From 0800 to 1600 the milkmaids rest. In the evening the milkmaids work from 1600 to 2000. From 2000 to 0400 a cowherd stands watch in the cattle barn. The milking of the cows takes place at the following times: 0410, 0710, 1610 and 1910. The first and third milkings last 1 hour 45 minutes; the second and fourth milkings last 45 minutes.

The cowherds who work from 0800 to 1600 let the cattle out for exercise, clean up the premises and bring the fodder and straw.

With a double-interval work schedule in a cattle barn, the milkmaids have only one break during the course of an eight-hour work day. This makes it more convenient for livestock workers.

Feeding and Caring for Cattle

In organizing the feeding of cattle it is necessary to see that the fodder rations are varied in their composition and include a maximum quantity of juicy and green fodders. In addition, the fodder rations should meet the requirements of the animals for proteins, minerals and vitamins.

The nutritive substances and the vitamins which are present in the fodders are used by the animals in the normal conduct of the vital functions (respiration, blood circulation, digestion, activity of the nervous system, etc.) and also in the formation of livestock products (meat, milk, fat).

Minerals are essential to normal digestion in the animals and also to the functioning of the nervous system, glands, etc. They enter into the composition of all the organs and tissues of the animal which participate in its complex metabolic processes. The requirements of the animals for fodder depend on the breed characteristics, live weight,

productivity, individual characteristics, air temperature, time of the year and the conditions under which the animals are kept.

Vitamins are of very great importance to the normal vital activity of the animal.

A deficiency of vitamin A causes a number of illnesses in the animal which are connected with a disruption of the normal condition of the nervous system (paralysis, weak muscles, etc.). The requirement of the animals for vitamin A is satisfied by the carotene in the fodders. There is much carotene in green grass, ensilage, red carrots and food hay, fish oil, fish flour, etc. The requirement of cows for carotene is 40 mg per fodder unit.

If the animals are not supplied with vitamin D, this can result in calves developing rickets, complication during calving, a lowering of the live weight and other deviations from the normal condition of the animals. Vitamin D is formed in the skin of the animal under the influence of solar and ultraviolet rays (when the animals are subjected to artificial radiation). A rich source of vitamin D is fish oil.

Vitamin E is contained in hay, green fodder and grain. A deficiency of it in the fodders has a negative effect on the reproductive capacity of the animals.

Vitamin K which affects the coagulation of blood is contained in fodders and is formed by microorganisms in the digestive tract of animals.

A deficiency of the B vitamins causes indigestion, retards the growth of the animals, and leads to a number of nervous and other ailments. The B vitamins are contained in many fodders: hay, bran, green fodders, yeast, potatoes, etc. In addition, they are formed by microorganisms in the rumen of the animals.

Vitamin C is contained in large quantities in green fodders, root plants and potatoes. A deficiency of vitamin C leads to scurvy. Vitamin C has a role in regulating the processes of cellular respiration and carbohydrate exchange in the organism.

The requirement of a cow for nutritive substances per kilogram of milk depends on the size of its yield. Cows with a high yield expend less fodder per unit of production than do cows with low milk productivity.

The fodder expenditure norms per kilogram of milk per year for cows with different annual yields are shown in Table 26 (according to the data of the All-Union Institute of Livestock Raising).

TABLE 26

Average annual yield of milk per cow (in kilograms)	Average live weight of the cows (in kilograms)	Expenditure per 1 kilogram of milk		Total requirement of fodder units per cow for 1 year
		Fodder units	Digestible protein (in grams)	

2,000	350-400	1.3-1.4	140-150	2,600-2,800
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TABLE 26 (continued)

3,000	400-450	1.1-1.2	120-130	3,300-3,500
4,000	450-550	1.0-1.05	115-120	4,000-4,200
5,000	550-600	0.9-0.95	110-115	4,600-4,800

The feeding norms for young growing cows and also for unfattened cows increase in comparison with the actual requirement of the animals based on live weight and productivity. For each kilogram of weight gain they must be given an additional five fodder units and 0.5 kilograms of digestible protein and also mineral feed (phosphorous and calcium). The cows should receive minerals at a rate of seven grams of calcium and five grams of phosphorous per fodder unit. In addition, they are given salt, preferably in the form of a salt lick.

The different expenditures of fodder on various farms where the annual yield of the cows is the same is a result of differences in the ability of the animals to use fodder in the formation of milk and also of differences in the type of feeding employed on the farms.

The type of feed depends on the percentage ratio of nutritive substances in the various fodder groups (rough, juicy, green and concentrated) which are fed per head of cattle per year. In various zones of the USSR the composition of fodder rations vary somewhat depending on the type of agricultural production which is involved and on the natural and climatic conditions of the given area.

The following types of feeding are used most widely.

1. A type which in the winter has a predominance of rough fodders and ensilage in the cows' rations while in the summer green fodder with a small addition of concentrates is used. The average weight of the rough and green fodders and the ensilage in the fodder balance is 85 to 90% with concentrated fodders comprising 10 to 15% of the total quantity of nutritive substances (in fodder units) which are fed to a cow in a year. With this type of feeding the productivity of cows comprises 2,000 to 3,000 kilograms of milk.

2. The type of feeding which is richest biologically and most advantageous from an economic point of view is one in which the fodder rations have a predominance of juicy (ensilage, rootplants and tubers) and green fodders with a moderate expenditure of concentrates. This type of feeding has a favorable effect on the state of health of the animals, they utilize the fodders better, and the cost ratio is improved. During the winter period the cows are fed 40 to 50 kilograms of various juicy fodders while in the summer they receive 60 to 80 kilograms of green fodder. The average weight of rough fodders in the fodder balance is 15 to 18% per year with each animal receiving a daily ration during the winter of 6 to 8 kilograms of hay. The expenditure of concentrated fodders, depending on the size of the yield of the cows, varies from 220 to 300 grams per kilogram of milk.

3. A type of feeding having a large percentage (with respect to fattening properties) of concentrated fodders and a minor percentage of juicy fodders lacks in value because it disrupts the normal ratio of phosphorous and calcium in the ration (the phosphorous predominates over the calcium) and does not supply the requirements of the animals for vitamins (especially carotene and vitamin D). The deficiency of calcium and vitamins in this case must be made up by feeding the cows chalk, vitamin A and D preparations, fish oil and fish flour.

Feeding highly productive cows rations with a high content of concentrated fodders for a long period of time has a negative effect on the reproductive ability of the animals, disrupts the exchange of minerals and leads to post-natal complications. In addition, this type of feeding is economically disadvantageous.

In Table 27 data is given on the expenditure of fodders (in various ratios) per cow per year on two kolkhozes which participated in the All-Union Agricultural Exhibit (according to A. P. Yurmaliat).

TABLE 27

Kolkhoz	Average annual yield (in kilograms)	Total amount of fodder which was fed (in fodder units)	Ratio of fodders (fodder units in percents)			
			Rough	Juicy	Green and Pasture	Concentrated
imeni Stalin of Moscow Oblast	5,022	4,700	17.7	35.1	19.3	27.9
imeni Kirov of Chernigov Oblast	2,762	3,534	25.5	10.4	50.7	13.4

On the kolkhoz imeni Stalin of Moscow Oblast where there is a high average yield, juicy fodders predominate in the winter rations; on the kolkhoz imeni Kirov, rough fodders predominate during the winter with a negligible expenditure of juicy fodders.

In some foreign countries (Sweden, the German Democratic Republic, Holland, and others), the ration of cows with yields up to ten kilograms per day consists of good leguminous hay, root plants and ensilage. The possibility of obtaining such yields without feeding concentrated fodders has been confirmed in practice on both kolkhozes and sovkhoses. In herds with a yield of 5,000 to 6,000 kilograms of milk, the average weight of juicy and green fodders is 65 to 70% while the concentrated fodders amount to 30 to 35%. It is possible to judge as to the effect of changing the type of feeding on the yield by examining the data of Table 28 (according to A. P. Beguchrv) for the kolkhoz imeni Stalin of Moscow Oblast.

TABLE 28

Year	Average yield per cow (in kilograms)	Total amount of fodder which was fed (in fodder units)	Ratio of fodders (fodder units in percents)				Milk obtained per 100 fodder units (in kilograms)	Amount of concentrates per kilogram of milk (in grams)
			Rough	Juicy	Green and pasture	Concentrated		
1940	3,715	3,827	19.9	10.7	24.7	44.7	97.1	418
1956	5,022	4,700	17.7	35.1	19.3	27.9	106.9	267

In order to provide for the proper feeding of the cattle during the winter, the requirements of the herd for fodder are determined for the whole year and by month; in addition, the plan for expending fodder is established. The fodder requirements are established based on the average composition of the herd according to the sex and age, herd changes during the stall period, the length of the stall period, planned productivity figures, live weight, weight gain and feeding norms. Then the fodder balance, the expenditure plan and, if it is necessary for the species, a plan for receiving fodders not on hand are compiled. All the fodder is expended on the basis of norms which are accepted on the farm for a given period of time.

Before feeding takes place, the fodder is prepared. Concentrated fodders (cereals and oil cake) are pulverized or ground after which several types of fodders are mixed and mineral feeds are added. Part of the concentrated fodders can be given by strewing it over rough and juicy fodders. In order that the green fodders will be better assimilated, sometimes a portion of the daily norm is brewed or salted.

Rough fodder (winter straw and chaff) is cut and steamed or is processed chemically. The steamed straw is fed warm and is salted or sprinkled with concentrates. Good summer straw is fed in small quantities without preparation.

Root plants, potatoes and turnips are washed and fed whole or cut up. Preparing fodders for feeding results in excessive expenditures of labor and reflects on the cost of the resulting product. Therefore, preliminary preparation of fodder is employed only in those cases where it is poorly eaten by the animals or where the assimilability of the fodder is much greater after it has been prepared. When cows are fed large portions of a given fodder, part of the portion is prepared. Fodder rations for cows are prepared so that they include at least two to three types of juicy fodders and several types of concentrated fodders. Rations which consist of more varied fodders are eaten

better by the animals, the intensity of secretion of the digestive juices is increased, and the digestibility of the fodder is improved.

The feeding regime is very important. The animals become accustomed very quickly to a definite time and order of feeding. The order of feeding various fodders differs from farm to farm. In establishing the order of feeding for cows on a daily basis, attention should be paid to the quantity of different fodders which an animal receives during the day. Large daily feedings of single fodder are best broken down into two or three separate feedings.

Usually the concentrated fodders are fed first and are followed by the juicy and then the rough fodders. On the sovkhos "Kazavayevo," concentrated and juicy fodders are given out prior to milking. During milking the cows eat the fodder they have just received. Hay is fed after milking. On the kolkhoz imeni Stalin of Moscow Oblast, the cows receive the concentrated fodders before milking and after milking they are given ensilage, root plants and hay.

Cattle should be provided with clean water; if possible the cattle barn should be provided with automatic watering equipment. The introduction of automatic watering, where other feeding conditions remain the same, increases the yield of the cows by 10 to 15%. Where there is not automatic watering in a barn, the cows are watered three or four times per day. The requirement of the cows for water depends on the quantity and type of fodder which they eat, the condition under which they are kept, and the productivity and general state of the animals. On an average a cow drinks 35 to 50 liters per day. The temperature of the water should be 6 to 10 degrees. Cows should not be given cold water because feeding a cow which is with calf and giving it cold water may cause a miscarriage.

It is necessary each day to clean the cows because the hide is very important in regulating the body temperature of the animal. In addition, it is partially through the skin that respiration takes place and that the harmful by-products of the metabolic processes are eliminated.

In caring for the hoofs, attention is given to cleaning them and to trimming them as required. When the hoofs become overgrown, the movement of the animals becomes more difficult and cracks, breaks and other damage appear on the hoofs.

In the winter the cattle are let out each day when the weather is good for two to three hours of exercise.

For strewing on the surface, winter straw preferably 10 to 15 centimeters long, peat and saw dust are used.

Keeping and Feeding Cows Before and After Calving

The high productivity of cows depends to a significant degree on their preparation for calving. Beginning with the second half of pregnancy, the feeding norms are increased somewhat in order to replace those nutritive substances which are going into the development of the embryo.

Pregnant cows should be exercised almost until the time at which they calve; however, in the period before calving they should be let out separately from the remainder of the herd in order that they not be harmed by the other cows. The exercise for the pregnant cows should consist of a slow walk of 1 to 1.5 kilometers.

Milking is stopped at 45 to 60 days prior to the actual calving. Cows which are not well fattened or which are calving for the first time should be freed from milking at 60 to 70 days prior to calving.

If the cows have yields of 3 to 4 kilograms of milk per day, the milking can be stopped at once. If the cows toward the end of lactation have yields of 15 to 20 kilograms a day, the milking is halted over a period of 6 to 10 days. When the milking of such cows is stopped, it is important to keep in mind the characteristics of the animals and to watch the condition of their udders. If any part of the udder becomes hard, this part of the udder is massaged and milked.

When milking is being discontinued on high-yield cows, concentrated and juicy fodders are eliminated from their rations and they are fed hay. If the cow continues to give a high yield, it is given only a limited amount of water and automatic watering is discontinued. At the same time the number of milkings is decreased, first to two milkings a day, then to one milking a day, and then to one milking every other day. Hero of Socialist Labor Z. V. Vikhreva, a milkmaid of the sovkhos "Kholmogorka" of Moscow Oblast, follows a procedure in lowering the yield of milk by first removing the concentrated and juicy fodders from the ration and then replacing part of the hay in the ration with straw.

In 5 to 8 days after the milk-flow has stopped, the ration of the cow is gradually increased and concentrated and juicy fodders are introduced. On approximately the tenth to fourteenth day the cows receive the full norm of fodders.

The ration of pregnant cows should include the necessary amount of protein, calcium, phosphorous and vitamins.

As mineral additions to their diet when these elements are insufficient in their ration, the cows are given chalk, bone flour, wood ash and salt.

During the dry period the cows are given food ensilage on the basis of 3 to 4 kilograms per 100 kilograms of live weight.

The dry cows from the group which is cared for by Hero of the Soviet Union M. Kh. Savchenko, a milkmaid of the kolkhos imeni Lenin of Lebedinsk Rayon of Sumy Oblast, received 5 kilograms of hay, 4 kilograms of straw, 15 to 25 kilograms of juicy fodders (ensilage and beets) and 3 kilograms of concentrated fodders. In addition, the animals are fed minerals (calcium and phosphorous).

N. Peva, a milkmaid on the kolkhos "Bolshevik" of Cherkassy Oblast, who obtained more than 7,000 kilograms of milk from each cow, during the dry period gave her cows up to 12 kilograms of rough fodder, 20 kilograms of beets, 15 kilograms of ensilage and 3 to 5 kilograms of concentrated fodders.

The experience of leading livestock raisers has shown that it is necessary to feed the animals during the dry period at the same level as for animals which during lactation have a yield of 10 to 12 kilograms. Only with such feeding will the cows be well nourished at the time of calving. For cows which have been well prepared, the calving is much easier.

At seven to ten days prior to the expected time of calving, the cows are given an appropriate veterinary examination and are transferred to the natal section which is set up in a special part of the calves stalls and has a separate entrance. The natal section should be light and clean and should be disinfected periodically. The stalls in the natal section are 1.8 meters wide and 2.2 to 2.5 meters high.

If there is no natal section on the farm, the cows before calving are left in the cattle barn but are put in special larger stalls. When the cattle are kept in camps in the summer, it is necessary to provide for the construction of special quarters for the handling of calving and for keeping the calves.

Cows which have been transferred to the natal section do not receive juicy and concentrated fodders in their rations which leaves only good hay (as much as is desired) in the rations. Exercise is stopped 2 to 3 days before calving.

Before calving the cows are cleaned; dirty areas and the rear part of the body are washed with warm water and then with a 1% solution of creolin or a 2% solution of lysol.

When the signs of approaching birth appear, the external sexual organs of the cow are washed with a weak solution of potassium permanganate; the dirty litter is removed and it is replaced with a thick coat of clean dry straw on top of which is placed clean burlap or canvas to receive the calf. The individuals who are delivering the calves should have clean hands and should be in clean coveralls.

After calving the cow must be given a bucket of warm water (20 to 25 degrees) to drink; in 1 to 1-1/2 hours it is given some good hay; and after 3 hours it is again given warm water or mash.

The first three days after calving the cow receives good hay. Weak animals should be given bran or oatmeal in the form of a warm mash.

On the third to sixth day after calving, depending on the condition of the udder, the cow begins to receive concentrate fodders at the rate of 0.5 to 1.0 kilograms per day. From the third or fourth day, root plants are gradually introduced into the ration after which ensilage is also included. At the same time a mineral supplement is given. At about the tenth to fourteenth day the cows receive a full diet of juicy, rough and concentrate fodders. From this time on, in order to receive higher yields, the cows are given a so-called advance supplement which is in addition to the basic ration which is based on the actual yield.

This supplement to the fodder ration (advance) usually is given with the aim of raising the daily yield by 15 to 20%. Hero of Socialist Labor M. Kh. Savchenko adds 2 to 3 fodder units for milking cows. On some farms milking cows are given an additional 1 kilogram of concentrated fodder above their normal requirements.

If the yield is raised, the ration is increased again and the process is continued as long as the yield continues to increase. If after the last addition the cow's yield does not increase, it is necessary to change somewhat the selection of fodders, keeping those fodders which the animal eats best. If the change of fodders does not cause an increase in yield, the last advance supplement is gradually excluded from the ration over the course of 8 to 10 days.

During the winter period the ration of milking cows should include more juicy fodder and in the summer there should be more green fodder. The daily ration of the cow Tisha from the kolkhoz imeni Lenin of Sumy Oblast and which gave 20 to 25 kilograms of milk per day, consisted of 10 kilograms of meadow hay, 4 kilograms of straw, 45 kilograms of ensilage and root plants, and 5 kilograms of concentrated fodder.

The cow "Enchantress," from the kolkhoz "Twelfth of October," of Kostroma Oblast, has a yield of 40 kilograms of milk and receives 26.5 fodder units per day. The cow, Hollyhock, which had the same yield, received a ration consisting of 8 kilograms of hay, 30 kilograms of mangel wursel, 20 kilograms of potato pulp, 24 kilograms of ensilage, 2 kilograms of dry pressings and 11 kilograms of concentrated fodder.

If the cows begin to lose appetite, the selection of fodders in the ration should be changed; the amount of some of the concentrated fodders should be decreased, and the amount of good hay should be increased. Usually after this the animals regain their appetites. The exchange of some fodders for others should be conducted gradually and the new fodders should be introduced into the ration gradually over three to five days.

The system of milking cows on the breeding sovkhos, "Karavayevo," involves abundant feeding during the dry period, light feeding just before calving, moderate feeding during the first days after calving, and abundant feeding of the cows beginning with the fifteenth to twentieth day after calving.

High yield cows are milked three or four times after calving and then they are put on a twice or thrice daily milking routine. On the second to fifth day, depending on the condition of the animals, they are let out for a walk or are turned out to the nearest pasture.

Organization of the Milking of Cows

The milking of cows should be conducted on all farms. The mass milking of cows is of vital importance in fulfilling the requirement of raising the production of milk per 100 hectares of agricultural land.

The experience of leading sovkhozes and kolkhozes shows that the basic requirement for raising the productivity of cattle is to change the conditions of the farm, i.e., to improve the conditions of feeding and keeping the animals.

Among the measures for providing a proper system of milking cows are the following: timely servicing and annual bearing of a calf; planned milkings and checks on the conduct of the plan; preparation of the cows for calving; improvement of the conditions of raising the young and raising the feeding level for milking cows whose ration in the winter should include rough, juicy and concentrated fodders and in the summer should consist chiefly of green fodder; good facilities and care for the cows during the stall and pasture periods; proper milking of the cows to include massaging the udders; and preparation of the fodders used in feeding.

In addition, other matters of great importance in handling dairy cows are the proper organization of labor on the farm and the mechanization of the basic tasks of livestock raising.

Governed by these principles, a large number of kolkhozes and sovkhozes have achieved high results in handling dairy cows.

On the kolkhoz imeni Lenin of Lukhovitskiy Rayon of Moscow Oblast, the average yield for the herd for 1957 was 5,078 kilograms in contrast to a yield of 2,653 kilograms in 1946. The sovkhos "Nikonovskoye," "Gerki II" and "Konstantinovo" of Moscow Oblast obtains more than 6,000 kilograms and many kolkhozes obtain more than 5,000 kilograms of milk per cow.

All cows in a herd are milked with the exception of those which are ill or have deficiencies in the udder (parts of the udder are atrophied). Milking should be begun after the first calving if the animals are well developed. In milking a group of older cows, preference is given to those cows which have an even lactation curve and higher butterfat content.

Hero of Socialist Labor Ye. A. Kirichenko, a milkmaid on the kolkhoz "Bolshevik" of Cherkassy Oblast, in the course of three years raised the yield of her cows from 3,821 to 7,585 kilograms of milk. Individual cows on this kolkhoz such as Visla and Snezhinka which had given 2,000 to 2,300 kilograms of milk now gave 7,000 to 8,000 kilograms.

Milkmaid I. Fokina of the sovkhos "Red Bottomlands" of Moscow Oblast in 1950 obtained 5,883 kilograms and in 1951 obtained 7,424 kilograms of milk from each cow in her group.

An essential for the proper milking of cows is the maximum utilization in the rations of juicy fodders to include corn ensilage while having a relatively low expenditure of concentrated fodders per kilogram of milk. The studies by Academician Ye. F. Liskun, Doctor of Agricultural Science N. I. Zakhar'yev, A. P. Yumaliat and others have established that low concentrate feeding for dairy cattle not only results in the more effective use of the rough and juicy fodders which are available on the farm but also results in higher yields when a varied assortment of juicy fodders is used.

In the tests by N. I. Zakhar'yev on using low concentrate feeding for cows, the expenditure of concentrated fodders per kilogram of milk was 189 to 242 grams with yields of greater than 5,000 kilograms.

By introducing into the ration a higher amount of juicy fodders, Hero of Socialist Labor K. M. Loshchenova for the last 4 years has fed the cows in her group an average of 240 to 270 grams of concentrated fodders per kilogram of milk whereas the expenditures of these fodders for the kolkhoz as a whole in 1940 amounted to 418 grams per kilogram of milk. On the kolkhoz "Twelfth of October," the cows which have an average daily yield of 20 to 25 kilograms, receive 55 kilograms of juicy fodders (potatoes, ensilage, root plants), 9 kilograms of hay and 4 kilograms of concentrated fodders.

The use by milking cows of increased amounts of juicy fodders provides a well-balanced fodder and is economically advantageous because it decreases the expenditures of expensive concentrated fodders. Rations with large amounts of juicy fodders have a favorable effect on the gastrointestinal tract of the animals.

Methods of Milking and Care of the Udder

Milking can be mechanical or by hand. The best way to milk by hand is with the fist. In this method the cow does not experience pain, the nipples are not harmed, and the milkmaid does not become as tired as when milking with the fingers.

The cows are milked with both hands, grasping the nipples obliquely (front right and left rear or just the opposite), or first the front and then the rear nipples are milked. In milking with the fist, the thumb and index finger seize and squeeze the nipples near its base and by squeezing the nipple with the index and other fingers milk is obtained. Then the pressure is relaxed in order that a new quantity of milk may enter the nipple from the udder and the nipple is again squeezed with the fingers. In milking with the fist, the hands of the milkmaid should be motionless with the only motion being the squeezing of the nipples by the fingers.

Milking should be rapid and energetic with even squeezing of the nipples. A milkmaid, Hero of Socialist Labor M. Kh. Savchenko, performs 80 to 90 squeezes of the nipple in a minute.

Before beginning to milk, the milkmaids wash their hands with soap, inspect the udder, rinse it with warm water and wipe it dry with a clean towel.

Before milking the udder is massaged which intensifies the blood circulation, the build-up of pressure in the udder and the discharge of milk. The massage is continued for 1/2 to 1-1/2 minutes. The massage consists of squeezing the udder near the nipples, pushing it upward and rubbing it frequently with the hands from top to bottom. The second massage of the udder takes place at the end of the milking. During the

second massage, both halves of the udder are first massaged and then its separate parts. After the concluding massage, the final part of the milking is performed. Massage is especially important during the initial period after a cow has calved because during the swelling of the udder, the massage helps to restore the normal condition of the milk gland.

The final milking out is very important because the final portions of milk have the highest butterfat content of 7 to 10 grams per milliliters of milk. Hero of Socialist Labor P. A. Malinina points out that after this final milking was introduced in 1949 on the kolkhoz "Twelfth of October," the average butterfat content in the milk for the herd increased from 3.88 in 1948 to 4.02 in 1952.

Many leading livestock workers massage the udder in the middle of the milking, usually after milking the two front nipples. After milking the nipples are wiped and are rubbed with vaseline or with fat as a substitute (boiled butter) which protects them from chapping.

The milking of the cows is conducted according to a strict order which, if disrupted, would have a negative effect on the size of the yield. Slow and agitated milking also lowers the yield of milk.

With machine milking, the milk is sucked from the nipples. Machine milking increases the labor productivity of the milkmaids, they tire less, and the milk is also exhausted completely from the udder.

The work of a milkmaid in machine milking involves preparing the cows for milking, a preparatory massage of the udder, adjusting the milking cups, observing the operation of the milking machine, and conducting the final massage and final milking of the cows. One milkmaid by machine milking can milk from two to four cows simultaneously.

The Soviet three phase milking machine which works on the principle of interrupted sucking of the milk makes it possible to obtain uncontaminated milk. The milking of one cow lasts five to seven minutes, depending on the size of the yield. It is necessary to watch for the end of the secretion of milk in order not to leave the milking cups on the nipples after the flow of milk has stopped.

The high labor productivity with machine milking is achieved by arranging special milking areas in the cattle barns; they have four to eight stands for the simultaneous milking of four or eight cows. On the sovkhoz "Yeyskiy" of Krasnodar Kray, on the kolkhoz imeni Makarov of Moscow Oblast and on other farms where milking areas have been established, milkmaids who handle 40 to 50 cows are able to milk 4 to 8 cows simultaneously. The expenditure of labor in mechanical milking is also curtailed when, in place of the milking buckets, containers are employed which are placed along the cowbarn on carts or when the milk flows directly into a milk line.

In foreign countries a two-phase milking machine which does not have a time for resting is employed. The process of milking passes somewhat more quickly than is the case with the triple-phase machine; however, when this system is employed, cases of ailments of the udder have been observed.

Keeping Cattle in Pastures

Keeping cattle in pastures is very important in raising the productivity of cattle because a cow gives the greatest quantity of milk during the summer period.

With their green fodders, pastures provide feed which is easily assimilated and is rich in protein and vitamins. As a result green fodders are a well-balanced feed. In addition, the time the animals spend in the open air moving about helps in hardening the organism and improves the functioning of the respiratory and digestive organs.

The transfer of the cattle to a pasture regime takes place gradually because an abrupt change in the type of feeding can lead to ailments of the gastro-intestinal tract and to a lowering of the productivity of the animals. Before moving the cattle to pasture, a plan is prepared for using the pastures which are available on the farm; in the plan are indicated the sequence and times of pasturing on various sectors, provisions for supplying the pasturing cattle with green mass, and the requirements for supplementary feeding. Watering places are established and the trails to them are prepared. The animals are given a veterinary-zootechnical examination; their hoofs are trimmed; and also the animals are broken down into flocks according to age and sex. Initially the cattle are put out to pasture only after feeding. Both before they are put out to pasture and during the first days in the pasture, the cows should be given rough fodder, root plants and ensilage. For the first two or three days the cattle are let out to pasture in the day after the dew has disappeared, preferably in the afternoon for two to four hours. The next three days they are let out for 4 to 6 hours. Then the time spent in the pasture is increased so that by the eighth to tenth day the cattle spend the whole day in the pasture. The cattle begin to graze in the pasture after the soil has dried and the height of the grass is 10 to 12 centimeters.

Pasturage of cattle. In breaking down the pasture land by sectors, a definite sequence of use is established. Depending on the quality of the grass, a herd of 100 cows is given 1.5 to 2 hectares each day. In the pasture the cattle should be moved slowly about their sector. A cowherd leads the herd and maintains a slow pace. A second cowherd follows the herd. The slow movement of the herd results in better condition for the grass; the cattle graze first at the places where they had already grazed and then the herd is shifted to an area of fresh grass. With this system the pasture is used more fully. For normal renewal of the grass each section of the pasture is in turn not used. The grass is left to be harvested for hay and is cut after seeding.

The system of using sectors for pasturage, as the experience on kolkhoses and sovkhoses of Moscow Oblast and other oblasts has shown, has resulted in higher yields of milk and makes it possible to keep a larger number of cattle in a given area than is possible where there is no system.

The sizes of the individual sectors and the periods of their use are established depending on the quality and productivity of the pasture, the length of time for the green cover to grow and provide additional fodder, and the relief of the area. Usually there are 6 to 10 sectors for a herd with each sector being grazed for 2 to 3 days. The cattle do not graze again on this sector until 3 to 4 weeks have elapsed.

When the vegetation grows back quickly on those sectors which are to be used last, the grass is cut and the after-grass is left for grazing. In planning the next use of the sectors it should be kept in mind that the length of time for grazing on them will be less because the intensity with which the grass grows back is lower after each session of grazing. When pastures are re-used, those sections which have regained the best cover are used first.

High-yield and artificial pastures are developed on smaller sections. In such cases an electric fence is erected and the cattle graze without cowherds being present. On farms various pastures are used depending on the productivity of the cows. After grazing, the grass remaining on each sector is cut and collected so that the after-grass will grow better. The manure which remains on the pasture should be scattered about the area.

During hot weather the pastures may be used in a twofold fashion with the cattle grazing in the morning and evening on the high dry pastures and during the day on the lower pastures.

For rest the cows are put in an area which has already been grazed in order to avoid dirtying the ungrazed area with feces and urine.

It is necessary in the summer to water the animals no less than three times per day. When there are no natural watering places with clean water in the pastures, wells are drilled along which are placed troughs for watering the cattle. On the kolkhoz "Red Collectivist" of Yaroslav Oblast, the cattle in the pastures are watered from troughs to which water is brought. Such a system of watering eliminates needless moving of the cattle for watering and meets their needs for water.

Daily schedule for the pasture. The milking of the cows in the pasture is conducted at a designated place to which the cattle are driven. At the milking sites, portable enclosures are erected with bindings and sheds for the cattle. Here the cattle rest during the hot part of the day and receive additional fodder in the form of green mass; highly productive animals also receive concentrated fodders. Usually the enclosures or sheds are erected near the watering places.

The daily schedule changes throughout the course of the summer. During the spring and at the beginning and end of the summer, the cattle should be in the pastures during the daytime. In the middle of the summer during the hot period the cattle are allowed to graze during the cooler morning and evening hours. In this connection the daily schedule is changed accordingly.

A given daily schedule will be introduced depending on the conditions on the farm, the state of the pasture lands, and the climatic conditions of the zone in which the farm is located. The average length of time for grazing cattle during the spring and fall should be 11 to 13 hours. Moving the cattle from the resting place to the pasture should not be more than 1.5 to 2 kilometers. During the pasture period the animals should be cleaned daily and when possible should bathe.

TABLE 29

Sample Daily Schedule for the Summer Period with Night Pasturing

<u>Name of the task</u>	<u>Beginning and end</u>	<u>Duration</u>
Pasturing and watering the cows	2330 - 0400	4 hr 30 min
Milking	0400 - 0530	1 hr 30 min
Pasturing and watering the cows	0530 - 1000	4 hr 30 min
Rest for the cows	1000 - 1100	1 hr
Milking	1100 - 1230	1 hr 30 min
Supplementary feeding with green and concentrated fodders	1230 - 1330	1 hr
Rest for the cows	1330 - 1530	2 hr
Watering and pasturing the cows	1530 - 2000	4 hr 30 min
Milking the cows	2000 - 2130	1 hr 30 min
Supplementary feeding with green and concentrated fodders	2130 - 2230	1 hr
Rest for the cows	2230 - 2330	1 hr

Keeping Cattle in Stalls

One of the basic means of raising the productivity of cattle is by keeping the cattle in a stall-camp regime and providing an uninterrupted supply of green fodder. Keeping the cattle in natural pastures, even when they are cared for completely, involves interruption in feeding them green fodder because of the uneven growth of the grass and because the grass becomes scorched in the middle of summer. By having supplementary green fodder through using a green conveyor and the available pasture lands, it is possible to provide the cattle with green fodder throughout the entire summer.

With the stall-camp system of keeping cattle, the interruptions in feeding the cattle which are the result of the natural and climatic conditions during summer are eliminated. Low-yield pasture lands are ploughed and sown with green conveyor crops.

The proper organization of the green conveyor increases considerably the production of green fodders and makes it possible to provide fodders which are more varied and more easily digested. In addition, when the cattle are transferred to summer camps, the veterinary-sanitary conditions under which the animals are kept are improved, the long movements to and from the pasture are eliminated, and during this time the cattle barns can be prepared for winter.

In working out measures for introducing the stall-camp system of keeping cattle, it is necessary to consider the characteristics of the given region or zone, the problem of raising the milk productivity of the cattle, the availability and qualitative state of the pasture lands, their productivity and the requirements of the cattle for fodder.

The introduction of the stall-camp system of keeping cattle insures the proper correlation and use of the natural fodder lands and crops of the green conveyor as related to the conditions of the various zones. In areas with a limited amount of natural fodder lands and also those which are located around industrial centers, the requirements of the cattle for green fodder are met basically by sowing fodder crops.

On the kolkhoz imeni Michurin of Selidovskiy Rayon of Stalino Oblast, natural grazing lands supply only 20% of the needs of the cattle for green fodders; on the kolkhoz imeni Chkalov of Dnepropetrovsk Oblast, a small quantity of natural fodder lands is used chiefly when the cattle are sent out for exercise.

The organization of the green conveyor in areas which have a small amount of natural fodder lands should provide for the continuous availability of green fodder beginning in the spring and lasting until late fall.

In areas which are better provided with natural fodder lands, feeding with green fodders which would comprise about 50% of the requirements for fodder constitutes a supplement to pasturing the cattle.

In areas which have a sufficient area under natural fodder lands, especial attention should be devoted when organizing the summer maintenance of the cattle to: 1) the rational utilization of the available natural fodder lands; 2) the elimination of unnecessary movements of the cattle for which reason the resting places for the cattle are close to the pastures; 3) providing the cattle with green fodder throughout the summer.

In organizing the summer maintenance of the cattle, a plan is prepared covering the requirements and the supply with respect to green fodders by month throughout the summer and taking into account the natural fodder lands available on the farm. The requirements of the animals for green fodders are calculated on the basis of the number of cattle on the farm during various months of the year, of the sex, age and fatness of the animals, and of the planned figures for milk yield and weight gain.

A typical requirement for green fodder per day amounts to 25 to 40 kilograms for bulls, 40 to 70 kilograms (depending on live weight and yield) for cows, 25 to 30 kilograms for calves over one year old, and 10

to 15 kilograms for calves up to one year old. The daily portions of green fodders are determined more exactly depending on the quality of the crops of the green conveyor and the expenditure of concentrated fodders. Pasture fodders are the most inexpensive fodders; therefore, in compiling the plan for the receipt of green fodders on the farm, it is necessary to consider the most rational utilization of the natural fodder lands.

On kolkhozes where the stall-camp maintenance of the cattle has been introduced, productivity has increased noticeably.

On the kolkhoz imeni Stalin of Stalino Oblast the yield of cows after only one year of stall-camp maintenance has increased from 2,092 to 4,083 kilograms.

A particularly large increase in the milk yield of cows occurs in the summer, as can be seen from Table 30.

TABLE 30

Name of the kolkhoz	Daily yield per cow (in kilograms)						
	Before and after the introduction of the stall-camp system	May	June	July	August	Sept.	Oct.
"Komintern," Mogilev Oblast	Before	5.8	4.8	5.1	3.9	2.0	1.0
	After	11.8	10.5	10.0	9.8	9.0	8.5
Imeni Chkalov, Dnepropetrovsk Oblast	Before	4.5	7.2	5.8	4.3	4.0	3.5
	After	9.0	12.0	12.0	11.2	10.7	9.2

After the stall-camp system of maintaining cattle was introduced on the kolkhoz imeni Kalinin of Dnepropetrovsk Oblast, the yield from the cows increased from 820 kilograms in 1954 to 2,793 kilograms in 1956. High results have also been obtained by using green mass to feed the young. After adopting the camp system for cattle and providing additional green fodder, the average daily weight gain of the calves on the kolkhoz "Tenth Anniversary of October" of Malo-Devitskiy Rayon of Chernigov Oblast increased from 700 to 1,100 grams per head. As a result of using this system, the kolkhoz obtained an additional 26 centners of weight gain for its calves.

Establishment of the summer camp. The site for a summer camp is selected on a pasture near areas sown to green conveyor crops in high, dry sectors. If there is no water line, the camp should not be far from a watering place. In areas which have only limited pasture lands, the summer camp for the cattle is established at a distance of 2 to 5 kilometers from the regular farm and in the direction of the passing roads.

The summer quarters for the cattle are in two forms: a single surface roof located so that the animals are in a straight row, and a double-surface roof with two rows for the animal and with center fodder passages.

On many kolkhozes and sovkhoses, services are prepared during the summer such as water pipes and electricity; automatic and mechanical milking of the cows is used; and feed troughs are supplied with green mass for the cattle. At the summer camps there should be enclosures for the cattle, places for the livestock workers to rest, and dairy and other necessary buildings.

The summer facilities should be inexpensive and should be made of local material. The places for the cattle, to include the enclosures, should be cleaned of manure and the manure should be removed beyond the limits of the camp.

A sample daily schedule for a stall-camp system is given in Table 31.

TABLE 31

Daily Schedule for Summer Stall-Camp Maintenance of Cattle

<u>Name of the task</u>	<u>Beginning and end</u>	<u>Duration</u>
Milking	0400 - 0530	1 hr 30 min
Cleaning the cows	0530 - 0600	30 min
Feeding the cows	0600 - 0630	30 min
Watering the cows and pasturing	0630 - 1030	4 hr
Rest	1030 - 1200	1 hr 30 min
Milking	1200 - 1330	1 hr 30 min
Feeding the cows	1330 - 1430	1 hr
Watering the cows; rest	1430 - 1600	1 hr 30 min
Pasturing the cows and watering	1600 - 2000	4 hr
Milking	2000 - 2130	1 hr 30 min
Feeding the cows	2130 - 2230	1 hr
Rest	2230 - 0400	5 hr 30 min

The cattle are fed green fodders during the day and in the evening hours. The experience of leading farms has shown that the edibility of green mass depends on a number of factors. The greatest edibility for green conveyor crops is observed in feeding the crops during different stages of their growth: for rye -- when it first begins to sprout; for corn -- during shooting; for legumes -- during budding and not later than 1-1/2 to 3 hours after mowing.

During the succeeding phases of vegetation, as for example during the earing phase for cereals and at the beginning of the flowering phase for legumes, green conveyor crops can be given as supplementary fodder. They are assimilated better by the animals when

they have been chopped up by an ensilage cutter and have been seasoned with concentrates or moistened with a saline solution. The feeding of green conveyor crops in combination with other crops is of great importance in raising the effectiveness with which the crops are utilized. Also of importance is the substitution of one crop with another depending on the stage of development of the plant. Therefore, the correct selection of the crops for the green conveyor and of the time of their sowing is of great importance. In order to provide the cattle with an uninterrupted supply of green mass, some crops are sown at two or three different times. In addition, second mowings are utilized and the crops which are selected for sowing are picked on the basis of high yield and differences in their periods of development.

The feeding of additional green fodder is begun in small quantities of 4 to 6 kilograms and then the norm is gradually increased. On some farms the green mass is given initially together with hay or cut straw.

When feeding large amounts of green mass, it is essential that the cows be given rough fodder in order to prevent gastro-intestinal ailments. Therefore, on the leading farms the cows have 1-1/2 to 2 kilograms of good hay included in their summer ration.

In some foreign countries the animals are given 2 to 3 kilograms of good summer straw a day during the summer period and also a part of the green mass is fed in a dried form.

The edibility of green conveyor crops during the early periods of their use for grazing is not lower than in the case of feeding from troughs. During the later stages of growth, the edibility of green mass is lower for grazing.

When green conveyor crops are used for grazing, there is a saving in the expenditure of labor for mowing and transporting the green mass. However, with grazing a portion of the green mass is trampled and is lost.

A combination of perennial and annual crops which hold up well under grazing are utilized. During the early phase of growth, such sowings are utilized for grazing, while in the later phases they are used for feeding.

When the cattle are to be transferred to a stall regime, the grazing time is gradually decreased by curtailing the morning and evening grazing time while at the same time the amount of juicy and rough fodders is increased as well as the time spent in feeding. Grazing during periods of frost or when the grass is covered with frost causes illness in the animals.

The transition to a stall regime is completed in 10 to 15 days. By this time the animals should be receiving a full winter ration with a large quantity of juicy fodders.

Feeding and Keeping Bull-Sires

The proper feeding and care of bulls lengthens the period of their usefulness. When the bulls do not receive a well-balanced and adequate diet, they lose weight, the quality of their semen is lowered, and the result is barrenness in the cows.

Excessive feeding of the bulls results in fatness, they become languid and function poorly in servicing the cows, and the quality of their semen is lowered. During the winter period the ration for bulls should contain good leguminous and cereal hay on the basis of 1 to 1.5 kilograms per 100 kilograms of live weight, root plants at the same rate, ensilage (1 kilogram per 100 kilograms of live weight), and a mixture of concentrated fodders (oats, oil cake, wheat siftings, etc.) in the amount of 4 to 5 kilograms per day. The quantity of concentrated fodders supplies 40% of the nutritive value of the ration.

It is especially important to provide a diet with a proper balance, both with respect to quantity and quality, of proteins, vitamins and minerals. Of the minerals, calcium and phosphorous are the most essential. With each fodder unit a bull is given 7 grams of calcium and 5 to 6 grams of phosphorous. Salt is given on the basis of 7 to 10 grams per 100 kilograms of live weight.

During the servicing period where the bull is carrying an average load, it should receive 100 to 125 grams of protein with each fodder unit. As a fodder containing a large amount of protein, the bulls receive meat, meat-bone and fish flour at the rate of 250 to 400 grams per day during the servicing period. In addition, they are given skim milk, cottage cheese and vitamin feeds.

Feeding the bull-sires fodders which are rich in carotene has a positive effect on the quality of their semen. Therefore, for each 100 kilograms of live weight the bulls should receive 60 to 80 milligrams of carotene. In their winter ration the bulls receive good hay, ensilage, red carrots and other fodders which contain vitamins. If there are not enough vitamins in the winter ration, it is essential to give fish oil at the rate of 50 to 100 grams per day.

A typical winter ration for a bull with a live weight of 700 kilograms and which is being used for siring could consist of 3.5 kilograms of a mixture of concentrated fodders (oats, siftings, oil cake), 7 kilograms of ensilage, 3 kilograms of fodder beets, 6 kilograms of meadow hay and 0.5 kilograms of fish flour.

The bulls are fed 3 times a day; however, the morning feeding is less bulky in order not to decrease the activeness of the bull during servicing.

In the summer the bulls should be put to pasture, and in this period their diet should be supplemented with green and concentrated fodders.

The bulls are kept in a common cattle barn in the end stalls of the same row in which the cows are located. The bulls should not be kept in isolated covered stalls or dark, closed premises because when

the bulls are separated from the cows, they often become bad-tempered and as a consequence of the difficulties in caring for them, they are often rejected prematurely.

The stalls for large bulls are made 1.5 to 1.75 meters wide and 2.1 to 2.4 meters long. A double chain with a soft leather collar is used. The ends of the chains are attached to the side posts of the feed trough.

The bulls should be brushed carefully each day and any dirty areas should be washed with warm water. In the summer the bulls should bathe if the temperature of the water is not lower than 18 degrees. In the winter it is very important to let the bulls out for a walk (2 to 3 hours) or to use them in a single harness to perform light work around the farm (transporting water, fodder, etc.). Light work has a positive effect on the state of health of a bull, improves its appetite and sexual activity and makes it more obedient. The bulls are gradually accustomed to work beginning at an age of 13 to 15 months. If the bulls are not used for light work, the best exercise is a slow walk of 2 to 3 kilometers. Especial attention is given to caring for the legs because bulls with weak, ailing legs cannot be used for servicing the cows. While the bull is being cleaned, its legs are massaged with a straw plait and the hoofs are cleaned of dirt. As the hoofs become overgrown, they should be trimmed. Excessively overgrown hoofs affect the positioning of the bull's legs and cause ailments of the ligaments and pain during movement. The training of the bull to be quiet and obedient should start at an early age. The attitude toward both the young and mature bulls should be relaxed and affectionate. The bulls should not be treated roughly or beaten and the young bulls should not be trained to butt.

At the age of 12 months a special ring is affixed in the soft part of the nose of the young bull. When the bull is to be led out for exercise, the ring is engaged with a hook which is affixed to the end of a stick. The presence of this nose ring makes it easier to care for the bull and makes the bull less dangerous. In order that the ring would not hinder the bull in feeding, it is held back by a strap which is fastened behind the animal's head.

The length of time during which the bull is used depends on such factors as a proper and well-balanced diet, uniform utilization of the bull throughout the course of the year, a relaxed attitude toward the animal, and attentive care; in particular, it is necessary to be watchful of the animal's legs.

Keeping Work Oxen and Caring for Them

Oxen are used for various farm and transport tasks. They are trained to work beginning at about two years of age. At first they are handled with a rope and a bridle, then later with a yoke and harness. For harnessing oxen it is possible to use single or double

yokes, special collars or saddle harness. The saddle harness is best because it is light and convenient and the oxen do not tire as much when it is used. With a double harness, animals are selected which are similar in height, strength, gait, age and temperament. If the animals are not similar with respect to these qualities, they become tired quickly and it is difficult to use them for work.

The oxen which have the best working qualities are those of the Kalmyk and Grey Ukrainian breeds plus hybrid oxen of the Simmental¹ breed.

When working, the oxen are fed hay, summer straw, juicy fodders (ensilage and root plants) and concentrated fodders. During the summer period the oxen are kept in the pasture and are fed green grass. When the oxen are well fed, they can work 10 hours a day. The oxen are kept in a special structure or in a separate section of a stable. They are cleaned each day and the condition of their legs and hoofs is also checked. After each hour of work, the oxen are given a ten minute rest period. The break at noon should be not less than 2 to 3 hours in order to allow the animals to digest their cud. The oxen should not work immediately after feeding. The animals may be watered while working but not later than 1/2 hour prior to the end of work or not earlier than 1-1/2 to 2 hours after the completion of work.

One's attitude toward the oxen should be even and relaxed.

Raising the Young

The problem of raising the young involves not only preserving all the calves which have been born but also obtaining in the future animals which have the desired characteristics, qualities and productivity. Therefore, in rearing the young cattle it is essential to create proper conditions of feeding and keeping the animals in order that, together with selection and culling, they will effect a qualitative improvement of the herd.

Our greatest scientists, N. P. Chirvinskiy, Ye. A. Bogdanov, P. N. Kuleshov, M. F. Ivanov and Ye. F. Liskun, always pointed to the influence of the system and the conditions of raising the young on the growth, development, build, early maturation and subsequent productivity of the animal.

Through the work of Soviet and foreign scientists it has been established that decisive influence on the development of the productive qualities of an animal is exerted by the conditions under which it is raised beginning from the earliest age; also it has been shown that when the animals have been raised under poor conditions, their productivity, even when they are fed well upon maturing, does not reach the required level. Therefore, a proper system of raising cattle should be understood to mean a system of feeding and keeping which facilitates the development of high productivity, the desired build and the other positive qualities of the breed.

In order to obtain strong and healthy offspring, it is necessary to prepare the cows well for calving. Inadequate feeding of the cows during pregnancy leads not only to the birth of weak, small, underweight calves but also has a negative effect on the later milk yield of the cows.

A. I. Kruglov established through his research that the live weight of calves at birth depends to a degree on the length of the dry periods of their mothers. The live weight of calves of the Yaroslav breed which came from cows which had a dry period of 1-1/2 to 2 months was 10 to 17% higher than the live weight of calves from cows which were kept under the same conditions but which had a shortened dry period.

The newly born calf has its mouth and nostrils cleaned of the saliva which interferes with its breathing by a clean towel; then it is wiped dry with a clean piece of burlap and with straw plait. This rubbing helps the blood circulation and the breathing of the calf.

In herds where there are no infectious diseases, the cow is allowed to lick its calf which has a positive effect on the respiratory organs and the functioning of the digestive tract of the calf. When the cow licks the calf the mucous is removed more thoroughly from the skin of the calf and the calf dries more quickly.

If the umbilical cord is not broken during birth, it is severed at a distance of 10 to 12 centimeters from the stomach and the end is dipped in clean tar, creolin or tincture of iodine. In tying the umbilical cord it is necessary first to squeeze any liquid from the cord. For the first two days the umbilical cord is dipped in tar or creolin 3 or 4 times a day. On the breeding sovkhos "Karavayevo" the cows are allowed to lick their calves after which the calves are taken to a prophylactic ward where they are kept in separate cells. After the calf dries, it is weighed and given a name and measured and the data is compiled and entered in a calf-rearing book.

Rearing Calves During the Nursing Period

In order to protect the calves from disease, it is very important to give them colostrum at an early time. Colostrum differs considerably from milk in its composition; it contains approximately 5 times more protein and twice as much minerals but has less fat and milk sugar. The proteins of colostrum -- globulin and albumin -- are assimilated easily by the calf. The higher acidity (about 40%) has a destructive effect on bacteria encountered in the gastro-intestinal tract of the calf. In addition, colostrum has immunizing qualities and with its laxative action cleanses the bowels of the calf of the initial excrement.

In colostrum there is five times more vitamin A (carotene) and vitamin D than in milk. The composition of the colostrum changes quickly and by 5 to 6 days after birth it has the qualities of ordinary milk.

The early giving of colostrum protects the calves from gastro-intestinal diseases. On the breeding sovkhos "Karavayevo" calves are given colostrum for the first time at 45 to 50 minutes after birth. Cowherd S. I. Savinova of the kolkhoz "Red October" of Kholmogorsk Rayon of Arkhangel'sk Oblast gives colostrum to calves at 1 to 1-1/2 hours after birth. When colostrum is given later (2 to 4 hours after birth), the calves are affected more often with gastro-intestinal ailments.

The cows are given colostrum 3 to 4 times a day at definite intervals and they receive 1.5 to 2.5 liters each time.

The colostrum is steamed immediately after it is obtained from the cow. Weak and small calves should receive their colostrum more frequently and in smaller amounts.

In some foreign countries a low-colostrum type of rearing is employed. In this case the calves receive 1 to 1-1/2 liters of colostrum on the first day and then the portions of colostrum and milk are increased by 1 liter a day through the tenth day. From the tenth day until an age of 4 to 5 weeks the calves receive from 9 to 10 liters of milk a day. Then they are gradually switched to a diet of skim milk.

In feeding the calves first the colostrum and then the mother's milk, special bottles with nipples should be used. In this way the milk enters the stomach of the calf in small quantities and is digested better. If the milk is given from a pail, the feeding time must be extended in order that the calf does not drink its ration of milk too quickly. Heroes of Socialist Labor A. A. Roschina and Z. O. Frolova who are cowherds at the kolkhoz "Forward to Socialism" of Sychevskiy Rayon of Smolensk Oblast interrupt the feeding of the calves 2 or 3 times with each ration. This "interrupted serving" improves the assimilation of the milk by the organism of the calf and eliminates the possibility of gastro-intestinal disease.

The calves are given the milk of their mothers until they are 15 to 20 days old after which they are given the mixed milk from general milkings. The calves continue to receive whole milk for 3 to 4 weeks and then the whole milk is gradually replaced with skim milk. Whole milk is excluded entirely from their ration by the time the calves reach the age of 2 to 3 months.

The milk period of feeding the calves continues for 5 to 6 months and on some breeding farms for 8 months. The normal amount of whole milk per calf during the milk period varies between 200 to 500 kilograms while the amount of skim milk is from 200 to 1,200 kilograms. Scientific research institutions have worked out charts for the feeding of milk and fodder to calves. These charts are based on the expectation of a given daily weight gain for the calves depending on their breeding value and breed. Various charts provide different amounts and schedules for giving whole and skim milk and also give the norms for concentrated, juicy and rough fodders for a six-month period. In addition, the charts indicate the sequence of feeding the various fodders (Table 32).

TABLE 32

Expenditure of Fodder in Raising Calves to the Age of Six Months (According to the All-Union Institute for Livestock Raising (in kilograms))

Fodders	Plans with large amounts of juicy fodder			Plans with moderate amounts of juicy fodder			Plans with large amounts of good ensilage		
Daily weight gains of calves on which the plans are based (in grams)									
	550- 600	650- 700	750- 800	550- 600	650- 700	750- 800	550- 600	650- 700	750- 800
Whole milk	180	200	250	180	200	250	180	200	250
Skin milk	200	400	700	200	400	700	200	400	700
Concentrated fodders	150	177	180	170	180	170	170	180	170
Potatoes	200	200	220	155	155	155	--	--	--
Beets	200	200	200	100	100	100	--	--	--
Ensilage	350	350	350	250	250	250	520	520	520
Hay	250	250	260	260	260	260	260	260	260

Breeding bulls are raised according to charts which have higher norms for the feeding of milk and fodder; it is planned to obtain a greater daily weight gain than is the case with heifers.

For each 100 kilograms of live weight the calves should receive from 13 to 15 grams of phosphorous and 20 to 26 grams of calcium.

For normal development, the young calf should also receive with its fodder the vitamins which are essential for the organism of the animal.

The growth of the young cow is planned in accordance with the general plan of breeding work for the farm while keeping in mind the biological characteristics of the breed and the obtaining by the time of the first covering of animals which are well developed and correspond to the typical pattern for the breed.

On the basis of the accepted plan of growth, a chart is prepared for feeding milk and the system of feeding and keeping the young is established. The level and type of feeding for the young influence the formation of the organism of the animal and its subsequent productivity. Calves of dairy breeds must be raised on moderate rations and, as soon as possible, they must be trained to eat large portions of juicy fodders. Calves of meat breeds are raised on heavier diets with higher amounts of concentrated fodders.

On the kolkhoz imeni Stalin of Lukhovitskiy Rayon of Moscow Oblast, the calves up to the age of 6 months are fed 550 kilograms of whole milk, 192 kilograms of concentrated fodders, 260 kilograms of hay, 400 kilograms of ensilage and 130 kilograms of beets. The average daily weight gain of the young calves for this period was 700 to 800 grams. On the kolkhoz "Red Collectivist" of Yaroslav Oblast the average daily weight gain for the calves was 750 to 800 grams with an expenditure per calf up to the age of 6 months of 430 kilograms of whole milk, 800 kilograms of skim milk, 100 kilograms of concentrated fodders, 450 kilograms of juicy fodders and 250 kilograms of hay. On the kolkhoz "Gardener" of Kostroma Oblast a calf receives on an average for six months 530 kilograms of whole milk, 210 kilograms of skim milk, 186 kilograms of concentrated fodders, 270 kilograms of hay and 450 kilograms of juicy fodders. The daily weight gain for this period was 700 to 800 grams per calf.

The experience of leading farms and leading livestock raisers shows that daily weight gains of 700 to 900 grams provide for the normal growth and development of the young through the age of six months.

Attempts to obtain higher weight gains (1.3 to 1.5 kilograms) when raising calves of dairy breeds have in a number of cases resulted in excessive fatness and to a consequent lowering of the breeding value of the animals.

When they become ill with diarrhea and also for preventative purposes, the calves, beginning from their second day of life, are given acidophilus clabber; it is added to the milk at an initial rate of 50 grams per day and the portion is gradually increased to 1 kilogram per day. Acidophilus clabber is prepared from pasturized milk to which pure strains of acidophilus bacteria have been added. The clabber is heated and mixed with the milk. When diarrhea appears, the amount of clabber is doubled (while decreasing the amount of milk) and it is fed to the calves an hour before they are given the milk. From their fifth day the calves are allowed to drink water freely which has been boiled and cooled to a temperature of 15 to 20 degrees.

The calves are given water at 40 to 50 minutes or sometimes at 1-1/2 hours after they have been given milk. When gastro-intestinal diseases appear, the amount of milk is decreased and part of it is replaced with boiled water. Clean, untreated water at a temperature of 10 to 12 degrees is given to the calves from the age of 3 to 4 weeks.

Beginning with their eighth to tenth day, the calves are introduced to good hay. It is best of all to give them vitamin hay which is cut before flowering and which is rich in protein and vitamins. From the third week the calves are given 10 to 20 grams of concentrated fodders; the quantity is increased so that by one month the calves are each receiving 100 grams.

Of the concentrated fodders the calves are first given sifted oatmeal, corn flour and wheat siftings; later they are given flax and sunflower oil cake. Oat liquor is a very beneficial substance which is given to the calves beginning at the age of 2 weeks.

A part of the ration of concentrated fodders is replaced by hay flour made from leguminous and grass hay.

Mineral feed -- chalk, salt -- is added to the milk beginning with the tenth day. Later the minerals are fed in mixture with the concentrated fodders. At first the calves are given 10 to 15 grams of mineral fodder a day which is increased gradually as the animals grow in size.

From the twenty-fifth to thirtieth day of age, and on some farms from the fifteenth day, the calves are given a hay infusion prepared from good quality hay. The utilization of the hay infusion stimulated the secretory functions of the digestive tract and is a good prophylactic and therapeutic agent for gastro-intestinal ailments in the calves.

In preparing the hay infusion, good cut hay is treated in barrels with hot water (temperature of 70 to 80 degrees); for each kilogram of hay, 6 to 7 liters of water are used. After 5 to 6 hours the infusion is strained, salt is added (1 gram per liter of the infusion), the temperature is raised to 30 to 35 degrees, and the infusion is given to the calves together with milk.

On the kolkhozes which are served by the Kholmogorsk State Breeding Unit [Rassadnik], the calves first are given no more than 0.5 liters of hay infusion after which the amount is increased by 0.5 liters every 10 days until it is given at the rate of 5 to 6 liters per day.

At the onset of gastro-intestinal diseases, the amount of milk which is given is decreased and a part of it is replaced by hay infusion. The hay infusion is prepared daily because it is not kept longer than one day.

Feeding the calves root plants -- beets, carrots, turnip cabbage and turnips -- begins with the second month. When raising the calves on rations in which juicy fodders predominate, the animals are introduced to root plants as soon as possible starting with the fourth week. The best juicy fodder for calves of this age is red carrots. At the age of 2 to 3 months, the calves are started on eating good quality ensilage.

During the summer period, hay and juicy fodders are excluded from the ration; the calves are put to pasture and receive supplements of green fodder.

Recently in some foreign countries, especially in the US, when the calves are raised on low milk norms with substitutions being used, antibiotics to the amount of 20 to 60 milligrams per head (biomycin, penicillin, etc.) are added to the mixture of concentrated fodders,

The results of using antibiotics depend on a number of conditions: the state of health of the animals; the conditions under which the animals are kept; and the quality of the fodders.

When healthy cows are fed a proper, well-balanced diet, the employment of antibiotics does not have any direct effect on the utilization of the fodder and the growth of the calves. Antibiotics are used in cases of infectious diseases according to the instructions of a veterinarian.

The feeding of antibiotics to mature animals sometimes has a negative effect on their appetites.

Keeping the Calves. For the first days after they are born, the calves are kept in separate cells; then beginning at the age of 1 to 2 months, they are moved to larger cells where 3 to 5 animals are kept. The structure for the calves must be kept clean and must be disinfected periodically; the manure is taken from the cells twice a day. The calves are cleaned daily with a brush; dirty spots are washed with warm water and are wiped dry. The dishes from which the calves are fed are kept clean and are rinsed with boiled water before and after each watering and the troughs are cleaned after each feeding.

After receiving milk the calf's muzzle should be wiped with a clean towel. In the winter in good weather, the cows are allowed outside for a few minutes exercise beginning with the age of 10 to 15 days. Gradually the period for exercise outdoors is increased so that by 2 months they spend 1-1/2 to 2 hours outside.

Raising Calves in Unheated Premises. Together with the practice of keeping the calves in heated structures, there has been a recently introduced wide-scale innovation on kolkhozes and sovkhozes where the calves have been kept in unheated structures. This method was developed by Hero of Socialist Labor S. I. Shteyman on the breeding sovkhoz "Karavayevo."

Raising calves in unheated premises hardens their organisms and has a positive effect on the metabolism and on the vitality of the animals. The low temperature in the building hinders the development of bacteria which cause disease in the calves; therefore, the young calves on the breeding sovkhoz "Karavayevo" do not suffer from gastrointestinal and pulmonary ailments. Here they obtain animals which are strong, hardy and highly productive and which have greater resistance against various diseases. The positive action of this system of raising animals is reflected in the increased length of time during which the cows are used. On the breeding sovkhoz "Karavayevo" many cows give high yields to an age of 12 to 15 years.

The structure for the calves should be made of logs, should be well caulked, should have double window frames, should have an intake-exhaust system of ventilation and should have a window area to floor area ratio of between 1:10 and 1:12. In quartering calves in an unheated structure one should start with the average cubic size of a structure for calves and the norm of 16 to 25 cubic meters per head.

On the breeding sovkhoz "Karavayevo" the newborn calf is taken to the unheated building in which the calves are kept and is placed in a cell which is 170 centimeters long, 120 centimeters wide and 100 to

110 centimeters high. The floor of the cell is made of loosely fitted boards so that the urine will leak through to the floor below.

The walls of the cell are made of tightly fitted boards; however, the front wall is a door which can be removed. The upper part of the door is latticed and a trough is hung from it. In the building the cells are placed at a distance of 25 to 30 centimeters from each other and not closer than 1 meter to the wall. Before the calf is placed in the cell, the floor of the cell is sprinkled with a thin layer of dry lime; then a layer of clean flooring 26 to 30 centimeters thick (7 to 8 kilograms of straw) is spread. Afterwards the upper soiled layer of flooring is removed each day while the complete flooring is removed every 2 to 3 weeks.

The calf which is placed in the cell is covered with a thin layer of straw and it is allowed to dry out. In 30 to 40 minutes, when the calf begins to move, the straws fall off. If the temperature in the calves' building goes lower than -7 degrees, the top of the cell is covered with a layer of straw. During severe frosts the young calves are dressed with specially made earmuffs.

The basic condition which makes it possible to employ this method of raising calves is the absence of dampness and drafts in the premises. The fluctuation of temperatures in the unheated structure are less abrupt and the air is cleaner and drier than in the heated structure. Ice which forms under the cells must be cleaned away and removed from the building.

The practice of raising calves in unheated structures has shown that good results can be obtained only when the cows are fed and kept properly before calving (which leads to the birth of strong and healthy calves), the appropriate quarters and flooring are available, and a high level of feeding is maintained for the calves. When these conditions are not present, this method of raising calves does not give favorable results.

Raising Calves by Nursing. This method of raising calves is employed widely in beef cattle raising. The new born calves are kept together with their mothers to an age of 7 to 8 months. The cows are not milked and all the milk -- about 700 to 1,000 liters -- is sucked by the calves. With the nursing method there are savings in the amount of labor involved in caring for the young, cases of illness or of loss of the calves decrease sharply, and the calves grow better attaining by weaning time a live weight of 220 to 250 kilograms. The calves are kept in the same premises as the cows and are kept together with other calves of the same age.

The premises should be dry and light and without drafts. The calves are provided with an adequate amount of flooring. With the nursing method the calves begin to graze sooner than is the case when they are fed by hand and they become accustomed to eating grass more quickly. It is essential that the calves become used to eating rough, juicy and concentrated fodders before they are weaned. With the great

number of spring births in beef cattle raising, the weaning of the calves takes place in the fall months. Therefore, the feeding of the calves after weaning should provide for normal growth. In the winter the calves are fed hay, summer straw and ensilage at will and they receive 1 to 1-1/2 kilograms of a mixture of concentrated fodders. After weaning the calves are formed in a flock of 100 to 120 head (with the young bulls and heifers being kept separately).

When cows have high milk productivity, they are allowed to nurse a second calf from a cow which had calved at about the same time. In the USA the raising of calves by "wet-nurse" cows is also employed in dairy cattle raising which means that less time is spent in caring for the calves. On some farms in England such cows nurse up to 12 calves per lactation while nursing a calf for 3 months and handling 2 to 4 calves at a time. With such a system of raising calves, the calves are brought to the nursing cows at the age of 7 to 15 days. The group method of raising calves using nursing cows was worked out by the Scientific Research Institute of Agriculture of the Southeast. At the 1957 All-Union Agricultural Exhibit, there were two cows from the experimental farm of this institute. The cow Spring, which had a yield of 4,250 kilograms of milk in 1956, in 1957 brought 8 calves in 2 turns to an age of 100 days with an average live weight at weaning of 123.1 kilograms. On a third turn the cow Spring raised 3 more calves. The average daily weight gain of the calves for this period was about 700 grams. The calves are brought to their foster mother at the age of 5 to 10 days; until this time they receive their mother's milk from bottles with nipples. Beginning from the tenth to twelfth day the calves are fed good hay in the winter and are let out to the pasture in the summer. The group method of nursing facilitates the raising of the calves without loss. After weaning the calves are raised according to approved charts and do not receive skim milk.

On some farms both in our country and abroad, the calves are nursed during the first 10 to 15 days and then are fed milk by hand. On the kolkhoz imeni Kirov of Kharkov Oblast this method of raising calves led to a sharp decrease in cases of ailments and of losses of calves, and there were no instances of the cows suffering from mastitis. The yields of the cows on this farm are over 2,000 liters.

Keeping Calves in the Summer. Depending on the conditions, various systems of keeping calves during the summer are employed on different farms. Inasmuch as the time spent in the pasture has a favorable effect on the state of health and the development of the calves, in good weather they should be kept in special areas from which they return to their quarters only at night.

On the breeding sovkhoz "Karavayevo" the calves are kept in a camp until the age of three months; they are kept in the same type of cell as in the winter except that they have a double sloping roof. The calves stay in these cells during the hot time of the day, while feeding, and at night. They are let out of their cells into an enclosure along the side of which are placed the cells.

On the kolkhoz "New Life" of Arkhangel'sk Oblast the calves are kept until the age of 6 months in the best pastures which are closest to the structure in which the calves are housed; these pastures are broken down into 4 or 5 enclosures which are separated from each other. The calves graze in each enclosure for several days. On rainy and cold days the calves spend the night in their regular quarters. On this kolkhoz the average daily weight gain of the calves during the summer period is 1000 to 1100 grams.

On the kolkhoz "Collective Labor" of the same oblast the calves are moved for the summer to a camp on one of the Islands in the Northern Dvina where they remain until fall. The pasture land on the island is divided into three sectors; the feeding of milk and concentrated fodders to the calves takes place in enclosures.

The experience of this kolkhoz shows that keeping the calves in a camp has a favorable effect on the state of health and the development of the animals. The average weight gain of the calves of this farm while they were in the pasture was 950 to 1,000 grams.

On the farm of the All-Union Experimental Station for Livestock Raising of Yaroslavl Oblast, the calves are transferred at the beginning of the pasture period to special pastures where they remain until fall. In the pastures there are special structures with wooden floors which are closed from three sides and which serve to house the calves in bad weather. Also there is a prophylactic station of a light type. In good weather the calves spend the nights in the enclosures which are equipped with feed troughs. Artificial pastures are established near the camp.

The calves spend the first 12 to 15 days after they are born in the prophylactic station; between the fifth to tenth day they are let out for exercise, the length of which is gradually increased.

The summer camp system makes it possible for the calves to spend more time moving about in the fresh air, reduces the expenditure of labor in caring for them and accustoms the calves to using the pastures at an earlier age. As a consequence the young calves grow and develop better.

Raising Calves During the Post-Milk Period

The raising of the calves during the post-milk period is less important than in the first period of their lives. After the age of 6 months the calves are kept in cattle barns in the winter with and without bindings.

From the age of 5 to 6 months the young bulls are separated from the heifers. Before being transferred to an older group, the calves should become accustomed to eating portions of rough and juicy fodders. From the age of 6 months to 1 year the daily ration should be 4 to 6 kilograms of hay, 1 to 2 kilograms of straw, 0.8 to 1.5 kilograms of a mixture of concentrated fodders and 8 to 12 kilograms of ensilage and other juicy fodders.

In raising young cattle it is essential to feed them large portions of juicy (ensilage and root plants) and green fodders. According to the data of the Siberian Scientific Research Institute of Livestock Raising, cows which are raised on moderate amounts of whole and skim milk, limited quantities of concentrated fodders and large portions of juicy and green fodders had yields for the first two lactations which were 500 kilograms greater than did cows which were raised on rations containing a large quantity of concentrated fodders.

A mixture of concentrated fodders (wheat siftings, ground oil cake, combined fodder, oats, etc.) is fed to the calves in a dry form; root plants are washed and cut up beforehand. In addition, the calves receive mineral feed (salt, chalk, bone flour) which is added to the mixture of concentrated fodders. The young calves are fed 2 to 3 times a day and are given all the clean water they want. During both the winter and summer periods the feeding of the calves and the care for them are conducted in accordance with a definite schedule for the day.

During the winter period the calves must be cleaned daily while during the summer period they should bathe.

In some foreign countries of Europe and in the USA, the calves are kept in light structures without bindings during the winter period.

Such a system of keeping the calves, when the animals received a proper balanced diet, facilitates the obtaining of strong, hardy and healthy animals which are more resistant to disease. At the same time the amount of space required per head is decreased and the bacteria conditions in the building are improved; less labor is required to care for the animals and the construction of the building is cheaper.

When the calves are kept under free conditions, the expenditures of fodder increase because the organism of the animal experiences a greater heat loss; the expenditure of straw for flooring is almost doubled in comparison with keeping the cattle on bindings. The soiled flooring is covered with clean straw each day, and the manure is carried off 1 to 3 times a year. In keeping the cattle in a place with such flooring, the quality of the manure is higher than when the animals are kept on bindings because the loss of nitrogen is less.

The feeding and care of the calves should be organized so as to minimize the expenditures of labor. For this reason the feeding and watering of the animals is mechanized. In order to avoid injuries to the calves when they are kept under free conditions, their horns are removed by chemical means (for example, by cauterizing with caustic potash).

In our country the practice of keeping calves unfettered during the post-milk period is widespread in beef cattle raising. It is also practiced on a number of farms which specialize in dairying.

During the summer period the calves which are over 6 months old are kept in the pasture; for this special camps or enclosures are established where they are kept at night or when receiving supplementary feedings.

In the camps shelters are erected with closed sides, feed troughs and watering troughs (if there is no reservoir for watering the animals).

Before moving the calves to the pasture, a veterinary-zootechnical inspection is conducted. The animals are broken down into groups according to sex and are weighed.

The calves are brought into the summer pasture regime gradually. For the first few days they are let out to the pasture for 1 to 2 hours after they have been fed. Then the amount of time spent in the pasture is increased and the animals are transferred to camps such as those in the Kholmogorsk Rayon of Arkhangel'sk Oblast where they spend the whole summer on islands. For grazing the cattle, the corral system of pasturing is employed. The calves must not be allowed in the pasture when the early morning dew is on the ground or in a clover pasture after a rain.

Supplementary feeding with concentrated and green fodders takes place in the evening after the animals have returned from the pasture.

The live weight of an animal is an indicator of its development. Therefore, the calves are weighed each month and the weight gain which was attained is compared with that which was planned. With proper feeding the average daily weight gain during the post-milk period should be 100 to 200 grams lower than during the milk period. With such weight gains the calves grow at a more uniform rate without the jumps which occur when there is an abrupt change in the feeding routine such as occurs when they are transferred to an older group.

The proper development of the heifers during the post-milk period is very important if they are to be covered at the age of 18 to 20 months. Any lagging in growth during this period leads to delays in servicing the heifers which is economically not good.

On the breeding sovkhos "Karavayevo" the average daily weight gain for calves of the Kostroma breed at an age of 3 to 10 months is usually 800 to 1,000 grams.

Many leading livestock raisers who successfully employ the achievements of zootechnical science and develop new techniques and methods of raising calves have been able to preserve all the offspring which come under their care and have been able to obtain healthy and highly productive animals.

For many years now there has been no loss of calves on the breeding sovkhos "Karavayevo." On the breeding farm of the kolkhoz "New Life" of Arkhangel'sk Oblast there have been 1,528 calves raised over the past 14 years without any loss. A calf tender from this kolkhoz, V. Ye. Pekisheva, raised more than 600 calves to the age of 6 months during the time that she worked. The calf tenders of the

kolkhoz "Affair of October" of Ryazan' Oblast who worked under the direction of their brigade leader, Hero of Socialist Labor K. K. Petukhova, raised 1,600 calves over the period of 16 years and had an average daily weight gain of about 1,000 grams. Calf tender V. S. Lushpa of the sovkhos "Steppe" of Kursk Oblast with a group of 25 young bulls obtained an average weight gain of 1,086 grams per day; by the age of 6 months the average weight of the animals in her group was 236 kilograms.

Similar results in raising calves have been achieved by many other leading livestock raisers. A distinctive characteristic of their work is their attentive study of the condition and characteristics of each animal and also their individual approach to the problem of feeding and caring for the animals.

Organization of the Fattening of Cattle

Of exceptionally great importance in the system of measures designed to raise the production of meat in the country and increase its quality is the matter of fattening the cattle. A substantial reserve in the raising of meat productivity is the matter of raising all animals which are not used to replenish the herd to an age of 1-1/2 to 2 years.

Calves which are being raised for meat are put to pasture to fatten in the spring of the next year; in the fall they can be slaughtered for meat or fattened some more on juicy fodders and waste from the food industry.

The raising of non-breeding calves for meat is conducted with an abundant diet. In such a case the calves at the age of 1 year achieve a weight of 300 to 350 kilograms and by 1-1/2 years they have a live weight of 420 to 450 kilograms.

According to the data of Professor M. F. Tomme, in order to raise a calf to the age of 1-1/2 years, it must receive 2,500 to 2,700 fodder units.

As a result of the fattening, the live weight and the fatness of the cattle is increased; this is connected with an increase in the quantity of muscular and fat tissue; also the amount of water in the meat is less.

According to the data of A. K. Shvabe, in fattening oxen the following changes take place with respect to the amount of water, protein and fat in the meat (in percent, without ash substances):

	Water	Protein	Fat
Before fattening	74.4	20.9	3.7
After fattening	63.6	17.0	18.7

In pasture fattening of the cattle the live weight of the animals increases by 30 to 50%; the deposits of fat increase by 2 to 3 times; and the average caloric content of the meat is 1-1/2 to 3 times greater. Pasture fattening significantly diminishes the expenditures in caring for, keeping and feeding the cattle. For pasture fattening and hand fattening the cattle should be separated into special flocks; as livestock raising develops on the kolkhozes, separate farms are established for this purpose.

The effectiveness of pasture fattening depends on the quality of the pastures which have been selected, the size of the flock and the correctness with which it has been formed, the breed, sex, age and past diet of the animals, the length of the fattening period, and the method of grazing.

The most proven type of pasture fattening provides for supplementary feeding (with green fodder or concentrated fodders) during the period of low yield in the natural pastures.

For pasture fattening separate pasture sections are selected which are broken down into enclosures and a definite order for their use is established. The number of enclosures in a sector depends on the quality of the grass, the type of pastures, the relief of the area, the availability of water and the size of the flock.

The pasture fattening of the cattle takes place during the course of 4 to 5 months beginning in the early spring.

The flocks for fattening should be as uniform as possible. For this reason, in selecting the flock animals are picked which are of the same breed, of approximately the same age and of the same sex and degree of fatness.

In mixed flocks (dissimilar in composition and age), the weight gains of the animals are lower than in flocks which are uniform in composition. Grazing by mixed flocks results in uneven and incomplete use of the pastures. In the steppe regions the size of the fattening flocks can be from 150 to 175 head and in other regions from 120 to 150 head.

Control over the progress of the fattening is accomplished by monthly weighings of the whole flock or of a constant group of 15 to 20 animals.

All the animals are weighed before and after the pasture fattening period.

Under similar conditions of pasture or hand fattening, animals of meat and meat-dairy breeds achieve a relatively higher weight gain with a lesser expenditure of fodder per unit of weight gain than do dairy cattle.

Castrated animals have high weight gains and better quality meat when subjected to pasture or hand fattening. When they are put on pasture or hand fattening, bulls should definitely be castrated. Young bulls which are to mature and be fattened are castrated at the age of 6 to 10 months. Young castrated bulls have high weight gains and grow

rapidly from 15 to 18 months when they are given a balanced diet. At this age the young castrated bulls of meat breeds have an average weight gain of 100 to 150 kilograms and achieve a weight of 450 to 500 kilograms for the 100 to 150 days of pasture fattening. When they are slaughtered, such animals provide fine leather.

Animals which are of low or average fatness are put on pasture fattening. Cattle which are overly drained should be hand fattened prior to the pasture fattening or they should be put into separate flocks which are given supplementary fodder.

The results of pasture fattening depend to a considerable degree on the technique of grazing the cattle. In the pasture the flock should be formed in a line about 200 to 250 meters wide and 50 to 60 meters deep. The experience of leading farms shows that the length of time that the cattle graze, especially when the pastures are being scorched by the hot sun, should be not less than 13 to 15 hours a day (including night grazing).

The grazing is accomplished according to a schedule for the day; on hot days the cattle are allowed to graze at night. These cattle should be watered not less than 3 times a day.

Two senior cowherds of the kolkhoz "Twelve Years of October" of AK-Bulakskiy Rayon of Orenburg Oblast, Mukhambetov and Talmegambetov, with an average flock of 136 head obtained an average weight gain for the fattening period of 1,147 to 1,220 grams per day. The kolkhozes of Saratov Oblast obtain an average daily weight gain of 1,000 to 1,200 grams.

During the pasture fattening period the cattle are also fed sown grass, early ensilage, feed melon crops, and concentrated fodders (1 to 2 kilograms per head per day). In the steppe regions of Stavropol' Kray, in order to provide additional fodder during the period when the natural pastures are scorched by the sun, sections are sown to grasses (alfalfa, corn, mogar and millet) which are used for grazing.

With the combined use of natural pastures and artificial grazing land, the average daily weight gain for young castrated bulls on the kolkhoz imeni Budennyy of Stavropol' Kray was 1,080 grams. During the fattening period the animals should receive an average of 40 to 70 grams of salt per day.

The basic types of fodder for hand fattening the animals are waste products of the food industry -- squeezings, liquor residue. The effectiveness of the fattening depends on the correct selection of the animals to be fattened and the organization of the feeding and care of the animals.

After a veterinary inspection, rejected animals and young castrated bulls aged 1-1/2 and over are put on a fattening regime. The animals which are to be fattened are broken down into groups by sex, age and live weight in order that group feeding may be conducted.

The average length of time of the fattening of mature cattle is 80 to 90 days; for young cattle it is 100 to 150 days. With an average daily weight gain of 900 to 1,200 grams for the fattening period,

mature cows experience a 20% weight increase and the young cows have a 40% increase. Animals which are of above average or average fatness are taken from the fattening regime. For the best organization of the feeding the whole time for fattening is divided into three cycles; the fodder rations for each cycle are determined separately for the young and for the mature animals depending on their live weight and degree of fatness.

When using squeezings and liquor residue in fattening, more roughage (straw), squeezings and liquor residue are fed in the first and second periods. Approximately 2 to 3 weeks before the end of the fattening period, the amount of squeezings and liquor residue in the ration is decreased somewhat and the quantity of concentrated fodders is increased and a portion of the straw is replaced with hay.

The feeding of the animals being fattened is conducted according to established norms. The squeezings and liquor residue are introduced gradually into the ration over the course of 8 to 10 days. At the beginning the squeezings are given at the rate of 16 to 20 kilograms a day; this is increased to 70 to 80 kilograms a day for mature animals and 45 to 50 kilograms for young animals. For the fattening period, the squeezings comprise 65 to 70% of the food value of the ration, while roughage comprises 10 to 15% and concentrated fodders amount to 20 to 25%. The dry squeezings have water added about 6 to 10 hours before feeding on the basis of one part of squeezings to 3 to 4 parts of water. In order that it be eaten best, the squeezings are seasoned with molasses at the rate of 1.5 to 2 kilograms per head per day.

Roughage is given twice a day, in the morning and in the evening, at the rate of 4 to 5 kilograms to the mature animals and 3 to 4 kilograms to the young animals each day; this included 1.5 to 2 kilograms of good hay. At the beginning, concentrated fodders are given at the rate of 0.5 to 1 kilogram per day while at the end of the fattening period 2 to 2.5 kilograms are given. For the entire period adult animals receive 100 to 120 kilograms of concentrated fodders whereas the young animals receive 120 to 150 kilograms. Rations with a large quantity of squeezings contain little phosphorous; therefore, with such a ration the animals must be given bone flour or phosphorites to the amount of 40 to 50 grams per day.

When liquor residue is used for adult animals, the quantity of residue is gradually increased to 90 liters a day while for the young animals it reaches 50 to 60 liters. Roughage (straw, chaff) is cut up and steeped with the liquor residue. Fresh liquor residue is given warm (at temperature of 20 to 25 degrees); liquor residue which is not fresh and starting to spoil causes gastro-intestinal ailments. In using a liquor residue ration the following feeding norms are followed: adult animals receive 6 to 8 kilograms of roughage while the young animals receive 4 to 6 kilograms of roughage, including 1.5 to 2 kilograms of hay; the expenditure of concentrated fodders for the entire fattening period is 1 to 1.5 centners. Rations which have a high percentage of liquor residue contain little calcium; therefore, the animals must be given 50 to 80 grams of chalk per head per day.

The use of potato pulp for fattening is similar in organization to the procedures with squeezings and liquor residue. Potato pulp is fed in an ensilage form or it is used to steep straw cuttings. Adult cattle are given 40 to 50 kilograms of the pulp a day. If a greater amount of moist potato pulp is fed, gastro-intestinal ailments may result.

Good results are obtained by fattening cattle with juicy fodders. It is desirable to have them included in the rations in several forms such as ensilage from various plants, root plants, potatoes, turnips, etc. Fattening with juicy fodders is performed in the fall. The best ensilage is from feed cabbage, etc. The portions of ensilage are increased gradually to 40 kilograms a day for mature cattle and 25 kilograms for young cattle.

In addition to ensilage, the animals which are being fattened are given (in the first and second periods) 4 to 6 kilograms of hay and vetch oats of good quality and 1 to 2 kilograms of concentrated fodders. The norm for a portion of potato leaf ensilage is 15 to 25 kilograms. The ensilage should be of good quality; it should not be kept for a long time in the barn. In fattening with ensilage, the mineral balance should be maintained especially with respect to calcium.

In fattening cattle on root plants, they must be cleaned of dirt, washed and cut up before feeding. Spoiled root plants must not be given to the cattle.

Adult cattle are given fodder beets, turnips and fodder pumpkins up to 50 to 60 kilograms; young cattle, depending on their live weight, receive 20 to 30 kilograms. The norm for roughage is 5 to 9 kilograms a day. The amount of concentrated fodders given during the fattening period is the same as when squeezings or liquor residue are used.

The results of fattening depend on the proper feeding and keeping of the animals. The cattle are fed 3 to 4 times a day depending on the volume of the fodder rations; they are watered 2 to 3 times a day.

During the fattening period the animals receive an adequate amount of minerals. For each 100 kilograms of live weight the animals receive, depending on their age, 12 to 15 grams of calcium, 5 to 8 grams of phosphorous and 30 to 60 grams of salt per head per day.

Minerals are fed in mixture with other fodders. For mature cattle the rations should contain not less than 10 to 15 milligrams of carotene per 100 grams of live weight while the corresponding figure for young cattle is 15 to 20 milligrams.

The premises in which the fattening takes place should be kept clean and the feed troughs should be emptied regularly of anything left from the fodder. The temperature of the premises is 3 to 5 degrees. In compiling a daily schedule, it is necessary to plan a time for the animals to rest. As a control measure the animals are measured each month.