

Group I

K A N K R E J

Origin

The Kankrej breed of cattle¹ takes its name from a territory of that name in North Gujarat of Bombay Province, India. The home of the breed is to the southeast of the Desert of Cutch in Western India, extending from the southwest corner of the Tharparkar District of Sind Province of Pakistan to Ahmedabad District in Bombay Province of India, and from Deesa in the east to Radhanpur in the west of the Banaskantha District of Bombay Province, particularly along the banks of the rivers Banas and Saraswati which flow from east to west and drain into the desert of Cutch.

In Radhanpur State, which is adjacent to the Kankrej tract, the breed is known as Wadhia. In Cutch State it is known as Wagad or Wagadia, taking its name from a community of herdsmen who breed these cattle. A similar variety known as Sanchoke is bred in Jodhpur of Rajputana, India. (Anonymous, 1926 (a)).

The pictures and carvings obtained from Mohenjodaro excavations in Sind, Pakistan, show that the cattle types existing in those days (about 3,000 B.C.) were very similar to Kankrej. The large Malvi breed of Rajputana resembles the Kankrej in some respects, though the size and shape of horns are different.

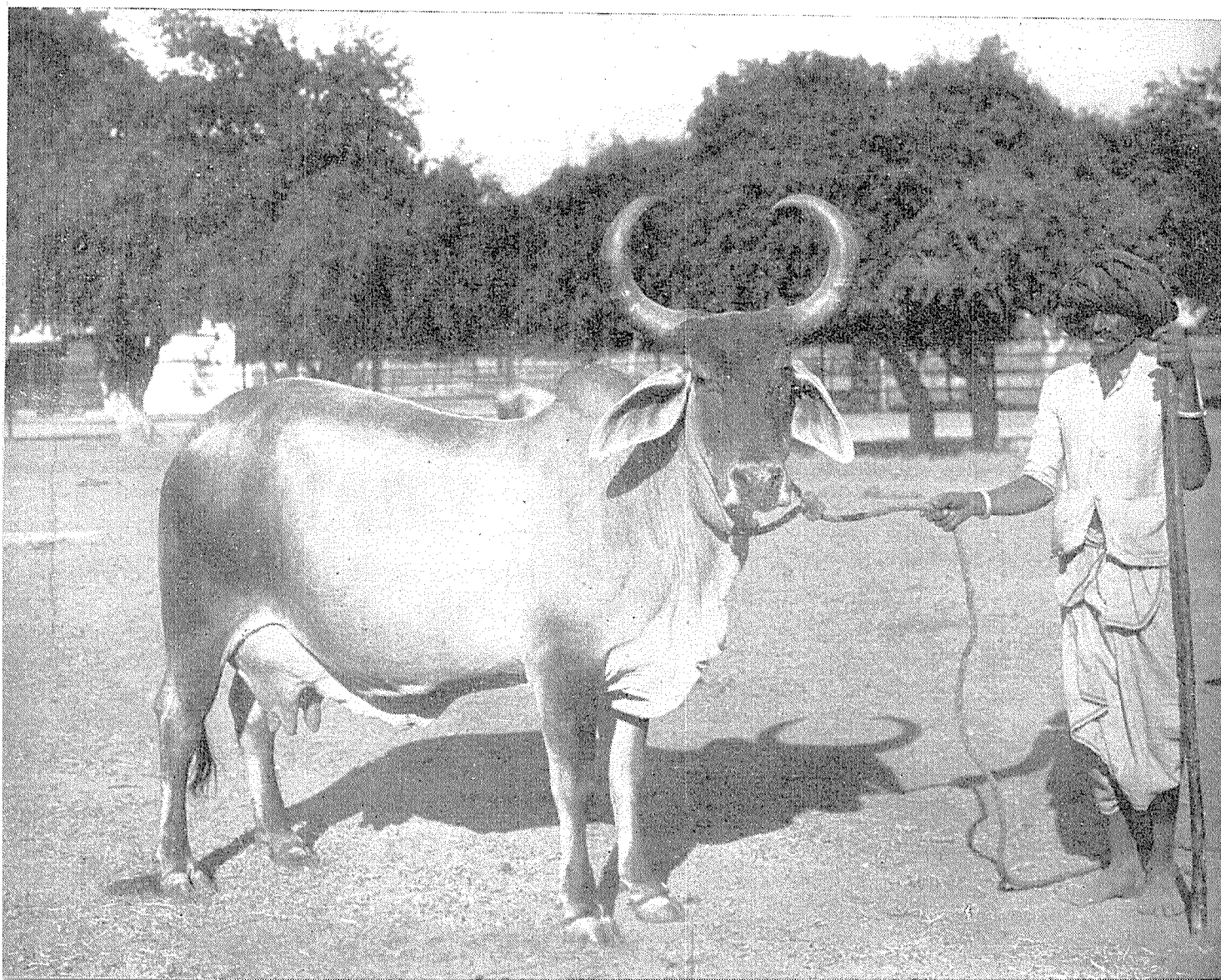
¹ See Figures 13 and 14.

Conditions in the Native Home of the Breed

Location, Topography and Soils

The area covered by this breed is roughly 700 square miles. The longitudinal position is between 71° and 74° E. and it is on either side of the Tropic of Cancer between 21° and 24° N. The Kankrej breeding tract is low-lying and dry. For the most part it is a treeless tract, and whatever trees are there are on the borders of the ponds and along the river banks. The two chief rivers, Banas and Saraswati, which flow through this tract are also seasonal and are partly dry during the summer months. In the southwestern part of the region the soils are sandy loam and heavy black, while on the eastern side they are mostly sandy with some sandy loam areas. In some districts the soil is clay loam of whitish gray color. When wet such soil is sticky and difficult to work and when dry it cakes and soon cracks over

FIGURE 13. Kankrej cows are fair milkers.



a large area. The sub-soil is yellowish white, of compact structure mixed with lime nodules and is impervious.

For the most part the country is a sandy, treeless plain with, in some places, rolling sand hills and between them valleys of black clay. To the north and northeast bordering on Sirohi lies an area covered with rocks and forest-clad hill ranges.

Climate

Climate varies greatly with the distance from the sea. Towards the sea it is more temperate with high humidity but with appreciable air movement. From November to February it is dry and cool, and spells of cold occur occasionally when the temperature goes down to 40°F. From March to June is the hot season when the temperature at times reaches as much as 120°F. Average rainfall ranges from 20 to 30 inches and is usually concentrated within the period from July to October. The climate during the rainy season is hot and humid, but nearer the sea fast air movement makes the weather pleasant.

Table 1. Climatological Data for the Kankrej Area

MEASURE OF CLIMATE	AVERAGE DATA BY MONTHS											
	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
(a)												
Mean maximum temp. °F . . .	82.4	89.4	98.2	105.5	110.2	104.8	95.5	91.9	94.4	97.6	91.7	85.6
Mean minimum temp. °F . . .	53.9	58.6	66.2	75.5	81.2	83.6	79.3	78.5	76.6	71.9	63.1	56.2
Rainfall, in inches	0.32	—	0.03	0.16	0.18	3.62	13.14	6.73	2.12	0.13	0.29	—
(b)												
Mean maximum temp. °F . . .	83.5	86.4	95.8	103.6	107.0	102.2	93.7	89.4	93.4	97.5	92.3	85.8
Mean minimum temp. °F . . .	51.4	54.3	63.1	71.3	77.4	80.5	78.1	75.9	74.1	66.9	57.9	52.3
Mean daily relative humidity, percent	48.0	42.0	40.0	43.0	57.0	68.0	80.0	84.0	77.0	53.0	42.0	46.0
Rainfall, in inches	0.11	0.16	0.08	0.03	0.43	2.18	9.0	8.62	3.54	0.41	0.10	0.04

(a) Supplied by the Director, Institute of Agriculture, Anand, Bombay from the data collected at Chharodi, Kankrej Cattle Farm, 1940-48.

(b) Average of 10 years for the Kankrej area supplied by the Indian Meteorological Department, Government of India, New Delhi.

The further climatological data from Deesa and Ahmedabad, represented in Table 2, will be of interest.

Table 2. Climatological Data from Deesa and Ahmedabad

MEASURES OF CLIMATE	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
D E E S A												
Barometric pressure reduced to 32°F	29.55	29.50	29.43	29.34	29.26	29.13	29.09	29.16	29.28	29.42	29.51	29.55
Mean wind velocity in miles per hour	3.32	3.38	3.32	3.60	5.26	6.54	5.93	4.76	3.17	2.55	2.83	3.10
Humidity % . .	37.0	33.0	31.0	31.0	44.0	57.0	73.0	78.0	70.0	51.0	38.0	39.0
Vapor pressure in inches of mercury . . .	0.230	0.244	0.286	0.370	0.592	0.750	0.851	0.831	0.765	0.504	0.315	0.251
Mean monthly evaporation in inches	9.18	9.35	14.97	19.53	22.75	18.99	10.23	6.70	7.38	10.20	10.95	8.93
AHMEDABAD												
Barometric pressure reduced to 32°F	29.86	29.82	29.75	29.66	29.59	29.45	29.42	29.49	29.60	29.72	29.81	29.86
Mean wind velocity in miles per hour	1.94	1.94	2.00	2.11	2.80	3.14	2.74	2.28	1.83	1.48	1.83	1.94
Humidity % . .	36.0	40.0	35.0	37.0	47.0	59.0	74.0	77.0	71.0	54.0	42.0	39.0
Vapor pressure in inches of mercury . . .	0.280	0.308	0.340	0.449	0.657	0.786	0.871	0.843	0.787	0.560	0.367	0.300
Mean monthly evaporation in inches	9.30	7.84	12.09	14.40	16.22	12.15	6.63	5.05	5.79	8.31	9.09	8.80

Indian Meteorological Department. Scientific notes Vol. VI. No. 61, pages 29 and 31.

Vegetation

Scrub forests and grazing areas are found in the north and northwest part of the tract. Common trees to be found are *Acacia catechu*, *Zizyphus jujuba* and *Boswellia thurifera* and *Ficus religiosa*. Prominent grasses found in the area are *Andropogon annulatus*, *Andropogon contortus*, *Ischaemum rugosum* and *Polytoca barbata*. Wherever pasture is available it is seasonal

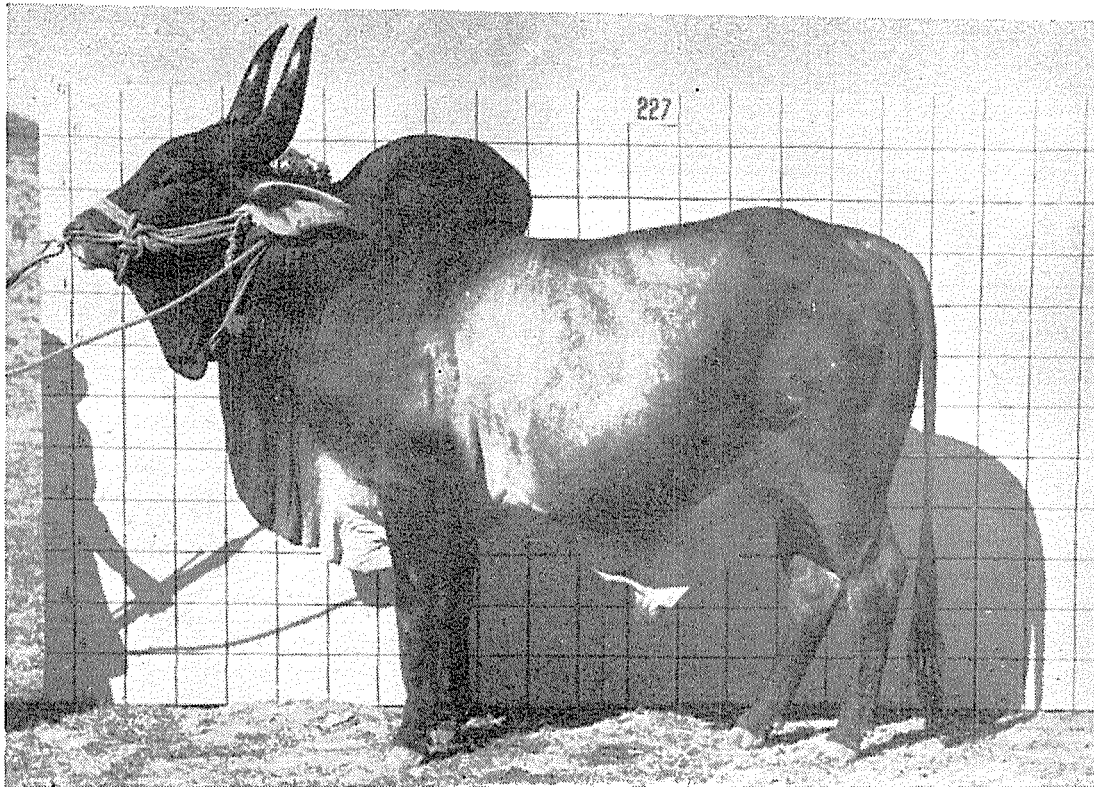
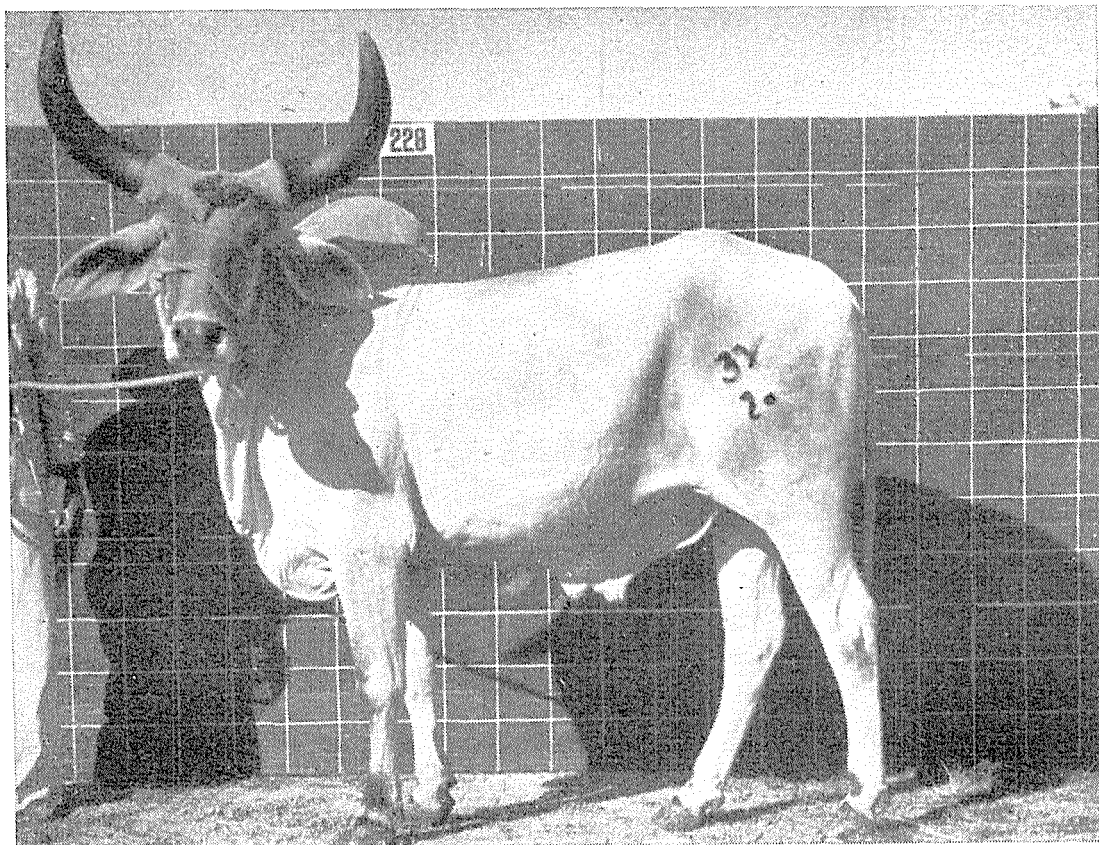


FIGURE 14. The Kankrej breed is very highly prized in its native home for the production of fast, powerful draft bullocks. Above: a Kankrej bull. Below: a Kankrej bullock.



only. The growing season is from July to October. Pastures which are not grazed are usually harvested during the months of October and November, when the grasses are usually dry and coarse, and less nutritious than during the active growing season.

The low-lying area of the tract is flooded with 3 to 4 feet of water retained by embankments around the fields and is used for paddy cultivation when the water goes down. In some parts wheat is also cultivated when the water dries up completely. Usually in the black soils, rice, wheat, millets, sorghum or sugar-cane are grown. In the light soils, pulses, oilseeds, sorghum and millets are extensively grown. Of the oilseeds, castor, rapeseed and sesamum are common. In the sandy areas palmyra palm is also cultivated. *Cyamopsis psoralioides* or *Cyamopsis tetragonoloba*, locally known as Guar, is a legume extensively cultivated and the seed is used as a cattle feed. Cotton seed and oil cakes are widely used as concentrates. No fodder crops as such are grown for cattle feeding and only the stovers and straws are used as stored roughages.

Management Practices

Kankrej cattle have a very important place in the agricultural economy of the whole of Gujarat and Saurashtra regions of Bombay Province. Bullocks of this breed are the chief motive power for all agricultural operations and for road transport in rural areas. But the majority of cultivators depend on professional breeders for the production of cattle.

In the past, the Kankrej breed has been developed mainly by professional breeders. Until recently these breeders were solely dependent on their cattle, but as more of the pasture lands were brought under cultivation the breeders had to settle down and pay attention to the cultivation of crops. Principal communities associated with the breeding of Kankrej cattle both in Gujarat and Kathiawar are the Rabaris, the Bharwads, the Maldharis, the Ahirs and the Charans.

The Rabaris and the Bharwads are the main cattle-breeding communities in Gujarat and it is estimated that practically 90 percent of the Kankrej cows in northern and central Gujarat belong to these communities. The villagers usually keep their cattle loose and seldom tied, each breeder making a paddock of thorns near his house in which the cattle are kept at night, from

which they are taken out for grazing in the day time. During the rainy season, when the village pastures offer some grazing, the cattle are kept in the village, but during dry months the cattle, particularly dry cows, young stock and breeding bulls, are taken miles away from home in search of fodder, going as far as south Rajputana in search of grazing. The Rabari and Bharwad breeders seldom store fodder for periods of scarcity.

Calves are not separated from cows until weaned by their dams. Breeders take great pains in selecting and caring for male calves to be retained for breeding. Other male calves are sold at ages varying from 6 to 12 months, being castrated and reared as bullocks for cultivators.

Physical Characteristics of the Breed

The Kankrej is one of the heaviest of the Indian breeds of cattle, and, being of all-India importance, is described by the Indian Council of Agricultural Research (Ware, 1938).

Table 3. Average Measurements of Kankrej Cattle

MEASURE	At one year	At two years	Mature
<i>Females</i>	388.0	538.0	929.0
Weight in pounds (at birth - 46.4)	42.9	48.7	55.0
Length from shoulder point to pinbones, in inches	42.5	47.2	51.5
Height at withers, in inches	20.0	22.2	26.0
Depth of chest, in inches	12.4	14.5	20.0
Width of hips, in inches	51.4	59.2	70.0
Heart girth, in inches			

MEASURE	At one year	At two years	Mature bull	Mature bullock
<i>Males</i>	396.0	551.0	1 357.0	1 222.0
Weight in pounds (at birth - 51.2)	44.9	46.9	62.7	63.2
Length from shoulder point to pinbones, in inches	44.7	48.1	62.2	59.2
Height at withers, in inches	21.4	21.6	30.2	31.8
Depth of chest, in inches	12.9	14.2	22.5	23.1
Width of hips, in inches	53.1	59.2	79.0	77.5
Heart girth, in inches				

Data collected at Northcote Cattle Farm, Chharodi, Bombay State, India.

Color varies from silver gray to iron gray or steel black. Newly born calves have rusty red-colored polls, this color disappearing within 6 to 9 months. Forequarters, hump and hindquarters are darker than the barrel, especially in males. The switch of the tail is black in color. The forehead is broad and slightly dished in the center. The face is short, and the nose looks slightly upturned. The strong lyre-shaped horns are covered with skin to a higher point than in other breeds. The ears are very characteristic, being large, pendulous and open. The legs are particularly shapely and well-placed and the feet small, round and durable. They are active and strong. The hump in the males is well-developed and not so firm as in some breeds. The dewlap is thin but pendulous and males have pendulous sheaths. Pigmentation of the skin is dark and the skin is slightly loose and of medium thickness. Hairs are soft and short.

Functional Characteristics of the Breed

Kankrej cattle are very highly prized as fast, powerful draft cattle. They are also fair producers of milk. The average milk production of Kankrej cows, based on records of performance at recognized farms in India during 1936-37 to 1939-40, is shown in Table 4 and of a herd at Chharodi in Table 5.

Table 4. Average Production of Kankrej Cattle at Recognized Farms in India

YEAR	No. of records averaged	Average lactation yield, pounds	Average lactation length, (days)	Average dry period, (days)
1936-37	54	3 232	305	184
1937-38	54	3 159	303	178
1938-39	38	3 161	315	144
1939-40	11	2 965	366	180

Memorandum - Ministry of Agriculture, Government of India. (Anonymous, 1950.)

**Table 5. Production of Kankrej Herd at Chharodi
(Bombay State, India)**

PRODUCTION	No. of animals	Quantities produced, lbs.	Fat %	Days in milk	Average calving interval days	Average no. of lactations during life
Average	33	2 868	4.56	279	499	8.5
Superior	17	4 392	4.69	336	499	7.5

Communication from the Director of the Institute of Agriculture, Anand, Bombay.

Frequency distribution of 348 Kankrej records of milk production from Anand and Chharodi Kankrej cattle farms during 1941-44 is as follows:

Below 1,500 lbs.	67
1,501 - 2,500 lbs.	85
2,501 - 3,500 lbs.	97
3,501 - 4,500 lbs.	62
4,501 - 5,500 lbs.	32
Above 5,500 lbs.	10

Performance records given in Tables 6 and 7 which follow refer to additional milk production performance of Kankrej cattle maintained at Chharodi and Anand respectively during the period 1941-1951. At Chharodi the cattle are maintained on semi-ranching conditions while the cattle at Anand are maintained under superior conditions of feeding and management.

**Table 6. Milk Production of Kankrej Herd at Chharodi,
Bombay State, for the Period 1941-1951**

CLASS OF COWS	No. of cows	No. of lactations	Average milk yield per lactation, pounds	No. of days in milk	No. of days dry	Average calving interval (days)
Selected cows .	40	121	4 443	371	153	524
Average cows .	45	91	2 665	307	191	498

Data supplied through the Indian Council of Agricultural Research.

**Table 7. Milk Production of Kankrej Herd at Anand,
Bombay State, for the Period 1941-1951**

CLASS OF COWS	No. of cows	No. of lactations	Average milk yield per lactation, pounds	No. of days in milk	No. of days dry	Average calving interval (days)
Selected cows .	22	57	4 893	362	117	479
Average cows .	13	49	3 067	252	144	396

Data supplied through the Indian Council of Agricultural Research.

The average age at first calving estimated from 294 calving records was 48.47 months, variation being from 33.1 months to 78-27 month—data supplied by Ministry of Agriculture, India. Though cows are bred throughout the year, there is a strong tendency for matings to take place from March to August. The average birth weight of males is 51.24 lbs., based on 255 records, and of females is 46.37 lbs., based on 287 records.

Average age at first service in males kept for breeding was calculated to be 34.4 months, over 50 records. Bulls are quick breeders and have an active breeding life of about 9 years, from 7 records. Male calves not required for breeding are castrated between 6-12 months of age, and are put to work when they are 3 to 4 years of age and weigh about 800 to 900 lbs.

Kankrej bullocks are noted as good draft animals, being very fast in cart work yet very powerful for hauling heavy loads and for field work. The gait of the Kankrej is peculiar to the breed, smooth in action with a very long and even stride. A pair of bullocks will haul about 1,400-2,000 lbs. in an iron-tired cart on a rough road, while on a good road they can haul up to 4,000 lbs. in carts with pneumatic-tired wheels. They can cover a distance of 25 miles in 10 hours, and shorter distances at the rate of about 3 miles per hour. They are used for all kinds of field work such as plowing, harrowing, threshing, transportation, drawing water from wells, etc. Usually they work from 8 to 10 hours a day.

As the breed is not used for meat purposes in India, information is not available on its meat qualities. However, the breed shows excellent potentialities for beef production and has been used for this purpose in Brazil and the Gulf Coast region of the United States of America.

As regards resistance or otherwise to disease, it has been observed that they are resistant to Tick fever and also they show very little incidence of contagious abortion and tuberculosis, though no extensive studies are available to substantiate these observations regarding the latter two diseases. It has been noted that the bullocks are apt to suffer from cancer of the horn.

No specific genetic traits have been studied. It has been observed, however, that red color is recessive (Patel, 1945), and occasionally calves having red color are born.

Performance in Other Areas

Grading-up in India

In some parts of India the breed is used for grading-up local cattle, particularly in South Gujarat, Karnatak and Khandesh areas of Bombay State. It is also used in Ajmer-Merwara of Rajasthan, India. No records are available showing the results of grading-up work in other parts of India, but observations reveal that the grades are on the average better bullocks as well as better milkers than the local cattle. In all the areas mentioned above the cultivators are relatively prosperous and hard-working and are anxious to feed and care for better bullocks.

Brazil

Kankrej cattle, known in the Americas as Guzerat¹, were exported to Brazil as early as 1870. Fairly large consignments were exported in 1914. They are located mainly in the region of Central Brazil, especially in the States of Minas Gerais, São Paulo, Goiás, and Mato Grosso. There were some subsequent consignments but importation into Brazil was prohibited in 1921. They have been used for pure-breeding as well as for grading and cross-breeding, and have also entered into the formation of the Indubrasil breed of cattle which has been developed in Brazil.

Purebred Kankrej cattle are maintained at the Government's experimental livestock breeding station near Uberaba for improvement and study (Veiga, 1949). The station is located in

¹ See Figure 15.

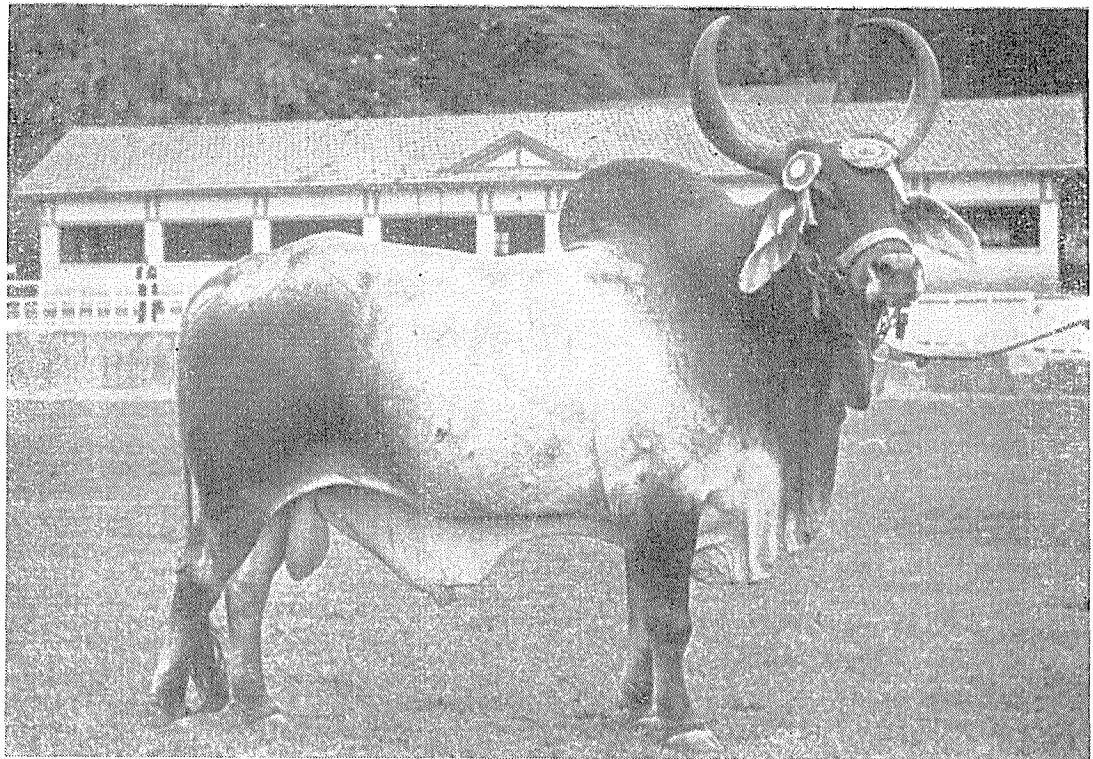
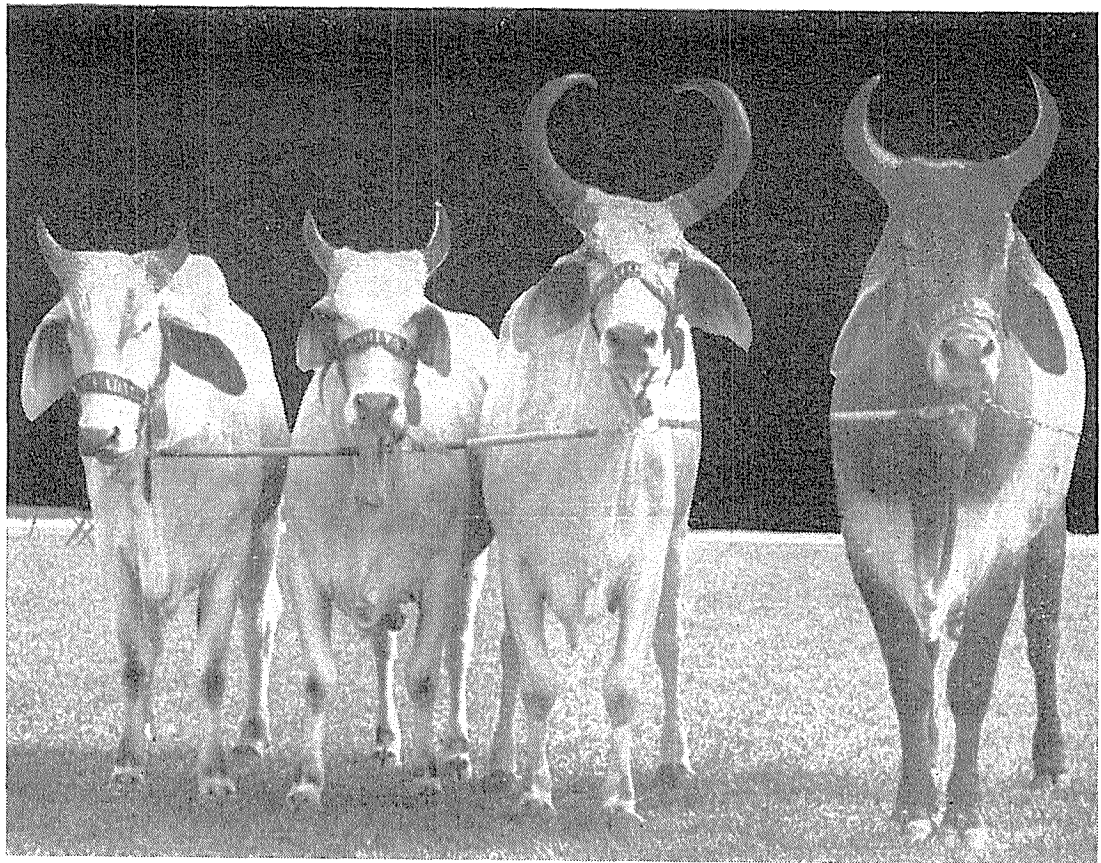


FIGURE 15. Kankrej cattle, which are known as “Guzerat” cattle in Brazil, have entered into the formation of the Indubrasil breed. Above: a Kankrej bull in Brazil. Below: a group of Kankrej steers in Brazil.



a zone of semi-humid tropical climate. The annual mean temperature is 72.0°F. It is 70°F. in the dry season and 73.5°F. during the rainy season. August is the driest month in the year with 55 percent of relative humidity. The annual mean precipitation of the region is 64.4 inches, January being the rainiest month with 12.8 inches of rain on the average.

The calving season usually begins by the middle of February and continues up to the beginning of November. Calves are usually left with the cows on pasture. Male calves are put on additional feed when they are six months old. This feed usually consists of ground millet, rice or wheat bran and cotton, the mixture having 14 percent protein. When the calves are about 8½ to 9 months old they are weaned and separated into sex groups. Bulls are allowed to breed when they are about 24 months of age, and heifers when they are 24-27 months old.

Weights of animals maintained at this station are given in Table 8.

Table 8. Average Weight of Kankrej Cattle in Pounds

A G E	Male	Female
	A	B
At birth	64.2 ± 2.7	61.7 ± 2.2
3 months	173.3 ± 4.6	155.5 ± 5.3
6 months	303.2 ± 9.9	239.9 ± 4.4
9 months	443.0 ± 15.4	384.3 ± 11.5
12 months	549.9 ± 20.5	473.0 ± 15.4
15 months	621.4 ± 35.1	532.5 ± 17.2
18 months	800.9 ± 43.4	639.9 ± 17.2
21 months	909.3 ± 39.2	678.9 ± 21.6
24 months	1 006.1 ± 37.5	751.0 ± 17.6
Daily gain in weight since birth until 24 months	1.308	0.975

Numbers sampled are shown in brackets. From figures of the Government's experimental livestock breeding station near Uberaba.

In most of the Brazilian regions Kankrej are used for beef as well as for milk. They are mostly raised on grassland and are ready for slaughter at the age of 3½ years.

In an experiment undertaken at the "Laboratorio di Genetica Animal" in São Paulo (Villares, 1943) to find out the influence of the environmental temperature on body temperature,

it was observed that the Kankrej Cattle (average of 7 animals) registered average body temperatures of 101.0°F. and 102.0°F. when atmospheric temperatures were 70.5°F. and 87.0°F. This may be compared to the body temperature of European breeds of cattle (average of 89 animals representing 6 breeds) 101.2°F. and 103.5°F. when atmospheric temperatures were 69.5°F. and 87.0°F.

United States of America

Numerous strains of cattle from India are bred in the Gulf Coast region of the United States, where they are commonly referred to collectively as Brahman cattle (Black, 1938). Kankrej cattle (or Guzerat as they are generally known in the United States) have been popular since 1924. Gulf Coast breeders have used Brahmans to improve their grade and nondescript local cattle by crossing. Breeding investigations are being conducted by the U.S. Department of Agriculture at the Iberia Livestock Experiment Farm, Jeannerette, La., to develop a strain from Brahman-Angus that would breed true for good beef type showing high adaptability to the region. The Brahman cattle used in this work contained a high proportion of Kankrej blood.

The Gulf Coast area is subtropical and has a high rainfall. Mean monthly temperatures and average rainfall calculated from records at the farm are given in Table 9. The averages were calculated from figures over a 16-year period (1932-47) (Baker and Black, 1950).

Cattle on the Iberia Livestock Experiment Farm are managed according to good range practice. Native and improved pastures are used to the best advantage. Supplemental feeds, such as grass silage, hay, cottonseed meal, are given for 60 to 90 days in the feed lot and on pastures late in the winter and early in the spring. The cows are bred to calve when they are 3 years of age. Calves are weaned when 6 to 8 months of age. Information on average weight of females, some beef production data and also heat tolerance coefficients, according to the formula evolved at this station, are given in Tables 10, 11 and 12.

**Table 9. Monthly Average Temperatures and Rainfall
at Iberia Livestock Experimental Farm**

MONTH	Average temperature, °F.	Average rainfall, inches
January	54.3	4.9
February	56.6	3.9
March	61.6	5.0
April	68.7	3.9
May	75.0	5.3
June	80.2	6.5
July	81.5	8.0
August	82.0	6.4
September	77.9	5.3
October	68.4	2.5
November	59.4	4.3
December	53.9	4.8
Total rainfall		60.8

**Tayle 10. Average Weights, in Pounds, of Female Cattle
from Birth to Six Years of Age (1932-46)**

BREEDING OF CATTLE BRAH- MAN ANGUS	AT BIRTH			AT 6 MONTHS			AT ONE YEAR			AT FOUR YEARS		
	No.	Wt.	S.D.*	No.	Wt.	S.D.*	No.	Wt.	S.D.*	No.	Wt.	S.D.*
Half-breds, 1st genera- tion	56	66.2	8.84	56	349.5	42.94	50	560.6	79.68	47	766.4	93.86
Half-breds, 2nd gene- ration	21	61.6	10.32	21	375.2	51.60	14	520.4	88.28	9	732.2	102.08
Quarter-breds, average	96	62.2	10.13	96	375.1	46.10	90	580.5	71.13	84	753.3	80.59
Quarter-breds, 2nd generation	50	60.6	10.71	50	356.2	43.17	43	503.4	80.18	34	672.9	82.91
Three-eighths breds, average	48	63.5	10.61	48	377.9	43.41	43	493.8	82.60	35	683.0	80.23
Three-eighths, 2nd generation	15	63.1	13.20	15	374.3	44.53	14	478.2	73.19	9	685.9	74.54
	AT TWO YEARS			AT THREE YEARS			AT FIVE YEARS			AT SIX YEARS		
Half-breds, 1st gene- ration	29	895.9	101.44	22	1 011.7	118.88	20	1 032.5	96.81	18	1 047.8	85.03
Quarter-breds, average	56	878.7	76.92	34	895.1	83.93	30	968.7	102.50	25	979.0	125.40
Quarter-breds, 2nd generation	9	757.2	93.11									
Three-eighths breds, average	13	801.5	98.96	5	913.0	84.08	4	955.0	79.27	4	978.9	42.50

Source: Baker and Black, 1950. * S. D. - Standard Deviation

Table 11. Average Beef Production Data for Cross-Bred Steers of Brahman-Angus Breeding Fed to a Final Weight of 750 Pounds

ITEM	Half-bred 1st gen.	Half-bred 2nd gen.	Three- eighths - bred, 1st gen.	Quarter - bred back cross gen.
Steers, number	15.0	5.0	7.0	22.0
Birth weight, in pounds	71.0	65.0	59.0	62.0
Weaning weight, in pounds	454.0	453.0	435.0	444.0
Gain from birth to weaning, in pounds	383.0	388.0	376.0	382.0
Age when weaned, in days	232.0	227.0	252.0	237.5
Daily gain to weaning, in pounds . .	1.70	1.71	1.49	1.61
Final weight, in pounds.	754.0	754.0	748.0	752.0
Cold carcass weight, in pounds . . .	414.0	411.0	384.0	411.0
Gain on feed, in pounds	299.0	300.0	313.0	308.0
Period on feed, in days.	235.0	233.0	261.0	257.0
Daily gain on feed, in pounds. . . .	1.27	1.29	1.20	1.20
Efficiency ¹	11.32	11.32	10.86	10.45
Carcass grade ²	19.0	18.8	17.1	17.8
Carcass yield ³ , percent	54.91	54.51	51.37	54.64
Age at slaughter, in days.	467.5	459.2	513.0	494.1

Source: Baker and Black, 1950. ¹ Gain per 100 pounds' digestible nutrients consumed. ² Prime, 1 to 6; Choice, 8 to 12; Good, 14 to 18; Commercial, 20 to 24; Utility, 26 to 30; Cutter, 32 to 36. ³ Based on cold-carcass weights divided by final weights.

Table 12. Summary of Heat-tolerance Results for Females in Brahman-Angus Cross-Bred Lines

BREEDING GROUP	HEIFERS				MATURE COWS			
	YEARLINGS		2 YEARS OLD		DRY		LACTATING	
	Num- ber	Heat tolerance, coefficient	Num- ber	Heat tolerance coefficient	Num- ber	Heat tolerance coefficient	Num- ber	Heat tolerance coefficient
Half-breds	12	81.25	11	86.45	13	87.77	32	84.66
Quarter-breds . . .	84	80.06	63	85.46	23	89.31	49	83.63
Three-eighths breds	47	80.98	32	86.34	10	88.85	15	84.80

Source: After Baker and Black, 1950. ¹ A low heat-tolerance coefficient signifies a high body temperature; a high coefficient, a low body temperature.

The Santa Gertrudis breed of beef cattle evolved in the

United States of America has Kankrej (Guzerat) blood in its make up (Rhoad, 1949).

Formosa

During Japanese occupation of the island, Kankrej cattle were imported during 1921 and subsequent years. As draft animals they are greatly appreciated by the Formosan sugarcane farmers.

Mauritius

Sugarcane estate owners imported Kankrej particularly for the production of draft animals, but no data have been published regarding the results.

Sources of Breeding Stock and Information Regarding the Breed

It is estimated that there are approximately 500,000 Kankrej cattle in Gujarat (Bombay State) in a total population of 1,300,000 cattle. The number is steadily increasing. The following may be contacted for further information regarding the breed and the availability of stock:

1. - Livestock Expert to the Government of Bombay, Poona, India;
2. - Director, Institute of Agriculture, Anand, Bombay, India;
3. - Animal Husbandry Commissioner to the Government of India, New Delhi, India;
4. - Secretary, Kankrej Cattle Breeding Society, Sanand, Ahmedabad District, India.

In Brazil, where some pure stock is maintained, the following agencies may be contacted for further information:

1. - Departamento de Producao Animal, Divisao de Zootecnia, Postal Box 215-B, São Paulo, Brazil;
2. - Sociedade Rural do Triangulo Mineiro, Postal Box 39, Uberaba - Minas Gerais, Brazil.

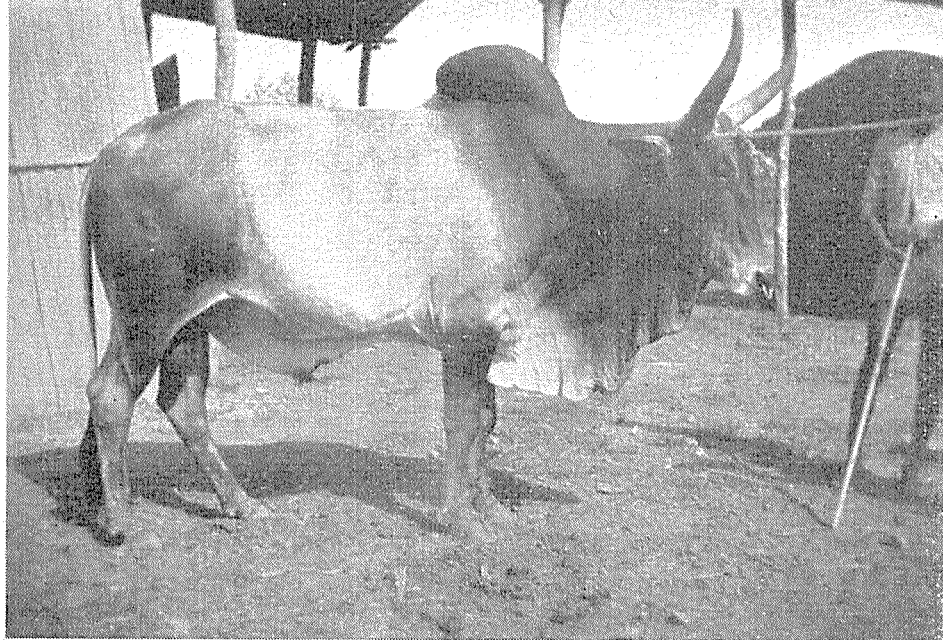
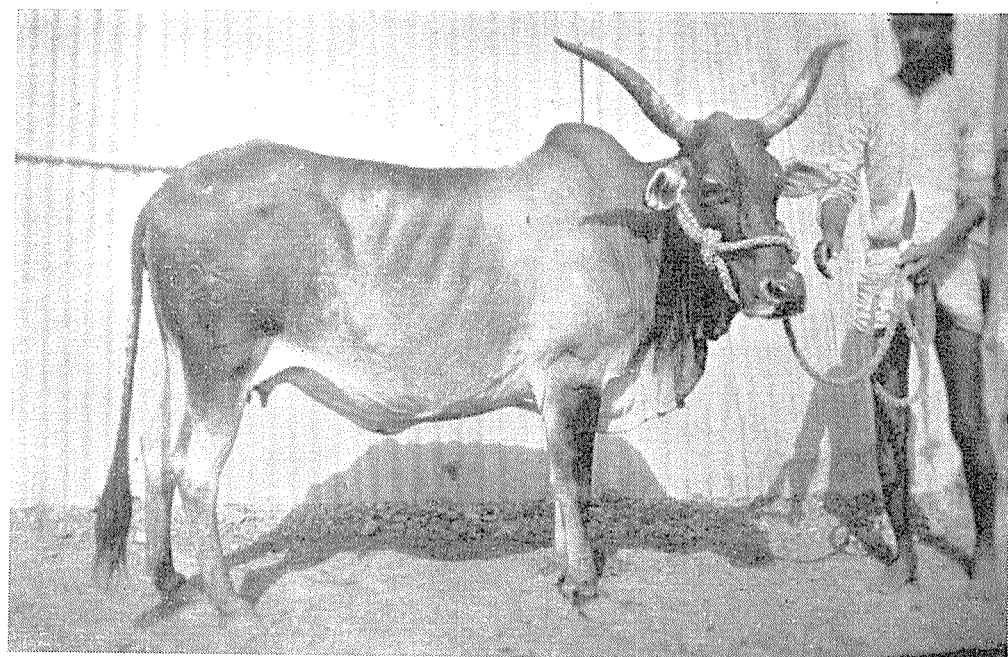


FIGURE 16. Kenwariya or Kenkatha cattle, bred beside the river Ken, resemble the Malvi breed. Left: a Kenwariya bull.



Right: a Kenwariya cow: they are poor milkers.



Left: a herd of Kenwariya cattle: they are small, sturdy and powerful draft animals.

KENWARIYA

Origin

The Kenwariya cattle¹, also known as Kenkatha, take their name from the River Ken, for they are bred along the banks of this small river in the hilly area of Bundelkhand. The River Ken originates in Vindhya Hills and flows through parts of Madhya Pradesh near Damoh, then enters the Banda district of Uttar Pradesh and joins the River Yamuna. Cattle of the Kenwariya type are also bred in the territories of Panna, Charkhari, Bijawar and Ajaigarh which are part of Vindhya Pradesh. As Malvi cattle are found extensively in Saugor and Damoh districts of Madhya Pradesh which is so near the Kenwariya tract, it seems reasonable to assume that Kenwariya cattle are related to Malvis in this area.

Conditions in the Native Home of the Breed

Location, Topography and Soils

The area where the breed is prevalent lies approximately between 78°5' and 81°0' east longitude and between the Tropic of Cancer and 26° north latitude. It is a rugged area transversed by the ranges of the Vindhya Hills, which never rise more than 2,000 feet above sea level. The Bundelkhand area lying southwest of the River Yamuna is non-alluvial in nature, the soils having been formed by the disintegration of the Central Indian hills, while sandstones, limestones and slates are extensively found.

Three types of soils are commonly found in the area. One type is reddish brown in color and very coarse-grained: it is shallow in depth and is poor in plant nutrients, and is usually found on high-lying areas where it produces very poor crops. The second type is brown in color, with greater depth, and is usually underlaid with a zone of calcium carbonate accumulation: it is suitable for cultivation provided manuring and irrigation facilities are available. The third type is dark brown to black in color and is the most fertile soil of the locality.

¹ See Figure 16.

Climate

During the summer, which extends from March to September, the maximum temperatures during the day are likely to exceed 115°F. during the months of May and June. Winters are comparatively mild. Air movement throughout the year is rapid. The average rainfall of the area is 35 to 40 inches. Most of the rainfall is concentrated during the months of July and August. The growing season of the grasses is thus short and they become coarse very quickly.

Vegetation

The whole of the area is known as a millet-growing area. *Andropogon sorghum* and *Pennisetum typhoideum* are extensively grown, also small millets such as *Panicum frumentaceum* and *Paspalum scrobiculatum* are on the poorer soils. Barley, wheat and oil seeds are grown as winter crops in the more fertile areas. A number of pulses such as *Cicer arietinum*, *Cajanus cajan*, *Ervum* (*Lens esculenta*), *Phaseolus mungo* and *P. aconitifolius* are also grown. Straws and husks from these crops are utilized as cattle feeds.

Management Practices

Only a few animals are maintained by each cultivator. Cows and young stock are maintained on grazing only which is scanty and generally consists of coarse grasses of low nutritive value. Bullocks are usually fed good quality straws.

Physical Characteristics of the Breed

The Kenwariya cattle are small, sturdy and fairly powerful, varying in color from gray on the barrel to dark gray on the rest of the body. The head is short and broad and the forehead is dished. Horns emerge from the outer angles of the poll in a markedly forward direction and terminate in sharp points. Ears are sharply pointed and do not droop. The body is short, deep and compact. The back is straight but the quarters are drooping. The limbs are short but powerful and the feet are hard. The hump is well-developed. The sheath is somewhat pendulous and ends with a black tip. The dewlap is moderately heavy. The tail

is of medium length with a black switch reaching below the hocks. Some physical measurements of animals of this breed are summarized in Table 13.

Table 13. Average Measurements of Kenwariya Cattle

MEASURE	MALE			FEMALE			Ox
	1 yr	2 yrs	Ma- ture	1 yr	2 yrs	Ma- ture	Ma- ture
Weight, in pounds	266	408	768	185	254	654	710
Length from shoulder point to pinbones, in inches	32	43	47	30	36	45	46
Height at withers, in inches	39	45	50	38	39	52	50
Depth of chest, in inches	10	11	18	8	10	16	17
Width of hips, in inches	11	18	20	11	12	17	18
Heart girth, in inches	50	56	70	43	46	66	68

Data collected by the Mechanized State Farm, Saidpur, District Jhansi, U.P.

Functional Characteristics of the Breed

Kenwariya animals are very popular for light draft on the road and for cultivation. They are observed to thrive on poor feed. On account of the hilly nature of the region and the poor grazing, only animals which can cover long distances and have strong feet can thrive under such rigorous conditions. Very little factual information is available at present on the functional characteristics of this breed.

Performance in Other Areas

The breed is restricted to the territory mentioned above.

Sources of Breeding Stock and Information Regarding the Breed

The Raja of Ajaigarh has contributed a great deal to the development of the breed in his territory. Further information regarding the breed may be had from the :

1. - Animal Husbandry Commissioner, Government of India, New Delhi, India;
2. - Animal Husbandry Commissioner to the Government of Uttar Pradesh, Lucknow, India.

KHERIGARH

Origin

Kherigarh cattle ¹ are closely allied to the Malvi breed (Anonymous, 1908). The Kherigarh breed is mostly found in the Kheri district of Uttar Pradesh, India. Though the horn formation is typical of the lyre-horned Malvi type, the animals of the breed are much lighter in general appearance than the Malvis.

Conditions in the Native Home of the Breed

Location, Topography and Soils

The Kheri district of Uttar Pradesh is located between 27°4' and 28°4' north latitude and between 80°2' and 81°2' east longitude. The district is bounded on the north by the River Mohan, separating it from Nepal, on the east by the Bahraich district and on the west by the district of Pilibhit. The district is studded with many lakes, while in the southwest area there are large shallow swamps.

Kheri is divided by the rivers which flow through the area into different tracts of varying conditions. The southwest region between the Rivers Sukheta and Gomti consists of fertile loam soils. The area between Gomti and Kathna is sandy and is called the Parehar tract: here the best Kherigarh cattle are bred. The most fertile part of the district is along the banks of the River Sarda in the northern region. The predominant soil consists of deep alluvium with occasional nodular limestone.

Climate

It is a submontane area having high humidity. During the summer months of May and June the maximum day temperature may go as high as 110° to 115°F. During the winter months the minimum temperatures rarely go below 35°F. The mean annual temperature is around 79°F. Annual rainfall ranges between 45 and 65 inches. In the northeast portion the rainfall is heavier.

¹ See Figure 17.

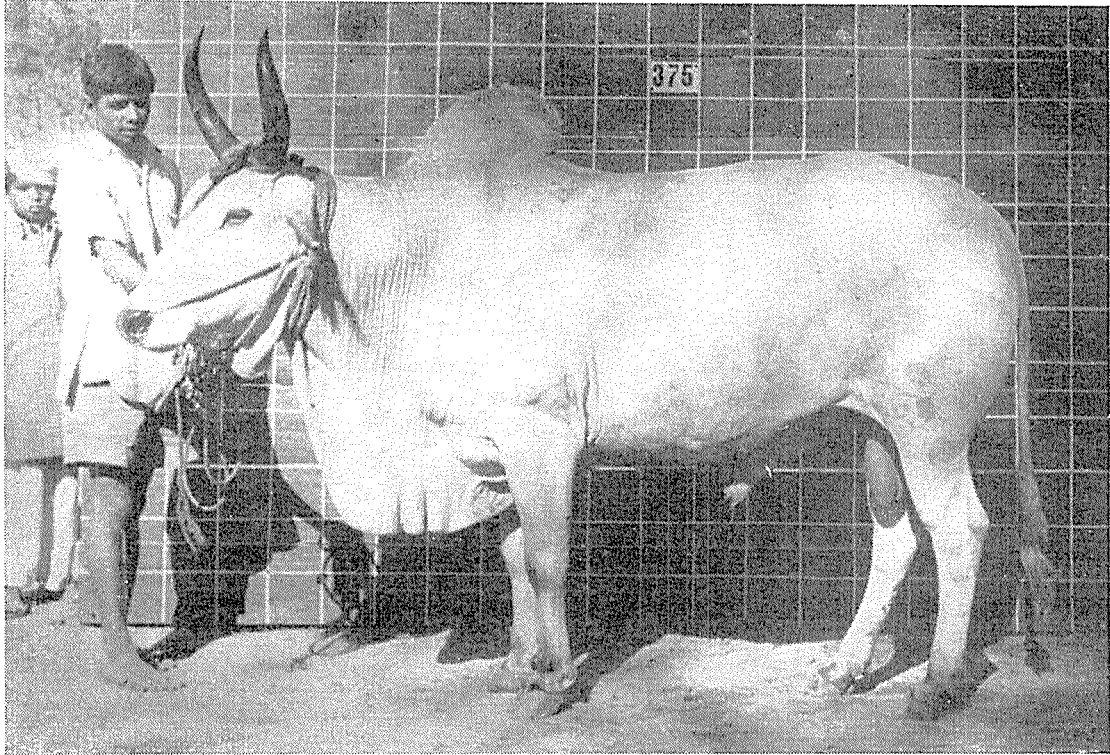
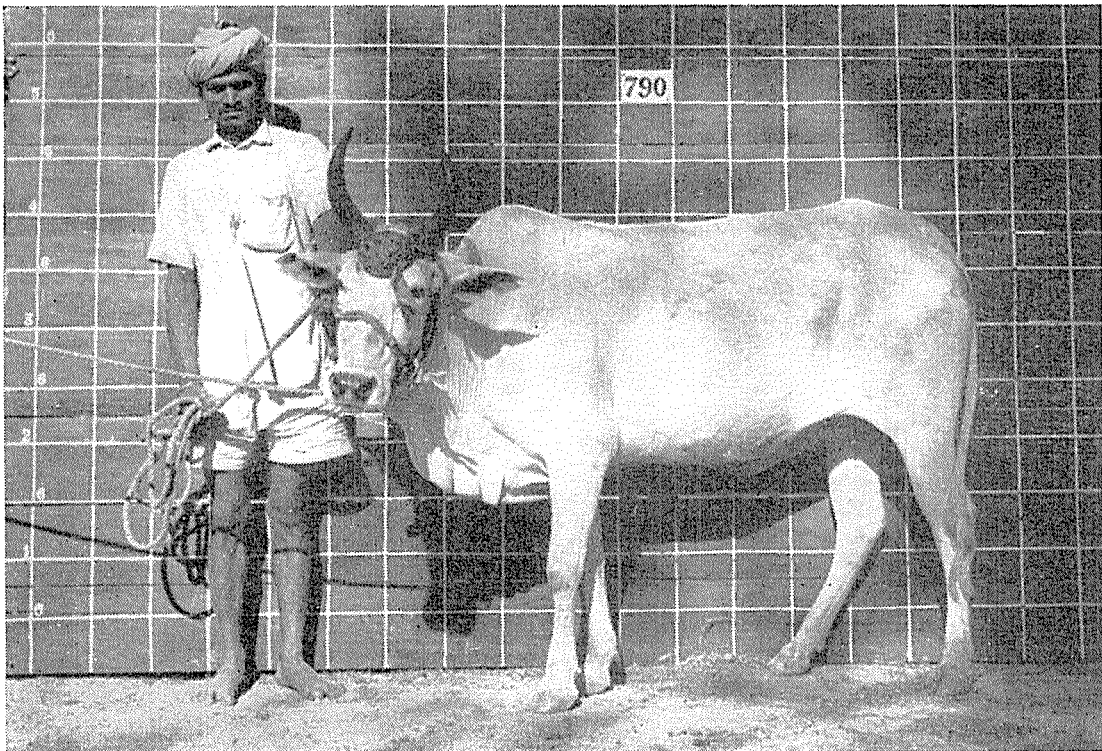


FIGURE 17. The Kherigarh breed is closely allied to the Malvi: it is found in Uttar Pradesh. The animals are active and good for light draft work, but the cows are poor milkers. Above: a Kherigarh bull.
Below: a Kherigarh cow.



Vegetation

The district contains the luxurious vegetation typical of the damp submontane tract. Sugarcane is grown extensively and, among other field crops, rice, maize, wheat, barley, chickpeas, lentils and oilseeds such as mustard and rape are largely grown. On account of favorable rainfall and availability of water from lakes and rivers for irrigation, large portions of agricultural land yield two crops per year. The region has an abundance of coarse grasses and most of the cattle are maintained on grazing.

Management Practices

As the Kheri district supplies large numbers of draft bullocks to the Oudh and Gorakhpur areas of Uttar Pradesh, breeders take great care in rearing male calves. The animals are maintained primarily on grazing. During the hot season large herds are moved into the pasture areas of Nepal for grazing. The cows, being very poor milkers, are not given much attention.

Physical Characteristics of the Breed

Kherigarh cattle are generally white or gray in color. The face is small and narrow. Horns are thin and upstanding and measure 12 to 18 inches in length in bulls; cows usually have smaller horns. The ears are small and the eyes bright. The neck is short and looks powerful. The hump is well-developed in bulls. The dewlap is thin and pendulous and starts from right under the chin and continues right down to the brisket. The barrel is broad and deep. The sheath is short and moderately tight. Limbs are light. The tail is long, ending in a white switch.

Functional Characteristics of the Breed

The cattle of this breed are very active and thrive on grazing only. The bullocks are good for light draft and quick, light transport. The cows are poor milkers. The Government of Uttar Pradesh maintains a large herd of these cattle, but very little information has been obtained on their functional characteristics. It has been observed that the animals mature late and heifers first produce calves when they are about 5 years of

age. Bullocks of this breed are in great demand for light cultivation in the eastern districts of Uttar Pradesh. They are particularly prized by cultivators for their endurance.

It is estimated that they start work when they are about 4 years of age and weigh about 600 pounds. It is claimed that a pair of bullocks can haul about 1 1/2 tons of load in a cart to a distance of 30 to 35 miles in a day traveling at times 3 to 4 miles per hour.

Performance in Other Areas

Bullocks of this breed are used in some of the Eastern districts of Uttar Pradesh, but no factual data are available on their performance in comparison with other breeds or types.

Sources of Breeding Stock and Information Regarding the Breed

There are large numbers of cattle in this region of the general conformation and type known as Kheri. Further information regarding the breed may be obtained from the:

1. - Animal Husbandry Commissioner to the Government of India, New Delhi, India;
2. - Animal Husbandry Commissioner to the Government of Uttar Pradesh, Lucknow, U.P., India.

MALVI

Origin

Olver (1938) classifies the Malvi¹ among the grayer, lyre-horned type represented by Kankrej cattle. He mentions that the large Malvi breed resembles the Kankrej in some respects though the horns are inclined more forward in the Malvis than in the Kankrej. He further states that it seems probable that there is a mixture of types in this breed but the face and horns

¹ See Figures 18 and 19.

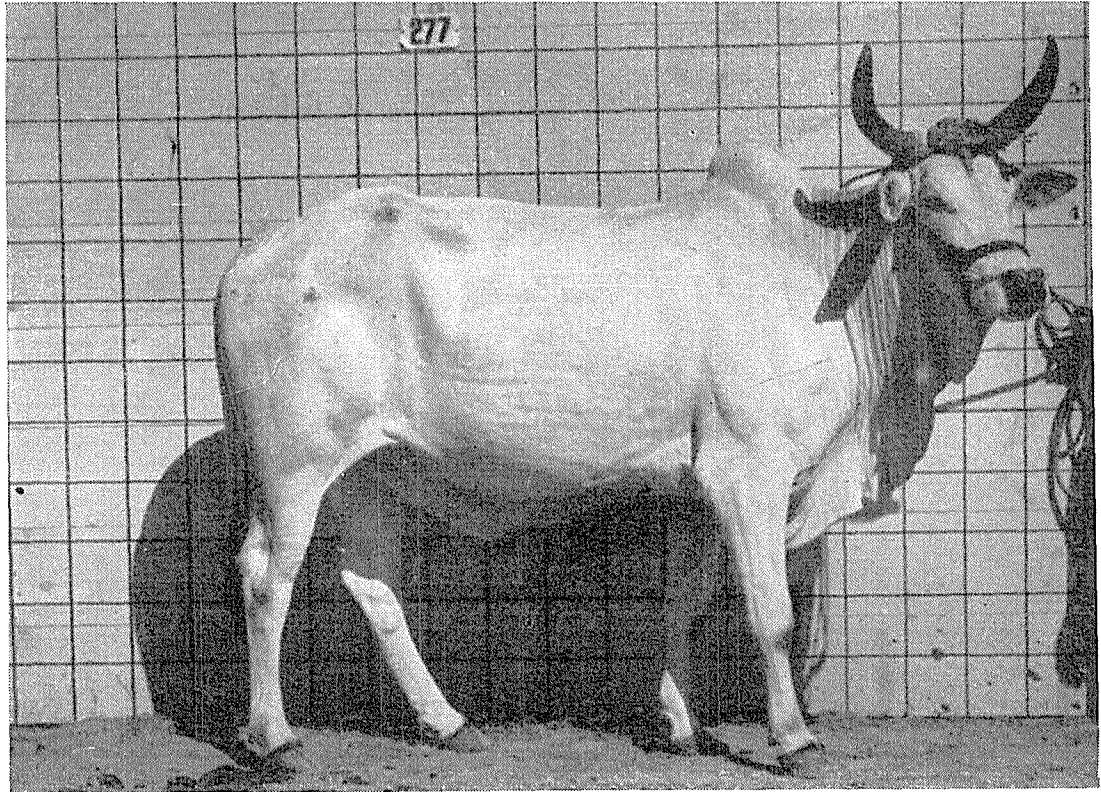


FIGURE 18. A Malvi bullock. The breed produces massive, compact animals good for draft work.

appear to be sufficiently similar to indicate some relationship to the Kankrej. Olver has also drawn attention to the resemblance between the Kankrej breed and the animal depicted on the seal which was recovered from the Mohenjo-daro site (estimated to be of 3,000 B.C.) but Ware (1942) thinks that the resemblance is even more striking between the animal on the seal and the lyre-horned Malvi breed.

Phillips (1944) classifies Malvis among the lyre-horned gray cattle with wide foreheads, prominent orbital arches, the face having a flat or dished-in profile. He also lists Kenwariya and Kherigarh in the group with the Malvis. Taking into consideration close similarity between these two latter breeds and Malvis and the geographical proximity of the habitat of these breeds it seems that possibly these latter two breeds are mere strains of the same stock represented by the Malvis.

The Malvi is primarily a draft breed which has developed into different strains which are heavy, light or medium in size, depending on soil conditions. For example, the Umatwara

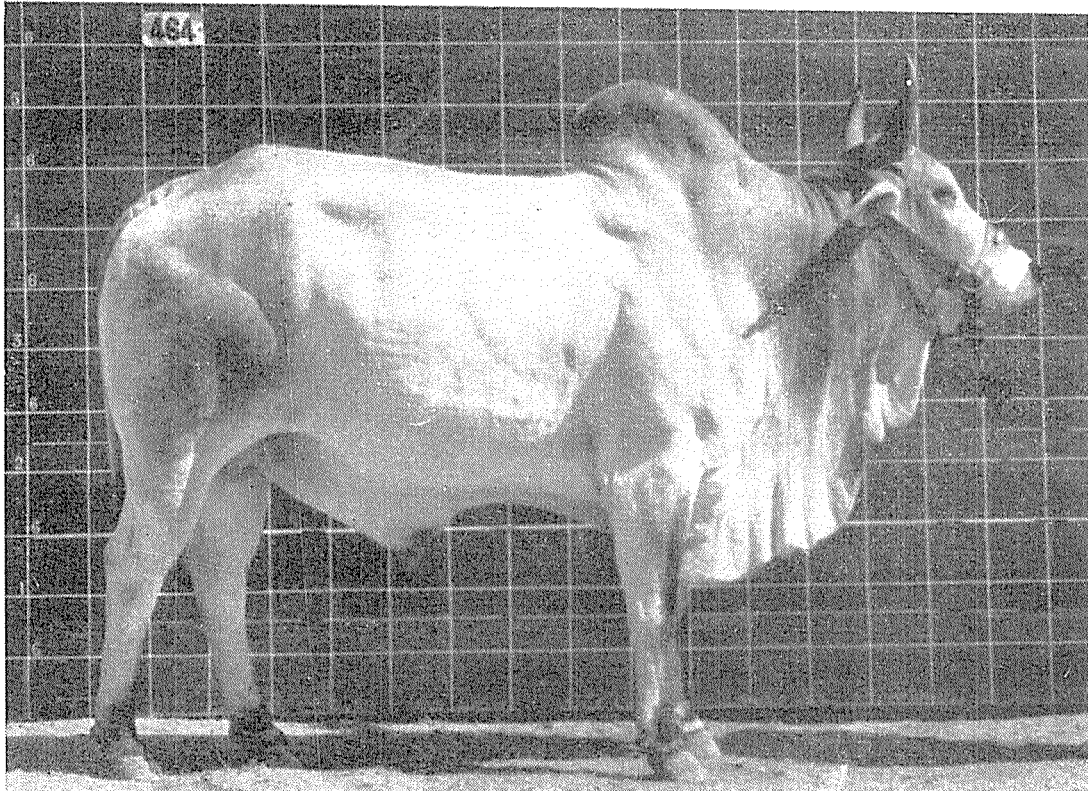
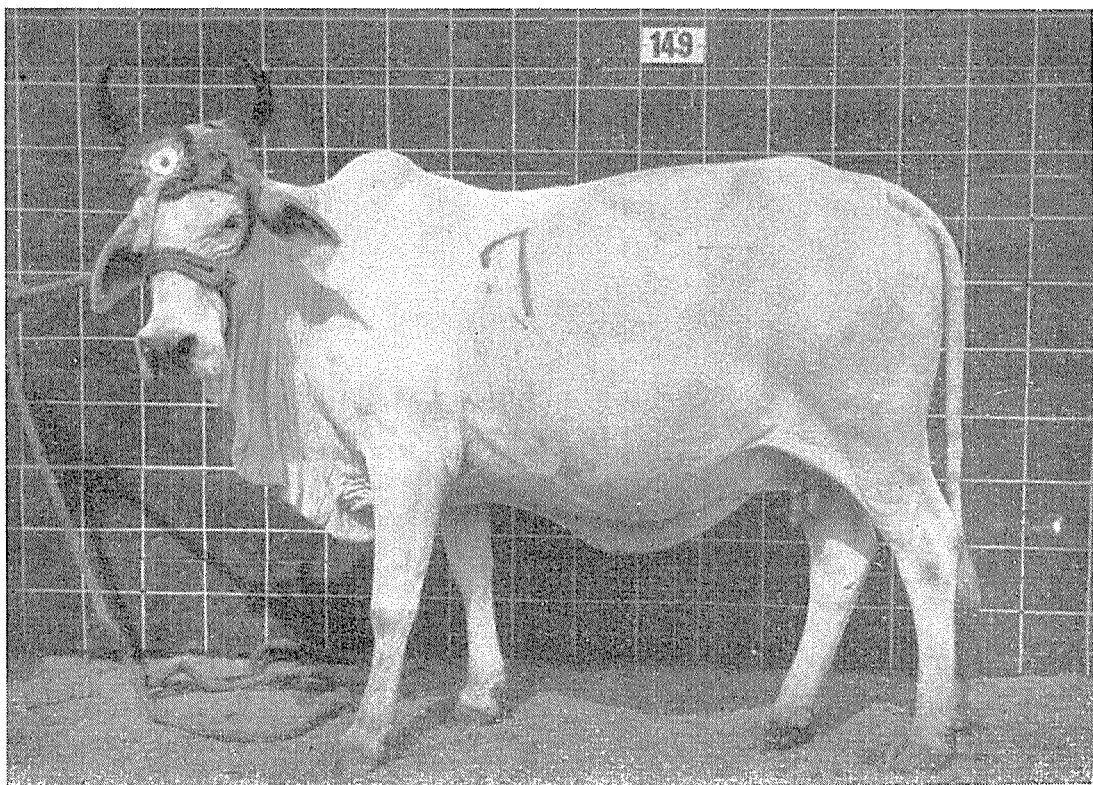


FIGURE 19. The Malvi is a Central Indian breed with variation in type in different areas: the cows are poor milkers. Above: a Malvi bull.
Below: a Malvi cow.



strain bred in Rajgarh and Narsingharh areas is a slightly heavier type while the type towards Saugar is light. These cattle are mainly bred in the Malwa tract of Madhyabharat State. In the western parts adjoining Rajputana the type bred is larger in size. In parts of Madhya Pradesh where Malvis are bred, it is smaller in size. It is also bred in the northeastern section of Hyderabad state, where it is a popular breed for medium and light draft on the roads and for cultivation.

Conditions in the Native Home of the Breed

Location, Topography and Soils

The area where Malvis exist lies between 22°4' and 25°9' north latitude and 74°3' and 78°5' east longitude. It consists of two parts, the Malwa plateau proper, and the adjoining hilly tract of Vindhya hills to the east. The plateau has an average altitude of 1,600 feet above sea level, but the higher plateau land consists of vast rolling plains with flat-topped hills scattered over their surface. Some of these hills rise to about 3,000 feet above sea level. The area has a number of rivers such as Betwa, Chambal, Kalisind, Mahi, Parbati, Sipra, Tons, Ken and Dhasan. Most of these rivers take a very precipitous route and during the monsoon cause extensive erosion. The majority of these flow northwards and westwards and join either the Yamuna or the Ganges rivers in the north.

The major portion of the area is covered with fertile black cotton soil of the heavy loam type. Lighter soils with greater proportion of sand are also prevalent.

Climate

The Malwa plateau on the whole has a dry, moderate climate. During the summer, which extends from March to June, the day temperatures during the hottest parts of May go as high as 105°F., but being dry, are not oppressive. Nights are normally pleasant with plenty of cool breeze. Meteorological observations representing averages of 25 years taken at Nimach and Indore,

and typical of the area for the months of January, May, July and November are presented in Table 14.

Table 14. Meteorological Observations Representing Averages of 25 Years for the Months of January, May, and November for Nimach and Indore

	Height, feet	JANUARY		MAY		JULY		NOVEMBER	
		Mean temp. F.	Diurnal range	Mean temp. F.	Diurnal range	Mean temp. F.	Diurnal range	Mean temp. F.	Diurnal range
Nimach . .	1 636	63.0	28.6	90.5	26.7	81.0	13.6	70.0	29.5
Indore . .	1 820	64.4	29.4	89.4	26.8	78.9	12.3	68.9	29.1

Average climatological data for the Malwa Tract are summarized in Table 15.

Table 15. Climatological Data for Malwa

MEASURE OF CLIMATE	AVERAGE DATA BY MONTH											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean maximum temp. °F . . .	79.3	82.8	91.2	99.2	104.4	97.3	85.6	84.1	85.9	88.7	83.6	79.0
Mean minimum temp. °F . . .	49.8	54.6	61.9	71.3	79.0	77.5	74.1	73.2	72.1	65.2	45.2	49.5
Mean daily rela- tive humidity per cent at 0800 hours	57.0	52.0	35.0	27.0	34.0	66.0	88.0	88.0	84.0	61.0	57.0	61.0
Rainfall, in inches	0.24	0.15	0.34	0.22	0.57	5.93	8.89	7.77	7.09	1.3	0.29	0.20

Source: Indian Meteorological Department Government, of India, New Delhi.

Vegetation

The tract is highly cultivated; where no grain has been planted the land is covered with heavy fields of grass affording excellent grazing to cattle. Grazing is also available in areas which are

preserved as forest areas. During the rains the grasses grow fast but the growing period is limited to about 3 to 4 months. The principal cultivated crops are sorghum, maize, millets, *Cajanus cajan*, *Panicum frumentaceum*, *Paspalum scrobiculatum*, *Phaseolus mungo*, *Cicer arietinum*, wheat, lentils, barley and various oil seeds such as linseed, sesamum, mustard and groundnut. By-products from these are utilized as cattle feed.

Management Practices

As every village carries some area reserved for grazing, villagers take their cattle during the daytime to these areas and bring them back to the village folds in the evening. The animals are given supplementary feed such as straw or hay. Only bullocks are given concentrates. Wherever well irrigation is available fodder crops such as sorghum, maize or *Cicer arietinum* are grown for feeding only good animals.

Physical Characteristics for the Breed

Malvi cattle have short, deep and compact bodies. The back is straight but the hindquarters are drooping. The legs are powerful but short and the hooves are strong and black in color. The dewlap is well-developed and the sheath is moderately pendulous. The head is short and broad with dished forehead. The hair around the eye sockets and the eye membranes are black in color. The muzzle is broad, dark colored and slightly upturned. The horns, which emerge from the outer angles of the poll in an outward and upward direction, are strong and pointed. The ears are short and pointed and not drooping. The tail is of moderate length with a black switch reaching to about the fetlock. The color is gray, deepening in the mature male to a dark iron gray almost black on the neck, shoulders, hump and quarters. The cows and bullocks eventually become nearly pure white with age.

Functional Characteristics of the Breed

The breed is well-known for its draft qualities. It is observed to be good on the road for quick transportation. Also the

bullocks work well in the black cotton soil. They show great endurance and ability to carry heavy loads on rough roads. The cows in the village areas are observed to be poor milkers but selected cows on the farm show that they can produce 2,000 to 2,700 lbs. of milk per lactation. Average milk production of Malvi cows at the government farm at Hyderabad has been 2,311 lbs. of milk in 300 days with 175 dry days (Anonymous, 1950). The average age at calving has been observed to be 3 years and 3 months, with a calving interval of about 16 to 18 months.

Performance in Other Areas

The breed has not been exported to other areas, hence no specific information is available on this point. Besides its native home of Malwa the breed is found in the northwest area of Hyderabad State, in the areas around Sangor district of Madhya Pradesh extending up to the borders of Uttar Pradesh and also towards Bundelkhand area.

Sources of Breeding Stock and Information Regarding the Breed

The estimated population of Malvis is around 4,950,000 (Anonymous, 1946). For further information regarding the breed and its availability the following may be contacted :

1. Animal Husbandry Commissioner to the Government of India, New Delhi.
2. Director, Veterinary Services, Madhya Pradesh, Nagpur, India.
3. Director of Veterinary and Animal Husbandry Department, Madhya Bharat, Gwalior, Madhya Bharat, India.
4. Director, Veterinary Department, Hyderabad Government, Hyderabad, India.

THARPARKAR or THARI

Origin

The breed came into prominence during the first World War when some animals were taken to supply milk for the Near East army camps. Here their capacity for production under rigorous feeding and unfavorable environmental conditions at once became apparent. Since then many breeding herds have been assembled in India and Pakistan.

In India and abroad, these cattle are known as Tharparkar ¹ since they come from the district of that name in the Province of Sind. The Tharparkar is, however, known differently in its own region. In its native tract and the areas neighboring on it, the breed is called Thari ², after the desert of Thar; and it is also occasionally known as Cutchi, because the breed is also found on the borders of Cutch which adjoins Tharparkar to the south. Then again, in the past these cattle have been known as White or Gray Sindhi, since they are native to the Province of Sind and akin in size to the Red Sindhi: this name, however, is no longer used.

Conditions in the desert area have always been precarious and the cattle of the area have migrated to the surrounding richer areas, while, whenever there is a good year and grass is plentiful in the Thari area, cattle from the surrounding Sindhi, Kankrej and Nagori country have come in and thus influenced the Thari breed. The influence of the Kankrej blood, however, has been most predominant because of the breeders' preference for this type, and also, as one legend goes, the Thari breeders of Badin, a village in the south of Thari, lived for some generations in Radhanpur State and later migrated to Badin and brought with them fine Kankrej cattle from Radhanpur occasionally also known as Wadhiyar (Anonymous, 1926 (f)). Kankrej cattle are also stated to have been brought from Palanpur agency by the Thari nomads.

Though the Kankrej influence is predominant, the influence of other breeds is evident depending on the location of the herds. This is emphasized by Williamson (1947) who observed that the

¹ See Figure 20.

² See Figure 21.

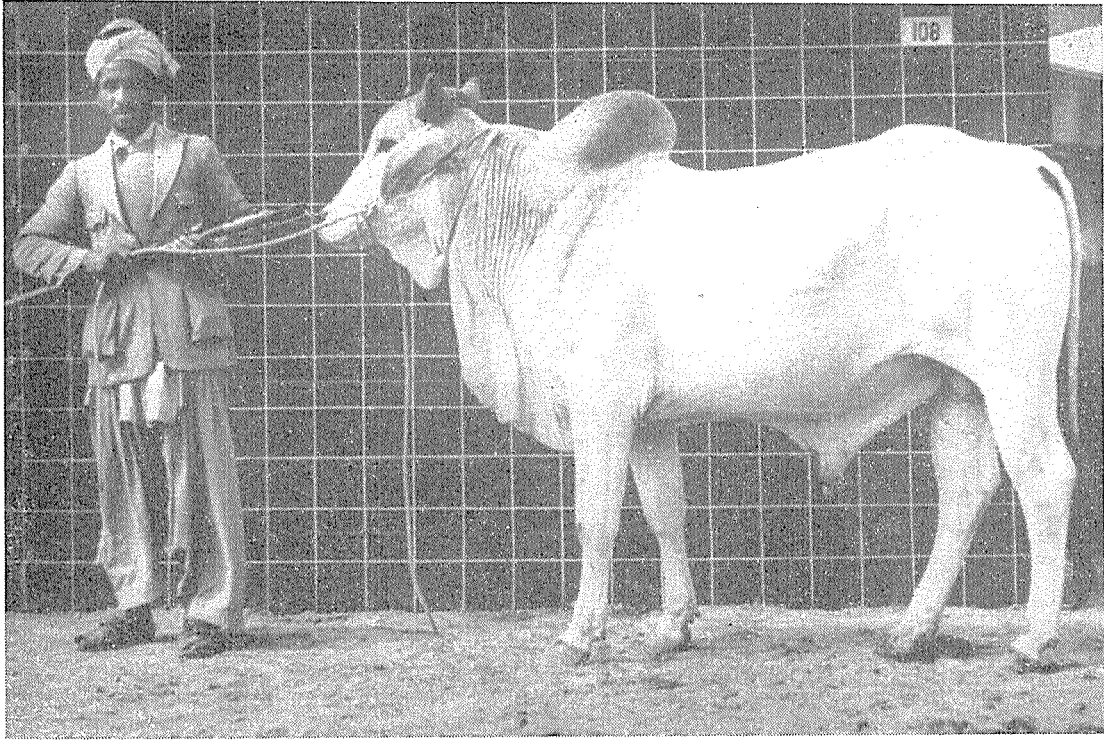
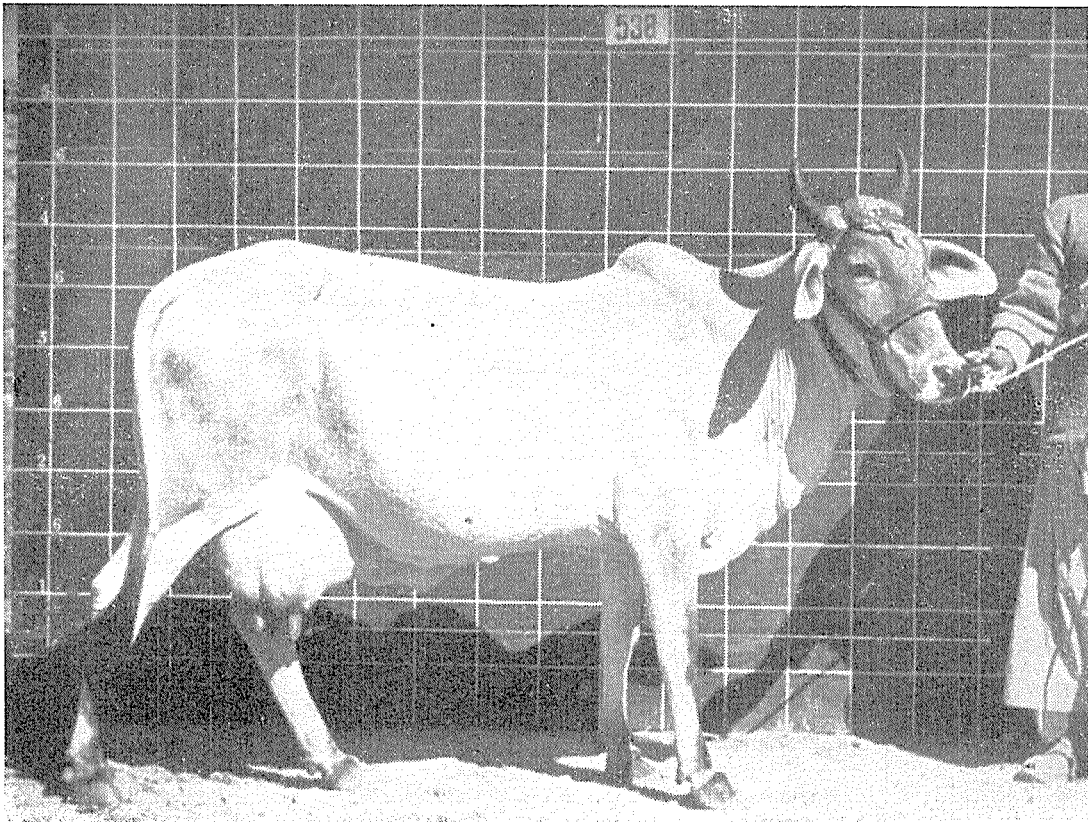


FIGURE 20. Tharparkar cattle are found in the desert of Thar, Sind, Pakistan, and also in Kutch, Jodhpur and Jaisatmer, India. They are of medium size and compact, useful as draft animals and the cows are fair to good milkers. Above: a Tharparkar bull. Below: a Tharparkar cow.



Thari is not a homogeneous breed, but that it has the influence of the Kankrej, Red Sindhi, Gir and Nagori breeds. He points out that in the Thari area, towards the western side, the influence of the Red Sindhi is prominent. Towards the northern and north-eastern side the Nagori influence is naturally detected. In other parts Kankrej influence is predominant. A sprinkling of Gir influence is also evident. In spite of this heterogeneity that one finds, the Thari breeders appear to have successfully developed a medium type which is a fairly good milk producer under the poor feeding conditions of the desert area and has great power of endurance and resistance to famine and drought, and which has ability to cover long distances under desert conditions.

It is observed that the typical Thari cattle are found in the areas in the vicinity of Umarmkot, Naukot, Dhoro Naro, Chhor, Mithi, Islamkot and Khari Ghulam Shah. They are also produced in the adjoining Indian States of Jodhpur, Jaisalmer and Cutch.

Conditions in the Native Home of the Breed

Location, Topography and Soils

The district of Tharparkar in the southwest portion of Sind Province of Pakistan lies between $24^{\circ}13'$ and $26^{\circ}2'$ north latitude and $68^{\circ}40'$ and $71^{\circ}11'$ east longitude. However, it is the eastern portion of the district which constitutes the Thar desert and is the native home of the Thari breed. The Thar desert region is a vast sparsely populated area measuring about 8,000 square miles. It is bounded on the south by the treeless desert Rann of Cutch, on the west by the alluvial plains of Sind, on the east and northeast by the States of Jaisalmer and Jodhpur of Rajasthan, India, and on the north by the district Nawabshah and Hyderabad.

The whole area consists largely of sand dunes running parallel from southwest to northeast. These dunes or ridges are locally known as *bhits*. Fine sands from the deltaic regions and Rann of Cutch are blown over during the long, hot, windy season towards northeast forming long ridges or dunes in its course. The origin of a ridge usually is a bush or other obstruction which arrests the sand to windward and shelters it to leeward. Once formed, the ridge itself becomes the obstruction and grows as it began with a gentle slope on the side facing the wind and an

abrupt fall on the other. The ridges are naturally irregular and only roughly parallel so that they often enclose sheltered valleys, above which they rise to a height of 100 to 300 feet. These valleys are frequently moist enough to admit cultivation and, when not cultivated, yield crops of grass.

On the sand hills very little rain suffices to sustain a surprising amount of vegetation consisting of *Salvadora*, *Acacia*, types of mimosa and other brush trees. Grasses also spring up with very little rain.

Climate

The desert area is comparatively healthy, being dry and cool. The southern area has a relatively mild, equable climate, while in the north the summers and winters are likely to be a little more severe. Frost is unknown. Temperatures as high as 120° F. have been recorded. The normal rainfall of the area is about 8 inches, most of it falling from July to September. During the months from March to June strong winds blow from the southwest over the desert area. Particularly during May the winds are apt to be violent. Heat, coupled with sand-laden winds, makes life very miserable during this period. Meteorological observations for Hyderabad, Sind, which is just outside the desert area but has very similar climatic conditions, are given in Table 16.

**Table 16. Meteorological Data for Hyderabad, Sind,
Representing Averages for 10 Years**

MEASURE OF CLIMATE	AVERAGE DATA BY MONTHS											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean maximum temp. °F . . .	75.8	81.2	92.5	101.8	107.0	104.5	99.3	95.8	97.3	97.8	88.8	78.6
Mean minimum temp. °F . . .	50.6	54.4	63.8	71.9	78.2	82.0	81.4	79.2	76.4	70.2	58.8	52.6
Mean daily rela- tive humidity per cent at 0800 hours	63.0	72.0	79.0	87.0	88.0	86.0	88.0	90.0	89.0	83.0	68.0	64.0
Rainfall, in inches	0.46	0.44	0.29	0.15	0.06	0.72	3.20	1.56	0.52	0.02	0.08	0.2

Observations taken by the Meteorological Department at Hyderabad, Sind.

Vegetation

In the desert area the rainfall is low and irregular. However, during a good rainy season several nutritious species of grasses spring up profusely and are grazed by cattle. The depressions between the dunes that exist in the area act as catchment areas for rain and are cultivated with quick-growing and drought-resistant crops such as *Andropogon sorghum*, *Pennisetum typhoideum* and *Cyamopsis psoralioides*. The dunes and other areas are covered with brushwood, several types of mimosa and also permanent bushes. Flowers, leaves and pods of *Acacia arabica* are extensively used for cattle feeding. Even the pods and seeds are stored for seasons of scarcity.

Management Practices

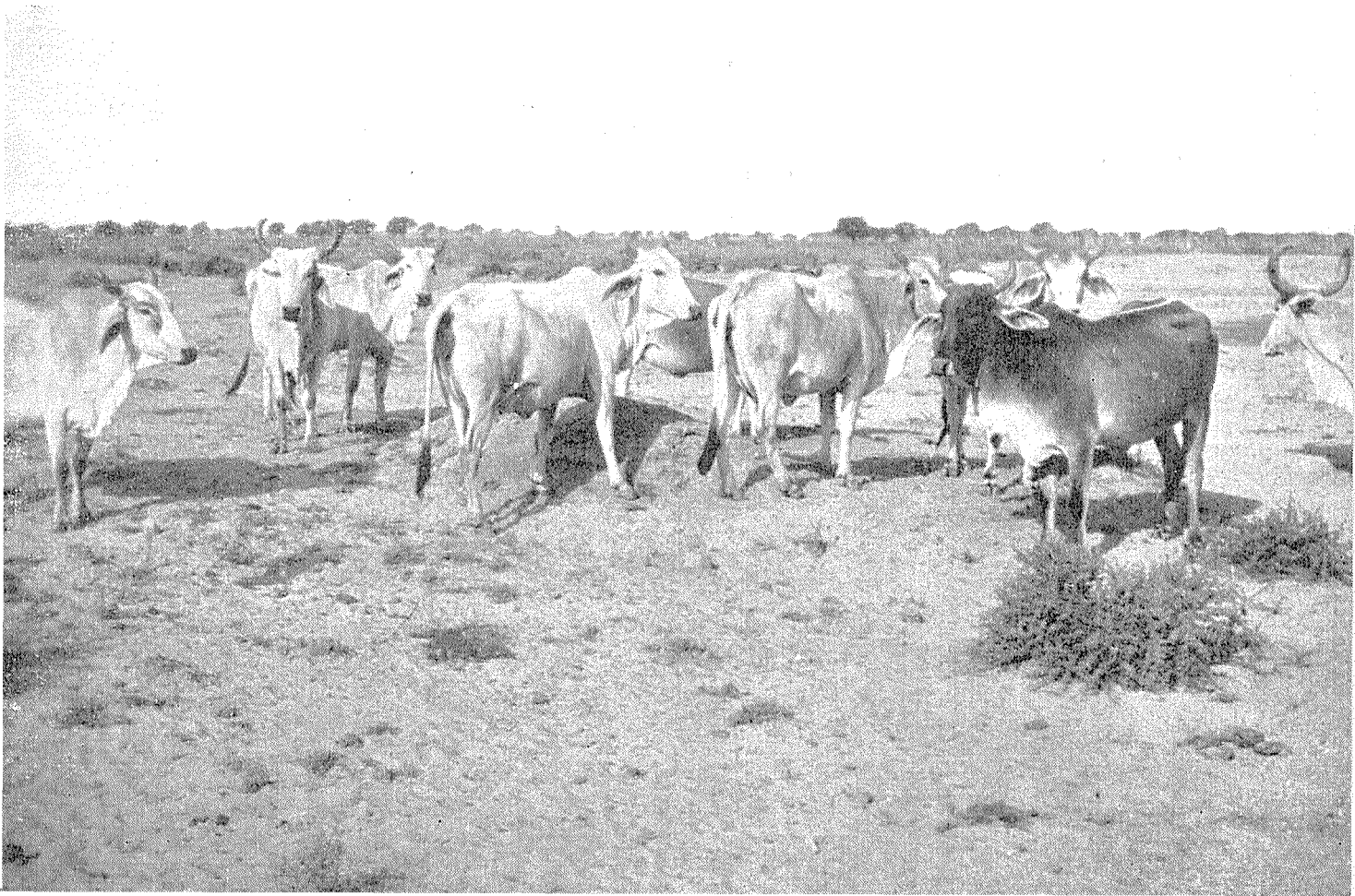
The management and feeding of Thari cattle differs in desert regions and in big villages and areas near towns. In the desert they remain in the open most of the time, feeding in the scrub grazing areas, coming to the village once a day in the morning for watering and milking purposes. The villages in these areas comprise a few straw huts located near a well. In these areas there are also some rainwater ponds where cattle go during the daytime, rest for a couple of hours and again go out for grazing. On the whole, however, watering places are too few and far between to serve as regular sources of water. Wells are deep, between 100 and 200 feet.

Stall feeding is not practised in the desert area, so the cattle subsist almost entirely on natural grazing available in the scrub forest areas. Leaves and stems of permanent bushes and shrubs and also loppings of trees like acacia are utilized for feeding cattle. Though famines are frequent, no systematic attempts are made to preserve grasses. This naturally causes heavy mortality among livestock during the famine years. By-products of cultivated crops such as millet (*Pennisetum typhoideum*) and *Cyamopsis psoralioides* are utilized for feeding during dry periods.

In the big villages and near towns there are professional cattle breeders known as Maldars who keep large herds of Thari cattle ranging from 50 to 300 head of cattle. The cattle are sent to the nearby grazing areas during the daytime but are brought



FIGURE 21. In their native home, Tharparkar cattle are known as Thari. They are observed to have some Kankrej blood. Above: Tharparkar bullocks and a bullock cart. Below: A herd of Tharparkars seer in a desert grazing area.



back to the villages or towns in the evening and are kept enclosed in an open space surrounded by thorny bushes. Milking stock is retained in these villages but dry stock is usually sent farther away in the desert areas where more grazing may be available.

Some of the Maldars follow agricultural pursuits and grow crops such as cotton, millets (*Pennisetum typhoideum* and *Andropogon sorghum*), wheat, pulses and cluster beans (*Cyamopsis psoraloides*). The cattle are allowed to graze on the residues of the harvested fields. Other breeders purchase grazing rights after the crops are harvested. During dry weather, Maldars feed their stock on stovers, straws and other by-products of crops.

Milking animals are usually given some concentrates such as crushed cluster beans, oil cakes and broken rice. Calves remain in the villages from birth to about 4 months, after which they are allowed to go for grazing, but are grazed separately and not with adult stock.

Physical Characteristics of the Breed

Average animals of the Tharparkar breed are deep, strongly built, medium-sized, with straight limbs and good feet, and with an alert and springy carriage. As the animals are not handled frequently they are apt to be wild and vicious.

The usual color of the cattle is white or gray. In males, the gray color may deepen, particularly on the fore and hind quarters. All along the backbone there is a light gray stripe. The color of the cattle deepens during the winter months and also when the cows are pregnant. In the Thari tract, in addition to white and gray coat color, black and red or combinations thereof are usually encountered on account of the influence of Red Sindhi and Gir, though breeders do not approve of these colors and usually discriminate against them.

The head is of medium size, the forehead broad and flat or slightly convex above eyes: the front of the horns and face are practically on one plane. The skin between the eyes is often wrinkled, the wrinkles running perpendicularly. The eyes are full and bright. The eyelashes are black and there is a small ring of black on the eyelids.

Ears are somewhat long, broad and semi-pendulous and face forwards. Length in males averages 12.44 ± 0.17 inches, while in

females it is 11.90 ± 0.17 inches. Width in the males averages 6.77 ± 0.22 inches, while in the females it is 6.51 ± 0.09 inches, according to Wahid (1952). Average data on certain body measurements are summarized in Table 17.

Table 17. Average Measurements of Tharparkar Cattle

MEASURE	At one year	At two years	Mature	
<i>Females</i>				
Weight, in pounds.				
Length from shoulder point to pinbones, in inches	37.31 ± 0.46 (10)	43.7 ± 0.99 (10)	52.46 ± 0.33 (25)	
Height at withers, in inches . .	39.85 ± 0.42 (10)	42.90 ± 0.51 (10)	49.70 ± 0.40 (25)	
Depth of chest, in inches . . .	19.35 ± 0.34 (10)	21.9 ± 0.16 (10)	25.54 ± 0.38 (25)	
Width of hips, in inches. . . .	11.15 ± 0.23 (10)	13.95 ± 0.25 (10)	17.86 ± 0.22 (25)	
Heart girth, in inches	47.10 ± 0.67 (10)	53.30 ± 0.95 (10)	65.22 ± 0.53 (25)	
MEASURE	At one year	At two years	Mature bull	Mature ox
<i>Males</i>				
Weight, in pounds .				
Length from shoulder point to pinbones, in inches	36.90 ± 0.78 (10)	47.50 ± 0.95 (10)	55.10 ± 0.49 (10)	56.64 ± 0.74 (10)
Height at withers, in inches	41.15 ± 0.38 (10)	46.90 ± 0.78 (10)	51.50 ± 0.39 (10)	53.45 ± 0.85 (10)
Depth of chest, in inches	19.29 ± 0.37 (10)	22.45 ± 0.41 (10)	23.85 ± 0.45 (10)	25.35 ± 0.45 (10)
Width of hips, in inches	11.25 ± 0.25 (10)	14.35 ± 0.23 (10)	19.95 ± 0.39 (10)	21.25 ± 0.33 (10)
Heart girth, in inches	47.10 ± 0.89 (10)	60.50 ± 0.35 (10)	72.70 ± 0.63 (10)	72.3 ± 0.80 (10)

Numbers sampled are shown in brackets.

Horns are set well apart curving gradually upwards and outwards in the same line as that of the poll with blunt points inclined inwards. A small portion of the skin with hairs extends over the base of the horns. In the males the horns are thicker, shorter and straighter than in the females.

The hump in the males is moderately well-developed, firm and placed in front of the withers. The dewlap is of medium size and the skin is fine and mellow. The sheath in the males is of moderate length, and is semi-pendulous. The navel flap in the females is prominent. The size is variable but on average

measures 6x2.5 inches. Shoulders are light and legs are comparatively short, but in good proportion to the body. The hooves are hard and black, of moderate size and have no tendency to turn out.

The color of the skin is black, except on the udder, under the belly, on the lower part of the dewlap and inside the ears where it is rich yellow. The hair is fine, short and straight, but in the male it is slightly curly on the forehead.

Functional Characteristics of the Breed

The Thari owner always sought for good milkers, as ghee or clarified butter is the main livestock product which gives him a dependable income, provided that the cows are good foragers and can withstand the rigorous conditions of life in the Tharparkar grazing district. He has also paid adequate attention to producing good quality, medium-sized, agile bullocks, thus trying to combine the qualities of milk production and draft ability in the breed. In the village areas the cows are milked only once in 24 hours and the calves are not weaned. Under these conditions it is estimated that they produce about 1,000 to 2,500 lbs. of milk in a lactation.

The government farm at Sakrand, Sind, has been systematically breeding Thari cattle for several years: another farm for Thari cattle has been opened recently at Mirpurkhas, Sind.

At the Sakrand farm weaning is not practiced, and under these conditions the average milk production of 174 samples has been $2,527 \pm 80.39$ lbs. in 298.7 ± 9.74 days. It is estimated that calves must have taken about 1,000 lbs. While a special group of 9 samples produced $6,232 \pm 121.5$ lbs. at the same farm an average of 50 samples was $4,596 \pm 61.9$ lbs.

Data in Table 18 summarize the milk production per lactation for different lactations studied at the Sakrand farm.

Table 18. Production of Thari Cows at Sakrand, Sind, Farm During Different Lactations

	1st	2nd	3rd	4th	5th	6th	7th
Yield in pounds (after calves were suckled)	3 382	3 392	3 642	3 581	3 647	3 228	3 562
Number of lactations	26	34	27	22	17	12	8

The average dry period for cows at the Sakrand farm from an analysis of 117 samples was 232.5 ± 15.2 days, while the average calving interval in 154 calving records was found to be 17.5 ± 0.61 months.

Complete lactation records during the whole of a lifetime were available for 38 cows only and it was observed that the average number of lactations during a lifetime worked out to 5.85 ± 0.25 , although for the entire breed it is estimated to be in the neighborhood of four. The average age at first calving is observed to be 47.24 ± 2.5 months.

Thari bulls, probably on account of poor nutritional levels in the home country, start service at the age of about $3\frac{1}{2}$ years, and it is estimated that the average breeding life of Thari bulls is 7 years, with a range of 5 to 9 years. They are observed to be quick breeders.

Thari bullocks are seldom put to work before they are $3\frac{1}{2}$ years old, when they are given light work and gradually accustomed to heavier tasks by the time they are 5 to 6 years of age. Then they do all types of field work, including working Persian wheels for drawing water, and they are considered to be particularly apt for carting. It is observed that these bullocks require careful handling as they are apt to be vicious. However, animals which are carefully and frequently handled become fairly docile.

The average weight pulled by a pair of Thari bullocks in desert areas is $\frac{1}{2}$ to $\frac{3}{4}$ ton in a cart with iron-rimmed wheels at the rate of about 2 to $2\frac{1}{2}$ miles per hour. The usual distance covered during a day is 18 to 20 miles. In cities and on hard evenly constructed roads a pair of bullocks can pull loads of $1\frac{1}{2}$ to $2\frac{1}{4}$ tons in a cart fitted with pneumatic tires. The daily distance covered varies from 20 to 25 miles in about 8 to 10 hours a day. Single bullocks are worked as pack animals and they usually carry a load of 350 to 500 lbs.

Thari cattle are said to be very hardy and resistant to several tropical diseases but definite data are lacking. Although animals of the breed are excellent foragers and can stand the rigors of climatic and environmental conditions, they have not been used primarily as a source of meat, and breeders have given little attention to meat qualities. No data are available on carcass qualities and characteristics of the meat.

Performance in Other Areas

India

Owing to their capacity for milk production as well as for work and their ability to thrive on scanty fodders, the Tharparkar cattle are now bred on a number of government farms in India. They are also used for grading-up local inferior cattle in certain areas where the farmers particularly like gray or white cattle. Thari cattle are also produced in the States of Jodhpur, Jaisalmer and Cutch in India.

Three of the most important Thari herds are established at Karnal in the Punjab State and at Patna and at Kanke, Ranchi, in the State of Bihar.

Fine performances of the Tharparkar cattle during the first World War in Mesopotamia encouraged the Government of India to experiment on these animals. A herd of Tharparkar cattle was established at Karnal in the Punjab in 1923. Karnal is situated in an area which has mostly sandy loam soil. Summer temperatures are fairly high, reaching 116° F., but summers are usually dry. Annual rainfall is about 25 to 30 inches. The area is noted for its abundance of grasses. At the Karnal farm in the pasture area, *Cynodon dactylon* is predominant and relished by the cattle. Besides pasture, fodder crops such as cowpeas, Egyptian clover, sorghum and maize are also grown. Calves are weaned at birth.

Average milk production, based on 568 lactations from the year 1923 to 1934, at the Karnal farm is shown in Table 19 (Dastur and Kothavalla, 1946).

**Table 19. Average Milk Production of Tharparkar Cows
at Government Cattle Farm, Karnal (1923-1934)**

MEASURE OF PRODUCTION	Purchased cows	Farm-bred cows
Average milk production, in pounds	2 294	3 791
Average days in milk	242	311
Average dry days	147	95

Cows at this farm were milked 4 times a day during recent years and under these conditions the average milk production

has been 4,349 lbs. in 286 days, average percentage of fat being 4.2. Individuals have yielded as much as 9,655 lbs. in 305 days. The average calving interval has been 14½ months, and average age at first calving during recent years, 2 years 8 months and 10 days. Though no particular season has been observed for mating it has been noticed that the maximum number of services have taken place during the months of February and March. Average birth weights of male calves have been 54 lbs., while those of females have been 52 lbs. Males, on average for 20 bulls, start service at the age of 2 years 9 months and 18 days, with an average breeding life of 10 years. They are noted for their quick service.

Bullocks are put to work on the Karnal farm when they are about 3 years old and have attained the weight of about 850 pounds. They are agile and swift, and willing workers. A pair of bullocks will haul a load of 4,000 lbs. in a cart with pneumatic tires. They are able to cover a distance of about 25 miles in a day of 8 hours. Without any load they can take a cart at the rate of 4 to 5 miles per hour. The measurements summarized in Table 20 were recorded at the Karnal farm.

Table 20. Average Measurements of Thari Cattle

MEASURE	At one year	At two years	Mature
<i>Females</i>			
Weight, in pounds	347 (9)	548 (9)	845 (9)
Length from shoulder point to pin bones, in inches	43 (9)	50 (9)	57 (9)
Height at withers, in inches	41 (9)	46.5 (9)	48 (9)
Depth of chest, in inches	18 (9)	22 (9)	24.5 (9)
Width of hips, in inches	13 (9)	17 (9)	20 (9)
Heart girth, in inches	48 (9)	59 (9)	69 (9)

MEASURE	At one year	At two years	Mature bull	Mature bullock
<i>Males</i>				
Weight, in pounds	344 (9)	540 (9)	1260 (9)	956 (6)
Length from shoulder point to pin bones, in inches	42.5 (9)	50 (9)	63 (9)	56.5 (6)
Height at withers, in inches	41 (9)	47.5 (9)	54.5 (9)	52 (6)
Depth of chest, in inches	19 (9)	22 (9)	27.5 (9)	26 (6)
Width of hips, in inches	12 (9)	15.5 (9)	20 (9)	19 (6)
Heart girth, in inches	49 (9)	57.5 (9)	77 (9)	70 (6)

Numbers sampled are shown in brackets.

In addition to Karnal, herds of Tharparkar cattle are also maintained in government farms at Patna and Ranchi in Bihar. Both of these places are located in paddy-growing areas with average rainfall ranging from 45 to 55 inches. The highest average maximum temperature during May and June may exceed 105° F. at Patna. Ranchi is at an elevation of over 3,000 feet.

The data in Table 21 are a summary of the production of Tharparkar cattle bred on the Government farms in India from a Report of the Ministry of Agriculture, India, 1950.

Table 21. Average Performance of Tharparkar Cows

NAME OF FARM	No. of records	Lactation yield - lbs	Days in milk	Days dry
Government Cattle Farm, Patna . .	37	3 080	244	157
Government Farm, Kanke, Ranchi .	21	4 282	277	186
Indian Agricultural Research Institute, Karnal	46	4 869	280	155

The average performance records as reported from recognized farms in India during 1936/37 to 1939/40, are summarized in Table 22.

Table 22. Average Records of Performance of Farm-Bred Cows at Recognized Farms in India during 1936-37 to 1939-40

YEAR	No. of records	Lactation yield, pounds	Days in milk	Days dry
1936-37	89	4 056	281	118
1937-38	109	4 056	267	162
1938-39	90	4 721	270	150
1939-40	109	4 323	268	154

Studies conducted at the Indian Veterinary Research Institute (Bhattacharya *et al.*, 1950; 1952) from 699 Tharparkar cows with 2,425 calvings showed that the average gestation period for female births was 286.89 days while the average gestation period in case of male births was 288.97 days.

It was observed that sex ratio in calves born was 99.83 males for 100 females. The incidence of twinning was 0.46 per 100 calvings.

Sources of Breeding Stock and Information Regarding the Breed

It is estimated that the number of Thari cattle in Pakistan is approximately 652,000 (Livestock Wealth of Pakistan, 1949). The most important places where Thari cattle are found are Dhoro Naro, Mithi, Chhor, Islamkot, Mirpurkhas, Khari Ghulam Shah and Naukot; also in the cattle markets of Badin and Mithichachro. In India the breed may be available in parts of Jaisalmer and Jodhpur States. For further information, the following authorities may be contacted :

1. Animal Husbandry Commissioner, Government of Pakistan, Karachi, Pakistan;
2. Livestock Officer, Sind, Mirpurkhas, Sind, Pakistan;
3. Animal Husbandry Commissioner, Government of India, New Delhi, India.

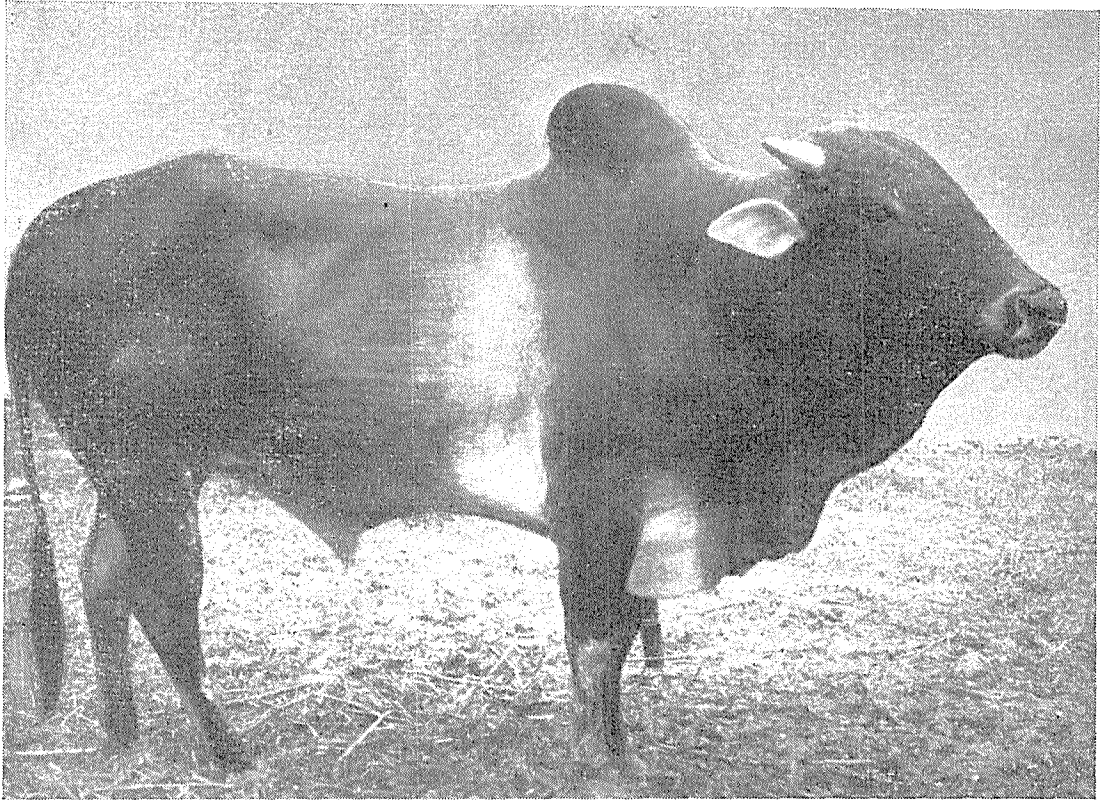


FIGURE 22. The Bachaur breed, found in Bihar, closely resembles the Hariana. The cows give very little milk. Above: a Bachaur bull. Below: a Bachaur cow.

By courtesy of Mr. S. R. Sen.

