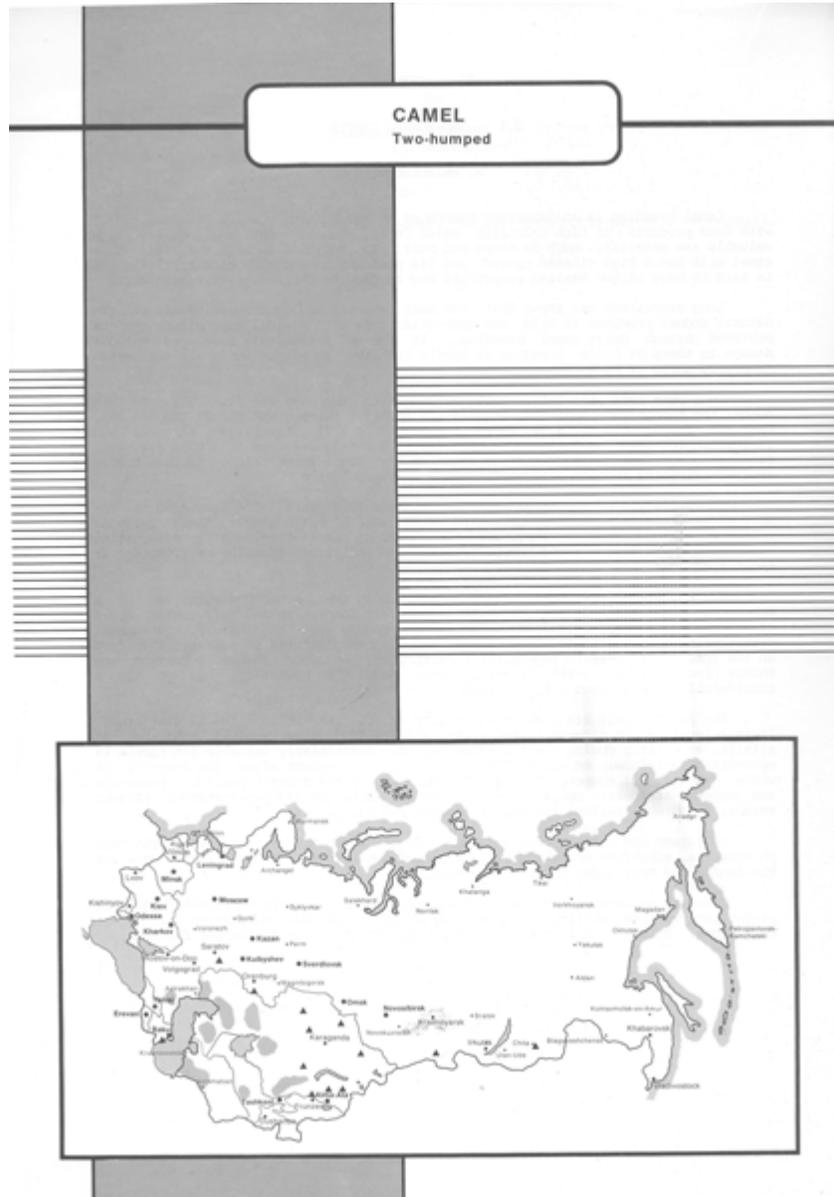

8. CAMELS

8.1 TWO-HUMPED CAMELS

A. Baimukanov



Camel breeding is an important branch of animal husbandry which provides people with food products of high calorific value (milk, shubat, meat) and industry with valuable raw materials, such as hides and hair. In addition to high calorific value camel milk has a high vitamin content and its proteins have a high digestibility; it is said to have unique healing properties and is used to treat digestive disorders.

Long experience has shown that the most rational and comprehensive use of the natural fodder produced in arid and semi-arid areas with minimal

expenditure can be achieved through dairy camel breeding. It can be intensively developed without damage to sheep or horse breeding as camels can live on plants which are not eaten either by sheep or by horses. On 1 June 1984 the total stock of camels in the USSR was 241 000; of this number the Kazakh SSR accounted for 123 000 or 51%, Turkmen SSR for 87 000 or 36%, Uzbek SSR for 21 000 or 8.7%, RSFSR for 9 000 or 3.7%, Azerbaijan, Kirgizia and Tajikistan for 1000 or 0.6%. The main camel breeding areas in the USSR are thus Kazakhstan and Turkmenia. 135 000 head of the camel stock belong to the public sector. Breeding females account for 37% of the population.

Domestication of the camel took place about 5000 years B.C. According to the zoological classification they belong to a suborder of Artiodactyla, named Tylopoda (Greek = callous feet). There are two forms of these Camelidae: dromedaries (Camelus dromedarius) or one-humped camels and Bactrians (Camelus bactrianus) or two-humped ones.

The Bactrians are distributed, in the main over areas characterized by a monotonous desert relief, low precipitation, great insolation and very scarce cover of drought-resistant vegetation. The camels endure well the sharply continental desert climate with hard frosts in winter and high temperatures in summer. They feed on the specialized desert vegetation - halophytes, wormwood, shrubs, subshrubs and thorny plants - can drink brackish water and, when necessary, can go for a considerable time without water or food. The plant camels are particularly fond of is camel thorn (Alhagi camelorum). It is a legume which flowers twice a year and its food value is higher than that of alfalfa, especially during the flowering period. Particularly valuable for camels is ephemeral vegetation, on which they quickly put on weight after the scarcity of winter pasture. In summer, towards the beginning of the drought period, ephemerals and grasses are burnt up and their place is taken by drought-resistant plants: shrubs, subshrubs, various species of legumes and halophytes.

In autumn and winter, when the supply of grass diminishes sharply, camels feed on thistles, subshrubs and shrubs, wormwood and camel thorn. They skilfully pick out the tender and nourishing parts of the plants.

There is no other agricultural animal which combines, like the camel, high milk production, working ability, meat and hair production and adaptation to desert conditions. This is due to their peculiar body structure and biological features.

The camel's body is deep and comparatively short; legs, especially hind ones, are long. With such a build, camels have a sweeping pace and are good pack carriers. At the end of their long legs they have no hoofs, but cloven paws. The padded soles of the feet widen on treading the ground. This structure of the feet facilitates walking through quicksands and soft snow but hampers movement on muddy and slippery ground. Unlike hoofed animals, camels do not trample pastures, which is beneficial for grasslands. Camels can quickly put on weight and store a large amount (100-150 kg) of fat in their humps, which provides much more energy per unit of live weight than does food and acts as an insurance against times of food shortage. In winter camels become covered with thick hair, which protects them from cold. In the spring it sheds and in summer they lose their hair coat. The hair coat has an important adaptive property: it protects from overheating, diminishes evaporation and preserves moisture. The shorn camel loses

through the skin surface much more water than before shearing. The camel can survive losing water to the extent of over a quarter of its live weight; man perishes if he loses even half this amount.

All this shows the camel's high adaptation to desert conditions. The camel also possesses the ability, which is rare among homoiothermic animals, to alter its body temperature most significantly: from 34 C at night to 42 C at noon. This enables the animal to reduce the loss of moisture which would occur if it sweated to maintain a lower body temperature.

The breeding season is January to May and during this time females come into heat one, two or three times. For a fertile mating it is essential to know the time of ovulation. Ovulation occurs towards the end of the heat period. Oestrus lasts about 8 days and the entire sexual cycle takes 16 days. To ensure a high conception rate female camels are served twice: on the second day of heat and again 2-3 days later.

Sexual maturity of Bactrian females is reached at the age of 1.5 years but they are not served until 2-3 years, when their live weight reaches 70% of the weight of lactating animals. At the age of 2 years males are separated from females, but they are not used as sires till 4 years of age at the earliest, and then very sparingly.

The gestation period of Bactrians is 415 days and birth weight is 40-45 kg. The foetus develops in the left horn of the uterus. Suckling camels grow quickly. Deposition of fat in the hump of the young, provided they develop normally, starts at the age of 1.5 months. The live weight of a Bactrian calf of the Kazakh breed reaches 200 kg at the age of one year and 350-400 kg at two. Such a high weight gain under range conditions is unparalleled.

The lactation period lasts for 18 months and therefore the output of young per 100 females and the farm economic return, as far as reproduction of stock is concerned, are summed up once in two years.

The number of Bactrians in the USSR is 147 000. They are represented by the Kazakh, Kalmyk and Mongolian breeds, which are raised for meat and wool production.

The Kazakh breed, which numbers 132 000, is reared in Kazakhstan, Uzbekistan, Kirgizia and Astrakhan, Saratov and Volgograd regions of the Russian Federation. As for body conformation they have a long-coupled body and a wide chest. Well-fattened males have a live weight of 692 kg and sometimes reach 1000 kg. Meat yield is 60% and hair clip from 8.5-9.5 to 13 kg. The live weight of females is 500-607 kg; meat yield is 57% and hair yield 5-7 kg. In a 12-month lactation they give 1750 litres of milk with a fat content of 5.8-6.5%. Some give 6-8 litres of milk with thrice daily milking. The best camels of the Kazakh breed are reared in Chimkent, Kzyl-Orda and Mangyshlak regions of Kazakhstan.

The young stock of this breed is destined for meat production with an average live weight of 400-450 kg and meat yield of 65%. In addition they produce 4.5 kg of first-grade wool.

The Kalmyk breed (11 000 head) is considered an improved one. They are big animals with well-developed skeleton, musculature and hair cover and have a great capacity for carrying loads and for work.

The females have a live weight of 650-700 kg, net meat yield 56.8%, wool yield 8 kg. Their milk yield is 10-15% less than that of the Kazakh breed and the fat content is 5.5%. The average live weight of breeding males is 760 kg (maximum 1042 kg); meat yield is 60% and hair yield 10-13 kg.

Kalmyk Bactrians are reared in the main in the Kalmyk ASSR, Astrakhan region of the RSFSR, and in Guryev, Mangyshlak, Ural and Kzyl-Orda regions of the Kazakh SSR.

The Mongolian breed of Bactrians is an imported one. They are smaller than the Kalmyk and Kazakh breeds but have a great depth of body, endurance, liveliness and a good hair coat. The hair yield of females averages 5.3 kg and lactation milk yield is 400-500 litres. The live weight of males is 500-550 kg and of females 500 kg.

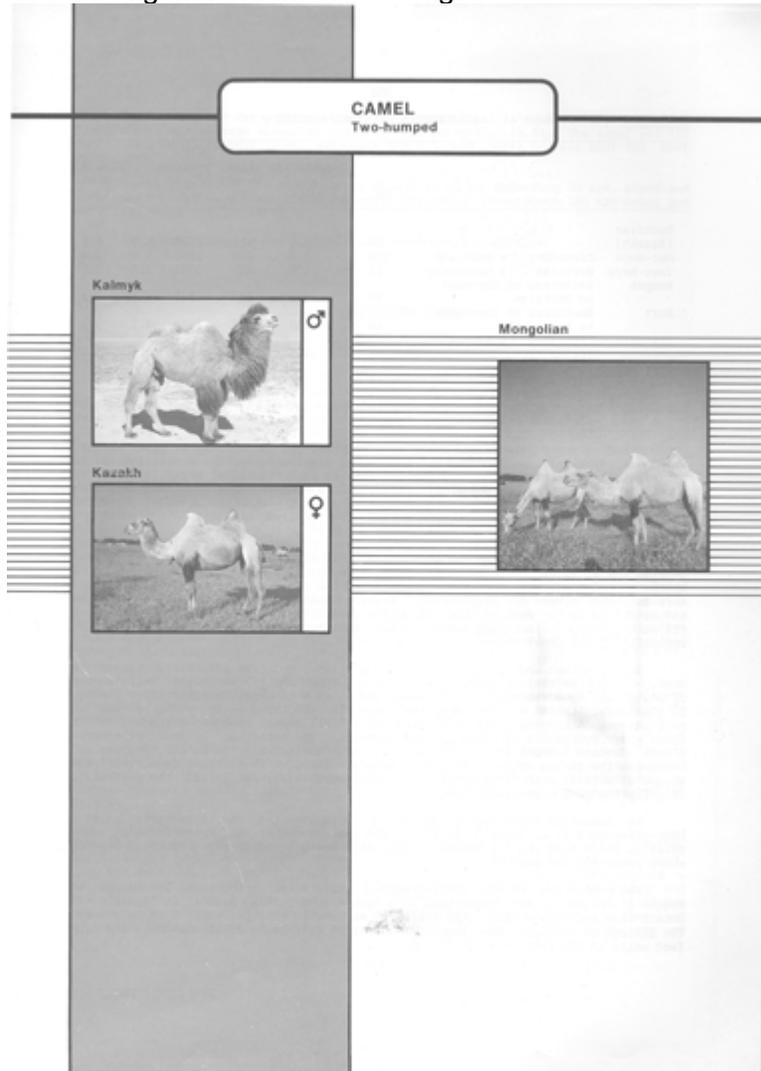


Table 8.1 AVERAGE MEASUREMENTS OF MATURE BACTRIAN FEMALES OF DIFFERENT BREEDS (CM)

Breed	Height between humps	Body length	Chest girth	Shank girth
Kalmyk	186.0	158.1	226.0	20.0
Kazakh	179.1	155.6	236.1	20.1
Mongolian	166.1	146.5	207.0	1802

In order to breed high-producing animals and to provide the shubat (sour milk) producing units with females with high milk yield, the author and specialists of state animal breeding farm Timurski in Chimkent region of the Kazakh SSR used pure breeding, crossbreeding and interspecific crossing. Pure breeding makes it possible: to improve the breeding and productive qualities of camels as well as working towards the breeding of a stud type Kazakh Bactrian (BK) and of a Dromedary (DK), with the creation of new strains, such as Kara-Bura, Ak-Bope, N 5484 and others; to work out methods of breeding young stock with a satisfactory conformation, strong constitution, high productivity and the ability to transmit the economically beneficial traits to the progeny.

Crossbreeding is aimed at obtaining crosses of the second and third generation. Breeding of the crosses inter se fixes the type of the improved camels with increased live weight, hair cover and viability.

First crosses between Bactrian and dromedary have a single hump with a small depression at the front towards the top. Backcrosses begin to resemble the purebred Bactrian or dromedary.

The investigations of interspecific hybridization, carried out for a number of years by the author, have shown the impossibility of maintaining hybrid vigour by breeding the first generation hybrids inter se or by grading to either of the initial species. Maintenance of heterosis through criss-crossing has given positive results: criss-crosses (Kez-nar and Kurt-nar) had higher milk yields and good meat characteristics. About 70-75% of hybrid females came on heat again 20-25 days after calving, which meant 20-30 extra calves from 100 females in the next year.

Table 8.2 PERFORMANCE OF CAMEL HYBRIDS

		NO.	Gestation length (days)	Live weight (kg)	Milk yield in 12mo (kg)	Fat %	Fleece weight (kg)
Bactrian (Kazakh)		80	415	611	1750	5.8	6.0
Nar-maya	Dromedary x Bactrian	105	410	670	2955	4.6	4.9
Iner-maya	Bactrian x Dromedary	10	400	605	3563	3.5	3.5
Kospak	Backcross of Nar-maya to Bactrian	59	390	644	1925	4.6	5.2
Kurt	Backcross of Iner-maya to Dromedary	46	380	535	2544	4.1	3.2
Kez-nar	Dromedary x Kospak (criss-cross)	23	385	650	3876	4.6	5.0
Kurt-nar	Bactrian x Kurt (criss-cross)	15	387	640	4565	4.5	3.7
Dromedary (Turkmen)		10	385	558	4000	3.5	3.1

Breeding the criss-crosses inter se, however, led to decrease of live weight. This made necessary continuation of the work, consisting in the investigation of different methods of crossing of hybrid females with the sire, Kurt IV, also of hybrid origin, to find out possibilities for maintaining the

heterosis and obtaining high milk yielding animals giving 4500 litres of milk, with the average butterfat content of 4.5% or more and preserving the desired qualities in subsequent generations as well.

Experiments prove that the progeny of the sire, Kurt IV, (produced by four generations of inter se breeding of the Kurt hybrid) is markedly different after 6 months of age from their test contemporaries of the same age by greater live weight, more intensive growth and development. Provided that the pasture fattening in spring and autumn is good, each of them can boast 1500-2000 g average daily weight gain. The well-developed lactating females thus obtained are an important reserve for replenishing the camel stock.

To strengthen and promote valuable qualities, positive assortative mating is used. To combine characteristics of different types and to compensate deficiencies of one parent by advantages of the other, use is made of negative assortative mating. In commercial farms a two-stage selection is practised - on pedigree and on performance. A progeny test is carried out at all animal breeding farms and other farms where systematic breeding records are kept. The selection by pedigree ensures a more adequate transmission of valuable parents' characteristics to the progeny and increases the fixing of the genotype. Timely evaluation facilitates forming of the groups of animals with similar qualities and productivity, and raises the percentage of offspring of the desirable type.

In commercial herds high-producing improvers are used, and in pedigree herds -high-class ones (i.e. progeny tested). The maximum number of females for the young sires is 10-15 head and for adults 25-30. All breeding males are given full feeding while preparing for service.

The experience of the camel-breeding state farm Kzyl-Uzenski in Mangyshlak region of the Kazakh SSR shows that in a specialized milking herd it is possible to obtain from one female 1000- 1500 litres of marketable milk per year, with an average fat content of 4.0-6.5%, the input per 100 kg of milk being 10-11 man-hours and 1.5 feed units in addition to range forage.

The carcass and fat weight of a well-fattened camel is equal to the weight of 12-15 sheep, the average slaughter yield of meat being 61.7-65.8%. The input per 100 kg of camel meat is only 76-80 man-hours and 6.5 feed units or half that for beef production.

The hair yield of one camel varies from 3 to 16 kg, depending on age, breed and genotype, as well as the method of shearing, the input being about 188 man-hours and 89.2 feed units per 100 kg of hair.

These data indicate the high efficiency of camel production.

8.2 ONE-HUMPED CAMELS

B. Meredov

All dromedaries in the Soviet Union belong to one breed, whose Turkmen name is Arvana, i.e. purebred. For the nomadic Turkoman population living in the Kara-Kum desert the Arvana has been for millennia almost the only animal supplying milk, meat, wool and transport. Rock drawings of one-humped camels, probably domesticated, have been found in the northwest foothills of the Sultan-Uizdag in northern Turkmenistan in the settlement of Byash-Tyube which dates to 3000-1500 BC. Some rock drawings in the Chendir ravine in the western slopes of the Kopet-Dag in southwest Turkmenistan depict domesticated dromedaries and riders and date to the beginning of our era. We cannot exclude the possibility that dromedaries were independently domesticated in Turkmenistan and in Arabia 5000-6000 years ago. From time immemorial Arvana dromedaries have been used for breeding strong hybrids capable of great endurance. The best hybrids were obtained by crossing Arvana sires with females of the Kalmyk Bactrian breed. However, the Turkmens never bred from hybrids.

The Arvana is a typically milk-yielding, pack-carrying and smooth-riding breed of camels. The present-day qualities have been achieved by long selection: special attention was paid to the use of sires out of high milk yielding females. Arvanas have the highest milk yield of all breeds in the world. Since 1930 selective breeding has been carried out by Sakar-Chaga and Jebel camel-breeding farms and Kazanjik state breeding centre in Turkmenia.

At the present time the Arvana breed is widely used to improve milk and meat production of the Kazakh Bactrians, and a Kazakh type of the Arvana breed has been developed from the cross. As improvers of dromedaries they are much in demand in the republics of Central Asia and in countries of the Near East.

Arvana dromedaries are reared in all parts of Turkmenia, as well as in Uzbekistan, Azerbaijan and the southern districts of Kazakhstan. They are also found in Turkey, northern Iran and Afghanistan, where they may have been introduced by Turkmen migrants in the 12th century during the conquest of these countries by the Seljuks.

Arvana dromedaries are reared in the hot and arid climate of the Kara-Kum and Kyzyl-Kum deserts and Ustyurt semi-desert in Central Asia with sandy areas, saline soils, takyrs ^{1/} and tablelands. Dromedaries are kept on pasture all the year round. They can feed on the desert vegetation which is rejected by most other animals - shrubs, subshrubs and saline herbage - and are often satisfied with saline and brackish water. The herbage productivity of the pastures typical of the Kara-Kum desert varies between 150 and 600 kg of dry feed per hectare. During autumn and winter the camels feed on Haloxylon aphyllum and H. persicum, Salsola gemmascens and s. orientalis, Astragalus and Aristida karelinii and A. pennata. In the spring the desert is covered by ephemerals. Near the oases various grasses and camel thorn abound. At this time the camels graze well and recover their condition. They store in the hump up to 40-60 kg of fat which they use when lacking feed.

^{1/} Large, smooth plant-free areas.

Arvana camels are not adapted to severe winters. In zones of high humidity they are susceptible to parasitic blood diseases and helminthiasis and are defenceless against bloodsucking insects.

In recent years the stock of camels in public farms of the Turkmen SSR has increased and reproduction rates in the herds have improved considerably. Four new camel breeding state farms have been organized and complex dairy units, specializing in the production and processing of camel's milk, are being set up. The number of dromedaries in public farms in the USSR has grown in the last ten years from 54 000 to 72 200 head, while the total stock in all categories of farms now amounts to 109 800 (see Table 8.3).

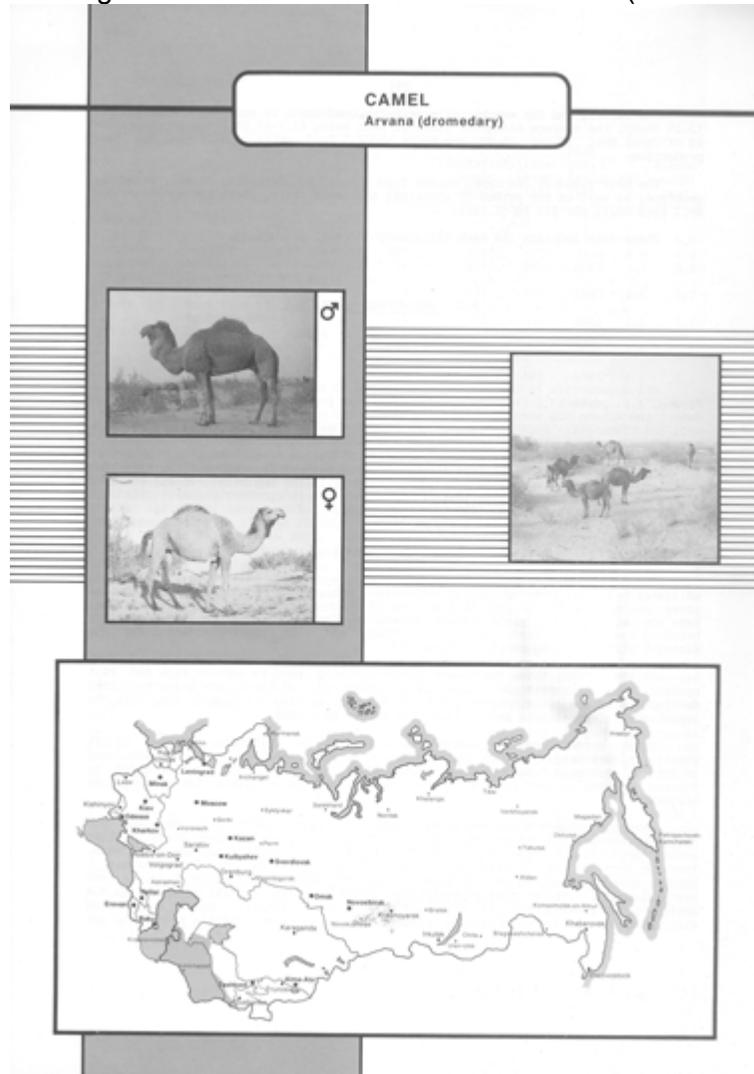


Table 8.3 NUMBERS OF ARVANA DROMEDARIES (1000 HEAD)

Republic	1984	1964	Year 1974	1980	1984
Turkmenia	78.7	72.4	86.4	83.3	85.7
Uzbekistan	55.2	23.7	22.8	20.3	21.2
Kazakh, Azerbaijan and Tajik SSRs	11.8	1.2	0.5	2.9	2.9
USSR Total	145.7	97.3	109.7	106.5	109.8

Dromedaries of the Arvana breed have a good conformation and strong body build. Their head is lean, neck long, chest wide and deep. They have a compact hump rising sharply in the middle part of the back. The legs are correctly set and the callous soles afford traction and facilitate walking on quicksands.

Arvana camels are brown in colour varying from light red to dark brown; occasionally they are white, roan or mouse coloured. Their wool cover is curly. Beard and mane are developed only on the upper and lower parts of the neck. Near the shoulder blades they have "epaulettes" i.e. long (8-12 cm) and slightly curly hairs.

Arvana dromedaries rarely suffer from infectious diseases such as tuberculosis and brucellosis while cases of leucosis have never been observed. Bovine brucellosis has been recorded in places with sick cattle and sheep.

While belonging to the same breed, Arvana dromedaries in different regions differ from each other in body build. The largest type inhabits the east of Turkmenia, which has a number of districts with abundant vegetation. The western (Jebel) type has an average height, stocky build and meat type, and is highly adapted to year-long pasture management. The eastern (Sakarchagin) type is characterized by large stature, dry constitution, good conformation, voluminous udder and high milk production. This type is an improver for the entire Arvana breed. Crossing sires of the eastern type with females of the western improves the conformation, milking capacity and the volume and form of the udder.

Arvana camels are early maturing: they reach maturity before the age of two years; the females are mated when they reach three years of age and have a live weight of 350-400 kg. Males are used for service from 4-5 to 15-16 years of age. Breeding is restricted to the season from January to April. Gestation period is, on average, 385 days and the females give birth about every two years. Shortening the calving interval as practised in Turkmenia makes possible two calves in three years.

The live weight of calves at birth is 38-40 kg. Their rapid live-weight gain is maintained during the first year of life, the average daily live-weight gain being 950-1030 g. Weaning is done at the age of one year.

The milk yield of Arvana dromedaries approaches that of dairy cows. The lactation period lasts 15-18 months. For a group of females in the camel breeding farm Sakar-Chaga average milk yield was 4387 kg in 18 months, the yield of the first calvers being 3117 kg. The average daily yield of some animals amounted to 15 kg, the top yield being 19 kg. In addition to the amount needed for suckling calves, females can give 1718 kg of marketable milk with 4.13% of fat in a 12-month lactation.

Females are milked by hand 2-6 times per day depending on the yield. Machine milking is also practised.

Dromedary milk, consists of 13.6% dry matter, 3.5% protein, 4.9% lactose and 0.7% ash. Acidity of the fresh milk is 20-25°T 1>/. The high bactericidal properties of camel's milk retard the development of acidity and facilitate storing (at 30 C) up to 24 hours so that it remains fresh during transport. The peoples of Central Asia have been since the earliest times well acquainted with the high nutritive, dietetic and curative properties of camel's milk and its products.

Arvana dromedaries easily put on weight when grazing and produce good and palatable meat; yield at slaughter in 2-3 year-old animals of average fatness is 54.2%.

The average wool clip of males is 3.28 kg and that of females 2.10 kg. The fleece wool of adult Arvana camels totals 91.2% of the clip (the rest is threads and tips) and the clean wool yield of fibres is 78.6%. Fibre diameter is 12-27 μ m and length 4-12 cm. Dromedary wool possesses a number of valuable technological properties, such as low heat conductivity, softness and strength. Out of it a wide range of technical and warm fabrics are manufactured. The local population uses camel wool for the production of natural yarn and knitted wear.

The main advantage of camels as beasts of burden consists in their ability to traverse deserts and in being cheap load carriers. In an 8-10 hour working day Arvana camels can carry packs weighing 200-300 kg for a distance of 30-35 km.

Since 1947 the Turkmen Republic has introduced the Republic Herdbook of the Arvana breed which has registered 2000 elite and first-class camels.

There is considerable activity in breeding Arvana dromedaries at the camel breeding complex Sakar-Chaga, in the state camel breeding pedigree farm Turkmenistan as well as in seven other camel breeding pedigree collective and state farms in Turkmenia. More than 12 000 high-class breeding animals are concentrated in these farms, of which more than 5000 are females.

Purebred animals on state and collective farms totalled 31 000 in 1980.

Leading lines are Batly 6-64, Gok-Kaplan 4-156 and Shatlyk 8-49.

^{1/} The Turner's degrees (°T) of acidity stand for the number of millilitres of 0.1N alkaline (KOH or NaOH) solution required to neutralize 100 ml of milk dissolved by the same quantity of distilled water, with phenolphthalein being used as indicator.

Arvana camels are chiefly improved by selection within the pure breed. In recent years the improvement work is being carried out on the basis of a pedigree selection plan worked out in the Turkmen Institute of Animal Husbandry and Veterinary Science. To form a nucleus on breeding farms, preference is given to animals possessing strong constitution, heavy weight, high indices of productivity and belonging to a well-known line. Great attention is also paid to adaptive qualities i.e. ability to maintain condition and productivity in the extreme conditions of year-long pasture management.

The programme of selection is worked out with due account of the types existing within the breed. Within each type new sire lines, families and crosses are being created on the basis of outstanding specimens. These breeding methods promote the maintenance of the breed's genetic diversity

and the development of intra-breed types as well as improving breed characters and performance of the entire stock of Arvana dromedaries.

BIBLIOGRAPHY

(In Russian)

Baimukanov A. Problems of camel breeding in Kazakhstan. Kaynar, Alma-Ata. 1981.

Baimukanov A. Methods of breeding and assessment of the productivity of camels. Paper for the 33rd Meeting of the European Association for Animal Production. 1982.

Kugenev P.B. Camel breeding. Patrice Lumumba Friendship University, Moscow. 1982. Lakoza I.I. Camel breeding. Selkhozgiz, Moscow. 1953.

Terentyev S.M. Camel breeding. Kolos, Moscow. 1975.

Meredov B. Some problems of Arvana camel breeding and rearing in Turkmenia. 1984 Konevodstvo i Konnyi Sport No. 12, 22-23.