

Cattle Genetic Resources of Orissa

KHARIAR

INDIA_CATTLE_1500_KHARIAR_03034



B. P. Sethi, S. K. Dash and P.C. Ray



Orissa Livestock Resources Development Society (OLRDS)

Orissa University of Agriculture and Technology (OUAT)

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Published under
**Orissa Livestock Resources Development Society (OLRDS)
and Orissa University of Agriculture & Technology (OUAT)**



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PREFACE

Various indigenous breeds of cattle and buffalo in our country are the result of thousands of years of selection, evolution and development of the wild species in the process of domestication suiting to the local agro-climatic conditions. The Indian cattle breeds were developed both for agricultural operations and dairy performance with differential degree of importance as per needs.

Khariar cattle, one of the lesser-known cattle breed is indigenous to the state of Orissa, which has been contributing to the welfare of farming community in general and landless, small and marginal farmers in particular in its native tract. Information on distribution, enumeration, physical parameters, production as well as reproduction performance of general and elite animals alongwith the socio-economic profile of farmers is essentially required to know the status of this breed towards developing strategy for conservation and improvement.

Orissa Livestock Resources Development Society (OLRDS) by sanctioning a Project on survey, evaluation and characterization of Khariar cattle, has provided adequate technological and financial support to carry out the research activities which provided the raw material to bring this manuscript to its present form.

The logistic support of F & ARD Department, Govt. of Orissa and all the infrastructure and administrative support of Prof. D. P. Ray, Vice-Chancellor, OUAT have ultimately helped the better understanding of this unique cattle genetic resource indigenous to the state of Orissa and realising the present status.

Last but not the least, the cooperation and assistance rendered by the real stake holders of Khariar cattle, during the survey visits and collection of data which made the real base of this bulletin, is highly appreciable. At the end the authors thank all the members, who directly or indirectly supported this mission.

This manuscript will be useful to academicians, researchers, planners, policy makers and all those who keep interest in animal genetic resources of India as a whole and Orissa in particular.

OLRDS, Cuttack.

April, 2009.

Authors

Introduction

India is endowed with vast and varied forms of animal genetic resources that have played crucial role in augmenting agrarian economy. Livestock sector is an important source of income and employment for landless and small landholders. The role of livestock in enhancing rural livelihood is being increasingly recognised in development circles.

The growth in crop production alone could not be sustained; hence the focus is shifted to sustainable agriculture and its diversification. Indigenous genetic resources in livestock sector and their conservation have thus become crucial for sustained food production.

Livestock production systems in India are mostly based on low cost agrobyp-products and traditional technologies primarily for producing milk, draft power, meat, egg, fiber etc. Resource-poor small and marginal farmers and landless labourers maintain majority of the livestock.

The importance of livestock goes beyond its function in food production. Livestock provide valuable draft power, organic manure for agriculture, dung as fuel for domestic purpose and other by-products. Most of the cattle and buffalo in Orissa are domesticated more for draft animal production than for milk alone.

In India, most of the breeds have generally been named after their habitats or based on their prominent characters. The name, Khariar cattle has its roots from the cluster of hamlets and villages of the flock owners in and around Khariar in Nuapada district of Orissa. The main dialect spoken in Nuapada is Kosali. The local dialect is strongly influenced by Loria which is the main language spoken in the state of Chattisgarh. The main tribes living in the district are Gonds, Bhunjias, Chakotias, Dals and Souras. The schedule castes are the Ghasis, Chamars and Doms. Other backward castes are Praharias. The district is one of the poorest in Orissa.



Characterisation of the Breed

During the present study, information on 3324 animals of all age groups belonging to 636 farm families were collected through massive survey covering 42 villages. The information on body confirmation were collected by actual measurements and on production, reproduction and socio economic profile were collected through interactions and structure scheduled questionnaires developed by NBAGR with little modifications.

A - Breed name and Synonyms

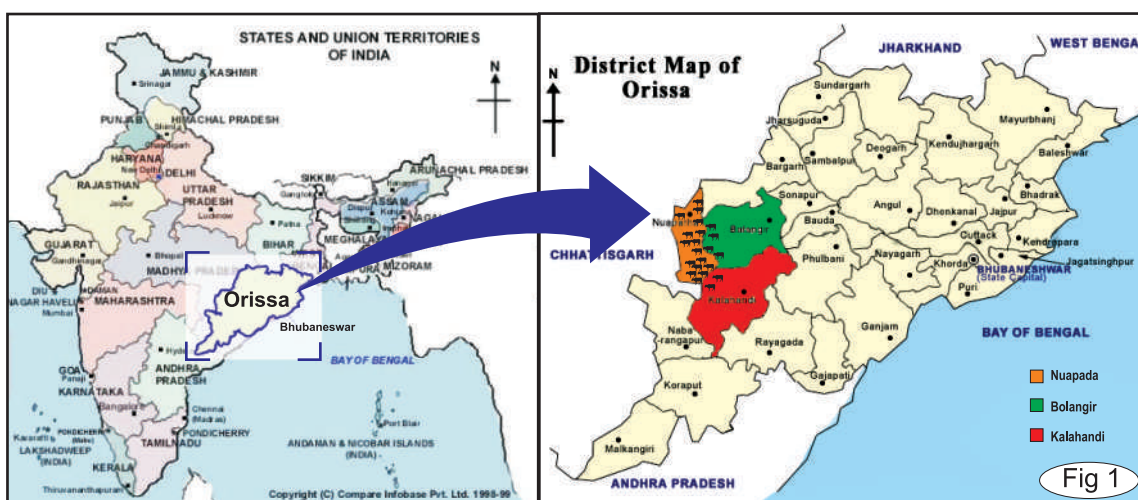
The name of 'Khariar' breed has been derived from the place of its origin, the Khariar region in Nuapada district in Orissa. Locally these cattle are called as 'Deshi' cattle. Good number of these animals are found in Khariar, Sinapali and Boden area in Nuapada district. However, cattle of this breed are present in all parts of Nuapada district. The adjoining areas in Kalahandi and Bolangir district also harbor a few animals of this breed. The migration of this cattle type mostly depends on marketing. Khariar bullocks are marketed extensively in local cattle markets. The indigenous cattle in adjoining area are physically different from Khariar cattle.

This breed of cattle is reared by all sections of the people, even by large farmers. No particular caste, creed, religion or community is responsible for rearing this cattle type. Khariar cattle mostly live on grazing on road side vegetations and feed and fodder resources in nearby jungle and hillocks. They cover a distance of 3-4 Km in nearby areas to fill their rumen and come back to the shed by evening. Coat colour of Khariar cattle ranges from light brown to grey with unique orientation of horn.



B - Native tract

Khariar cattle are seen in its purest form in all parts of Nuapada district. More animals of this breed are found in Khariar, Komna, Sinapali and Boden blocks. Adjoining areas extending a few km. in Kalahandi and Bolangir district in south also harbor this breed of cattle. The name of breed backs to Khariar block, which is the centre of its natural habitat. The native tract of the breed is distributed over 82°20' to 82°40' East longitude and 20° 00'N to 21°05' North latitude spread over an area of 4400 sq.km.(Fig 1). The climatic conditions of the area in terms of minimum and maximum temperature and average rainfall in the region are presented in Table 1. The climate is generally hot, semi-arid tropical in nature. The average maximum and minimum temperatures are 42.2° C and 13.1° C observed in the month of May and January, respectively. The average relative humidity ranges between 39.8 and 86.8 per cent over the months during the year. The average annual rainfall is 1378.2 mm received in 111 rainy days. The seasons observed are cold or winter (November to February), summer (March to July) and rainy (August to October). The tract receives maximum amount of rain during the monsoon (month of maximum, August: 384.6 mm). The soil in the native tract is red, red yellow and black. 'Jonk' is the main river, which flows in the native tract and is very prone to flood. Western part of Nuapada district is covered with dense forest with long tropical grass over them. The forest and the river Jonk are the natural hurdles in migration of Khariar cattle to neighbouring areas in Chhatishgarh state. However, farmers from Chhatishgarh purchase the bullocks of this breed from cattle markets in the native tract. Nuapada district is famous for production of rice, sugarcane, ragi, pulses and vegetables. Generally rice straw, gram straw and dry grass is fed to the animals during early



stage of lactation and to working bullocks, lest the animals are reared under nil or very low input system. In Nuapada district, the forests, cultivable, uncultivable lands and pasture lands constitute 36.66, 52.79, 4.90 and 2.93 per cent, respectively. The magnitude of change in land utilization over a decade shows decline in forest and pasturelands in the district. 30.28% of the people in the native tract possess land holding of less than 1 Ha. The corresponding figures for possession of 1 to 2 Ha and more than 2 Ha of land holding are 47.15 and 22.57 %, respectively.

C - Origin of the breed

Specific literature is not available on development of this breed. It is assumed that the topography of the area, evolution process and selective breeding for producing a better animal, suiting to the need resulted in the development of this cattle type or breed. This breed might have been developed from the indigenous animals through several generations of natural selection and selective breeding as well. As agriculture has been the primary profession and draft power is the important requirement for agricultural operations, selection stress must have been put on draftability to bring this animal type to the present form. Further the preference of brown colour over light or white coat colour must have played vital role in bringing brownish coat colour to most of the population in the native tract.

D - Utility of the breed

Khariar is basically a draft animal (Fig 2). The bullocks are very good draft animals and are preferred in and around the native tract for agricultural operations and transportation as well. However, the cows produce considerable quantity of milk, often used for family consumption and even marketed at times. These cows assure economic protection and good nutrition to owner as well as other family members as these animals are very good producers under low input system of



rearing. The amount of milk obtained from them by milking over and above nursing of the calves is sold locally mostly to the sweet stalls at the rate of Rs.25/- per liter. None of the farmers rear Khariar cattle for breeding or religious purpose.

The dung is very useful in making manure for agriculture purpose, fuel at the time of scarcity and painting of walls of houses. The cow dung is often used as manure for own land, however, at times it is sold at the rate of Rs.800/- per tractor load. The farmers prepare 'Ghasi', a dried dung cake, which serve as very good source of fuel in rainy season. The castrated male at the age of 2 to 3 years is sold at a price of Rs. 4000 to Rs. 5000/-.



Fig 3

Adult bullock pairs, ready for ploughing and carting (Fig 3) are sold at an average price of Rs. 10,000 to Rs. 18,000/- depending on the health condition of the animals. So these animals serve as a bank for the owners to meet the emergencies, if any, by virtue of their demand in agricultural operations not only in the native tract but also in nearby areas extending to Kalahandi and Bolangir district in Orissa and adjoining regions in Chhatishgarh state. It is also observed that lactating cows are also taken to the market for trading .

E - Physical Characteristics

Khariar is a small sized, horned, strong, mostly draft type docile cattle with good posture. Bulls look very strong and vigorous with well developed hump, naval flap and medium dewlap. The hump, neck and some region of face and back are



Fig 4



Fig 5

dark in colour and the coat colour is mostly deep brown (Fig 4). The cows are mostly brown in colour having proportionate and compact body with graceful appearance (Fig 5). About 30% of cows are grey in colour and a few are having black and mixed coat colour. The pin bones are distinct and quite wide apart compared with the body confirmation. The milk vein is medium in appearance. Vulva is comparatively larger. Small, strong, stumpy and mostly horizontal horns having rounded tips is an important feature of this cattle type (Fig 6). The tail extends below the hock. It is tapering towards tip with voluminous black switch. The ears are short and dewlap is thin, small and soft. The body confirmation traits along with body weight at different stages of growth are presented in Table 2. Coat colour of calves are lighter at birth , which becomes darker at adulthood. The breeding bulls develop darker coat colour at the front half of the body (Fig 7), if castrated at earlier age, this feature is not seen in bullocks.



Fig 6



Fig 7

Head profile

Khariar cattle possess small sized head with flat and straight fore head, depressed in between the eyes. Prominent frontal eminence, raised more than its counterparts in the adjoining regions is characteristic of this breed (Fig 8). Presence



Fig 8



Fig 9

of irregular shaped white marking on fore head in most of the brown coat coloured animals is another unique characteristic of this breed (Fig 9). From preliminary study it is observed to be an autosomal dominant trait. Head of these animals is in upright position. Ears are medium in size and horizontal in position. The average size of head in adult males and females are 41.85 ± 0.51 and 41.34 ± 0.42 cm, respectively.

Coat colour

The coat colour of these animals ranges from brown to grey. About 70% are brown and 25% are grey in colour. A few are having black and mixed coat colour. However, bulls are mostly deep brown in colour. Bulls are characterized with dark colour from hump through neck to head region. The dark colour develops at the time of maturity. If the males are castrated the coat colour remains light brown throughout the body. The colour of the muzzle and switch is usually black. Hooves are usually black. However, grey coloured switch and muzzle are seen in 10 % of cases.

Horns

Both males and females are horned. Two types of orientation of horns are seen in this breed viz. horizontal (Fig 10) and upward inward (Fig 11). Horns in males are stronger than that of females. Colour of the horn is always black. It is seen that the horns grow with the age of the animal even at later age. The old animals have irregular shape of horns most of which are bent down ward and are broken in many cases. Average size of horn in adult males and females are 12.34 ± 0.21 and 10.12 ± 0.27 cm., respectively.

Ear

The ears are medium and horizontal in position. The inner side of pinnae is lighter than the external side (Fig 12). Unlike any other body parts, the size of ear does not



increase proportionately with the advance in age. The average ear length in adult males and females are 18.66 ± 0.35 and 18.54 ± 0.34 cm, respectively.

Udder

The udder is bowel shaped, which is distinctly seen from both sides and rear part of the animal. The udder shrinks to nothing after milking. Milk vein is less prominent. Teats are small with rounded tips (Fig 13).



Fig 13

Tail

Tail length of Khariar cattle is conspicuous with age. Tail length is around 56% of the height of the animal at birth (Fig 14), which is around 73% at adult stage,



Fig 14



Fig 15

swinging it touches the thoracic region, even upto scapula. The average tail length of adult males and females are 83.11 ± 0.93 and 81.67 ± 0.96 cm, respectively.

Switch

Switch of this animal is thick and the predominant colour of the switch is



Fig 16

F. Management Practices

Khariar cattle are reared mostly under extensive system. A few animals are reared under semi-intensive system with very less input as agricultural byproducts and kitchen waste. None of these animals are provided with any concentrate feed supplement.

Khariar cattle are usually let loose in the morning and allowed to graze across hillocks (Fig 17), road side vegetations and open fields through out the day. Lactating cows are milked once in early morning prior to letting them for grazing purpose.



Fig 17

The cattle population of one village or hamlet are taken together as a herd to grazing field by one or two persons during cropping season to avoid any damage to the cultivated crop. The herdsman moves with the herd and facilitates the grazing of the animals (Fig 18) and brings the animals back to the village in the evening. During post harvest period the animals often go for grazing in the morning and voluntarily come back to the shed in the evening.



Fig 18

G - Housing

The random survey regarding housing of the animals in the breeding tract revealed that about 74.6% of the farmers house their animals in a shed. Rest of the farmers does not provide any defined shed for their animals. A part of dwelling house or a thatched roof only is used as rest place (Fig 19) for the animals during rain and



Fig 19

cold nights . The sheds are found to be kutcha with mud flooring and thatched roof .Generally closed housing system (76%) was followed in comparison to open housing system (24%). In general the conditions of sheds were the indication of resource poor farming community. Sanitary condition of the sheds was poor in 80% of cases under study.

H - Feeding

Khariar cattle depend solely on grazing. Feeding of straw, little amount of rice bran and kitchen waste is confined to lactating cows and working bullocks. A few farmers feed their cows regularly with locally available grass, being collected from the field. The drinking water for animals during their stay in the shed is from all available sources i.e. well, tube well, tank, river etc. During grazing hours the animals are taken to nearby water source and at the time of return. In some places all the animals of one village are kept near the bank of the river during night particularly in Summer season (Fig 20).

I - Breeding

Cattle owners do not have individual bulls in their herds, but usually there are a few bulls available in the village herd. Generally two to three bulls are seen in a herd of 80 to 100 cows. The cattle of one village usually constitute a herd to go out for grazing. Most of the breeding activities occur in the grazing field. As the villages are situated not very far away from each other, the bulls often get scope to pass on their progeny to nearby villages. Usually the cow in oestrus at grazing is mated by the strongest bull in the herd. The breeding is mostly carried out in the cattle herds by the Khariar bulls and other indigenous bulls accompanying the herd. The cow owners speculate about the sires only after the birth of calves. Very few resource-rich farmers opt for artificial insemination for selected cows, where normally Jersey or Red Sindhi semen is used. Mostly the farmers prefer the cows to be bred by local bulls to get good bullocks either for own agricultural operations or to fetch good market price.



Fig 20

It has been observed that some bulls with congenital defect are present in the native tract of Khariar cattle. The best male calves are generally castrated to make bullocks due to its preference in farming community.

J -Reproductive Performance

The reproductive performance of this cattle breed is presented in Table 3. Cow of Khariar breed comes to heat at around 40 months and drops its first calf at around 51 months of age. The average calving interval in these cows is 17 months with gestation period of 274 days. These cows give birth during all the seasons of the year. But maximum calvings occur in rainy season. The distribution of oestrus in Khariar cattle is presented in Table 4.

The reproductive diseases observed in Khariar cattle are presented in Table 5, however, these cows are better than other counterparts in the native tract with respect to the reproductive problems.

K - Dairy Performance

Khariar cows are poor milk yielders having average daily milk yield of 1200 to 1500 ml. with around 5% fat. During the present study average lactation milk yield of 450 liters was observed in a lactation length of 295 days in third parity. Cows with brown coat colour are better yielders than white coat coloured cows. No study has been undertaken in finding relationship between the two traits. Average dry period is around 7 to 8 months between two consecutive lactations. Detail dairy performance of Khariar cattle is presented in Table 6.

L - Work Performance

Khariar bullocks are known for their working ability in agricultural operations. These are hardy in nature. The hot humid climate does not affect the draft power of these animals. The draft ability of Khariar bullocks is clearly superior to that of other bullock types in the native tract and adjoining area. The ploughing capacity of Khariar bullock was estimated to be 959.84 and 697.64 sq. mt. per 100 kg. body



Fig 21



Fig 22

weight in wet soil and clay soil, respectively. Grey bullocks are preferred over brown bullocks for ploughing and planking (Fig 21). The carting capacity was estimated to be 325.44 kg. per 100 kg. of body weight of bullocks. Besides, Khariar bullocks are proving to be very good for threshing operations (Fig 22) in the native tract. The detail draft capacity of Khariar bullocks is presented in Table 7.

M - Health Status

Khariar cattle are resistant to many diseases and adverse climatic conditions. The general health condition of Khariar cattle is good. In the remote areas, farmers adopt indigenous knowledge to cure some minor diseases. The animals are periodically vaccinated against HS, BQ and FMD by veterinary aid centers. The age specific incidence of disease is presented in Table 8. In major cases farmers take the help of veterinary professionals. It is observed that occurrence of pneumonia is higher in new born calves compared to other age groups.

It is observed that change of season plays a great role in the manifestation of diseases. In rainy season the incidence of diarrhoea, fever, pneumonia and viral diseases are more compared to other seasons. The incidence of disease with respect to seasons is presents in Table 9.

N - Migration

Migration of Khariar cattle has been restricted only to southern and eastern parts of the native tract. The presence of river Jonk, deep forest and hill range on the northern and western side becomes hurdles in migration of these animals. The migration of the animals occurs due to marketing (sale/purchase) is the only medium in appearance of Khariar breed of cattle in adjoining area of the native tract extended to parts of Chhatishgarh. Many weekly markets are available in the native tract and adjoining area for sale of animals. The cows are seldom brought to the market for trading, but bullocks are of high demand among farmers for their worth in agriculture operations.



O - Socio-economic Profile of the Farmers

The socio-economic condition of farming community in Nuapada district as a whole is not so good as compared to other parts of the state. But the condition of farmers possessing Khariar cattle is comparatively good. More than 64% of Khariar cattle owners possess more than one acre of cultivable land (Table 10). Many marginal farmers and landless owners take care of their cattle more than that of small and large farmers. Khariar breed is in its purest form in the hand of landless and marginal farmers because they never go for artificial insemination of their animals with a belief that sophisticated management practices are needed for maintenance of crossbred cattle and the male calf is useless in the process of artificial insemination. But possession of this cattle population in the hands of this section of society is less. Therefore the number of Khariar cattle is fast decreasing in the native tract.

The female member of the family usually takes care of the calves and lactating cows. In most of the cases the females clean the shed, milk the cows and feed them with kitchen waste and other agricultural byproducts both in the morning and evening. All the milk products viz. ghee, curd and chhena preparation is performed by the female members. Drying of cow dung for use as fuel in emergency, particularly in rainy season is the most important task offered by the female member of the family. In most of the cases the male member takes care of the bullocks. Marketing of live animals and livestock products are often done by male member of the farm family.



RECOMMENDATIONS

Khariar breed of cattle is not in the list of recognised cattle breeds of India. Hence strategic breeding policy for its conservation and improvement is not being formulated at national and state level. Population of Khariar cattle is fast decreasing due to non-availability of quality bulls in the native tract. Better male calves are usually castrated for producing bullocks to fetch more price due to heavy demand of these bullocks in agricultural operations. Further, non-descript bulls and artificial insemination are responsible for genetic erosion of Khariar cattle germplasm in the native tract. So immediate steps should be taken to prevent this valuable cattle genetic resource from extinction.

Khariar cattle have many good qualities like adaptability to low input system of management, heat tolerance, low incidence of diseases and good draft capacity. The milk yield obtained from these animals will be of low cost as these animals are maintained mainly on grazing and agricultural by products. In the present study it has been observed that the between animal variability for the traits of interest is higher, which can be exploited for higher genetic gains through well planned and executed breeding programmes.

Keeping in view the economic importance, productivity, draft ability and adaptability of Khariar cattle in its native tract along with the socio-economic status of the farmers, efforts should be made for conservation and improvement of this valuable germplasm through selective breeding.

The existing herds of Khariar cattle need to be strengthened. In order to increase the herd size and check genetic deterioration in this breed, it is suggested that the progressive farmers / breeders, maintaining relatively large herds should be associated to form a sizable nucleus herd and test herds for production and evaluation of large number of breeding bulls. The nucleus herd could also be opened through two-way flow of superior germplasm.

Thus with the adoption of open nucleus breeding system (ONBS), genetic gain can be augmented not only in organized herds but also in farmers' herds. Besides this improved farming practices can be integrated with traditional farming practices to enhance the performance of Khariar cattle as a whole.

It is worthy to mention that improving the overall performance of locally adopted breeds with better package of management and breeding practices will often produce more sustained benefits than strategies involving replacement or crossing with exotic breeds.

To achieve the target for conservation and improvement of this breed, the following action plan is suggested.

1. Declaration of 'Khariar' as a cattle breed in India by appropriate authorities.
2. Restricted and planned use of artificial insemination facility in the native tract, where heavy concentration of Khariar cattle are present.
3. Establishment of breed nucleus herds, bull mother farms, young bull rearing centre and strengthening semen collection centre and cryo storage banks.
4. Formation of breed societies and involvement of NGOs for participation of farmers / breeders in breed conservation and improvement programmes.
5. Long term Implementation of selective breeding programmes in the native tract.

BREED DESCRIPTOR

I. GENERAL DESCRIPTION

1. Name of the breed : **Khariar**
2. Background for such a name : **Heavy concentration is in Khariar area in Nuapada district in Orissa.**
3. Species name : ***Bos indicus***
4. Most closely related breeds : **Motu**
5. Since when the breed is known :
6. Estimated population (Approx) : **50,000**

| | Male | Female |
|---------------------------|--------------|---------------|
| Claves (up to 1 year) | 4000 | 4000 |
| Stock (1 to 3 years) | 6000 | 7000 |
| Adult (3 years and above) | 12000 | 17000 |
| Milking females | - | 7500 |
| Stud bulls | 200 | - |
7. a. Native tract of distribution in terms of : **Longitude 82°20'E to 82°40'E
Latitude 20° 00'N to 21°05'N**
 - b. Approximate area of distribution (in sq. kms.) : **4400 sq.km.**
 - Place(s) : **Nuapada district and adjoining area in Kalahandi and Bolangir district. Heavy concentration is in Khariar, Komna, Sinapali and Boden blocks of Nuapada district.**
8. a. Communities responsible for developing the breed : **Not specific**
 - b. Description of community (Farmers/nomads/isolated/tribals) : **Farmers**
9. **Native environment**
 - a. Soil description
 - b. Minimum temperature **13.1°C** month of min. **January**
 - c. Maximum temperature **42.2°C** month of max. **May**
 - d. Maximum humidity **86.8** month of max. **July**
 - e. Minimum humidity **40.2** month of min **March**
 - f. Annual rain fall **1378.2 mm**
 - g. Peak rain **384.6 mm** month of peak. **August**
 - h. Annual duration of rain. : **111 days**
 - i. Annual duration of drought
 - j. Annual duration of flood : **10 days**
 - k. Elevation of land mean :
 - l. Sub-soil water depth during summer (in mtrs) : **10**
 - m. Sub-soil water depth during rainy season (in mtrs) : **4.5**
 - n. Forest area (in sq. kms.) : **1250 sq.km.**
 - o. Cultivated area : **163000 ha**

- p. Uncultivated area : **17000 ha**
- q. Main cultivated cereals : **Rice, Maize, Ragi**
- r. Main cultivated pulses : **Black gram, Kulthi**
- s. Other crops : **Sugarcane, Potato, Groundnut**
- 10. Feed**
- a. Major fodder trees**
- (i) Chakunda *Abizia lebeck*
- (ii) Sahada *Stveblus asper*
- (iii) Bamboo- *Bambusa tulda*
- (iv) Dhanwantari *Cyndophogon flexupsus*
- (v) Bara *Ficus bengalensis*
- (vi) Aswastha *Ficus religiosh*
- (vii) Mango *Magnifera indica*
- (viii) Jackfruit *Artocapus heterophylla*
- (ix) Acacia-*Acacia nilotica*
- b. Major native fodder grass**
- (i) Duba *Cynodon dactylon*
- (ii) Mutha *Cyperus rotundus*
- (iii) Bena *Vetiber zizanoids*
- (iv) Gugurchia *Chrysopogon aciculatus*
- c. Cultivated legume fodder and monocot grass**
- (i) Green gram *Phaseolus aureus*
- (ii) Black gram *Phaseolus mungo*
- (iii) Bengal Gram *Phaseolus radiatus*
- (iv) Cow pea *Vigna sinensis*
- (v) Maize *Zea mays*
- (vi) Sugarcane *Saccharum officinarum*
- (vii) Wheat *Triticum Sps.*
- (viii) Rice *Coryza sativa*
- d. Source of dry fodder : Straw**
- e. Seed and grain feed : Rice husk**
- f. Cakes and other concentrates : Nil**
- g. Any reported deficiency of minerals in water : Not studied**
- h. Any reported minerals in harmful quantity and sources : Not studied**
- 11. Housing**
- a. Only at night : **74.6%**
- b. Type of housing : **Kutchra with thatched roof with good Ventilation.**
- 12. Herd size in grazing**
- a. Number of breeding females : **56%**
- b. Number of replacement females : **20%**
- c. Number of bullocks : **3%**
- d. Number of calves (less than 6 months) : **17%**
- e. Bull : **4%**



13. Mating method

- a. Natural service (%) : 90%
b. Artificial insemination (%) : 10%

II. PHYSICAL CHARACTERS

1. COLOUR

| | Name | % Surface area in | |
|------------------|-------|-------------------|--------|
| | | Male | Female |
| a. Coat colour : | Brown | 80 | 70 |
| | Grey | 20 | 30 |
| b. Muzzle : | Black | 95 | 90 |
| | Grey | 5 | 10 |
| c. Switch: | Black | 90 | 92 |
| | Grey | 10 | 08 |
| d. Hoofs : | Black | 100 | 100 |

2. HORNS

| | | Male | Female |
|----------------------------|---------|----------------------|----------------------|
| a. Colour | : Black | 100 | 100 |
| b. Size | | 12.34 ± 0.21 | 10.12 ± 0.27 |
| c. Shape (Straight/curved) | | Straight | Straight |
| | | Horizontal (70%) | Horizontal (70%) |
| d. Orientation | | Upward ,inward (30%) | Upward ,inward (30%) |

3. EARS

- a. Length(avr) : 18.6cm
b. Orientation (Horizontal/drooping) : Horizontal

4. HEAD

- a. Forehead (Convex/concave/straight) : Straight
b. General description : Proportionate to body size

5. BODY

| | | <u>Male</u> | <u>Female</u> |
|------------------------------------|---|-------------|-----------------|
| a. Hump (Large/medium/small) | : | Medium | Medium |
| b. Dewlap (Large/medium/small) | : | Medium | Small |
| c. Naval flap (Large/medium/small) | : | Small | Nil |
| d. Penis sheath flap | : | Small | - |
| e. Basic temperament | : | Vigorous | Docile/ Fearing |

6. UDDER

- a. Shape (bowl/round/trough/pendulous) : Bowl
b. Fore-udder size (Large/medium/small): Small
c. Rear-udder size (Large/medium/small): Medium
d. Teat shape (cylindrical/funnel/pear) : Cylindrical
e. Teat tip (pointed/ round/flap) : Round
f. Milk vein (Large/medium/small) : small

III. PERFORMANCE

| | | | | | |
|--------------------------------------|----------------------|------------------|--------------|------------|-----------|
| 1. Body weight (kg) | Male | Female | | | |
| a. Birth weight | 12.12±0.38 | 11.23±0.43 | | | |
| b. Pre-weaning weight | 32.76±0.72 | 30.56±0.66 | | | |
| c. 12 month weight | 78.58±1.46 | 69.18±1.27 | | | |
| d. Adult weight | 195.56±3.56 | 156.16±3.34 | | | |
| 2. Body measurements (cm.) | Male | Female | | | |
| a. Chest-girth | 113.14±1.25 | 123.21±1.31 | | | |
| b. Body length | 114.02±1.39 | 106.16±1.41 | | | |
| c. Height at withers | 106.09±1.41 | 102.21±1.38 | | | |
| 3. Dairy performance | | Lactation | | | |
| | | I | II | III | IV |
| a. Daily milk yield (Ltr.) | 1.14 | 1.38 | 1.52 | 1.25 | |
| b. Peak milk yield (Ltr.) | 1.62 | 1.97 | 2.22 | 1.78 | |
| c. Days to reach peak yield | 76.3 | 75.5 | 65.7 | 65.4 | |
| d. Lactation length (Days) | 270.65 | 282.32 | 295.44 | 293.23 | |
| e. Lactation milk yield (Ltrs.) | 308.54 | 389.60 | 449.07 | 366.54 | |
| f. Fat % | 4.97 | 4.91 | 4.88 | 4.88 | |
| g. SNF % | 8.74 | 8.67 | 8.66 | 8.65 | |
| h. Milking rate (litres/min.) | - 1 lt. In 9 minutes | | | | |
| i. Productive life span (month) | - 135 months | | | | |
| j. Dry period | 241.47 | 229.80 | 216.68 | 218.89 | |
| 4. Reproduction | | | | | |
| a. Males | | | | | |
| (i) Age at first ejaculation (days) | | | | | |
| (ii) Age at first mating (days) | | | 1176.67 | | |
| b. Females | | | | | |
| (i) Age at first oestrus(days) | | | 1213.42±8.21 | | |
| (ii) Oestrus cycle duration (days) | | | 21 | | |
| (iii) Oestrus duration (hrs) | | | 24 | | |
| (iv) Age at first mating (days) | | | 1251.67±6.73 | | |
| (v) Age at first calving (days) | | | 1522.86±7.54 | | |
| (vi) Service period (days) | | | 239.15±2.22 | | |
| (vii) Calving interval (days) | | | 512.12±2.65 | | |
| (viii) Gestation length (days) | | | 274.56±1.12 | | |
| (ix) Twinning percentage | | | Nil | | |
| (x) Dystocia percentage | | | 4.4 | | |
| (xi) Placental retention (%) | | | 11.3 | | |
| (xii) Abortions (%) | | | 4.6 | | |
| (xiii) Still births (%) | | | 3.2 | | |
| (xiv) Post-gestational mortality (%) | | | Negligible | | |

- 5. Type of work**
- a. Purpose (Ploughing, threshing, Power etc.) : **All types of agricultural operations**
 - b. Capacity for work (Hard/medium/light) : **Hard**
 - c. Average duration of work per day (hrs) : **6 hours**
- 6. Drought tolerance** : **1**
(Allocate grades 1-5, 1=high)
- 7. Heat tolerance** : **1**
(Allocate grades 1-5, 1=high)
- 8. Diseases and parasites** : Resistance to many diseases. Parasitic infestation is moderate to high.
- 9. Measures against diseases** : Vaccination schedule is followed in most of the areas in the native tract. Farmers often treat the animals with indigenous medicines, however, veterinary service is available although the native tract.



TABLE 1. MONTHLY CLIMATIC PARAMETER OF KHARIAR CATTLE BREEDING TRACT

| Month | Jan | Feb | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | |
|-----------------------|------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Air Temp (°C) | Max | 18.4± 0.13 | 21.4± 0.11 | 33.7± 0.14 | 38.8± 0.22 | 42.2± 0.20 | 41.2± 0.23 | 27.3± 0.22 | 26.6± 0.23 | 25.7± 0.22 | 24.4± 0.15 | 21.2± 0.18 | |
| | Min | 13.1± 0.14 | 14.4± 0.23 | 17.9± 0.20 | 28.8± 0.18 | 26.8± 0.22 | 28.8± 0.18 | 23.1± 0.23 | 23.2± 0.19 | 21.5± 0.24 | 19.9± 0.22 | 16.5± 0.17 | 14.3± 0.19 |
| Relative Humidity (%) | Max | 59.4± 0.22 | 58.3± 0.24 | 51.8± 0.23 | 54.6± 0.28 | 57.2± 0.30 | 81.7± 0.31 | 86.8± 0.27 | 85.7± 0.31 | 79.9± 0.25 | 76.8± 0.28 | 64.5± 0.29 | 63.4± 0.25 |
| | Min | 44.5± 0.23 | 41.3± 0.27 | 40.2± 0.22 | 39.8± 0.23 | 41.5± 0.27 | 66.4± 0.24 | 78.4± 0.24 | 78.2± 0.22 | 69.6± 0.22 | 66.4± 0.21 | 52.3± 0.23 | 48.6± 0.21 |
| Rainfall (mm) | 11.5 | 15.4 | 13.6 | 23.7 | 33.7 | 228.3 | 343.5 | 384.6 | 220.9 | 81.9 | 17.9 | 3.2 | |
| Total rain days | 2.4 | 2.5 | 2.8 | 3.7 | 6.2 | 13.4 | 20.2 | 22.8 | 18.9 | 13.5 | 2.7 | 1.9 | |



TABLE 2. BODY WEIGHT AND BODY MEASUREMENTS OF KHARIAR CATTLE

| | SEX | BW (kg) | HW (cm) | BL (cm) | HG (cm) | PG (cm) | TL (cm) | HeL (cm) | HoL (cm) | EL (cm) | SL (cm) |
|---------------|-----|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|------------|-------------|
| Birth | M | 12.12±0.38 | 56.57±0.53 | 44.65±0.46 | 55.22±0.47 | 56.36±0.52 | 31.75±0.41 | 17.86±0.26 | - | 12.34±0.14 | 5.17±0.09 |
| | F | 11.23±0.43 | 55.32±0.45 | 43.31±0.42 | 54.64±0.43 | 55.76±0.55 | 31.64±0.30 | 17.54±0.32 | - | 12.13±0.13 | 5.11±0.0.08 |
| 3 month | M | 32.76±0.72 | 66.87±0.78 | 57.44± 0.76 | 72.67±1.02 | 73.45±1.03 | 44.85±0.52 | 23.22±0.47 | - | 13.11±0.21 | 6.02±0.07 |
| | F | 30.56±0.66 | 64.52±0.68 | 55.28±0.72 | 71.54±1.07 | 73.52±1.02 | 44.63±0.48 | 23.13±0.47 | - | 13.09±0.20 | 6.11±0.08 |
| 6 month | M | 47.23±1.12 | 76.98±1.14 | 72.54±1.13 | 82.67±1.12 | 82.87±1.04 | 53.87±0.72 | 28.82±0.45 | - | 15.17±0.27 | 7.23±0.08 |
| | F | 41.21±1.21 | 73.4±1.13 | 68.29±1.14 | 80.77±1.12 | 81.66±1.06 | 53.12±0.75 | 27.88±0.32 | - | 15.11±0.26 | 7.12±0.07 |
| 12 month | M | 78.58±1.46 | 85.21±0.93 | 83.53±1.03 | 95.42±1.39 | 96.73±1.21 | 63.85±0.81 | 33.11±0.52 | 2.32±0.07 | 17.22±0.33 | 12.89±0.11 |
| | F | 69.18±1.27 | 83.17±1.01 | 81.37±1.01 | 92.18±1.16 | 95.53±1.21 | 62.78±0.85 | 32.32±0.51 | 1.66±0.08 | 17.21±0.30 | 12.75±0.12 |
| Adult (>2 yr) | M | 195.99±3.56 | 106.09±1.41 | 114.02±1.39 | 133.14±1.25 | 136.23±1.22 | 83.11±0.93 | 41.85±0.51 | 12.34±0.21 | 18.66±0.35 | 16.21±0.22 |
| | F | 156.16±3.34 | 102.21±1.38 | 106.16±1.41 | 123.21±1.31 | 134.12±1.33 | 81.67±0.96 | 41.34±0.42 | 10.12±0.27 | 18.54±0.34 | 16.16±0.23 |

- BW - Body weight
- HW - Height at withers
- BL - Body length
- HG - Heart girth
- PG - Punch girth
- TL - Tail length
- HeL - Head length
- HoL - Horn length
- EL - Ear length
- SL - Switch length

TABLE 3. REPRODUCTION TRAITS OF KHARIAR CATTLE

| Sl. No | Traits | Observation |
|--------|--|---------------|
| 1 | Age at puberty (days) | 1213.42±8.21 |
| 2 | Oestrus cycle duration (days) | 21 |
| 3 | Oestrus duration (hrs) | 24 |
| 4 | Age at 1 st mating (days) | 1251.67±6.73 |
| 5 | Age at 1 st calving (days) | 1522.86±7.54 |
| 6 | Age at 2 nd calving (days) | 2034.98±10.32 |
| 7 | Interval from calving to conception (days) | 239.15±2.22 |
| 8 | Calving interval (days) | 512.12±2.65 |
| 9 | Gestation length (days) | 274.56±1.12 |
| 10 | Life time no. of calvings | 6.5 |

Table 4. Effect of season on distribution of oestrus of Khariar Cattle

| Sl. No | Animals | Summer | Rainy | Winter |
|--------|-----------|--------|--------|--------|
| 1 | Heifer | 12.8 % | 46.2% | 41.0 % |
| 2 | Adult cow | 15.7 % | 43.2 % | 41.1 % |

TABLE 5. INCIDENCE (%) OF REPRODUCTIVE HEALTH PROBLEMS OF KHARIAR CATTLE

| Type of problems | Zone | | | |
|-----------------------|---------|-------|----------|---------|
| | Khariar | Komna | Sinapali | Overall |
| Abortion | 3.8 | 4.8 | 4.5 | 4.6 |
| Still birth | 2.6 | 3.2 | 3.7 | 3.2 |
| Retention of placenta | 10.4 | 11.6 | 11.4 | 11.3 |
| Repeat breeding | 8.5 | 7.8 | 7.6 | 7.8 |
| Pyometra | 1.8 | 2.7 | 2.8 | 2.6 |
| Anoestrus | 7.8 | 8.6 | 10.2 | 9.1 |
| Dystocia | 3.7 | 4.2 | 5.6 | 4.4 |
| Prolapse | 7.8 | 5.8 | 7.6 | 7.2 |

TABLE 6. DAIRY PERFORMANCE OF KHARIAR CATTLE IN DIFFERENT LACTATIONS

| Dairy performance | Lactation | | | |
|---------------------------|---------------|---------------|---------------|---------------|
| | I | II | III | IV |
| Daily milk yield(lts) | 1.14 ± 0.18 | 1.38 ± 0.21 | 1.52 ± 0.18 | 1.25 ± 0.16 |
| Peak milk yield(lts) | 1.62 | 1.97 | 2.22 | 1.78 |
| Days to reach peak yield | 76.3 | 75.5 | 65.7 | 65.4 |
| Lactation length(days) | 270.65 ± 3.26 | 282.32 ± 3.75 | 295.44 ± 4.23 | 293.23 ± 4.23 |
| Lactation milk yield(lts) | 308.54 | 389.60 | 449.07 | 366.54 |
| Fat % | 4.97 | 4.91 | 4.88 | 4.88 |
| SNF % | 8.74 | 8.67 | 8.66 | 8.65 |
| Specific gravity of milk | 1.03 | 1.03 | 1.03 | 1.03 |
| Dry period(days) | 241.47 | 229.80 | 216.68 | 218.89 |

TABLE 7. DRAFT CAPACITY OF KHARIAR BULLOCKS.

| Ploughing | Wet soil | Clay soil |
|--|----------------------|-----------------------|
| Area ploughed in 6 hrs. | 3742.8±8.78 sq. mts. | 2734.6±8.22sq. mts |
| Ploughing capacity (sq.mt per 100 kg body weight) | 959.84 | 697.64 |
| Carting | Plain pucca road | Undulated kutcha road |
| Load drawn | 1275.66±12.15kg. | 1275.66±12.15kg. |
| Carting speed(mts./hrs) | 3.4km/hr | 2.5km/hr |
| Carting capacity (load drawn on kg per 100 kg body weight) | 325.44 | 325.44 |



TABLE 8. AGE SPECIFIC INCIDENCE OF DIFFERENT DISEASES IN KHARIAR CATTLE (%)

| Diseases / Symptoms | Age group | | |
|-----------------------------|---------------|-------------------|-------------|
| | Up to 1 month | > 1 mo. To 12 mo. | > 12 months |
| 1. Diarrhoea | 18.45 | 67.48 | 14.07 |
| 2. Fever | 25.20 | 34.30 | 40.50 |
| 3. Pneumonia | 44.32 | 37.22 | 18.46 |
| 4. Parasite | 12.24 | 44.36 | 43.39 |
| 5. Skin diseases | 5.18 | 42.35 | 52.47 |
| 6. Anorexia | 8.24 | 40.18 | 51.58 |
| 7. Ear/Eye inf | 10.19 | 44.31 | 45.50 |
| 8. Viral diseases | 4.51 | 35.14 | 60.35 |
| 9. Blood protozoan diseases | - | 38.23 | 61.77 |
| 10. Miscellaneous | 30.12 | 34.35 | 35.53 |

TABLE 9. SEASONALITY OF DISEASE INCIDENCE IN KHARIAR CATTLE (%)

| Disease / Symptoms | Season | | | Overall |
|-----------------------------|--------|-------|--------|---------|
| | Summer | Rainy | Winter | |
| 1. Diarrhoea | 8.4 | 22.3 | 5.3 | 36% |
| 2. Fever | 2.2 | 23.6 | 4.2 | 30% |
| 3. Pneumonia | - | 3.8 | 0.2 | 4% |
| 4. Parasite | 34.5 | 32.2 | 27.3 | 94% |
| 5. Skin disease | 2.7 | 3.3 | 3.1 | 9% |
| 6. Anorexia | 8.5 | 6.3 | 10.2 | 25% |
| 7. Ear/Eye. Inf | 0.1 | 2.7 | 0.2 | 3% |
| 8. Viral diseases | 1.8 | 17.2 | 1.0 | 20% |
| 9. Blood protozoan diseases | 3.6 | 5.2 | 2.2 | 11% |
| 10. Miscellaneous | 5.2 | 4.5 | 6.3 | 16% |



TABLE 10. LAND HOLDING OF KHARIAR CATTLE FARMERS (%)

| Zone | Land holding | | | |
|----------|--------------|--------------|----------------|-----------|
| | Landless | up to 1 acre | 1.1 to 2 acres | > 2 acres |
| Khariar | 18.66 | 19.22 | 28.68 | 33.44 |
| Komna | 16.07 | 20.26 | 32.23 | 31.44 |
| Sinapali | 11.26 | 20.12 | 36.35 | 32.27 |
| Overall | 15.74 | 19.82 | 31.99 | 32.45 |

TABLE 11. PHYSIOLOGICAL PARAMETERS OF KHARIAR CATTLE

| Sex | Age group | Rectal Temperature (⁰ F) | Pulse rate (per min.) | Respiration rate (per min.) |
|---------|-------------------|--------------------------------------|-----------------------|-----------------------------|
| Male | Up to 3 month | 102.5 ± 0.2 | 78.7 ± 0.4 | 22.5 ± 0.3 |
| | More than 3 month | 101.1 ± 0.2 | 68.4 ± 0.4 | 19.3 ± 0.3 |
| Female | Up to 3 month | 102.4 ± 0.2 | 78.5 ± 0.3 | 22.6 ± 0.3 |
| | More than 3 month | 101.2 ± 0.1 | 68.5 ± 0.2 | 19.4 ± 0.2 |
| Overall | | 101.7 ± 0.2 | 72.4 ± 0.3 | 20.3 ± 0.3 |



