



Centre for
Pastoralism

Pastoral Breeds of India



Centre for
Pastoralism

Pastoral Breeds of India

Compiled by

Dr D K Sadana

Indigenous Livestock Society-India and Retired Scientist,
ICAR-National Bureau of Animal Genetic Resources

With inputs from

Dr Varinder Singh Raina

Technical Consultant, Ministry of Fisheries,
Animal Husbandry and Dairying, Government of India

Dr Sanjay Chaudhary, Dr Aneet Kour and Dr Veenesh Rajpoot

ICAR--National Dairy Research Institute

Published by Centre for Pastoralism, 2020

© Centre for Pastoralism, 2020

Designed by 9twenty Creative (Goa)
www.9twentycreative.com

Centre for Pastoralism
*c/o Sahjeevan, 175 - Jalaram Society, Vijay Nagar,
Hospital Road, Bhuj-Kachchh, Gujarat 370 001*
Tel: +91 2832 251814

www.centreforpastoralism.org

Regd. Society no. Guj/245/Kutch
Reg. Public Charitable Trust no. F-421/Kutch

All rights reserved

Permission to reproduce material from this book is not mandatory. The authors and publisher would, however, expect acknowledgement of the source of the matter used. Kindly use the following while citing this report: Sadana, D.K., V. S. Raina, A.I Kour, V. Rajpoot and S. Choudhary, 2020. Pastoral Breeds of India. Centre for Pastoralism, New Delhi.

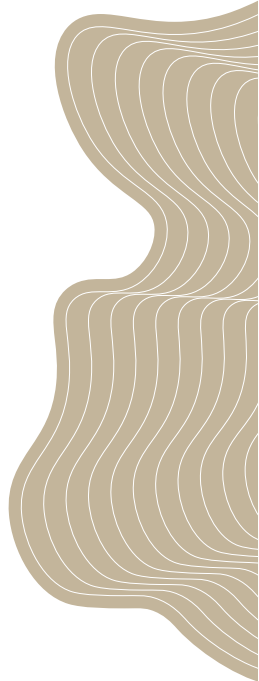
Supported by
Bharat Rural Livelihoods Foundation (BRLF)
*An independent society set up by the Government of India
to upscale civil society action in partnership with the Government*

- Axis Bank Foundation
- and
- Ford Foundation



Contents

List of Acronyms	ii
Executive Summary	iii
Acknowledgements	iv
Methods Used for Collection of Data/ Information	v
Summary Table of Registered and Pastoral Breeds in India ...	vi
Introduction	vii
 Pastoral Breeds of India	
<i>Cattle</i>	1
<i>Buffalo</i>	29
<i>Sheep</i>	45
<i>Goat</i>	105
<i>Camel</i>	125
<i>Horse</i>	145
<i>Pig</i>	150
<i>Donkey</i>	152
<i>Yak</i>	156
References	159
Index-1 (Species Index)	168
Index-2 (Breeds Index)	170



List of Acronyms

AH	Animal Husbandry
AI	Artificial Insemination
AICRP	All India Coordinated Research Project
BCRS	Bargur Cattle Research Station
BPL	Below Poverty Line
BPUMS	Banni Pashu Uchchherak Maldhari Sangathan
BQ	Black Quarter
BSF	Border Security Force
CFP	Centre for Pastoralism
DGMPS	Deccan Gorrela Mekala Pempakadarla Sangham
DNA	Deoxyribo Nucleic Acid
ETT	Embryo Transfer Technology
GNC	Ground Nut Cake
HP	Himachal Pradesh
HS	Haemorrhagic Septicemia
ICAR	Indian Council of Agricultural Research
IK-AB	Indigenous Knowledge about Animal Breeding
INR	Indian Rupee
ISDP	Intensive Sheep Development Project
J&K	Jammu & Kashmir
KCBS	Khariar Cattle Breeders' Society
KUUMS	Kachchh Unt Uchherak Maldhari Sangathan
LIC	Life Insurance Corporation
LIFE Network	Local Livestock for Empowerment Network
LPPS	Lokhit Pashu Palak Sansthan
MAFSU	Maharashtra Animal and Fishery Sciences University
MARAG	Maldhari Rural Action Group
NBA	National Biodiversity Authority
NBAGR	National Bureau of Animal Genetic Resources
NDDB	National Dairy Development Board
NDP	National Dairy Programme
NDRI	National Dairy Research Institution
NGO	Non-Government Organization
NMPS	National Mission for Protein Supplement
OBC	Other Backward Classes
OLRDS	Odisha Livestock Resources Development Society
PPR	Peste des petits ruminants
RAC	Recruitment and Assessment Centre
RGM	Rashtriya Gokul Mission
RKVY	Rashtriya Krishi Vikas Yojna
SAS Nagar	Sahibzada Ajit Singh Nagar
SDAU	Sardar Krushinagar Dantiwada Agricultural University
SEVA	Sustainable-agriculture and Environment Voluntary Action
SHG	Self Help Group
SKUAST-J/K	Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu & Kashmir
TANUVAS	Tamil Nadu Veterinary and Animal Sciences University
TDS	Total Dissolved Solids
WASSAN	Watershed Support Services and Activity Network

Executive Summary

Pastoral communities often move large distances in search of forage for their livestock. Not surprisingly, livestock that are bred and managed by pastoralists are characterized by their capacity to walk long distances and their ability to utilize the naturally available bio-mass of a variety of eco-systems. India's livestock has been classified into distinct breeds – each a genetic assemblage or population that is largely uniform within as well as separate from other such assemblages. Not all such distinct populations have been registered as breeds. In some instances, they are not recognized as distinct (being seen as part of existing assemblages). In other cases, the requisite documentation is underway to attempt to determine whether or not these are distinct populations. As on 31st March, 2020 197 distinct populations or breeds have been recognized within the country. These include a variety of cattle, buffalo, sheep, goat, yak and other domestic livestock species.

We scrutinized these 197 breeds to determine which amongst these are maintained under pastoral systems. We used the following working definition of pastoralism: “where communities undertake animal husbandry based on mobility for at least some weeks/months of the year, during which time there is dependence on common pool grazed resources, and for whom the primary income is derived from the management of livestock”. We noted that 73 of the 197 breeds in the country are managed under some level of pastoralist regime.

This report provides details on these 73 pastoral breeds, including information on the estimated current population, an assessment of the population's status with regard to whether or not it is endangered; details on its native tract and the ecosystem it grazes in; phenotypic and molecular characteristics, production and reproduction parameters, details regarding the communities that rear and manage the breed, and existing government or other plans to maintain the breed. Where possible, we have provided references to additional documentation and literature that is easily available. Although only a few Breed societies have been established in the country, mention of such societies has been made where these exist.

Details for the report have been collected primarily from the National Bureau of Animal Genetic Resources (NBAGR) and the National Dairy Research Institute (NDRI), both ICAR (Indian Council of Agricultural Research) Institutes located in Karnal, Haryana. Other sources have been mentioned in the bibliography.

LIFE Network and civil society more generally have been consulted for information or points of clarifications.

Acknowledgements

We would like to acknowledge the help and support received from several quarters in preparing this document. Our sincere thanks to Sandeep Virmani, the staff of Sahjeevan and its Board for their long term engagement with pastoralism and for their faith in our ability to carve out these details on pastoralist breeds from the obscure and sometimes confusing details available in the literature. Special thanks to Ramesh Bhatti, Sabyasachi Das and Sajal Kulkarni for filling in gaps, for ongoing discussions and for their constant encouragement. We are indebted to Shersinh Chauhan for photographs he has shared with us and for additional details on the pastoral breeds he has worked with. We are grateful to the directors, scientists and staff of NBAGR and NDRI, both ICAR institutes, where we made extensive use of their library collections. We are also grateful for the generosity with which photographs have been shared by several ICAR institutes viz. NBAGR Karnal, CIRB Hissar, NRCC Bikaner, CBF-JAU Junagadh, and by WASSAN in Telangana and Sahjeevan, Gujarat. We received wholehearted help from scientist-colleagues in different animal science and veterinary institutes and universities in different parts of the country and would like to record our gratitude to them. Grateful thanks to LIFE Network and SEVA for providing clarifications on several breeds local to their region. Our thanks to Riya Sequeira Shetty for coordinating the efforts to ensure this report saw the light of day. Our thanks to Vasant Saberwal for overseeing the writing of several drafts. We are grateful to Cfp for their financial support in compiling this document.

Methods Used

Breed details for each of the 197 registered livestock breeds [as on 31st March, 2020] were scrutinized to note whether the animals are taken away from the house/village for brief or longer periods and follow at least some level of mobility. Our working definition of Pastoralism – as mentioned above and reproduced below– was used to scrutinize breed details:

Animal husbandry based on mobility for at least some weeks/months of the year, during which time there is dependence on common pool grazed resources, and for whom the primary income is derived from the management of livestock.

The need was to look at details of each of the 197 registered breeds to assess which of these are currently managed as pastoral populations. Literature was consulted at the national libraries in two major institutes of ICAR (Indian Council of Agricultural Research, New Delhi) viz. NBAGR (National Bureau of Animal Genetic Resources) and NDRI (National Dairy Research Institute) that store and maintain authenticated information on indigenous breeds of livestock, their demography, husbandry practices and other details. Published material as well as the grey literature, and conference proceedings were consulted for necessary details. Although in our opinion pastoral management is a critical element in defining pastoral breeds, such information is rarely if ever mentioned in the relevant literature. Where necessary the team reached out to authors to ascertain how a particular breed was maintained and these conversations often generated additional points of discussion. Breed experts and colleagues in animal sciences and veterinary universities across the length and breadth of the country (Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir through to Kerala Agricultural University, Thrissur) provided valuable inputs in enabling us to categorise the breeds. LIFE Network, a network of NGOs and individual experts on indigenous livestock in the country, provided additional information in several cases.

Based on these efforts, and to the best of our judgment, these 73 breeds are managed under a variety of pastoral systems. Further study may identify additional populations in the remaining 124 breeds as managed by pastoralists. Equally, some of the 73 we have listed as pastoral breeds may turn out to have been wrongly categorized. We seek critical feedback to enable a continual updation of this report.

Summary Table of Registered and Pastoral Breeds in India

SR.	SPECIES	NUMBER OF REGISTERED BREEDS	NUMBER OF PASTORAL BREEDS
1	<i>Cattle</i>	50	13
2	<i>Buffalo</i>	17	07
3	<i>Sheep</i>	44	29
4	<i>Goat</i>	34	09
5	<i>Camel</i>	09	09
6	Others:		
	<i>Horse</i>	07	02
	<i>Pig</i>	10	01
	<i>Donkey</i>	03	02
	<i>Yak</i>	01	01
7	Remaining Breeds <i>[covering chicken, duck and geese]</i>	22	-
	TOTAL	197	73

As on 31 March, 2020. Source: <http://nbagr.res.in/Accessionbreed.html>

Introduction

While the nation has focused on high production hybrid animals, a large contribution to India's food security has come from a number of indigenous breeds and locally defined populations. Several of these breeds are maintained and bred by pastoral communities across the country. Gujarat has taken cognizance of the role of these communities in building India's genetically diverse livestock population and over the past decade has developed a unique process for identifying, recognizing and conserving these breeds. In 2010 the Government of India's National Bureau of Animal Genetic Resources (NBAGR) declared the Banni Buffalo, bred and managed by the Banni Maldhari pastoralists, as India's 11th buffalo breed. This was the first indigenous buffalo breed to be recognized as a distinct breed after India's independence.

Since then NBAGR has also accorded recognition to five additional breeds from Gujarat, including the unique Kharai Camel bred by Jat and Rabari Maldharis maintained in the mangroves of Gujarat and four other unique breeds - the Kahami goat and Panchali sheep maintained and bred by Bharwad and Rabari communities, the Halari donkey maintained by the Bharwad, Rabari and Kumbhar communities, and the Kachchhi-Sindhi horse maintained by the Sindhi, Gadvi, Meghval and other pastoralist communities. This recognition of locally developed breeds has been a matter of pride for the respective communities mainly because it credits the pastoralists as the scientific breeders of these animals.

Pastoral communities in different parts of the country, however, report a decline in the number of households involved in pastoralism and in the numbers of animals managed by them. This includes populations of yak, camel, donkey, sheep, goat, pig, buffalo and cows. Even though pastoralism makes significant contributions to India's wool, leather, milk and meat industries, and to India's domestic animal bio-diversity, and despite the knowledge that the movement of pastoralists through the countryside plays a critical role in maintaining the forest/grassland ecosystems, pastoralists are not a part of conversation at the level of food policy.

Pastoralists make unparalleled contributions to the country's food-basket and environmental safety by virtue of the locally adapted livestock breeds they maintain and breed. They are owners of the traditional knowledge required to utilize local breeds in a sustainable and environment friendly manner. Unfortunately, there is growing pressure on pastoral communities to sedentarize, and a direct outcome of this would include a gradual reduction in the numbers of breeds maintained by these communities. While a small proportion of pastoral breeds may find place within government programmes or within privately managed dairies, pastoralist sedentarization will almost certainly result in a decline in Indian domesticated bio-diversity.

This report is an attempt to place on record the diversity that currently exists, to provide, if you will, a baseline that we can use towards understanding our animal wealth and the contributions made by pastoral communities, but also to serve as a wake up call given the large number of populations whose numbers are on the decline, with the high probability of such decline accelerating over time.

We have used the following working definition of pastoralism:

Animal husbandry based on mobility for at least some weeks/months of the year, during which time there is dependence on common pool grazed resources, and for whom the primary income is derived from the management of livestock.

Based on this definition we have analyzed all the registered livestock breeds in the country [as on 31st March 2020] and classified them into two groups – breeds that are maintained and managed under pastoralism (in full or in part), and 'all the remaining breeds'.

A summary table is provided just after the methods section listing of the various breeds we consider to be linked to pastoralism.

This is a work in progress and we anticipate updating this as and when we receive additional information. We are interested in making this information available, but we are also keen to have readers provide critical feedback, either by way of pointing out errors or by providing additional information on these or additional populations. We will use any such information to update subsequent editions of the report. Contact details are provided on the back-cover of the report.

CATTLE

BARGUR	2
DANGI	4
GAOLAO	6
GIR	8
KANKREJ	10
RATHI	12
RED KANDHARI	14
UMBLACHERY	16
KHARIAR	18
PULIKULAM	20
BELAHY	22
PODA THURPU	24
NARI	26

CATTLE



Female

BARGUR

Production and Reproduction parameters

Average milk yield per lactation
350 kg ^(Ref-02)

Average calving interval
17 months ^(Ref-02)

Average age at first calving
40 months ^(Ref-04)

Estimated Population: 14,154 ^(Ref-01)

Population Status: Declining ^(Ref-05)

Native tract and ecosystem:

Bargur is a draught cattle breed native to Bargur forest hills in Bhavanitaluk of Erode district in Tamil Nadu. Due to their speed, endurance and trotting ability, they are used for agricultural operations in the rugged and inhospitable terrain of the Western Ghats ^(Ref-02).

Phenotypic and molecular characteristics:

These are compact sized, brown coloured animals with white markings. Horns are inclined backward, outward and upward with a forward curve and are sharp at the tip ^(Ref-02). Molecular characterization has revealed a genetic bottleneck that has resulted in a sharp decline in the population size ^(Ref-03).

Communities rearing the breed:

Lingayats ^(Ref-02)

Main use, economic value and markets:

Animals are generally used for draught purpose and for harvesting operations ^(Ref-02)



Male

Breed Association, plans and state schemes, any unique products:

- a — Bargur Cattle Research Station (BCRS) has been established by TANUVAS in Erode district of Tamil Nadu with the aim to conserve this breed ^(Ref-05)
- b — Animal Husbandry Department, Tamil Nadu is taking special initiatives to promote Bargur cattle by directing Aavin (Tamil Nadu Co-operative Milk Producers' Federation Limited) to start a cooperative society by procuring milk from Bargur cows ^(Ref-06)
- c — Lingayats, the community rearing Bargur cattle, have developed a bio-cultural protocol which calls on the National Biodiversity Authority (NBA) to recognize and conserve the breed ^(Ref-07).

Documentation on pastoralism:

- a — Lingayat communities are interested in reviving their pastoralist culture provided the forest department recognizes their grazing rights (for Bargur cattle) including camping inside the forest ^(Ref-08)
- b — The Lingayat pastoralists are one of the few pastoral communities to develop a bio-cultural protocol. ^(Ref-09)
- c — Lingayats are an indigenous Kannada-speaking community who live in the midst of the Bargur Forest Range situated in Western Ghats in Erode district, Tamil Nadu, south India. They number about 10,000 people. They rear Bargur (also spelt as Barghur) and act as custodians of the local forests ^(Ref-07).





Female

DANGI

Production and Reproduction parameters

Average milk yield per lactation:
430 kg ^(Ref-02)

Average calving interval:
19 months ^(Ref-02)

Average age at first calving:
53 months ^(Ref-02)

Average milk fat percentage:
4.3% ^(Ref-02)

Estimated Population: 1,19,373 ^(Ref-01)
Population Status: Not at Risk ^(Ref-233)

Native tract and ecosystem

Dangi is a cattle breed native to the hilly tract of the Akola taluk of Ahmednagar district and Sinner and Igatpuri taluks of Nasik district of Maharashtra. It is also native to the Dangs district of Gujarat. In general, these animals are found in the forests of the Sahyadri range ^(Ref-02).

Phenotypic and molecular characteristics

Animals have distinct white coat colour with red or black spots unevenly distributed throughout the body. The forehead is slightly protruding and horns are short and thick with lateral pointing tips ^(Ref-02). Molecular characterization of Dangi cattle is currently underway ^(Ref-10).

Special and unique characteristics:

The breed is known for its hardiness and its excellent draught performance in heavy rainfall areas, rice fields and hilly tracts ^(Ref-02).

Communities rearing the breed:

Kanadi, Mahadeo, Koli, Konkana, Thakar and Maratha communities, which are semi-nomadic are usually involved in the rearing of this breed. They practice seasonal migration and remain away from their villages for about 9 months a year. During the hot dry season, they migrate towards coastal areas and during heavy rainfall they settle at the foothills for protection from the cold ^(Ref-11).



Male

Main use, economic value and markets:

Due to excellent draught capacity, these animals are extensively used for carting timber and ploughing, harrowing and other agricultural operations ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Since Maharashtra is the major home tract of the Dangi breed, the state government promotes the protection and propagation of the breed ^(Ref-12). Also, under the Scheduled Caste Sub-plan, the government distributes indigenous the Dangi as a means of popularizing it ^(Ref-13).
- b — Under the RashtriyaGokul Mission, Embryo Transfer Technology (ETT) centres have been proposed to be established for indigenous cattle breeds including the Dangi in Pune and Nagpur ^(Ref-14).

Important documentation on pastoralism:

- a — Traditional Dangi management involves open grazing in forests and migration. As the tree cover has reduced and much of the remaining forest cover has been designated as reserved forests, herding families have had to reduce the number of animals they keep. Their herds of 150 to 200 animals have now shrunk to only 5–6 cattle each. Many families have stopped keeping these animals altogether, as they find it difficult to migrate. Today many Dangi owners regard the Forest Department as their biggest enemy ^(Ref-15).
- b — The Dangi breed is more productive under open grazing rather than stall-fed conditions. When forests were more abundant, Dangi owners grazed their animals largely in the open forests near their villages. However, as it has become harder to access these forests, families have started taking their animals for grazing to the villages of Igatpuri, Takibangala, Khardikasara and Shahapur ^(Ref-16).
- c — Traditional Dangi breeders are semi-nomadic. They wander from place to place for a period of 9 months from January to September. During the remaining 3 months they stay at home. Dangi cattle depend largely on whatever grazing they obtain during their wanderings. During the months of April and May, when most of the grasses in the forest areas are withered or consumed, the cattle are maintained on lopping from trees. The herds are driven 50 to 70 miles away from home in search of grazing ^(Ref-17).



CATTLE



Female

GAOLAO

Production and Reproduction parameters

Average milk yield per lactation:
604 kg ^(Ref-02)

Average calving interval:
14.15 months ^(Ref-02)

Average age at first calving:
54.74 months ^(Ref-02)

Average milk fat percentage:
4.32% ^(Ref-02)

Estimated Population: 1,21,538 ^(Ref-01)
Population Status: Declining ^(Ref-18)

Native tract and ecosystem:

Gaolao is a dual purpose breed native to Balaghat, Chhindwara and Seoni districts of Madhya Pradesh, Durg and Rajnandgaon districts of Chhattisgarh and Wardha and Nagpur districts of Maharashtra state ^(Ref-02).

Phenotypic and molecular characteristics:

The males are blackish white while females are white in colour. The horns are short, stumpy and curve back marginally. The forehead is slightly convex and the eyes almond shaped.. This breed is similar to the Ongole but is much lighter and more agile ^(Ref-02). Molecular characterization using microsatellite markers reveal little genetic differentiation between the Gaolao and Kenkatha breeds ^(Ref-19).

Communities rearing the breed:

The Nanda Gawali community has developed this breed ^(Ref-02).

Main values:

The Gaolao is used for quick transportation in hilly areas as it is a fast trotting breed. They also provide income to the farmers through the sale of milk ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a** — The Maharashtra government promotes the Gaolao breed through its conservation and propagation (Ref-20).
- b** — A project on Gaolao cattle is underway at the Nagpur Veterinary College, MAFSU, Nagpur to identify important candidate genes related to milk production. (Ref-21a)
- c** — SEVA, an NGO which promotes traditional knowledge and the rights of livestock keepers has been championing the cause of Gaolao cattle through their Breed Saviour Awards. (Ref-21b)

Important documentation on pastoralism:

- a** — Animals, mainly the Gaolao species, are grazed from mid-July to end-October (Ref-02) in extensive grasslands at strategic places preserved by the Forest Department. In general, cultivators do not keep more than six or eight animals but major landlords usually keep much larger numbers. An average big landlord in the Arvi subdivision possesses as many as 100 heads of cattle in his herd. He usually depends on grazing available in the nearby grasslands. (Ref-22)



CATTLE



Female

GIR

Production and Reproduction parameters

Average milk yield per lactation:
2,110 kg ^(Ref-02)

Average calving interval:
13.4 months ^(Ref-02)

Average age at first calving:
46.08 months ^(Ref-02)

Average milk fat percentage:
4.6% ^(Ref-02)

Estimated Population: 13,80,208 ^(Ref-01)
Population Status: Not at Risk ^(Ref-233)

Native tract and ecosystem:

The Gir is amongst the most popular milch cattle breeds in India. Its home tract is the Gir hills and the forests of Kathiawar region of Gujarat comprising Junagadh, Bhavnagar, Rajkot and Amreli districts ^(Ref-23).

Phenotypic and molecular characteristics:

Gir animals are usually pure red in colour, though some are speckled red. Their horns are distinctively curved into half-moons and their ears are long and pendulous ^(Ref-02). Several diversity studies show that the Gir is genetically closest to the Kankrej breed of cattle. ^{(Ref-24) (Ref-25)}

Unique characteristics:

Famous worldwide, the Gir has been exported to countries around the world for its unique features which include stress tolerance, resistance to various tropical diseases and for its high milk yield even with less fodder ^(Ref-02).

Communities rearing the breed:

Gir cattle are bred by professional breeder communities like Rabaris, Bhanoads, Maldharis, Ahirs and Charans. Migration starts from winter and ends with the onset of the f monsoon. Most Gir breeders return to the native tract when the monsoon begins and stay there till Diwali ^(Ref-11).



Male

Main values:

These animals are mostly bred for milk production. Bullocks are used to drag heavy loads on sandy, black or rocky soils ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a** — Gir Breeders Association Gujarat State (financially assisted by the Animal Husbandry Department, Gujarat) works for the preservation, improvement and better future of Gir cattle. Their activities include: enrolling Gir animal owners and collecting details about their animals, disseminating scientific knowledge on better husbandry practices through extension activities, arranging cow health competitions and felicitating the winners, providing a platform for sale and purchase of Gir animals and undertaking marketing activities for milk and milk products ^(Ref-26).
- b** — The Gir is the major cattle breed along with the Sahiwal. Central government efforts have been directed towards the promotion, development and conservation of the breed through initiatives like the Rashtriya Gokul Mission and the National Dairy Plan-I ^(Ref-27).
- c** — NDDDB has been a stalwart in Gir improvement, educating farmers on improved husbandry practices, increasing AI dissemination, setting up a centralized data recording system and upgrading nondescript animals with Gir germplasm ^(Ref-28).

Important documentation on pastoralism:

- a** — Both the Gir and Kankrej have evolved through centuries of breeding efforts by farming and pastoral, migratory communities of Gujarat. These include the Rabari, Bharwad, Maldhari, Charan and Ahir communities. ^(Ref-28).
- b** — These communities shepherd their cattle from place to place in search of grazing grounds. They find sufficient pasture from July to December and thereafter the animals migrate to adjoining districts ^(Ref-23).
- c** — The most important pastoral group are probably the Rabaris from Rajasthan and Gujarat who have created famous breeds like the Gir, Kankrej and Sanchori ^(Ref-16).
- d** — Rabaris, Bharwads, Maldharis, Ahirs and Charans are important pastoral communities rearing Gir cattle (Ref- 29, Ref-30, Ref-31)
- e** — Prized cattle breeds – the Gir and Kankrej – were the product of nomadic breeders (the Rabaris) who supply bullocks to sedentary farmers ^(Ref-32)





Female

KANKREJ

Production and Reproduction parameters

Average milk yield per lactation:
1,738 kg ^(Ref-02)

Average calving interval:
15.06 months ^(Ref-02)

Average age at first calving:
47.3 months ^(Ref-02)

Average milk fat percentage:
4.8% ^(Ref-34a)

Estimated Population: 19,45,094 ^(Ref-01)
Population Status: Not at Risk ^(Ref-233)

Native tract and ecosystem:

Kankrej is a dual purpose breed with its home tract in Ahmedabad, Banaskantha, Kheda, Mehsana, Sabarkantha, Kachchh districts of Gujarat and Barmer and the Jodhpur districts of Rajasthan ^(Ref-02).

Phenotypic and molecular characteristics:

Kankrej is the heaviest breed of cattle with a silver-grey to iron-grey or steel grey body colour. In males, the hump is slightly darker than the rest of the body. Animals have lyre-shaped horns, curved longer than in other breeds. The ears are large, open and pendulous ^(Ref-02). The genetic characterization indicates substantial variability in the breed and a higher genetic similarity to the Gir (Ref-33, Ref-24).

Unique characteristics:

The Kankrej animals have a distinctive gait called Swai chal (1¼ paces) by the breeders. The gait is smooth with the head held noticeably high and the stride long and even. The hind hoof is placed well ahead of the impression of the fore hoof ^(Ref-02).

Communities rearing the breed:

Rabaris, Maldharis, Bharwads, Ahir and Charans are associated with the rearing of the breed ^(Ref-02).



Male

Main values:

A dual purpose breed, it is used as both a draught animal for its milk. The bullocks are used for agricultural operations and road transport in villages ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Under Central Herd Registration Schemes, the central government has set up units to identify Kankrej animals. The National Dairy Plan-I envisages the development and conservation of the breed ^(Ref-27).
- b — For conservation and improvement of Kankrej animals, a cattle breeding farm was established at Bhuj, Gujarat in 1956. It is currently managed by the Gujarat Livestock Development Board. It promotes the scientific rearing of animals and supplies high genetic merit bulls to grampanchayats, gaushalas and panjarapoles ^(Ref-35a).

Important documentation on pastoralism:

- a — Both Gir and Kankrej have evolved through centuries of breeding efforts by the farming and pastoral, migratory communities of the Rabari, Bharwad, Maldhari and Charan ^(Ref-28) in Gujarat.
- b — The most important pastoral group in are probably the Rabaris from Rajasthan and Gujarat, who created such famous breeds as the Gir, Kankrej and Sanchoi ^(Ref-16).
- c — These most prized cattle breeds – the Gir and Kankrej – were the product of nomadic breeders (Rabaris) who supplied bullocks to sedentary farmers ^(Ref-32).
- d — Rabaris are an important pastoral community, rearing Kankrej cattle ^(Ref-34b).

The migratory rearing of livestock by pastoral communities is very common in the Western drylands of India. A study was conducted on a cattle herd in Haryana region migrating from the western dryland region of Rajasthan. The composite herd comprised 1068 animal heads from a group of 12 herders of a Rabari pastoral community of Rajasthan. Migration starts in autumn and continues till the onset of the monsoon with about four months of transitional stay in different districts of Haryana. A majority of the cattle in the herd were of the Kankrej breed (Ref-35b).





Female

RATHI

Production and Reproduction parameters

Average milk yield per lactation:

1,560 kg ^(Ref-02)

Average calving interval:

17.07 months ^(Ref-02)

Average age at first calving:

46.4 months ^(Ref-02)

Average milk fat percentage:

3.7-4.0 ^(Ref-37a)

Estimated Population: 8,65,921 ^(Ref-01)

Population Status: Not at Risk ^(Ref-233)

Native tract and ecosystem:

Rathi is a milch breed native to the Bikaner, Ganganagar and Jaisalmer districts of Rajasthan ^(Ref-02).

Phenotypic and molecular characteristics:

The animals are usually brown in colour with white patches all over the body. The horns are short to medium sized and are curved outward, upward and inward. The animals have a fine, loose dewlap, the face broad between eyes. The tail is long, tapering down to a black or white switch well below the hock ^(Ref-02). Studies on genetic characterization have revealed a higher genetic similarity between the Rathi and Tharparkar breeds ^(Ref-36).

Unique characteristics:

The Rathi breed seems to have originated from a mixture of Sahiwal, Red Sindhi, Tharparkar and Dhanni 'blood'. It is well adapted to the desert conditions of Rajasthan ^(Ref-02).

Communities rearing the breed:

The nomadic pastoral tribe called Rathis is involved in rearing this breed ^(Ref-02).

Main values:

Milk production ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — Under the National Programme for Bovine Breeding, the Rajasthan Livestock Development Board is establishing nucleus herds of Rath with superior bulls and bull mothers to form a pool of superior germplasm ^(Ref-37b).
- b — Under the National Dairy Plan–I, Rath is a priority breed for development and conservation through progeny testing and pedigree selection programmes ^(Ref-38).

Important documentation on pastoralism:

- a — The Rath are a nomadic Rajput clan, the name Rath derived from the breed of cattle they herd. As time went by they were forced to abandon their nomadic lifestyle and adapt to a semi-nomadic routine, settling down for part of the year ^(Ref-39).
- b — Some of the sub-groups of Sindhi Muslims (often classified as pastoralists) in Rajasthan are specialised cattle breeders and have developed one of the most important cattle breeds--the Rath ^(Ref-32).
- c — Historically, the Rath were a community of pastoral nomads, breeding mainly cows and sheep, as well as cultivating dry crops, and migrating three to nine months of the year. Till about the 1950s, no recognized rights to the land existed. This was in marked contrast to the related Pachhada community of Hisar and Mahendargarh districts of Haryana, who were forced to settle down by the British authorities in the late 19th century. With the construction of the Indira Gandhi Canal, land was divided up, and a large area granted to settlers. This led to a drastic reduction in grazing pasture land and the abandonment of the nomadic lifestyle. The community is now only partially nomadic with the majority remaining in the village ^(Ref-40).
- d — The Rathis get their name from a pastoral tribe called Rath who are Muslims of the Rajput community and lead a nomadic or stationary life . ^(Ref-41). 94681





Female

RED KANDHARI

Production and Reproduction parameters

Average milk yield per lactation:
598 kg ^(Ref-02)

Average calving interval:
14.61 months ^(Ref-02)

Average milk fat percentage:
4.57% ^(Ref-02)

Estimated Population: 2,35,058 ^(Ref-01)
Population Status: Not at Risk ^(Ref-233)

Native tract and ecosystem:

The Red Kandhari is a draught breed with its home tract in Ahmednagar, Parbhani, Beed, Nanded and Latur districts of Maharashtra ^(Ref-02).

Phenotypic and molecular characteristics:

The cattle are medium sized and are usually deep dark red in colour. Variations from dull red to almost brown are also found. The horns are evenly curved ^(Ref-02). The genetic characterization of the Red Kandhari reveals considerable genetic variations ^(Ref-42).

Main values:

This breed is mainly used for draught and transport. Bullocks are utilized for heavy work ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — To conserve and promote the breed, the Maharashtra government has included low yielding indigenous breeds such as the Red Kandhari in its scheme offering subsidies on cattle purchase to r farmers ^(Ref-43).
- b — Breed Conservation Awards are given annually by the NBAGR to livestock keepers (individuals as well as institutions) for the conservation of breeds in various categories. In 2017, a farmer from Ahmednagar, Maharashtra was awarded for the conservation of the Red Kandhari breed ^(Ref-44).

Important documentation on pastoralism:

- a — It is known that the Banjaras are also breeders of cattle, especially the Red (Lal) Kandhari, in this part of India. At the Banjara tunda (settlement) near the town of Kandhar, the Banjaras believe that they had brought the original stock from Rajasthan, and by crossing it with local animals, had created the Red Kandhari ^(Ref-45).
- b — The herd size is small and generally maintained on grazing alone. Small quantities of concentrate are offered only to bullocks, bull calves and milking females. The cattle remain mostly stationary ^(Ref-02).





Female

UMBLACHERY

Production and Reproduction parameters

Average milk yield per lactation:
494 kg ^(Ref-02)

Average calving interval:
14.6 months ^(Ref-02)

Average age at first calving:
52.4 months ^(Ref-02)

Average milk fat percentage:
4.94% ^(Ref-02)

Estimated Population: 39,050 ^(Ref-01)
Population Status: Declining ^(Ref-234, Ref-01)

Native tract and ecosystem:

Umblachery is an indigenous cattle breed native to the Nagapatinam and Thiruvavur districts of Tamil Nadu ^(Ref-02).

Phenotypic and molecular characteristics:

Umblachery is a draught breed, red at birth which transforms to grey in three or four months. The bulls are dark grey with black extremities, the cows grey with a lighter shade on the face, neck and hip region. The horns are very small in size and curve outward and inward and sometimes spread laterally. There are white markings on the face, limb and tail. All the legs have white marks below the hock region called Socks or Stockings. Even a portion of the hooves is white ^(Ref-02). Genetic characterization of the Umblachery breed using microsatellite markers reveal sufficient heterozygosity in the population ^(Ref-46).

Main values:

These are light built draught animals useful for work in marshy paddy fields. They are well suited to work in alluvial soil in their native tracts ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Tamil Nadu state government promotes the Umblachery breed among farmers by organizing cattle fairs or exhibitions and awarding prizes for the best maintained animals. Also, this breed is maintained in the Exotic Cattle Breeding Farm in Eachenkottai and the livestock farm in Korukkai with its ongoing semen production ^(Ref-47).
- b — A research project on “Genetic evaluation of draught animal power of Umblachery cattle in Cauvery Delta Zone” is underway in the Tamil Nadu Veterinary and Animal Sciences University ^(Ref-48).
- c — SEVA promoted the ‘Umblachery Cattle Breeders Association’ in Nagapattinam district in 2001. It comprised 234 members from 21 villages in the district. They de-silted nine ponds to provide drinking water for cattle and retrieved 107 acres of encroached pasture land in Umblachery village. A Participatory Calf Rearing Scheme was also introduced under which female calves and bulls are supplied to SHG members and breeders ^(Ref-78).

Important documentation on pastoralism:

- a — During the day, the cattle are tethered to wood packs or tree trunks. Most of the cows are not milked. Calves are allowed to suck their dams. Paddy straw is their main fodder. Bullocks and milking females are offered groundnut cake (GNC)/ sesame oilcakes. Rice bran and cottonseed are also fed to them. Herdsmen collect animals from various households in January or February and graze them for about six months. Usually the herd strength of such groups range from 250 to 400 animals. They are herded together to manure the fields ^(Ref-02).
- b — The animals are generally housed in sheds during the night with paddy straw being the staple fodder. The animals are usually taken out three to four kilometers for grazing. Concentrate feeds such as rice bran, soaked cotton seed and oil cakes are given only to working bullocks and cows in the early stage of lactation. In certain places herding is practiced. In January or February (after the harvesting of paddy), herdsmen collect the animals from various households and graze them for six months until June or July. At night, with the exception of calves and young stock, these herds are penned in agricultural fields for manure which is sold by the herdsmen ^(Ref-49).





Female

KHARIAR

Production and Reproduction parameters

Average milk yield per lactation:
300-450 kg ^(Ref-50)

Average calving interval:
16.84 months ^(Ref-02)

Average age at first calving:
50.09 months ^(Ref-02)

Average milk fat percentage:
4-5% ^(Ref-50)

Estimated Population: 2,90,015 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The breeding tract of the Khariar breed is in Nuapada district and its adjoining area in the Kalahandi and Balangir districts in Odisha state ^(Ref-02).

Phenotypic and molecular characteristics:

Khariar is a small sized, strong draught breed mainly brown in colour (sometimes grey) with straight horns. The hump, neck and some regions of the face and back are dark in colour ^(Ref-02). No documented evidence of any genetic diversity or characterization study of the breed has been found.

Main values:

The Khariar is basically a draught breed. Other utilities include milk, manure and fuel ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — Under the Odisha government's state plan scheme for the conservation and improvement of threatened indigenous breeds, breeders' forums were constituted for the Khariar to preserve and improve the valuable germplasm and to prevent the further dilution of its genetic potential through selective breeding ^(Ref-51).
- b — Under the aegis of the Odisha Livestock Resources Development Society (OLRDS), the Khariar Cattle Breeders Society (KCBS) was set up in Nuapada district for breed conservation and improvement ^(Ref-52).

Important documentation on pastoralism:

- a — Khariar cattle are mostly reared under an extensive system in which they are let loose in the morning and allowed to graze across hillocks, roadside vegetation and open fields throughout the day. The cattle population of a single village or hamlet are taken together as a herd to grazing fields by one or two persons during the cropping season to avoid any damage to the cultivated crop. These cattle depend solely on grazing. The feeding of straw, a small amount of ricebran and kitchen waste is confined to lactating cows and working bullocks ^(Ref-53).
- b — The migration of Khariar cattle has been restricted only to the southern and eastern parts of the native tract. The presence of the River Jonk, deep forests and hill ranges on the northern and western sides are hurdles in the migration of these animals. This migration occurs due to marketing which is the only reason for Khariar animals showing up in the adjoining areas of their native tract extending to Chhattisgarh ^(Ref-54).





Female

PULIKULAM

Production and Reproduction parameters

Average age at first calving:
50 months ^(Ref-02)

Estimated Population: 21,225 ^(Ref-01)
Population Status: Endangered ^(Ref-233)

Native tract and ecosystem:

Pulikulam is a native cattle species with its breeding tract in Madurai, Sivaganga and Virudhunagar districts of Tamil Nadu ^(Ref-02).

Phenotypic and molecular characteristics:

The males are dark grey while the females are white or grey. They are small with a compact body and short legs. The horns are curved outwards, upwards, backwards and inwards ending with pointed tips set wide apart. The forehead is broad and level with a groove at the centre. The hump is large in males and small in females. The udder is not well developed ^(Ref-02). Molecular characterization has revealed that the breed has not suffered a genetic bottleneck in the recent past ^(Ref-55).

Special and unique characters:

Bulls are used in bull riding events (Jallikattu).

Communities rearing the breed:

Pulikulam animals are maintained mostly by the Konar and Thevar communities ^(Ref-02).

Main values:

Milking is done only on 10 to 15 cows in a herd to meet the requirements of herdsmen. The bulls are also trained for riding events called Jallikattu, a popular sport in the region ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — SEVA promotes pastoralists rearing the breed and it is owing to their efforts that Pulikulam was registered as a breed by NBAGR ^(Ref-56).
- b — Under the Rashtriya Gokul Mission, a frozen semen station was set up at Hosur to cater to the frozen semen requirements of for the Pulikulam breed ^(Ref-57).
- c — To contain its dwindling population, the Tamil Nadu government organizes a Pulikulam cattle expo to spread awareness about the breed and to felicitate well bred and pure animals ^(Ref-58).

Important documentation on pastoralism:

- a — Indian pastoralists like the Konar and other communities maintain the Pulikulam breed of cattle ^(Ref-34b)
- b — The Pulikulam is maintained in large migratory herds in the Madurai area of Tamil Nadu ^(Ref-59)
- c — The migratory herd sizes range from 150 to 400 animals in the Madurai and Sivaganga Districts ^(Ref-60)
- d — For the bull riding event (Jallikattu) medium sized, horned, strong Pulikulam with good posture are trained. Herders derive income through penning, the sale of male calves and manure. The animals are taken to graze in the forests during the monsoon season between Oct–Jan and later, move to the plains to graze in the harvested fields. Forest grazing, however, has not been permitted over the last 13 years and is therefore a major reason for the decline in the population of the cattle from 1 lakh during the 1990s to 21,225 in 2012 ^(Ref-61).
- e — Pulikulam animals are maintained under an Extensive system of rearing and have transhumant mobility ^(Ref-02)



CATTLE



Female

BELAHI

Production and Reproduction parameters

Average milk yield per lactation:

1,014 kg ^(Ref-02)

Average milk fat percentage:

5.25% ^(Ref-02)

Estimated Population: App. 25,000 ^(Ref-62)

Population Status: Stable ^(Ref-233)

Native tract and ecosystem:

The Belahi breed of cattle is found in the foothills of the Shivalik range in Ambala, Panchkula and Yamunanagar districts of Haryana and in the Union Territory of Chandigarh ^(Ref-02).

Phenotypic and molecular characteristics:

These are medium sized animals, reddish brown and grey or white in colour with sickle shaped horns curved upwards and inwards. The face and extremities are white with different degrees of white on the ventral part of the body. The animals have a broad and straight head with a prominent poll ^(Ref-02).

A study on their genetic characterization reveals a similarity between the Sahiwal and Belahi breeds ^(Ref-63).

Communities rearing the breed:

Gujjars, also known as Langarias, have maintained this breed over several generations ^(Ref-02).

Main values:

The animals are used for milk, draught and manure ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Haryana state Animal Husbandry department has started a scheme for the conservation and development of indigenous cattle (Gausamvardhan) under which high yielding Belahi cows are identified and cash incentives given to the owners of these cows. All identified animals would be insured as per the prevailing insurance scheme or in the absence of which, 100% insurance premium would be met in the case of SC beneficiaries and 50% for general beneficiaries. The main aim of this scheme is to encourage farmers to rear good quality animals of the breed ^(Ref-64).
- b — A Breed Conservation Award is given annually to an individual/institution for conserving and maintaining a breed. In 2017, the award was bestowed on Md. Islam from the village of Rehna in Panchkula, Haryana for conserving the Belahi breed in its home tract ^(Ref-44).

Important documentation on pastoralism:

- a — This rare migratory breed has about 20,000 animals, is well adapted to the local environment and is an excellent dual-purpose (milk and draught) cattle genetic resource under the extensive management system. It provides livelihood and security to the Gujjar pastoralists of the region ^(Ref-63).
- b — The Belahi cattle are mainly utilised for milking, draught and manure. The Gujjars/ Langarias have been maintaining the breed for generations. The breed is reared under a low input migratory system. It migration period begins in February–March and ends in t October–November every year ^(Ref-65).
- c — The Belahi is a dual type cattle reared for milk and as a draught animal by the Gujjar community in the foothills of Haryana. It is maintained under the low input migratory system ^(Ref-66).
- d — Belahi are distinct migratory cattle with a number of unique qualities related to better thriving and adaptation. The Belahi cattle are reared by the Gujjars. Being pastoralist, their lives are associated entirely with the Belahi cattle. They are involved in cattle rearing throughout the year. They migrate along with their livestock from their native places to specific destinations. Indeed, for as long as 8 to 9 months a year, they remain outside their homes. They can be found in their native regions only during the 3 or 4 months of winter after they have returned ^(Ref-67).





Female

PODA THURPU

Production and Reproduction parameters

Daily milk yield:

2-3 kg (Ref-244)

Average lactation milk yield:

494 - 646 kg (Ref-244)

Average fat percentage:

3.7-4.1 (Ref-260)

Average age at first calving:

47-57 months (Ref-260)

Average service period:

80-100 days (Ref-260)

Average calving interval:

11-12 months (Ref-260)

Average duration of work per day:

7.5 hours (Ref-260)

Draught tolerance:

Very Good (Ref-260)

Heat tolerance:

Very Good (Ref-260)

Average herd size:

23-75 (Ref-244)

Estimated Population: Approx 15,000 (Ref-244)

Population Status: Vulnerable (Ref-233)

Native tract and ecosystem:

These cattle are distributed in the Nagarkurnool district of Telangana (Ref-244).

Phenotypic and molecular characteristics:

These are medium sized animals with a white coat with brown patches or a red/brown coat with white patches. Broad at the base, the horns are straight and upward or point forward. The forehead is convex with a deep groove at the centre in a majority of cases (Ref-244). As of now, no documented proof is available on the molecular characterization of Poda Thurpu cattle.

Special and unique characters:

These animals are usually maintained under an open grazing system and have excellent long migration capacity over undulating forest topography (Ref-244).

No cattle feed is required to raise the animal as it sustains itself on nothing but little fodder. It consumes less than 20 litres of water a day, which is exceptionally low (Ref-257).

Communities rearing the breed:

The Lambadis (a Scheduled Tribe), the Yadavas (Golla) (an OBC) and Chenchus (a particularly vulnerable Tribal Group) are traditional breeders of the Thurpu (Ref-258).



Male

Main values:

Poda Thurpu cattle are reared mainly as draught animals. The bullocks have excellent draught capacity in terms of endurance, speed and stamina and are preferred in both dryland and wetland agriculture ^(Ref-244).

Breed Association, plans and state schemes, any unique products:

- a** — The Telangana State Biodiversity Board along with support from the Animal Husbandry department and Watershed Support Services and Activity Network (WASSAN), an NGO, have worked together for the conservation of Poda Thurpu. They were also instrumental in getting the breed registered ^(Ref-259).
- b** — The NGO WASSAN conducted research on a total of 800 animals including 100 bullock pairs, 200 cows, 100 bulls and 400 calves to study the biometry and performance of Thurpu cattle ^(Ref-257).
- c** — To recognise the community of farmers who have been breeding this cattle in Amrabad, Mannanur, Achampet and surrounding areas for about 400 years now, a new breeder association called Amrabad Poda Thurupu Lakshmi Gau Sangam was created with the efforts of WASSAN ^(Ref-257).

Important research papers and documentation on pastoralism:

- a** — Market surveys have been conducted at the local livestock markets for the collection of data related to the market price of the Poda Thurpu as well as the identification of traders and potential buyers of the cattle. In addition, a study team has also travelled along with the migrating herds to observe the native habitat and agro-forest ecosystems through which the herds move on their seasonal migration ^(Ref-260).
- b** — The Poda Thurpu cattle breed is maintained almost exclusively under the agro-pastoral and mobile pastoral systems by the agro-pastoral communities (Lambadi and Golla) of Telangana state on the Deccan Plateau. This also represents a classic case of a community-bred-ecosystem, which plays a vital role in the evolution of the germplasm ^(Ref-260).
- c** — The animals are reared in hundreds by the Lambada Golla and ST communities of Amrabad, Achampet, Lingala and Padra mandals. They are not stall-fed and owe their strong hooves to grazing in forests and hillocks ^(Ref-261).
- d** — These animals are usually maintained under the open grazing system and have an excellent long migration capacity over undulated forest topography ^(Ref-244).



CATTLE



Female

NARI

Production and Reproduction parameters

Average age at first calving (months):
 $44.56 + 0.60$ (Ref-248)

Average calving interval (days):
 $360.00 + 1.10$ (Ref-248)

Average milk yield per lactation (kg):
 $1647.36 + 30.83$ (Ref-248)

Average fat percentage (%):
 $4.64 + 0.15$ (Ref-248)

Estimated Population: 55,000 (Ref-248)

Population Status: Not at Risk (Ref-233)

Native tract and ecosystem:

The breed has its native tract in the Sirohi and Pali districts of Rajasthan and the Sabarkantha and Banaskantha districts of Gujarat (Ref-248).

Phenotypic and molecular characteristics:

Its colour varies from white to grayish white. Its horns are generally widespread, long and thick at the bottom and pointed at the tips. Its shape varies from straight, curved to spirally curved. The male horns are usually pointed forward in orientation while the horns of the female are mostly oriented outwards. The face is moderate in length and width. The forehead is fairly broader and slightly concave. A majority of cows and bullocks/bulls possess large and well developed humps (Ref-248). Literature on the molecular characterization of the Nari cattle breed is not available.

Special and unique characters:

The horns are usually spirally curved and point outwards, imparting a wild visage (Ref-248).

Naris possess an excellent migratory capacity and a unique migration pattern especially around the Aravalli forest range (Ref-248).

Communities rearing the breed:

The Raika/Rabari of Sirohi and Pali districts are the communities who have maintained and conserved this majestic cattle breed (Ref-248).



Male

Main values:

The Nari is a dual purpose cattle breed, used for both milk and as a draught animal. Its milk is traded locally and male calves/ bullocks are sold to farmers for their draught power in agricultural activities ^(Ref-248).

Breed Association, plans and state schemes, any unique products:

- a — Leaders in the field have only recently become aware of the existence and extent of IK-AB, whose significance is slowly being recognized. In the context of a GTZ-supported project, Lokhit Pashu-Palak Sansthan and other Indian NGOs of the LIFE Network (see box) have developed participatory approaches and tools for documenting breeds on the basis of their keepers' breeding goals and IK. This process has turned up several scientifically unrecorded breeds such as Nari cattle ^(Ref-249).
- b — Maniram Rebari of Sirohi district in Rajasthan was awarded Breed Saviour Award 2010 for the conservation of Nari cattle ^(Ref-250).

Important research papers and documentation on pastoralism:

- a — In adjoining Bali tehsil, Nari animals migrate to the hilly areas of the Aravalli hills. In Sirohi district, the Raika community migrates along with their Nari herds in November/ December every year to Gujarat state due to the unavailability of adequate feed and fodder. They cover about 200 km migrating and finally stay in places like Himatnagar Idar, Kherbrahma (Sabarkantha district) or Dessa, Palanpur (Banaskantha district). The onward journey is completed in about 30 days. The community moves along with their families including non-school going children. The return journey is completed in 8 to 10 days, mostly after the onset of rains in July/ August. From August to October/ November, they stay in their villages. Some Nari herds were also reported to have migrated to Haryana ^(Ref-248).
- b — Pastoralists play an important role in the conservation of indigenous livestock breeds (such as the one-humped camel, the Toda buffalo, Nari and Malaimadu cattle, Deccani sheep), while Adivasis conserve valuable poultry genetic resources such as the Aseel chicken ^(Ref-74).
- c — The Raikas, famous pastoralists of Rajasthan, developed and stewarded the famous livestock of Rajasthan, including the camel, the Sirohi goat, most of its sheep breeds, and the Nari and Sanchori cattle breeds ^(Ref-16).

The Raika Biocultural Protocol mentions Nari cattle thus: “We keep the Nari cattle in large herds of 100-150 animals and take them on migration, usually to Gujarat. Overnight, the animals stay in thorn enclosures. We believe in guna or pure-breeding and to not dilute the traits and good quality of the breed, we select the breeding bull with great care based on its lineage and performance of female relatives. We also sell fresh milk to the dairy societies when on migration in Gujarat” ^(Ref-251).



BUFFALO

JAFFARABADI	30
NAGPURI	32
TODA	34
BANNI	36
LUIT (SWAMP)	38
CHHATTISGARHI	40
GOJRI	42

BUFFALO



Female

JAFFARABADI

Production and Reproduction parameters

Average milk yield per lactation:
2,239 kg ^(Ref-02)

Average calving interval:
14.6 months ^(Ref-02)

Average age at first calving:
45 months ^(Ref-02)

Average milk fat percentage:
7.68% ^(Ref-02)

Estimated Population: 5,71,077 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

Jaffarabadi breed of buffalo has Amreli, Bhavnagar, Jamnagar, Junagadh, Rajkot and Porbandar districts of Gujarat as its breeding tract ^(Ref-02).

Phenotypic and molecular characteristics:

Jaffarabadi is the heaviest breed of Indian buffaloes. It is generally black in colour with some animals exhibiting a white or grey tail switch. The horns are long with a wide variation but usually emerge out by compressing the head. They are curled downward and sideways, then upwards and inwards to form a ring-like structure. The horn shape, distinctive to this breed, makes the eyes look small. These eyes are also called 'study eyes', especially in males ^(Ref-02). Micro-satellite based genetic characterization have revealed that the breed has not undergone any genetic bottleneck in the recent past ^(Ref-68) and it was similar genetically to the Nagpuri breed and highly distinct from the other riverine breeds of adjoining areas (Ref-69, Ref-70).

Special and unique characteristics:

It is the heaviest breed of Indian buffaloes and is known for its ability to fight lions in the Gir forests ^(Ref-02).



Male

Communities rearing the breed:

Rabri, Bhadvad, Aher and Mer communities rear this breed. It is the major source of livelihood for Maldhari herdsman ^(Ref-02).

Main values:

They are mostly used for milk, draught and transportation ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Under NDP-I, Jaffarabadi is one amongst six buffalo breeds for which conservation and development work will be undertaken ^(Ref-71).
- b — The Gujarat government is promoting the pure breeding of Jaffarabadi animals, increasing the adoption of artificial insemination and genetic improvement through pedigree selection and, consequently, progeny testing in their home tract. Also, nondescript animals in the Jaffarabadi breeding tract will be upgraded using its semen ^(Ref-72).

Important documentation on pastoralism:

- a — These animals are mostly maintained by traditional nomadic breeders called Maldharis (Ref-73, Ref-74).
- b — In forest areas, the Maldharis keep their animals in “Nesdas” – heavily barricaded in front to protect the animals from lions and other wild animals. They are maintained on natural pastures throughout the year ^(Ref-02).



BUFFALO



Female

NAGPURI

Production and Reproduction parameters

Average milk yield per lactation:

1,039 kg ^(Ref-02)

Average calving interval:

14 months ^(Ref-02)

Average age at first calving:

57 months ^(Ref-02)

Average milk fat percentage:

8.25% ^(Ref-02)

Estimated Population: **73,584** ^(Ref-01)

Population Status: **Declining** ^(Ref-235)

Native tract and ecosystem:

The Nagpuri buffalo is native to the Vidarbha region of Maharashtra which comprises Akola, Amravati, Yavatmal, Wardha and Nagpur districts ^(Ref-02).

Phenotypic and molecular characteristics:

The animals are black with white patches on the face, legs and tip of the tail. The horns are flat, upward in orientation, curved and carried back on the side of the neck almost to the shoulders like a pair of swords ^(Ref-02). Genetic diversity studies suggest a sufficient genetic variability present in the breed as also a close similarity to the Jaffarabadi breed (Ref-75, Ref-70).

Special and unique characteristics:

The breed is adapted to the hot climate of the region. The shape and size of its horns protect the animal from wild animals while moving through the forest ^(Ref-02).

Main values:

The breed is mainly used for milk and heavy draught work. Farmers of the region prefer this breed due to its low maintenance cost, higher milk fat and regularity in breeding ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Maharashtra government has identified the Nagpuri buffalo as a breed which needs to be protected and propagated. For this purpose, Nagpuri animals will be bred with the semen of bulls of the same breed and local nondescript animals of the region upgraded with the Nagpuri semen ^(Ref-76).
- b — The shape and size of the horns provide protection to them from wild animals while passing through the forest ^(Ref-02).





Female

TODA

Production and Reproduction parameters

Average milk yield per lactation:
500 kg ^(Ref-02)

Average calving interval:
15.7 months ^(Ref-02)

Average age at first calving:
48 months ^(Ref-02)

Average milk fat percentage:
8.22% ^(Ref-02)

Estimated Population: 3,003 ^(Ref-01)
Population Status: Endangered ^(Ref-236, Ref-233)

Native tract and ecosystem:

The Toda buffalo is native to the Nilgiri district of Tamil Nadu ^(Ref-02).

Phenotypic and molecular characteristics:

At birth the calf is fawn coloured which later changes to ash-grey. In adult buffaloes, the predominant colours are fawn and ash-grey. The horns are long, set wide apart, outward, slightly downward and upward with the points re-curved inwards to form a crescent shape or semicircle. A narrow band of dense hair covers the top line from the crest of the neck to the point of origin of the tail. Also, two chevron markings, one just around the jowl and the other anterior to the brisket region are also present ^(Ref-02). Genetic characterization reveal that the Toda along with the Jaffarabadi and Pandharpuri belong to one lineage and were separate from other main breeds 1800-2700 years ago ^(Ref-77).

Special and unique characteristics:

It is the only breed other than the Kaziranga buffalo in Assam which can thrive well in high rainfall and high humidity areas ^(Ref-02).

Communities rearing the breed: It is reared by the herdsmen of the Toda tribe in the Nilgiris ^(Ref-02).



Male

Main values:

The breed is mainly used for draught purposes and has a socio-cultural role in religious ceremonies ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — SEVA has promoted the Panchapandavar Buffalo Keepers Association for the conservation of the Toda buffalo breed. Under this, deworming training is organized for members, microcredit is being provided to build calf sheds and due to its persistent efforts, original pasture lands have been restored ^(Ref-78).
- b — The Tamil Nadu government is promoting the conservation of the Toda breed in its home tract by encouraging the breeding of true-to-the-type animals and artificial insemination of the semen of bulls of the same breed ^(Ref-79).

Important documentation on pastoralism:

- a — The life of the Toda tribe is unimaginable without the daily rituals associated with the rearing of buffaloes. In their pastoralist culture, there is a definite feeling of custodianship of their herds – at least on the part of the older generation ^(Ref-74).
- b — Pastoralist breeds lie on the border between wild and domestic. For instance, the Toda do not themselves select male buffaloes for breeding, but instead leave this entirely to natural selection. The male buffaloes roam about on their own in the forest. Only the most dominant male has the opportunity to breed with the female buffaloes. ^(Ref-74).
- c — The breed is semi-wild and raised under semi-nomadic conditions with freedom in grazing ^(Ref-80).



BUFFALO



Female

BANNI

Production and Reproduction parameters

Average milk yield per lactation:
2,857.2 kg (Ref-02)

Average calving interval:
12.24 months (Ref-02)

Average age at first calving:
40.3 months (Ref-02)

Average milk fat percentage:
6.65% (Ref-02)

Estimated Population: 2,39,572 (Ref-01)

Population Status: Not at risk (Ref-233, Ref-237)

Native tract and ecosystem:

The Banni breed of Gujarat is found in Kachchh district where the soil is highly calcareous, saline and loam sandy, has poor water holding capacity, low permeability and is prone to erosion (Ref-02).

Phenotypic and molecular characteristics:

The breed is mainly black in colour though copper coloured animals are also found. The horns are curved and medium to large in size and are vertical and upwards in direction with inverted double/single coiling (Ref-02). A molecular characterization has revealed the genetic uniqueness of the Banni among various buffalo breeds in India and its close similarity with the Jaffarabadi species (Ref-69).

Special and unique characteristics:

The Banni breed has adapted to local climatic conditions and the traditional extensive system of night grazing (Ref-02).

Communities rearing the breed: The Sindhi Maldharis of the Banni area maintain this breed under the pastoral system with night grazing in the Banni grasslands near the Rann of Kachchh (Ref-02).

Main values:

The Banni are mainly reared for milch purposes (Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — The Maldharis of Banni came together to form the 'Banni Pashu Uchherak Maldhari Sangathan' (Banni Breeders' Association) with membership of more than 970 animal breeders. The objectives of this association include



Male

in situ conservation and improvement of the Banni buffalo, lobbying and advocacy for recognizing the Banni buffalo, land use rights of Maldharis on Banni grasslands, the establishment of organized animal and milk markets and strengthening backward linkages like feed, animal health care services and water (Ref- 85).

- b** — A research project on this population undertaken by NBAGR, Karnal from 2003 to 05 examined the morphological and molecular distinctness of Banni from other breeds. Later, in 2006, Sahjeevan, an NGO in collaboration with Sardar Krushinagar Dantewada Agricultural University (SDAU) and with the support of the Animal Husbandry Department, Gujarat worked along with Banni breeders for the identification of the animals for in situ conservation in their home tract. Sahjeevan, with the help of NBAGR, Karnal, has been instrumental in getting this breed registered in 2010 ^(Ref-86).
- c** — Under NDP-I, Banni is one of the buffalo breeds to be developed and conserved through progeny testing and the pedigree selection programme ^(Ref-71).

Important documentation on pastoralism:

- a** — The Sindhi Maldharis of the Banni region maintain the Banni buffalo under pastoral systems with night grazing in the grasslands near the Rann of Kachchh. They stay in small settlements locally known as “Vandh”. For green fodder, buffalos are completely dependent on a good monsoon in the Banni grassland. Buffaloes graze in nearby areas during the hot day hours and cover long distances in the cold nights. During scarcity and drought, the Banni breeders migrate outside to other regions of Kachchh and even to other districts of Gujarat.
- b** — The pastoralists of Banni have been producing milk that has far outstripped local demand, and hence the prices remained depressed till 2008. Setting up a milk dairy to market milk outside of Kachchh was the need of the hour, and to this end BPUMS started discussions with NDDDB. NDDDB in close collaboration with BPUMS then set up bulk milk cooling centres in the villages of Banni. As a result, the price of milk has tripled over the last decade. This has also led to an increased production of milk. Now Banni produces more than 100,000 litres of milk daily, up from 60,000 litres in 2008. Today the size of the livestock economy stands at an estimated INR 110 crore per year ^(Ref-87).
- c** — There are more than 20 Maldhari communities in Gujarat. Most of these communities are considered to have arrived in this region over a millennium ago from the adjoining areas of Sindh, Baluchistan, Afghanistan and the central Asian regions. Many of them possess large herds of camels, goats, sheep, buffaloes or cows while some have very little livestock and are extremely poor and marginalised among the rural communities. As experienced all over the world, these migrant, nomadic communities remain widely excluded from all the social development and welfare benefits including basic education thus aggravating their marginalisation and vulnerability ^(Ref-88).
- d** — Banni Pashu Mela has become an annual affair since 2008 and has attracted traders from all over India and outside ^(Ref-89).



BUFFALO



Female

LUIT (SWAMP)

Production and Reproduction parameters

Average milk yield per lactation:
449.4 kg ^(Ref-02)

Average calving interval:
15.31 months ^(Ref-02)

Average age at first calving:
53.55 months ^(Ref-02)

Average milk fat percentage:
8.68% ^(Ref-02)

Estimated Population: 1,14,951 ^(Ref-81)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

Luit is a swamp buffalo native to Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat, Dhemaji, Majuli, Lakhimpur and Biswanath districts of Assam.

Phenotypic and molecular characteristics:

The animals are medium-sized, strongly built and black in colour. The horns are curved laterally backwards and upwards forming a semi-circle. They have a broad and concave forehead with prominent eyes and a wide muzzle. They possess light white stockings up to the knee in both fore and hind legs, and their tail is short ^(Ref-02). Molecular diversity studies have reported the clustering of Upper Assamese, Chilika and Mediterranean breeds of buffaloes in one cluster distinct from other riverine Indian breeds ^(Ref-82).

Special and unique characteristics:

Luit (swamp) buffaloes are distinct from riverine breeds of buffaloes in that they have 48 chromosomes instead of 50 in the latter, out of which 23 pairs are autosomes and one pair is the sex chromosome. The fourth pair of metacentric chromosomes of the swamp buffalo resulted from the tandem fusion of chromosome no. 4 and 9 of riverine buffaloes ^(Ref-02).



Male

Communities rearing the breed:

The local people of Assam have been traditionally rearing these animals on the embankments and small islands of the mighty Brahmaputra (also known as Luit) river ^(Ref-02).

Main values:

They are reared for milk and draught purposes. The bullocks are excellent draught animals used for carting and ploughing, especially in muddy fields for paddy cultivation ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — To popularize buffalo breeding in Assam, the state government has encouraged pure line breeding of Luit animals and open nucleus breeding in selected villages. Also, the government has undertaken a Buffalo Khunti Area Development initiative to bring khutis (river islands, river banks and forest land where animals graze) under the organized husbandry sector for scientific breeding, health coverage and marketing of the produce ^(Ref-83).

Important documentation on pastoralism:

- a — A large proportion of these buffaloes are reared on river islands, river banks and forest land in large groups, locally called khunti, which means nomadic ^(Ref-02).
- b — The buffaloes are reared traditionally in an extensively managed nomadic system under zero input conditions, locally termed as the khunti system ^(Ref-84).



BUFFALO



Female

CHHATTISGARHI

Production and Reproduction parameters

Average milk yield per lactation:

1,180 kg ^(Ref-02)

Average milk fat percentage:

9.49% ^(Ref-02)

Estimated Population: 1,50,000 ^(Ref-90)

Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The Chhattisgarhi buffalo's domain includes Kavardha, Korba, Sarguja, Bilaspur, Jashpur, Mahasumund, Dhamtari, Kanker, Balrampur and Bemetara districts of Chhattisgarh ^(Ref-02).

Phenotypic and molecular characteristics: They are medium-sized, mostly black, some-times grey in colour. The horns are large and heavy curved laterally backwards with the tip pointing upwards ^(Ref-02). No documented evidence of genetic characterization studies on the Chhattisgarhi breed has been found.

Special and unique characteristics:

These bovines are slow maturing and average milkers. The 'peda' made from their milk is a famous product ^(Ref-02).

Main values:

This breed is reared for three purposes – draught, milk and meat. The Chhattisgarhi buffalo bullocks are preferred over cow bullocks to plough rice fields during the monsoon ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a** — The Chhattisgarhi has only recently been registered in September 2018. So it does not feature in state and central government schemes at the moment.

Important documentation on pastoralism:

The breed is semi-migratory in nature and follows a transhumant pattern. Under a unique management system called the 'Bathaan'system the buffaloes are taken to nearby forests, hillocks and free grazing land during summers and herds of farmers pool to save costs on labour and management ^(Ref-02).



BUFFALO



Female

GOJRI

Production and Reproduction parameters

Average milk yield:

3 to 8 kg (Ref-244)

Lactation yield:

800 to 1200 kg (Ref-244)

Average milk fat percentage:

7.5 (Ref-256)

Average age at first calving:

4-5 yrs (Ref-254)

Calving interval:

20-25 months (Ref-254)

Average herd size:

3 to 12 (Ref-254)

Estimated Population: Approx 50,000 (Ref-244)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The breed is found in Pathankot, Gurdaspur, Hoshiarpur, Rupnagar and SAS Nagar (Mohali) districts of Punjab and Kangra and the Chamba districts of Himachal Pradesh (Ref-244).

Phenotypic and molecular characteristics:

These buffaloes have a proportionate and medium body build and are mostly brown or black in colour. The horns are medium to large with an orientation curved backwards and then towards the front to complete the loop, locally called 'Pattih wale seengh' (Ref-252). The molecular characterization of Gojri buffalo has been accomplished using SSR markers (Ref-253).

Special and unique characteristics:

- a — Gojri animals can thrive on very low quality grass and roughage even during the peak summer and still produce quality milk (Ref-254)
- b — They can travel long distances (seasonal migration) and can easily climb hilltops for grazing (Ref-244)

Communities rearing the breed:

Gojri buffalo keepers belong to the Muslim Gujjar community, distributed throughout Punjab and in parts of Himachal Pradesh and J&K (Ref-254).



Male

Main values:

Both milk yield and draught power (ploughing and other agricultural operations) ^(Ref-244)

Breed Association, plans and state schemes, any unique products:

Murid Ali, a member of the Muslim Gujjar community was conferred with the Breed Saviour Award 2013 for his contribution to the conservation of the breed ^(Ref-254).

Important research papers and documentation on pastoralism:

- a — Gojri buffaloes are reared in a semimigratory/pastoral management system by the Gujjar community in Pathankot, Gurdaspur, Hoshiarpur, Rupnagar and SAS Nagar (Mohali) districts of Punjab and Kangra and the Chamba districts of Himachal Pradesh ^(Ref-244).
- b — Pilot surveys were conducted to identify and evaluate the indigenous but migratory buffalo population in Himachal Pradesh and Punjab state. The Gojri buffalo, called so as they are reared by the Gujjar community, was identified as the novel migratory germplasm in the region ^(Ref-255).
- c — Murid Ali and his close relatives reside in the nearby areas of Pathankot, Gurdaspur, and the adjoining border areas of J&K and Himachal Pradesh. Some distant relatives do migrate but this is entirely up to the individual family. Only families with a permit can graze their cattle in the on the hilltops of Himachal Pradesh ^(Ref-254).



SHEEP

BALANGIR	46
BELLARY	48
BHAKARWAL	50
BONPALA	52
CHANGTHANGI	54
CHOKLA	56
CHHOTANAGPURI	58
COIMBATORE	60
DECCANI	62
GADDI	64
GANJAM	66
GUREZ	68
HASSAN	70
JAISALMERI	72
KARNAH	74
MAGRA	76
MANDYA	78
MARWARI	80
NALI	82
NELLORE	84
PATTANWADI	86
POONCHI	88
RAMNAD WHITE	90
RAMPUR BUSHAIR	92
SONADI	94
TIBETAN	96
TIRUCHI BLACK	98
CHEEVADU	100
PANCHALI	102

SHEEP



Female

BALANGIR

Production and Reproduction parameters

Average litter size born:

1 (Ref-02)

Estimated Population: 2,48,986 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Balangir sheep breed is native to the Balangir, Sambalpur and Sundargarh districts of Odisha (Ref-02).

Phenotypic and molecular characteristics:

The species is medium sized, white or light brown or even of mixed colour and occasionally black. Only the males have horns. The ears are small and stumpy with the fleece is extremely coarse and hairy, the legs and belly are devoid of wool (Ref-02). The breed has been genetically characterized and its genetic diversity studied through microsatellite DNA profiling (Ref-169).

Main values:

Reared for meat and wool (Ref-02).



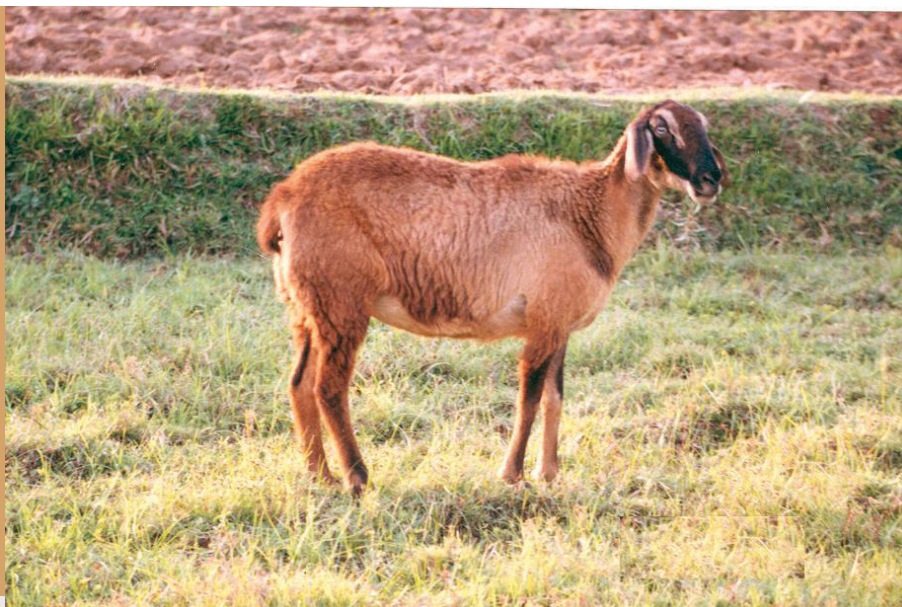
Male

Breed Association, plans and state schemes, any unique products:

- a — The Balangir is one of the focus breeds of sheep of the Odisha state government. The development programmer includes: promotional measures for the development and supply of breeding rams and bucks through selected breeders, skill training of rural technicians and the promotion of Breeders' Associations, self-help groups, voluntary and Non-Governmental organizations. There are supportive and subsidy components to these programmes as well ^(Ref-170).
- b — The Odisha state government also conducts annual vaccination and control programmes against diseases like Haemorrhagic Septicemia (HS) and Black Quarter (BQ). These measures are based on the state endemic chart and ring vaccinations and stamping out procedures during outbreaks. Vaccines are delivered to Breeders' Associations and Self -help groups for timely use by the village technicians ^(Ref-170).



SHEEP



Female

BELLARY

Production and Reproduction parameters

Average litter size born:

1 (Ref-02)

Average fibre diameter (μ):

59.03 (Ref-02)

Estimated Population: 16,73,154 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Bellary breed of sheep is native to Bellary, Chitradurga, Devanagere and Haveri districts of Karnataka (Ref-02).

Phenotypic and molecular characteristics:

The coat colour ranges between various combinations of black and white to complete black, though most animals are black with patches of white all over the body, including the head, thorax, abdomen, belly and legs. Wholly whitewhite animals are rare. About 89% of rams are horned and only about 9.5% of ewes are horned. The horns are thick at the base, corrugated and curved in rams with pointed tips. The ears are tubular and medium in size. The belly and legs are devoid of wool (Ref-02). Molecular analysis has revealed that the population has not suffered any recent bottleneck (Ref-171).

Main values:

Reared for meat and wool (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Karnataka state government is setting up a sheep breeding farm for Bellary sheep ^(Ref-172).
- b — In Anantpur district of Andhra Pradesh, the government provides 50 per cent subsidy to beneficiaries for maintaining individual units (100 ewes and 3 rams) of Bellary sheep ^(Ref-173).
- c — Sheep health coverage is being carried out through the Karnataka Sheep and Wool Development Corporation which also supplies anti-parasite drugs to sheep and goats free of cost. Other activities of the corporation include training and educating farmers, besides extension activities and publicity. An improved breed of rams are supplied at subsidized rates to interested farmers to rear superior breeds ^(Ref-174).
- d — For the security of shepherds, sheep are being insured under the scheme without considering breed, age and sex. The value of the sheep is fixed at Rs. 1500. These facilities have been extended to members of the sheep and wool producers' cooperative societies. If the member is willing to insure more than 10 sheep, the member has to pay 4% insurance premium along with 12.36% service tax to the insurance companies ^(Ref-174).

Important documentation on pastoralism:

- a — Bellary sheep flocks are maintained under an extensive system of management without any supplementation. The flocks migrate during the period of December-August to the south of the state and cover a total distance of about 150-300 km. Four to five sheep breeders join their flocks to move in a single group. One person is chosen as the group leader taking into consideration his ability to communicate, bargain and settle various deals favourably during the course of migration ^(Ref-171).



SHEEP



Female

BHAKARWAL

Production and Reproduction parameters

Average lambing interval:
12 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average fleece weight (kg/year):
1.5 (Ref-02)

Average staple length (cm):
7.75 cm (Ref-02)

Average fibre diameter (μ):
30 μ (Ref-02)

Average dressing percentage:
55% (Ref-02)

Estimated Population: 82,334 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

Udhampur, Jammu and Rajouri districts of Jammu and Kashmir are the breeding tracts of this breed (Ref-02).

Phenotypic and molecular characteristics:

Bhakarwal sheep are medium sized with a typical Roman nose and black head. They are generally white in colour with a black head. A few black coloured variety also exist. The horns are medium sized, curved backward and downwards and are whitish grey to brown in colour. The ewes are generally polled but bear horns occasionally. The ears are horizontal and directed backwards. While the body coat is wooly, the head, face and legs are devoid of wool (Ref-02). The breed has been genetically characterized and its similarity with the local Purky sheep population was found to be very high (Ref-174).

Special and unique characteristics:

The breed is a sturdy and excellent climber (Ref-02).

Communities rearing the breed:

The breed is reared by the nomadic Bhakarwals tribe, its name derived from the community (Ref-02).

Main values:

Reared for meat and wool, (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — Under a centrally sponsored scheme, the J&K government promotes g native sheep breeds including the Bhakarwa. This has been done through the intensive cluster development and venture capital funds for the establishment of sheep farm units (25 Ewes +1 Ram and 500 Ewes + 25 Rams) provided by the government which also plans to strengthen the potential sheep breeding farms towardsr their corporatization ^(Ref-166).
- b — Also, pilot projects for artificial insemination in sheep with the collaboration of SKUAST-J/K are ongoing ^(Ref-166).

Important research papers and documentation on pastoralism:

- a — The animals are maintained on open grazing in natural grasslands with no supplementary feeding. During the winter, tree loppings and jungle hay is fed to them. A large number of flocks migrate to Kashmir valley in the areas of Pahalgam, Shopian, Sonamarg, Minimarg, Baltal, Gurej, Sokhnai and Toss Maidan in summer for grazing. The flocks move down to low lying hills in winter. In the evenings they are confined to temporary enclosures. The rest of the time they are kept in the open throughout the year ^(Ref-02).
- b — The Bakarwal (also Bakharwal, Bakrawallah and Bakerwal) are a mostly- Muslim nomadic tribe based in the Pir Panjal and Himalayan mountains of South Asia. They are traditionally, and still mainly, goatherds and shepherds. They reside in the entire Kashmir region between India and Pakistan and in the Nuristan province of Afghanistan ^(Ref-175).
- c — The breed has no distinct home tract, and the sheep are entirely migratory. Bakharwal sheep flocks winter in the Pir Panjal ranges of Jammu division and in summer migrate to the Kashmir Valley, crossing the high mountain passes ^(Ref-176).



SHEEP



Female

BONPALA

Production and Reproduction parameters

Average age at first lambing:

24 months (Ref-02)

Average lambing interval:

12 months (Ref-02)

Average milk fat percentage:

6.1% (Ref-02)

Average litter size born:

1 (Ref-02)

Average fleece weight (kg/year):

1 (Ref-02)

Average staple length (cm):

9.86 cm (Ref-02)

Average fibre diameter (μ):

54.08 μ (Ref-02)

Estimated Population: 2,31,860 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Bonpala breed is native to the state of Sikkim and is found in the districts of Sikkim North, East, South and West (Ref-02).

Phenotypic and molecular characteristics:

The breed is tall, leggy and well-built. The fleece colour ranges from completely white to completely black and generally is a mixture of black and white. Horns are present in males and in some females. These are directed slightly upward before running backwards, and then twisted forward and outward. They are thick and long in rams and thin and small in ewes. The nose is typically of a Roman type and more prominent in males. The ears are small and tabular and the fleece coarse, hairy and open. The belly and legs are devoid of wool (Ref-02). The breed possesses significant genetic variability and has not suffered any genetic bottleneck (Ref-177).

Special and unique characteristics:

The breed is typically migratory and grazes at different altitudes (Ref-02).

Communities rearing the breed:

The Gurung community has developed this breed (Ref-02).



Male

Main values:

Reared for meat and wool ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Under the project 'Conservation of threatened breeds – Banpala Sheep', the Sikkim government has revived the Begha Sheep Farm as a nucleus for the breed. Here at least 35 Banpala sheep have been kept for breeding. Other than the farm, around 18 traditional farmers have also been listed as members of the Banpala Sheep Breeders Association. All the farmers have been provided 4 Banpala sheep each and other basic materials to initiate a breeding programme. This will make up one complete unit of the Banpala Sheep conservation programme at Begha, Dentam and West Sikkim ^(Ref-178).
- b — Under this conservation programme, a second breeding unit is under establishment at Sardong Village in West Sikkim. The farmers of this village have established their traditional sheep farm in the natural breeding groundstract ^(Ref-178).

Important documentation on pastoralism:

- a — In Sikkim, Banpala sheep start migrating in late March or early April and remain in the higher hills to avoid rain, besides the poisonous plants and leeches endemic with the rains in the lower hills ^(Ref-179).
- b — The Banpala sheep breed is reared under the nomadic system and is typically migratory ^(Ref-02).
- c — Traditionally, Garpala sheep are reared in village settlements whereas the Banpala are taken for migration (gar: home, bon: forest, pala: rearing) ^(Ref-180).



SHEEP



Female

CHANGTHANGI

Production and Reproduction parameters

Average age at first lambing:
28 months (Ref-02)

Average lambing interval:
12 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average fleece weight (kg/year):
0.95 (Ref-02)

Average staple length (cm):
9.4 cm (Ref-02)

Average fibre diameter (μ):
41.14 μ (Ref-02)

Average dressing percentage:
41% (Ref-02)

Estimated Population: 65,115 (Ref-01)
Population Status: Declining (Ref-242)

Native tract and ecosystem:

This breed is native to the Leh district of the Union Territory of Ladakh (Ref-02).

Phenotypic and molecular characteristics:

The animals are strongly built with good fleece cover of extraordinarily long staple length. The coat is white with brown patches on the eyelids, legs, ears, muzzle, hocks and hooves. The horns are long, curving backward, downward, forward and upward. The legs, face and tail are devoid of wool. The ears droop and are medium in size (Ref-02). The breed has genetic variability and has not suffered any genetic bottlenecks (Ref-181).

Special and unique characteristics:

This variety is well adapted to the adversities of snow and are always kept in the highlands and never brought down to the low hills (Ref-02).

Communities rearing the breed:

The breed has been developed and reared by the nomadic Changpa community (Ref-02).

Main values:

The dual purpose of meat and wool production (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The breeding policy of the erstwhile state of Jammu and Kashmir promotes selective breeding of Changthangi sheep in the Ladakh division ^(Ref-182).
- b — The district sector schemes of the sheep husbandry department include the improvement of migratory routes and subsidy/incentives to Chopans ^(Ref-166).

Important documentation on pastoralism:

- a — Changthangi sheep, locally known as Changluk, is a high potential breed found in the Changthang area of Leh. Changthangi sheep are seasonal breeders and the major breeding season is from July to December. This sheep is mainly reared by a nomadic tribe called Changpa along with the pashmina producing Changthangi goat ^(Ref-183).
- b — Changthangi sheep have a flock size of 200-300 in r migratory flocks which usually combine sheep and goats, generally in a ratio of 30:70 ^(Ref-184).



SHEEP



Female

CHOKLA

Production and Reproduction parameters

Average age at first lambing:

18 months (Ref-02)

Average lambing interval:

12 months (Ref-02)

Average litter size born:

1 (Ref-02)

Average fleece weight (kg/year):

1.75 (Ref-02)

Average staple length (cm):

5.5 cm (Ref-02)

Average fibre diameter (μ):

23.4 μ (Ref-02)

Estimated Population: 2,61,514 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Chokla breed of sheep is native to Nagaur, Sikar and Churu districts of Rajasthan state (Ref-02).

Phenotypic and molecular characteristics:

The breed is light to medium sized with a white coat. The face, generally devoid of wool, is dark brown (Raata Munda), and the colour may extend up to the middle of the neck. The ears are small to medium in length (9-11cm) and tubular, the coat dense and relatively fine. Both the sexes are polled (Ref-02). The breed was found to be genetically close to the Nali sheep of Rajasthan and a high level of inbreeding was found (Ref-186).

Special and unique characters:

The Chokla breed has the unique characteristics of a fine carpet quality fleece and survives on scarce fodder resources under field conditions during drought—a regular feature of the physical environment of the Chokla breeding tract (Ref-02).

Communities rearing the breed:

Khatik, Rebari, Gujjar, Jat and Meena (Ref-185).

Main values:

Both wool and meat production (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Network Project on Sheep Improvement, a project on the evaluation and improvement of Chokla sheep, was undertaken to improve the breed through selective breeding. Under this project, breeding rams are selected based on indices incorporating the greasy fleece weight and body weight at 6 months of age. Surplus rams are distributed to farmers through the state government of Rajasthan ^(Ref-185).
- b — Central Sheep and Wool Research Institute, Avikanagar provides elite rams of the Chokla breed to farmers, NGOs and developmental agencies. It also disseminates the technology developed on sheep production and its utilization besides honing skills through training, consultancy, contract research, contract service, incentives and rewards. ^(Ref-187).
- c — To improve the sheep population of the state genetically by providing superior breeding males (rams) to sheep breeders, the Rajasthan AH department runs a sheep breeding farm at Fatehpur (Sikar). The indigenous pure bred rams of breeds like the Chokla have been distributed to sheep breeders at Rs. 50 per kg live weight ^(Ref-205).

Important documentation on pastoralism:

- a — Migration is a common practice in Chokla sheep. The flocks start migrating in February/March and return to their homestead in July with the onset of the monsoon. The sheep breeders go on foot within the state of Rajasthan whereas truck loads of animals are taken to the distant areas of Loharu, Mahendragarh, Hisar, Charkha-Dadri, Rewari and Narnaul in Haryana state ^(Ref-185).
- b — The Chokla sheep are hardy and well adapted to arid and semi-arid tropical environments and are suited for the region where migration is a common practice ^(Ref-188).



SHEEP



Female

CHHOTANAGPURI

Production and Reproduction parameters

Average age at first lambing:
12.56 months (Ref-02)

Average lambing interval:
6.57 months (Ref-02)

Average litter size born:
1.08 (Ref-02)

Average dressing percentage:
48.42% (Ref-02)

Estimated Population: 5,16,692 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The breed's home tract comprises Bankura, Purulia and Midnapur districts of West Bengal and East Singhbhum, West Singhbhum, Ranchi, Dhanbad, Hazaribagh and Palamau districts of Jharkhand (Ref-02).

Phenotypic and molecular characteristics:

These are small, lightweight animals, mostly brown in colour. Some are white, black or black and brown. The horns are small, curved laterally backward, downward and forward with a flattened conical apex and numerous ridges while the females are polled. The ears are small and parallel to the head, the fleece coarse, hairy and open (Ref-02). The breed has been characterized and studied for its genetic diversity (Ref-189).

Communities rearing the breed:

The breed is mainly maintained by the tribals of Jharkhand (Ref-02).



Male

Main values:

It is reared both for wool and meat production ^(Ref-02).

Important documentation on pastoralism:

The Chhotanagpuri breed is reared under both stationary and transhumant systems of management ^(Ref-02).



SHEEP



Female

COIMBATORE

Production and Reproduction parameters

Average age at first lambing:
16.6 months (Ref-02)

Average lambing interval:
7.7 months (Ref-02)

Average milk fat percentage:
6.98% (Ref-02)

Average litter size born:
1 (Ref-02)

Average fleece weight (kg/year):
0.328 (Ref-02)

Average staple length (cm):
4.76 cm (Ref-02)

Average fibre diameter (μ):
47.05 μ (Ref-02)

Average dressing percentage:
43% (Ref-02)

Estimated Population: 28,725 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The breed is found in Coimbatore and the Erode/Periyar districts of Tamil Nadu (Ref-02).

Phenotypic and molecular characteristics:

These are medium sized animals with a slightly convex head. The body colour is white with touches of black or brown on the face, ears and neck. The colour also extends to the shoulder, chest and back. All females and a majority of males are polled. Their orientation backwards, outward and twisted, the horns are medium to large, black in colour and present in about 35 percent of males. The fleece is white, coarse and open, the head and face devoid of wool (Ref-02). High genetic variability with little inbreeding was found in the population (Ref-190).

Communities rearing the breed:

The Kurumba/Kuruba, a shepherd community of Palladam taluk in Coimbatore district (Ref-02).

Main values:

The breed is reared both for meat and wool (Ref-02).



Male

Important research papers and documentation on pastoralism:

- a — The flocks migrate to the Dindigul and Madurai districts of Tamil Nadu and the Palakkad and Thrissur districts of Kerala ^(Ref-02).
- b — A study was conducted in the districts of Ramanathapuram, Sivagangai and Pudukkottai in the Southern agro-climatic zone of Tamil Nadu where the migratory system of sheep production is practiced as a traditional occupation by a large number of sheep farmers. In the present study, the migratory routes followed were regular over the years though the routes were not permanent among the Coimbatore sheep migratory flocks ^(Ref-191).



SHEEP



Female

DECCANI

Production and Reproduction parameters

Average age at first lambing:
15.67 months (Ref-02)

Average lambing interval:
9.48 months (Ref-02)

Average litter size born:
1.04 (Ref-02)

Average fleece weight (kg/year):
0.74 (Ref-02)

Average dressing percentage:
51.5% (Ref-02)

Estimated Population: 37,23,406 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

Belgaum district in Karnataka and Nashik, Ahmednagar, Pune, Satara, Sangli, Solapur, Kolhapur and Beed districts in Maharashtra constitute the home tract of this breed (Ref-02).

Phenotypic and molecular characteristics:

The breed is predominantly black or black with white markings. White and brown/fawn animals have also been seen. Horns and beards are absent. The face is narrow with a Roman nose, the head convex and the ears of medium size (16-17cm), flat and pendulous. Wattles are absent. The fleece is extremely coarse, hairy and open. The head and face are bare while the legs are covered up to the shoulder and fetlock joint. The belly is covered (Ref-02). A molecular genetic study revealed that there is a high genetic variation within the breed (Ref-192).

Communities rearing the breed:

It has been traditionally reared by pastoral communities of the area such as the Kurmas and Gollas in Andhra Pradesh, the Dhangars in Maharashtra and the Kurubas in Karnataka (Ref-195).

Main values:

The breed is reared for meat and wool (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Deccan Gorrela Mekala Pempakadarla Sangham (DGMPS) is a society for shepherds from Peddagottimukka village of Medak district. They rear the Deccani sheep breed which is under threat of extinction due to the promotion of red/brown sheep breeds reared for their meat. The shepherds have teamed up with NGOs and have started identifying rams to ensure the breed survives ^(Ref-193).
- b — The Maharashtra government is executing a Sheep and Wool improvement programme in Beed, Parbhani, Nanded, Aurangabad, Jalgaon and Satara. Under this scheme the main components involved are health care, breed improvement, product development, marketing assistance and training to shepherds. This has been undertaken to increase the productivity of the Deccani breed. Two lakh sheep in the districts of Beed, Parbhani, Nanded, Aurangabad, Jalgaon, and Satara have been adopted under the programme and are being provided with all kinds of health services such as deworming and vaccination. ^(Ref-194).

Important documentation on pastoralism:

- a — Animals are reared under the stationary as well as the transhumant system of management. During the monsoon, the animals graze on the grasslands but during the remainder of the year, they graze in the fallow parts of otherwise cultivated land ^(Ref-02).
- b — The Deccani breed is well-suited to the extreme temperatures of the Deccan peninsula and is capable of long-distance migration. It has been traditionally reared by the pastoral communities such as the Kurmas and Gollas in Andhra Pradesh, the Dhangars in Maharashtra and the Kurubas in Karnataka. These communities have a strong synergistic relationship with farmers along the traditional migratory routes. The penning of sheep flocks in farmer fields contributes to maintaining and improving soil fertility ^(Ref-195).



SHEEP



Female

GADDI

Production and Reproduction parameters

Average age at first lambing:
23.75 months ^(Ref-02)

Average lambing interval:
12.33 months ^(Ref-02)

Average litter size born:
1 ^(Ref-02)

Average staple length (cm):
5.7 cm ^(Ref-02)

Average fibre diameter (μ):
28.52 μ ^(Ref-02)

Estimated Population: 2,95,010 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The Gaddi breed of sheep has Bilaspur, Chamba, Kangra, Kullu and Lahaul and Spiti districts of Himachal Pradesh as their home tract ^(Ref-02).

Phenotypic and molecular characteristics:

These are medium sized animals which are usually white although tan, brown and black and mixtures of these are also seen. Both sexes are armed with horns which are curved and medium sized in rams (18.5 cm) and small in females (6.4 cm). The ears are small and the fleece relatively fine and dense ^(Ref-02). No documented report of genetic characterization of Gaddi animals has been available.

Communities rearing the breed:

The Gaddi tribe of Himachal Pradesh ^(Ref-02).

Main values:

The breed is reared for wool and meat ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

The Himachal Pradesh government is strengthening its farms to promote sheep rearing, one of the main occupations of the people in the hill state. The sheep breeding farms at Jeori in Shimla district, Tal in Hamirpur district and Sarol in Chamba district are to be strengthened ^(Ref-196).

Important documentation on pastoralism:

- a — Semi-nomadic, the Gaddi migrate with their livestock during summers and wait out winters in their homes, mostly in the Chamba and Kangra districts. Since their farms yield little, they depend on selling sheep, wool and goatskin to traders, often exchanging meat for foodgrain in the villages they pass during migration ^(Ref-197).
- b — Gaddi sheep are reared under both the stationary and transhumant systems of rearing ^(Ref-02).
- c — A couple of Gaddis still own over 500 sheep each in various pockets. Gaddi sheep are migratory and on their to and fro movement to summer pastures, the Gaddis halt for a month or so in their home tract to feed the sheep on the stubble of harvested crops, and to receive the rewards of new lambing ^(Ref-198).
- d — The Gaddi are a distinct tribe of nomadic pastoralists of Himachal Pradesh involved in the rearing of sheep and goats of the Gaddi breed. Their flocks are managed totally under the extensive (migratory) production system. During summers the flocks climb to high altitude alpine Himalayan pastures and during winters they graze in the foothills ^(Ref-199).



SHEEP



Female

GANJAM

Production and Reproduction parameters

Average litter size born:

1 (Ref-02)

Average staple length (cm):

5.7 cm (Ref-02)

Estimated Population: 87,597 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Ganjam breed has Ganjam, Koraput, Phulbani and the Puri districts of Odisha as its home tract (Ref-02).

Phenotypic and molecular characteristics:

The Ganjam medium sized with the coat colour ranging from brown to dark tan. The animals may have white spots on the body. The ears are medium sized and drooping (13 cm) and the nose line slightly convex. The fleece is hairy and short. The Ganjam's hair is used as fibre (Ref-02). Genetic characterization revealed no bottleneck in the population and substantial genetic diversity (Ref-200).

Communities rearing the breed:

The Gola community (Ref-02).

Main use, economic value and markets:

The animals are reared solely for their meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Ganjam is one of the main breeds of goats which have been identified by the Odisha government for conservation and development because of their unique traits ^(Ref-201).
- b — The state government of Odisha has proposed to establish a sheep breeding farm. Selective breeding of indigenous species with improved stock has been taken up for genetic upgradation to improve the existing stock ^(Ref-147).

Important documentation on pastoralism:

The sheep are allowed to graze on natural grasses and shrubs from 9 to 10 am in the morning and to 6 pm in the evening for a distance of 5 to 10 km. During migration, this distance may increase to 15 to 20 km. Most of the flocks migrate from January to June to nearby areas like Nimsala, Palur, Ambri, Sunkara, Khalikot, Rambha, Narayan, Phasla and Bhalsa ^(Ref-200).



SHEEP



Female

GUREZ

Production and Reproduction parameters

Average lambing interval:
12 months (Ref-02)

Average litter size born:
1.04 (Ref-02)

Average dressing percentage:
55% (Ref-02)

Estimated Population: 17,207 (Ref-01)

Population Status: Vulnerable (Ref-233)

Native tract and ecosystem:

The Gurez breed of sheep is native to the Baramulla district of Jammu and Kashmir (Ref-02).

Phenotypic and molecular characteristics:

The Gurez is the heaviest sheep found in Jammu and Kashmir. They are predominantly white with a brown or black patch on the muzzle and around the eyes. Entirely coloured sheep may also be found. Horns are present in males whereas the females are generally polled. The ears are medium sized, thin and pointed. The body is mostly well covered with white fleece (Ref-02). A higher degree of inbreeding has been found in the population which calls for immediate attention on its conservation (Ref-202).

Special and unique characteristics:

It is the heaviest breed found in J&K. Also, multiple horns have been detected in some animals of both the sexes in the Gurez breed (Ref-02).

Communities rearing the breed:

The sheep breeders belong to the Dardi tribe who are responsible for the development of this breed (Ref-202).



Male

Main values:

The Gurez are reared for their meat and wool ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Under the centrally sponsored scheme, the J&K government is promoting native sheep breeds through intensive cluster development and venture capital funds for the establishment of sheep farm units (25 ewes + 1 ram and 500 ewes + 25 rams). The government has also planned to strengthen the potential sheep breeding farms and to act on their corporatization ^(Ref-166).
- b — Also underway are pilot projects for artificial insemination in sheep with the collaboration of SKUAST-J/K ^(Ref-166).

Important research papers and documentation on pastoralism:

Almost all sheep migrate to high altitude mountains after spring when the snow starts melting. Migration to alpine pastures begins in April/May and takes a month or so, depending on the vegetation available on the way. Some farmers who do not have permanent houses also move to alpine pastures with their livestock from their temporary settlements in valleys or in the foothills. The flocks start returning to their home during September/October and reach their destination latest by November as there is heavy snowfall in the entire region ^(Ref-202).



SHEEP



Female

HASSAN

Production and Reproduction parameters

Average lambing interval:

15 months (Ref-02)

Average litter size born:

1 (Ref-02)

Average fleece weight (kg/year):

0.35 (Ref-02)

Estimated Population: 7,03,012 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Hassan breed of sheep is native to Hassan district of Karnataka (Ref-02).

Phenotypic and molecular characteristics:

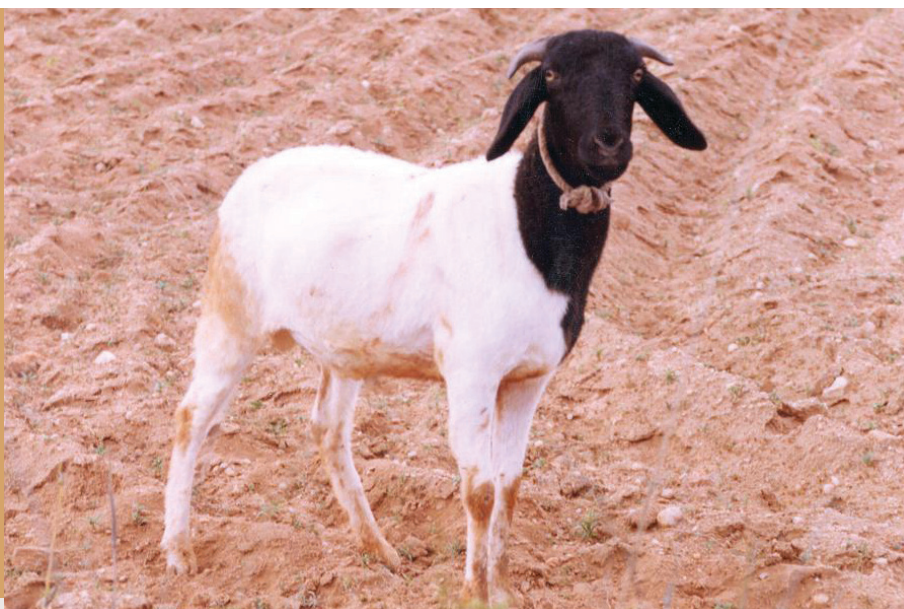
The animals are small sized and the body is white with light brown or black spots. The fleece is white. Females are usually polled while about 30-40% of the males are horned and the remaining polled. The horns are medium to small, curved backward, outward and downward. The fleece is extremely coarse and open with the legs and belly devoid of wool (Ref-02). Genetic characterization has revealed that the population has not suffered any recent bottleneck (Ref-203).

Main values:

The animals are reared for meat and wool (Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Sheep health coverage is conducted through the Karnataka Sheep and Wool Development Corporation which also supplies anti-parasite drugs free of cost. Other activities of the corporation include training and educating farmers,



Male

extension activities and publicity. At subsidised rates, an improved breed of rams is supplied from farms to interested farmers for breed improvement ^(Ref-174).

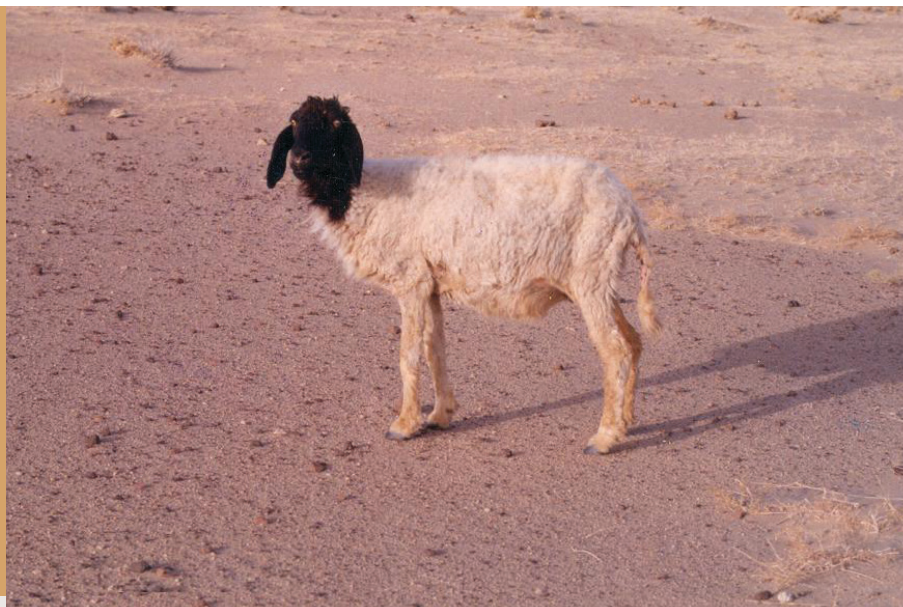
- b** — For the security of shepherds, sheep are insured under a scheme without considering breed, age and sex. The value of the sheep is fixed at Rs. 1500. These facilities are being extended to members of sheep and wool producers' cooperative societies. If a member is willing to insure more than 10 sheep, the member has to pay 4% insurance premium along with 12.36% service tax to the insurance companies ^(Ref-174).
- c** — Kendriya Bhed Palak Bima Yojana: To provide insurance coverage to sheep breeders in case of natural death, an amount of Rs. 60,000 is paid to the family of sheep breeders. In case of partial disability, an amount of Rs. 7,500 is paid. For accidental death or if the breeder loses both legs/limbs/eyes, an amount of Rs. 1,50,000 is paid. With respect to the insurance premium the farmer pays Rs 80, LIC Rs 100 and Central Wool Development Boards contribute Rs.150. To avail of these benefits, the shepherd should be a member of a Sheep and Wool Producers Co-operative Society and within the age group of 18 to 60 years. For their children studying in the 9th to 12th standards, a scholarship of Rs. 100 per month per student is given to two children of the insured shepherd ^(Ref-174).

Important documentation on pastoralism:

- a** — Both transhumant and stationary systems of rearing are evident. A few flocks migrate during March, April and May within the state ^(Ref-02).
- b** — About 90% of the flocks are stationary with the remaining undertaking short migrations during the lean periods of March to June. They migrate to other blocks of the district or to neighboring districts. ^(Ref-203)



SHEEP



Female

JAISALMERI

Production and Reproduction parameters

Average lambing interval:
12 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average fleece weight (kg/year):
1.54 (Ref-02)

Estimated Population: 10,18,880 (Ref-01)
Population Status: Not at risk (Ref-204)

Native tract and ecosystem:

The Jaisalmeri breed of sheep is native to Barmer, Bikaner, Jaisalmer and Jodhpur districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

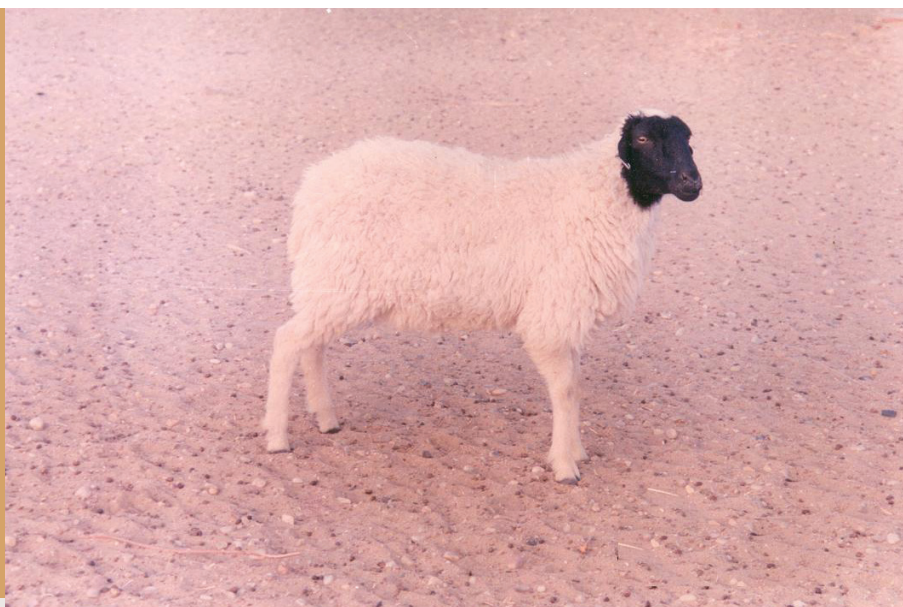
The animals are fairly well built and tall, their faces black or dark brown, the colour extending up to the neck. Both the sexes are polled. The legs are long, the head large with a typical Roman nose. They have long, drooping ears, generally with a cartilaginous appendage (Ref-02). The breed has sufficient genetic variability for its survival with the scope of improvement through selection (Ref-204).

Communities rearing the breed:

Jaisalmeri sheep are reared by Raika Hindus who live a nomadic life along with their sheep flocks for more than 8 months a year (Ref-204).

Main values:

The Jaisalmeri are reared for their wool and meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — Under the centrally sponsored PPR control programme, the government of Rajasthan provides free PPR vaccines to the entire sheep population ^(Ref-206).
- b — The Jaisalmeri could be improved through selective breeding for higher body weight and more wool production ^(Ref-211).

Important documentation on pastoralism:

- a — Jaisalmeri sheep are reared in an extensive system under the zero input management pattern. The animals are raised in both pastoral and sedentary systems in Jaisalmer district in limited numbers while the major flocks migrate for 6-8 months depending on the rains in the main breeding tract and access to grazing resources ^(Ref-204).
- b — In certain parts, flocks may migrate a little for water during the summer months ^(Ref-02).



SHEEP



Female

KARNAH

Production and Reproduction parameters

Average age at first lambing:
25 months (Ref-02)

Average lambing interval:
12 months (Ref-02)

Average milk fat percentage:
4.2% (Ref-02)

Average litter size born:
1.04 (Ref-02)

Average dressing percentage:
55% (Ref-02)

Estimated Population: 2,946 (Ref-01)
Population Status: Endangered (Ref-233)

Native tract and ecosystem:

The Karnah breed is native to the Kupwara district of Jammu and Kashmir (Ref-02).

Phenotypic and molecular characteristics:

The sheep are large with a deep body and are mainly white with a few animals marked with black or brown spots on the face. Around 94% of the rams have large curved horns. All females are polled. The horns take a backward turn and then forward and upward with pointed tips. The ears are pendulous and medium sized and the nose line is prominent (Ref-02). A genetic diversity study has revealed that though the population has not suffered any genetic bottleneck, the inbreeding estimates were quite high due to their small population (Ref-207).

Special and unique characteristics:

The Karnah is an important sheep breed of the region that yields white fleece of long wool fibres usable both in hand and machine spinning. Also, the breed has a unique ability to walk long distances in hilly tracts (Ref-02).

Main values:

The Karnah is reared for both wool and meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

With the Karnah recognized as an important breed in the Kashmir region of J&K, the government has emphasized on selective breeding for better and more wool and mutton production. It also aims to increase AI coverage in order to stem inbreeding ^(Ref-208).

Important documentation on pastoralism:

- a — Under the semi-migratory system of sheep husbandry practices, the shepherds move to alpine pastures in the summer but in winter they remain in their villages ^(Ref-207).
- b — A transhumant system of rearing is followed in grazing. The sheep travel up to 3,600 m altitudes in the range of Sunder Gali in summer and are stall fed in winter ^(Ref-02).



SHEEP



Female

MAGRA

Production and Reproduction parameters

Average lambing interval:
15 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average dressing percentage:
44.75% (Ref-02)

Estimated Population: 5,07,915 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Magra breed is native to Banswara, Chittorgarh, Dungarpur and Udaipur districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

The sheep are white with brown patches around the eyes. The skin colour is pink. Both the sexes are polled. The ears are stumpy or small and tubular. The fleece is of medium carpet quality, extremely white and lustrous and not very dense (Ref-02). The breed has a high level of genetic diversity with no recent genetic bottleneck observed (Ref-209).

Communities rearing the breed:

Jat, Rajputs and Naiks maintain this breed (Ref-209).

Main values:

Reared for their wool and meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — To improve the sheep population of the state genetically by providing superior breeding males (rams) to sheep breeders, The Rajasthan AH department runs a sheep breeding farm at Fatehpur (Sikar). The indigenous pure bred rams have been distributed to sheep breeders at Rs. 50 per kg live weight ^(Ref-205).
- b — Also, the government of Rajasthan promotes selective breeding of indigenous breeds like the Magra in its home tract for its body weight, wool resilience and its lustre ^(Ref-210).



SHEEP



Female

MANDYA

Production and Reproduction parameters

Average age at first lambing:
32 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average dressing percentage:
48% (Ref-02)

Estimated Population: 2,44,468 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Mandya breed of sheep is native to the Mandya, Mysore and Bangalore rural districts of Karnataka (Ref-02).

Phenotypic and molecular characteristics:

The coat colour is white with the light brown of the face usually extending up to the neck; some animals may be completely white. Both breeds are polled. The males may rarely have scars or small horns. The breed has a compact body with a typical reversed U-shape conformation from the rear. The ears are medium to long (13 cm), leafy and drooping. A large percentage of animals carry wattles. They possess a slightly Roman nose and the coat is extremely coarse and hairy (Ref-02). There was substantial genetic variability in the population and no bottleneck was found (Ref-212).

Main values:

The breed is reared for meat only (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The state government of Karnataka is establishing a semen bank to undertake artificial insemination in sheep and goat in order to encourage a conservation and development programme for indigenous breeds of sheep ^(Ref-213).
- b — Kendriya Bhed Palakbima Yojana: To provide insurance coverage to sheep breeders in case of natural death, an amount of Rs. 60,000 will be paid to their families. In case of partial disability, an amount of Rs. 7,500 will be paid. For accidental death or in case of loss of both legs/limbs/both eyes, an amount of Rs. 150000 will be paid. For the insurance, the premium contribution of the farmer is Rs. 80 with LIC contributing Rs.100 and the Central Wool Development Boards Rs.150. To avail of these benefits, the shepherd should be a member in the Sheep and Wool Producers Co-operative Societies and be in the age group of 18 to 60 years. For children of the members of the local Sheep and Wool Producers Society studying in 9th to 12th standard, a scholarship of Rs. 100 per month per student will be paid to two children of the insured shepherd ^(Ref-174).

Important documentation on pastoralism:

- a — The breed is reared under both stationary and transhumant systems of management. There is migration in some flocks during March, April and May within the state ^(Ref-02).



SHEEP



Female

MARWARI

Production and Reproduction parameters

Average litter size born:

1 (Ref-02)

Average fleece weight (kg/year):

1.78 (Ref-02)

Estimated Population: 30,74,952 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Marwari breed is native to Ajmer, Barmer, Jalore, Jodhpur, Nagaur and Pali districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

The face is typically black and the colour extends up to the lower part of the neck. Both the sexes are polled. The ears are tubular and extremely small in size, the nose straight, flat and tapering. The fleece is white and not very dense (Ref-02). Genetic characterization has revealed substantial genetic variability in the Marwari sheep population and no bottleneck was found (Ref-213).

Special and unique characteristics:

Marwari sheep are quite hardy and adaptable to an arid climate and can walk long distances for grazing (Ref-02).

Communities rearing the breed:

The Raika and Rebari communities (Ref-213).

Main values:

The breed is reared both for wool and meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Rajasthan state government promotes the improvement of the Marwari sheep breed through selective breeding for higher body weight and wool production ^(Ref-211).
- b — The All India Coordinated Research Project on Marwari Goat Improvement functions in the home tract of this breed in and around the Bikaner district of Rajasthan at four field unit centres: Deshnok, Kalyansar, Moonsar and Raisar. There has been a definite improvement in the growth performance of Marwari goats. This improvement is due to the distribution of selected elite sires in farmers' flocks and effective health coverage. There has been growing interest among farmers to get their sheep 'registered in the project, use improved elite sires and adopt scientific management of flocks and taking advantage of treatment and disease preventive services provided to them' ^(Ref-214)

Important documentation on pastoralism:

- a — The Marwari is predominantly a migratory sheep. The migration from Jalore, Sirohi and Pali districts takes place within the state and towards Madhya Pradesh and Gujarat following fixed routes. The migration extends over 6 to 9 months starting from October/November with the flocks returning to their homesteads in June/July. Fixed routes are followed towards Madhya Pradesh, Uttar Pradesh, Haryana and Gujarat. The migratory groups comprise 4-10 sheep flocks and are accompanied by other animals like goats, camels, dogs and donkeys ^(Ref-213).
- b — Flocks of Marwari sheep go on migration for a period of six months ^(Ref-02).



SHEEP



Female

NALI

Production and Reproduction parameters

Average litter size born:

1 (Ref-02)

Average staple length (cm):

7.4 (Ref-02)

Average dressing percentage:

59% (Ref-02)

Native tract and ecosystem:

The Nali breed of sheep is native to Hisar, Ganganagar, Jhunjhunu and Churu districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

The animals are predominantly white and the light brown of the face may extend to the neck. Both sexes are polled. The ears are large and leafy, the fleece white, coarse, dense and long stapled. The forehead, belly and legs are covered with wool (Ref-02). Genetic characterization has revealed substantial genetic variability in the Nali sheep population (Ref-215).

Communities rearing the breed:

The Kumhars, Mohammedans and Bawaria, Rajput, Jat and Brahman communities (Ref-02).

Main values:

The breed is reared both for wool and meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

The Rajasthan state government aims to conserve the Nali breed and further improve its traits like body weight and wool yield through selective breeding ^(Ref-211).

Important documentation on pastoralism:

- a — During lean grazing conditions, migration takes place from March to June/July both within and outside the state to mainly Haryana. The flocks return to their homestead in July with the onset of the monsoon. The migratory flocks are kept in open fields at night. The sheep breeders are paid by the field owner in cash or kind in lieu of fertilizing the fields by sheep droppings during the night ^(Ref-215).
- b — Flocks are stationary but may migrate in the peak summer in search of grazing land. Nali sheep are accustomed to night grazing and stubble grazing ^(Ref-02).



SHEEP



Female

NELLORE

Production and Reproduction parameters

Average age at first lambing:
28.2 months (Ref-02)

Average lambing interval:
14.26 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average dressing percentage:
47% (Ref-02)

Estimated Population: 69,42,182 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

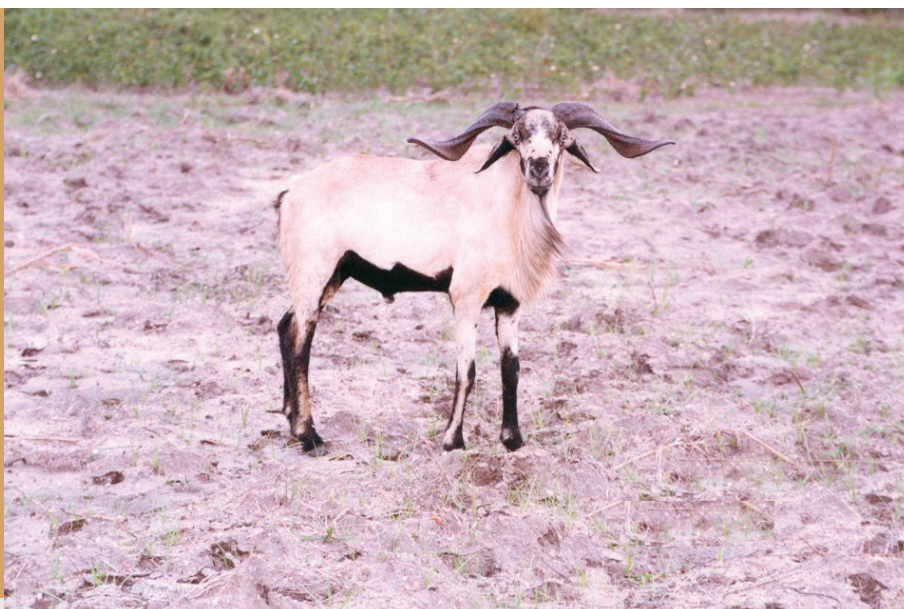
The breed is native to Nellore and the Ongole/Prakasam districts of Andhra Pradesh (Ref-02)

Phenotypic and molecular characteristics:

These are tall animals, red or white and with or without black on the ventral side of the body. The colour types are the Palla which is completely white or white with light brown spots on the head, neck, back and legs and the Jodipi or Jodimpu which is white with black spots around the lips, eyes, lower jaw and belly. Horns are found in males only. The animals have little hair except at the brisket, withers and breech. The ears are long (15.11cm) and drooping. 86% of the animals carry wattles (Ref-02). Diversity analysis indicates that there is substantial genetic variation though inbreeding in varying degrees was also present in the population (Ref-217).

Main values:

The breed is reared solely for its meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

Pasu Nastaparihar Padhakam: The Government pays compensation to all categories of livestock owners including big farmers, when mortality is reported in the case of cows/she buffaloes and to all sheep and goat rearers/owners irrespective of the caste of the farmer in the event of death. Sheep and goats aged 6 months and above are eligible for compensation under the scheme. Every death up to 20 animals per family per annum in the case of sheep and goats are eligible for compensation. The death of three or more sheep or goats can be compensated for on each occasion. The compensation payable is Rs. 6,000 per animal ^(Ref-216).

Important documentation on pastoralism:

Animals are reared under both stationary as well as transhumant systems of management ^(Ref-02).



SHEEP



Female

PATTANWADI

Production and Reproduction parameters

Average age at first lambing:
33.26 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average fleece weight (kg/year):
1.05 (Ref-02)

Estimated Population: 4,72,997 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

Patanwadi sheep are native to Mehsana, Amreli, Bhavnagar, Jamnagar, Junagadh, Katchchh, Rajkot, Surendranagar and Patan districts of Gujarat (Ref-02).

Phenotypic and molecular characteristics:

The nimal's face is light to dark brown while the fleece is white with a typically Roman nose. Both the sexes are polled. The ears are medium to large with a hairy tuft. The fleece is of medium carpet quality and not very dense. Migratory sheep have a larger body and long legs. They have a coarse fleece and are found in Western and North-Eastern Gujarat (Ref-02). Genetic characterization has revealed that there has been intermixture of the Patanwadi, Marwari and Dumba species in the breeding tract (Ref-218).

Communities rearing the breed:

The Rabari and Bharwad communities (Ref-02)

Main values:

The breed is reared for wool as well as its meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

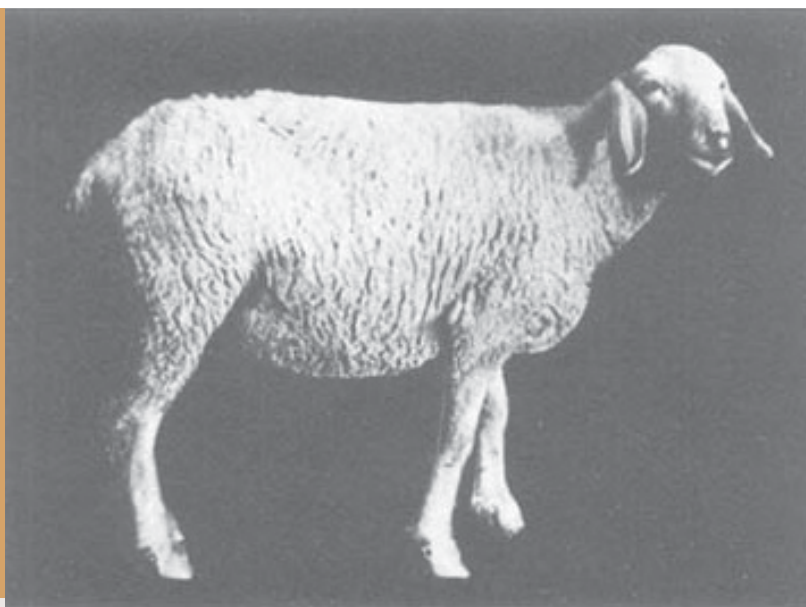
The Department of Animal Husbandry, Gujarat is improving and propagating Patanwadi sheep by selective breeding. Improved pure bred rams of higher genetic merit are produced at four sheep breeding farms (two at Morbi and one each in Naliya and Jasdan). The rams produced on these farms are distributed to breeders at a nominal cost. The rams produced at the breeders' are also certified for breeding. Certification and distribution of rams is done through the sheep service centres of Intensive Sheep Development Projects, (ISDP), Migratory Sheep-Goat Service Centres and Sheep Extension Centres ^(Ref-219).

Important documentation on pastoralism:

- a — Breeder communities like the Rabari, Bharwad and other pastoral communities maintain Marwari sheep besides Patanwadi in pastoral conditions in North Gujarat and Kachchh in large flock sizes. Preference for the Marwadi breed over the Patanwadi in North Gujarat and Kachchh is because of their hardy nature and their ability to migrate and survive with minimum inputs ^(Ref-11).
- b — Patanwadi animals are reared under both stationary as well as transhumant systems of management ^(Ref-02).



SHEEP



Female

POONCHI

Production and Reproduction parameters

Average staple length (cm):

3.82 (Ref-219)

Estimated Population: 2,643 (Ref-01)

Population Status: Endangered (Ref-233)

Native tract and ecosystem:

Poonchi sheep are native to the Poonch and Rajouri districts of Jammu and Kashmir (Ref-02).

Phenotypic and molecular characteristics:

These are medium sized animals, predominantly white in colour, including the face, but spotted animals are also seen. The male has horns. The nose and forehead is flat while the ears are medium in size and drooping. The body is covered with white, medium to coarse fleece. The belly is covered and the legs and face are devoid of wool (Ref-02). There is no documented evidence for genetic characterization of the Poonchi breed.

Main values:

The breed is reared solely for wool (Ref-02).

Breed Association, plans and state schemes, any unique products:

Poonchi is recognized as an important sheep breed of the Jammu region in J&K. The government emphasizes selective breeding of sheep for better and more wool production. Also, it aims to increase AI coverage o stem inbreeding among the animals ^(Ref-208).

Important documentation on pastoralism:

Animals are reared under the transhumant system of management. In summer, the animals graze on highland pasture. The flocks are mostly stall fed in winter ^(Ref-02).



SHEEP



Female

RAMNAD WHITE

Production and Reproduction parameters

Average age at first lambing:
23.6 months (Ref-02)

Average litter size:
1 (Ref-02)

Estimated Population: 7,10,028 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Ramnad White breed is native to the Pudukkottai, Ramanathapuram and Sivaganga districts of Tamil Nadu (Ref-02).

Phenotypic and molecular characteristics:

These are medium sized animals, predominantly white with black on the ventral aspect of the body. The rams are horned and the ewes polled. The horns are spiral, thick and corrugated, running backwards and outwards. The ears are leaf like, medium in size (12-13cm) and semi-pendulous. The body is covered with short hair (Ref-02). Genetic characterization reveals substantial genetic diversity with a low level of inbreeding (Ref-220).

Main values:

The breed is reared solely for meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

Tamil Nadu government has set up sheep breeding farms for Ramnad white breed at Pudukottai and Sivaganga districts in order to carry out improvement of the breed ^(Ref-221).

Important documentation on pastoralism:

Animals are reared under extensive system of management. There is local migration from March to May ^(Ref-02).



SHEEP



Female

RAMPUR BUSHAIR

Production and Reproduction parameters

Average age at first lambing:
29.69 months ^(Ref-02)

Average litter size:
1 ^(Ref-02)

Average lambing interval:
7.4 months ^(Ref-02)

Average staple length (cm):
4.3 cm ^(Ref-02)

Average fibre diameter (μ):
31.09 μ ^(Ref-02)

Average dressing percentage:
49% ^(Ref-02)

Estimated Population: 23,600 ^(Ref-01)

Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The Rampur Bushair sheep breed is native to Kinnaur, Shimla and the Lahaul and Spiti districts of Himachal Pradesh ^(Ref-02).

Phenotypic and molecular characteristics:

These are medium sized animals with the fleece colour predominantly white with brown extremities including the face, neck, belly and legs. About 21% of them are black. Both males and females have horns, curling backwards, downwards and outwards. They are medium to large (15-25cm) in size. The ears are flat and drooping and the nose is Roman. The fleece is of medium quality and dense. The legs, belly and face are devoid of wool ^(Ref-02). The genetic variability estimated using microsatellite markers was found to be sufficient in the population ^(Ref-222).

Main values:

The breed is reared for wool, meat and pelt ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

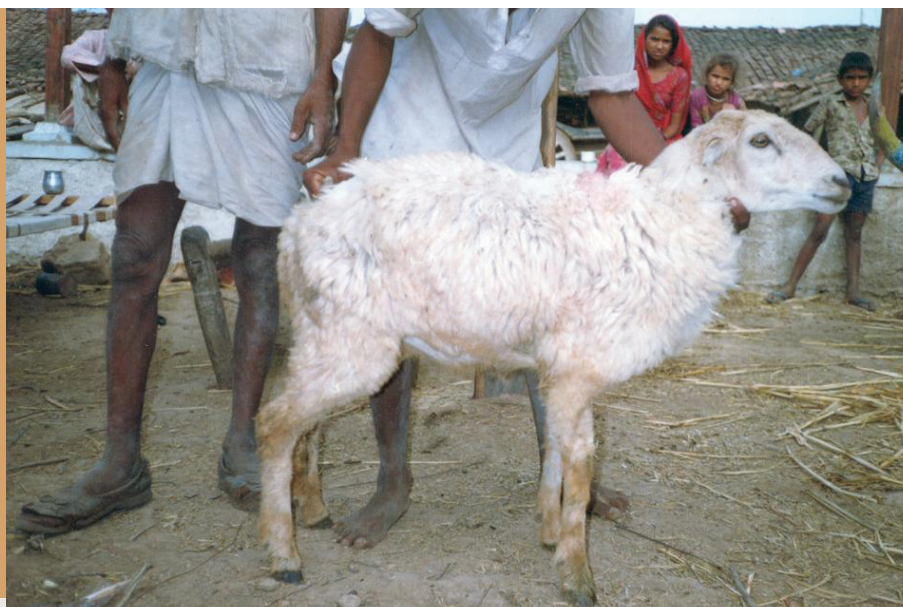
The Himachal Pradesh government is undertaking mass vaccination of sheep against sheep pox, PPR and enterotoxaemia diseases free of cost ^(Ref-223).

Important documentation on pastoralism:

The animals are raised under the transhumant system of management. They are hardy, can travel long distances and can thrive on scanty pastures ^(Ref-02).



SHEEP



Female

SONADI

Production and Reproduction parameters

Average litter size:

1 (Ref-02)

Average milk yield per lactation:

23.8 kg (Ref-02)

Average lambing interval:

18 months (Ref-02)

Average staple length (cm):

4.58 cm (Ref-02)

Average fibre diameter (μ):

52.65 μ (Ref-02)

Average dressing percentage:

48% (Ref-02)

Estimated Population: 1,57,694 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Sonadi sheep breed is native to the Banswara, Chittorgarh, Dungarpur and Udaipur districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

The face is light brown or white with the body covered by a white, open and extremely coarse and hairy fleece. The face, belly and legs are devoid of wool. Both the sexes are polled. The ears are long (16-17cm), flat and drooping, the belly and legs devoid of wool (Ref-02). No genetic bottleneck was found in the Sonadi population in the recent past and sufficient variability exists (Ref-224).

Communities rearing the breed:

The Gadri, Rebari, Meena and Khatik communities (Ref-224).

Main values:

The breed is reared for wool and meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

The Government of Rajasthan has introduced insurance schemes for sheep owners and sheep grazers. Preference is given to Sonadi sheep and sheep breeders maintaining pure bred indigenous sheep ^(Ref-224).

The Rajasthan government has undertaken the PPR Control Programme to provide preventive vaccination and strengthen diagnostics facilities for PPR disease in the state ^(Ref-225).

Important documentation on pastoralism:

The sheep are raised on an extensive system of management. Local migration in search of food and water occurs in summer ^(Ref-02).



SHEEP



Female

TIBETAN

Production and Reproduction parameters

Average age at first lambing:

14 months (Ref-02)

Average litter size:

1.3 (Ref-02)

Average lambing interval:

11.5 months (Ref-02)

Average fleece weight (kg/year):

0.76 (Ref-02)

Average staple length (cm):

7.5 cm (Ref-02)

Average fibre diameter (μ):

22.5 μ (Ref-02)

Average dressing percentage:

49% (Ref-02)

Estimated Population: 5,796 (Ref-01)

Population Status: Declining (Ref-227)

Native tract and ecosystem:

The Tibetan sheep breed is native to Sikkim, West Kameng and East Kameng districts of Sikkim (Ref-02).

Phenotypic and molecular characteristics:

The breed is medium sized, mostly white with a black or brown face. Brown or white spots are also observed on the body. The rams are horned while the ewes are polled. The medium sized spiral horns run upward, downward and upward with a sharp tip. The nose line is convex, the ears small, broad, drooping and pendulous. The fleece is relatively fine and dense, the belly, legs and face devoid of wool. Brown or black wool mark the neck (Ref-02). Genetic diversity studies present a serious decline in the sheep population and diminished genetic diversity (Ref-227).

Main values:

The breed is reared for meat and wool (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

The Tibetan sheep conservation programme has been launched by the Sikkim government in the Lachen district of North Sikkim ^(Ref-226).



SHEEP



Female

TIRUCHI BLACK

Production and Reproduction parameters

Average litter size:

1 (Ref-02)

Average fleece weight (kg/year):

0.4 (Ref-02)

Estimated Population: 47,493 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

This breed is native to Salem, Dharmapuri, Tiruvannamalai and Perambalur districts of Tamil Nadu (Ref-02).

Phenotypic and molecular characteristics:

These are small sized animals with a completely black coat colour. Horns are found only in males. The ears are short (9.59 cm), directed downward and forward. The fleece is extremely coarse, hairy and open (Ref-02). Genetic characterization reveals the absence of a genetic bottleneck, and inbreeding in the population (Ref-228).

Main values:

The animals are reared only for meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

For the development of the Tiruchy Black, surveys, evaluation, characterisation and conservation of the breed is being undertaken ^(Ref-230).

Important documentation on pastoralism:

This study found that the sero-prevalence of sheep pox was significantly higher in animals maintained in the transhumant pastoral system (36.83%) than in those leading stationary lives. In the present study, the Tiruchy (45.61%) showed significantly higher sero-positivity than the Mecheri ^(Ref-229).



SHEEP



Female

CHEEVADU

Production and Reproduction parameters

Average litter size:

1 (Ref-02)

Average age at first lambing:

18.19 months (Ref-02)

Average lambing interval:

8.48 months (Ref-02)

Estimated Population: 1,58,200 (Ref-01)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

Cheevadu sheep are native to the Tirunelveli district of Tamil Nadu (Ref-02).

Phenotypic and molecular characteristics:

They are light brown in colour though some are dark brown and a few are tan. The horns, present in both breeds, are highly corrugated, curved horizontally outward and backward with a blunt conical apex with a few thick ridges. The dorsal part of the body is light brown and the ventral part, from the jaw to the inguinal region, is lighter. These animals are known as "Arichevaadu". The head is erect and high (Ref-02). No reported genetic characterization and diversity study has been reported so far on the breed.

Special and unique characteristics:

The breed is economically unique as it survives on dry land as well as near coastal area ecosystems (Ref-02).

Communities rearing the breed:

Mainly the Konar and Pallar communities in Alangulam, Tirunelveli, Sankarankovil and Nanguneri taluka. People in Kuruvikulam, Pappakudi, Melaneelithanallur, Manur, and Nanguneri as well as the Ottapidaram Panchayat Union areas of Tuticorin district rear this unique breed by maintaining a sole extensive system (Ref-231).



Male

Main values:

The animals are reared for their meat, skin and manure and are imbued with religious and cultural importance as well ^(Ref-02).

Important documentation on pastoralism:

- a — A few flocks follow a temporary migration pattern during April to June, sometimes extended to July, depending on the monsoon. Hair clipping is done once i a year, mostly during the summer month of May ^(Ref-02).
- b — A majority of farmers in the breeding tract have stationary flocks. However, a few farmers go on temporary migration during April to June, sometimes extended up to July. The flocks return with the onset of monsoon showers. During migration the sheep are penned in private fields in lieu of stubble grazing and some returns are made to the flock owners in cash or kind ^(Ref-231).



SHEEP



Female

PANCHALI

Production and Reproduction parameters

Average age at first lambing:
21.2 months (Ref-02)

Average lambing interval:
11.8 months (Ref-02)

Average milk yield per lactation:
120.5 kg (Ref-02)

Average milk fat percentage:
4.9% (Ref-02)

Average fleece weight (kg/year):
0.55 (Ref-02)

Average staple length (cm):
5.81 cm (Ref-02)

Average fibre diameter (μ):
41.22 μ (Ref-02)

Average dressing percentage:
55.6% (Ref-02)

Estimated population: 1,68,969 (Ref-232)

Population status: Not at risk (Ref-233)

Native tract and ecosystem:

Panchali sheep are native to Surendranagar, Rajkot, Botad, Bhavnagar and Kachchh districts of Gujarat (Ref-02).

Phenotypic and molecular characteristics:

The animals are white in colour, the head or facial parts light brown, blackish brown or brown and black. These colours stretch on to the ventral part of the neck and in some animals on the whole neck and below the knee joint on the foreleg and below the hock joint on the hind leg. The head is convex, the ears long and pendulous. The tail is long and the udder well-developed. The head, face and belly are devoid of wool though the legs are covered up to the elbow joint of the fore leg and the stifle joint of the hind leg. Tufts of fibre/hair on the ears are evident in some animals (Ref-02). No reported genetic characterization and diversity study has been reported so far on the breed.

Special and unique characteristics:

These sheep generally give only one lamb per year. Panchali sheep can easily support twin lambs though breeders do not prefer twinning as they have to take extra care of these twins for their survival during migration which starts just before or immediately after the onset of the lambing season. About 83% are singles, 16% twins and the rest triplets or quadruplets. These animals have an excellent migratory capability (Ref-02).



Male

Communities rearing the breed:

Nomadic communities like the Rabaris and Bharwad keep Panchali-Dumma sheep. They migrate through Kheda, Nadiad, Anand, Mehmudabad and up to the Vadodra area of central and south Gujarat ^(Ref-02).

Main values:

The animals are reared for milk, meat, manure and fibre/wool ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — Panchali sheep breeders have organized themselves under the Panchal Dumma Ghetu Uccherak Maldhari Sangathan in order to promote and conserve the breed ^(Ref-02).
- b — For improvement of the Panchali (Duma) breed, a sheep breeding farm has been set up at Jasdan in Rajkot district for the selective breeding of animals. The rams produced on these farms are distributed to breeders at a nominal cost. The rams produced with the breeders are also certified and distributed through the Sheep Service Centres of Intensive Sheep Development Projects (ISDP), Migratory Sheep-Goat Service Centres and Sheep Extension Centres ^(Ref-150).

Important documentation on pastoralism:

A majority of Panchali sheep breeders live a nomadic lifestyle. During the monsoon, they stay in their native places and usually take flocks to the grazing area of nearby villages during the day. They do not provide any shelter to the animals. During winter and summer, they migrate to pre-decided areas of Central Gujarat like Kheda, Anand, Ahmedabad and Vadodra for grazing. Breeders usually keep only one breeding ram in a flock. It runs with the flock full time, but breeding is allowed only during a particular season ^(Ref-02).



GOAT

CHANGTHANGI	106
GADDI	108
GANJAM	110
GOHILWADI	112
KACHCHHI	114
MARWARI	116
ZALAWADI	118
KAHMI	120
BHAKARWALI	122

GOAT



Female

CHANGTHANGI

Production and Reproduction parameters

Average lambing interval:
13.05 months (Ref-02)

Average Age at first kidding:
27.4 months (Ref-02)

Average litter size born:
1 (Ref-02)

Average staple length (cm):
4.95 cm (Ref-02)

Average fibre diameter (μ):
12.72 μ (Ref-02)

Estimated Population: 1,96,210 (Ref-01)
Population Status: Declining (Ref-241)

Native tract and ecosystem:

The Changthangi goat breed is native to the Leh and Kargil districts of the Union Territory of Ladakh (Ref-02).

Phenotypic and molecular characteristics:

Changthangi animals are medium sized, predominantly white in colour with a mixture of brown and black. The horns are large and twisted like a corkscrew, turned outward, upward and inward to form a semi-circle. Their ears are small, erect and stumpy. The hair of this breed is used to make the world famous cashmere or pashmina fibre (Ref-02).

Special and unique characteristics:

Ultra fine cashmere wool is obtained from the hair of these goats. Once woven, this is known as pashmina. Shawls made from pashmina are very fine and are exported worldwide (Ref-134). The breed has also adapted itself to the cold desert area of Ladakh where the temperature falls as low as (-) 400 C. The breed is also known for its quick movement (Ref-02). It has been genetically characterized and found that there is substantial genetic variability in the population and that it has not suffered any genetic bottleneck (Ref-135).

Communities rearing the breed:

Changthangi goats are reared by a nomadic community called the Changpa in the Changthang region of Greater Ladakh (Ref-134).

Main values:

The breed is mostly reared for its hair to make pashmina and for its meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — Under the Pashmina Promotion Programme of the wool board, key interventions include transfer of technologies for year round availability of nutrition, better health facilities under prevailing production systems, multiplication and dissemination of elite germplasm for improvement of production and productivity, and extension of pashmina rearing activity in new areas. Other activities include skill and capacity building, design development and product diversification, provision of common facilities to improve the quality of pashmina products besides the, branding, labeling and promotion of pashmina products and establishing market linkages and platforms ^(Ref-136).
- b — The animal husbandry department in the erstwhile state of Jammu and Kashmir promotes selective breeding of pashmina goats and its introduction into non-traditional areas. The government also works on the identification of nuclear markers for higher Pashmina production, systemic surveys on pasture biomass production, evaluation and development of packages for their improvement and utilization, surveillance of disease profile of pashmina goats and the development of packages for disease diagnosis and prophylaxis to arrest mortality besides improvements in the processing of pashmina and establishing standards for the quality evaluation of pashmina products (Ref-137, Ref-138).

Important documentation on pastoralism:

- a — The nomads of Changthang primarily keep sheep, goats, yaks and horses. The sheep provide meat for consumption or for trading, the wool likewise for their own needs or to sell. The animals also provide milk for three months of the year, mainly for their own consumption and as a basic ingredient for the production of yoghurt, butter and cheese. The sheep are also used to carry burdens up to 10 kg for a distance of 12 kms per day. Of equal importance to the Changpa nomads are goats. The most valuable product that the Changthang goats provide, apart from the hide (pelt), meat and milk, is pashmina wool. The nomads use this purely for trading and do not keep any for themselves. The hardy and agile Changthangi animals are well adapted to the migratory life practiced under difficult conditions by the Changpa. The Changpa live in their traditional “Rebo” which consists of a circular tent with a heating arrangement in the centre. The herds are taken out each day for grazing and return to the villages or encampment by night. The herds remain migratory throughout the year and the grazing areas during summer and winter have been properly earmarked ^(Ref-139).
- b — The migratory aspects of Changthangi pashmina goat flock rearers was studied to examine the livestock population, pastures, nature and routes of livestock migration along with the rights of stakeholders in the cold arid region of Changthang in Ladakh. The livestock in Changthang is reared mainly under an extensive and completely migratory production system with camp movements 6 to 10 times a year. Livestock migration is followed in accordance with the traditional socially established annual routes ^(Ref-140).



GOAT



Female

GADDI

Production and Reproduction parameters

Average milk yield per lactation:
52.5 kg ^(Ref-02)

Average milk fat percentage:
5.21% ^(Ref-02)

Average litter size born:
1.2 ^(Ref-02)

Average Fleece weight (kg/year):
0.3 kg/year ^(Ref-02)

Average fibre diameter (μ):
74.5 μ ^(Ref-02)

Estimated Population: 3,63,872 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The Gaddi breed of goat is native to the Chamba, Kangra, Kullu and Shimla districts of Himachal Pradesh and Jammu district in Jammu and Kashmir ^(Ref-02).

Phenotypic and molecular characteristics:

The Gaddi goat is predominantly white but some black coloured animals are also found. The horns are long, directed upwards and backwards and occasionally twisted. The ears droop and the skin is very tough and covered with long, coarse hairs measuring 17-25 cm ^(Ref-02). Molecular characterization has revealed high genetic variability in the Gaddi goat population ^(Ref-141).

Special and unique characteristics:

During the summer season, Gaddi goats move to higher altitudes where lush green grass is available ^(Ref-02).

Communities rearing the breed:

These goats are named after the Gaddi tribe which is involved in rearing these animals ^(Ref-02).

Main values:

The animals are used for the production of meat and fibre and also as pack animals ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The erstwhile state of Jammu and Kashmir has promoted in situ conservation of local Gaddi goats in the Jammu division ^(Ref-142).
- b — Under the centrally sponsored PPR Control Programme, the Himachal Pradesh government has undertaken mass vaccination of goats (covering at least 30% of the population) against PPR disease free of cost ^(Ref-143).
- c — Also, the HP government is providing funds for medicines for ecto- and endo-parasites for the deworming of goats, for health care facilities, and to train goat breeders ^(Ref-143).
- d — Scheme for implementation of BPL Krishak Bakri Palan Yojna: Under this scheme, landless, BPL category farmers (with preference given to women farmers) are provided goat units of (10 female +1 male/4 female +1 male /2 female +1 male) on 60% subsidy to increase income generation opportunities for economically weaker segments of society as well as to increase meat production ^(Ref-143).

Important research papers and documentation on pastoralism:

- a — The “Gaddi”, also known as the “White Himalayan goat” is the predominant goat breed of the high altitude, Western temperate Himalayas with its true home tract in the hills of Himachal Pradesh. Its distribution extends to the adjoining hilly areas of Jammu and Kashmir and Uttarakhand. In Himachal Pradesh, these goats are reared by traditional “Gaddi” shepherds, a distinct tribe of nomadic pastoralists. Their name has led to the nomenclature of the “Gaddi” breed ^(Ref-141).
- b — The Gaddi are a distinct tribe of nomadic pastoralists of Himachal Pradesh involved in the rearing of sheep and goats of the Gaddi breed. Their flocks are managed totally under the extensive (migratory) production system. During summers the flocks climb to high altitude alpine Himalayan pastures and during winters they are grazed in the foothills ^(Ref-144).
- c — During summers, Gaddi goats move to higher altitudes where lush green grass is available ^(Ref-02).



GOAT



Female

GANJAM

Production and Reproduction parameters

Average age at first kidding:
19.19 months ^(Ref-02)

Average kidding interval:
11.09 months ^(Ref-02)

Average milk yield per lactation:
65 kg ^(Ref-02)

Average milk fat percentage:
3.92% ^(Ref-02)

Average litter size born:
1 ^(Ref-02)

Estimated Population: 3,17,063 ^(Ref-01)
Population Status: Declining ^(Ref-241)

Native tract and ecosystem:

Ganjam, Rayagada, Gajapati, Khurda and Nayagarh districts of Odisha constitute the breeding tract of Ganjam goats ^(Ref-02).

Phenotypic and molecular characteristics:

The animals are usually black or brown black but white, brown and spotted ones have also been found. The horns are long, twisted and curved and point backwards and upwards. The head is convex, the ears long and drooping. The males usually have beards and wattles are present in both sexes ^(Ref-02). Molecular characterization has revealed that the Ganjam goat population has sufficient genetic variability which could be exploited for the selection of good animals in the future ^(Ref-145)

Special and unique characteristics:

Big sized horns are a peculiar feature of Ganjam goats ^(Ref-02).

Communities rearing the breed:

The Ganjam goat breed has been developed by the Gola tribe ^(Ref-02).

Main values:

Used for the production of milk and meat ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — As a part of the National Mission for Protein Supplement (NMPS) under RKVY, the Odisha government has started a 'Special Programme for Goat Development' which envisages goat farming for the economic upliftment of farmers and to generate employment. This includes setting up goat units (for native breeds like Ganjam) with scientific management to promote higher productivity and better health care. The farmers are selected from those who maintain at least 10 or more goats for over a year and who are willing to contribute half of the unit cost they wish to undertake. A unit size of 50 females and 3 male goats are supported. As per the scheme, metal feeders, health cover packages, vitamin/ mineral supplementation, and the insurance of supplied animals are provided ^(Ref-146).
- b — Another area of intervention is at the clusters with total population of 2000 goats in a radius of 10 km, covering about 15-20 villages depending on the density and distribution of goats in the districts. The 20 clusters are identified amongst these districts during the current year. The owners'/goat rearers' names are registered and veterinary health care is provided to the goats of the beneficiaries. A lead farmer/family member of the beneficiaries in the cluster area are enrolled by the Department as Goat Scouts on a contract basis. They are responsible for the identification of goat clusters, registration of names and for liaisoning with the district/sub-divisional and local veterinary institution for implementation of the scheme. The activities under the scheme include provision of mass deworming, vaccination, area specific mineral mixture and fattening with concentrate feed at the rate of 250 gm per day for 60 days pre-slaughter ^(Ref-146).
- c — The Odisha government is setting up four goat breeding farms in which pure stock of locally suitable breeds like Black Bengal and Ganjam will be reared. Selective breeding of indigenous stock with improved stock for genetic upgradation will also be taken up ^(Ref-147).

Important documentation on pastoralism:

An aspect hard to portray in this report is the unusual level of animal husbandry practiced by Mayurbhanj's tribal people. The human care on display everywhere for goats (Black Bengal and Ganjam breeds) and other animal stock is exceptional, actually tender as well as responsible. After a morning spent freely grazing on rice and natural fields, the goats are brought back to the homestead, where the adult animals are lightly tethered and rest comfortably in the shade of the household's inner courtyard, with their kids running about, free to frolic or to nibble on the green shoots of fresh fodder brought back from the forest that morning. Living so intimately with their animals, these tribal families are exemplars of modestly enterprising and enabling pastoral traditions. The goats are raised alongside cattle and chickens, with chicks climbing on the backs and heads of the goats, calves taking comfort from lying next to she-goats, and the (human) family members going about their daily chores and business, which include the business of tending to the needs of all these animals with which they share their homes (this being more 'courtyard' than 'barnyard biodiversity'.) While the economic prospects here do not (yet) loom large, one senses something else, some ecosystem/human system integrity, some agricultural algorithms of enduring value, at work ^(Ref-148).



GOAT



Female

GOHILWADI

Production and Reproduction parameters

Average age at first kidding:
18 months (Ref-02)

Average kidding interval:
9.86 months (Ref-02)

Average milk yield per lactation:
240 kg (Ref-02)

Average litter size born:
1.5 (Ref-02)

Average fleece weight (kg/year):
3.17 (Ref-02)

Estimated Population: 1,68,917 (Ref-01)
Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Gohilwadi breed is native to the Amreli, Bhavnagar, Junagadh, Rajkot and Porbandar districts of Gujarat (Ref-02).

Phenotypic and molecular characteristics:

The Gohilwadi breed is black in colour and the horns slightly twisted and turned upward, outward and backward. The nose line is slightly convex. The ears are tubular and drooping and the body is covered with coarse long hair (Ref-02). Genetic variability studies reveal that the Gohilwadi is closest to the Zalawadi and genetically distant from the Surti (Ref-149).

Special and unique characteristics:

The animals are adapted to a hot semi-arid climate and medium and deep black soil prevalent in the South Saurashtra zone of the Kathiawar Peninsula (Ref-02).

Communities rearing the breed:

The Bharwad and Rabari communities are involved in rearing this breed (Ref-11).

Main values:

The Gohilwadi is a dual purpose goat and is reared for milk as well as meat (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Gujarat state government has set up a goat breeding farm for Gohilwadi goats at Morbi in district Morbi ^(Ref-150).
- b — The state government of Gujarat also provides a subsidy scheme for the establishment of a goat unit (10+1, 10 goats and 1 male goat) to Scheduled Castes, Scheduled Tribe women and general category persons. The scheme aims at supplementary income from the sale of milk from goats and by the rearing and selling of goats. In this scheme, the beneficiary is given a subsidy of 50% of the unit cost or a maximum of Rs. 30,000 ^(Ref-150).

Important documentation on pastoralism:

- a — The animals are maintained through grazing. The Bharwad and Rabari communities maintain the goats in medium to large flock sizes in a traditional pastoral system. A breeder with a large flock stays or returns and stays in his native village. In the beginning of the winter he migrates to central (Ahmedabad, Anand) and south Gujarat (Karjan-Vadodara, Bharuch.) and stays there for the winter and summer and returns during the monsoon. Migration is both manual and mechanized with only a few using trucks for transportation. Breeders with small flocks depend on grazing in nearby areas. Selective and controlled breeding with a single kidding a year is followed by the majority of breeders ^(Ref-11).
- b — A study on Gohilwadi goats belonging to 56 flocks of 17 villages in the Kathiawad region of Gujarat was carried out to evaluate their management and performance. The people of the Rebari and Bharwad communities mostly rear these goats. The flock size varies from 10 to 78 with an average of 28 ± 3 . The goats were mostly (76%) kept in open corrals enclosed with bush fencing. These goats were maintained on range grazing, without supplementary feeding. About 35-50% (medium to large size) flocks migrate for 6-8 months towards North and South Gujarat in summer and sizeable flocks (10-15%) remain on migration throughout the year. Goats (>87%) were bred during summer (April-June) due to better biomass availability with the onset of rain in July ^(Ref-151).
- c — The Bharwad and Rabari communities are pastoral communities spread across the Saurashtra region of Gujarat. They keep small ruminants such as the Gohilwadi, Zalawadi and Kahami goat breeds and large ruminants such as Gir cows and Jaffarabadi buffaloes ^(Ref-152).



GOAT



Female

KACHCHHI

Production and Reproduction parameters

Average age at first kidding:
24.14 months ^(Ref-02)

Average kidding interval:
10.38 months ^(Ref-02)

Average milk yield per lactation:
114.5 kg ^(Ref-02)

Average litter size born:
1.12 ^(Ref-02)

Average dressing percentage:
58.4% ^(Ref-02)

Estimated Population: 3,80,723 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The Kachchhi breed of goat derives its name from the Kachchh region of Gujarat state and has Banaskantha, Mehsana, Kachchh and Patan districts of the state as its home tract ^(Ref-02).

Phenotypic and molecular characteristics:

The coat is predominantly black with white spots on the neck, mouth and ear region. The horns are small to long, corkscrew shaped and directed upwards. The breed has a slight Roman nose with long, coarse hairs ^(Ref-02). Genetic diversity studies indicate sufficient genetic variation and that the breed receives new genetic materials through the introduction of immigrants ^(Ref-153)

Main values:

The Kachchhi is a dual purpose goat breed and is reared for milk as well as meat ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The state government of Gujarat provides a subsidy scheme for the establishment of a goat unit (10+1, 10 goats and 1 male goat) to Scheduled Castes, Scheduled Tribe women and general category persons. The scheme aims at supplementary income through the sale of milk from goats and by rearing and selling goats.. In this scheme, the beneficiary is given a subsidy of - 50% of unit cost or a maximum of Rs. 30,000 ^(Ref-150).
- b — The Gujarat state government has set up a goat breeding farm for the Kachchhi breed at Naliya in Kachchh district ^(Ref-150).

Important documentation on pastoralism:

In t drought-hit Kachchh, all living beings—man, animal, plants —struggle to cope. A large segment of this semi-arid landscape are livestock breeders or Maldharis, a community that often falls off the picture when drought is mentioned. Left with little choice, they have been migrating to other parts of Gujarat in hordes since the last year in search of fodder and water for their animals. In response, the district administration has opened grass depots for cattle and buffaloes and offered subsidies on fodder. However, on the fringes are nomadic communities who own goats, sheep and camels and who have been left bereft of any such relief ^(Ref-154).



GOAT



Female

MARWARI

Production and Reproduction parameters

Average age at first kidding:
15.4 months ^(Ref-02)

Average milk yield per lactation:
85.8 kg ^(Ref-02)

Average milk fat percentage:
4.1% ^(Ref-02)

Average dressing percentage:
56.3% ^(Ref-02)

Estimated Population: 53,47,830 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The native tract of the breed lies in Barmer, Bikaner, Jaisalmer, Jalore, Jodhpur, Nagaur and the Pali districts of Rajasthan ^(Ref-02).

Phenotypic and molecular characteristics:

The goats are black with corkscrew type horns directed upward and backward. They are small to long in size. The breed has pendulous ears with a long and shaggy hair coat. A thick beard is found in both sexes ^(Ref-02). Genetic diversity analysis has revealed that the breed has substantial genetic variability and it appears to be divided into significantly differentiated small sub-populations leading to inbreeding. However, there is a constant influx of immigrants, leading to variations in the germplasm ^(Ref-155)

Special and unique characteristics:

Marwari goats are well adapted to the inhospitable agro-climatic conditions of the hot, arid region ^(Ref-02).

Main values:

The Marwari is a dual purpose goat breed and is reared for milk and meat ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

Under the ICAR Network and AICRP programmes, organised government goat farms for the Marwari breed have been set up for its genetic improvement, both under organized farms and field conditions ^(Ref-156).

Important research papers and documentation on pastoralism:

The flocks are usually stationary but during scarcity of fodder resources, they migrate to the adjoining states of Haryana, Madhya Pradesh, Uttar Pradesh and Gujarat to graze ^(Ref-155).



GOAT



Female

ZALAWADI

Production and Reproduction parameters

Average age at first kidding:
22.17 months ^(Ref-02)

Average kidding interval:
11.27 months ^(Ref-02)

Average milk yield per lactation:
294 kg ^(Ref-02)

Estimated Population: 3,90,800 ^(Ref-01)
Population Status: Not at risk ^(Ref-233)

Native tract and ecosystem:

The Zalawadi breed is native to the Rajkot and Surendranagar districts of Gujarat ^(Ref-02).

Phenotypic and molecular characteristics:

The body is covered with black, lustrous and shining hair. The horns are of the corkscrew type, moving straight upwards, backwards and slightly outward with pointed tips. The ears are long, wide, leaf-like and drooping. The udder is well developed with a distinctly placed long cylindrical teat projecting slightly outward and forward ^(Ref-02). The Zalawadi breed is found to be genetically close to the Gohilwadi breed on genetic characterization and there are no genetic bottlenecks in the population ^(Ref-157)

Communities rearing the breed:

The Bharwad and Rabari community ^(Ref-233)

Main values:

The Zalawadi breed reared for its milk and meat ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The state government of Gujarat provides subsidy schemes for the establishment of goat units (10+1, 10 goats and 1 male goat) to Scheduled Castes, Scheduled Tribe women and general category persons. The scheme aims at supplementary income from the sale of milk from goats and by rearing and selling them. In this scheme, the beneficiary is given a subsidy consisting of 50% of unit cost or a maximum of Rs. 30,000 ^(Ref-150).
- b — The Gujarat state government has set up a goat breeding farm for the Zalawadi breed at Morbi in district Morbi ^(Ref-150).

Important documentation on pastoralism:

The Bharwad and Rabari community of the Zalawad region of Saurashtra maintains the goats in medium to large flocks in a traditional pastoral system. Breeders with large flocks migrate within Surendranagar district (Wadhwan and Lakhtar) upto (Sanand, Viramgam and surrounding areas, Ahmedabad and (Kadi) Mehsana district in Central Gujarat and a few to South Gujarat. Migration starts after Diwali to the late summer months. They then return to their native tract/village after the first rains (beginning of the monsoon) and only then men migrate to the Kachchh district for one or two months with the Zhalawadi flock. Breeders with small flocks depend on grazing in nearby areas. Migration is both manual and mechanized as a few of them use trucks for transportation. Selective and controlled breeding is followed with single kidding in a year by a majority of the breeders ^(Ref-233).

The Zalawadi is one of the major goat breeds in Gujarat. Animals of this breed are reared by traditional shepherd communities (Rabaris and Bharwads) in the semi-arid area of Sourashtra region where rainfall is erratic and low ^(Ref-158).



GOAT



Female

KAHMI

Production and Reproduction parameters

Average age at first kidding:
22.45 months ^(Ref-02)

Average kidding interval:
9.57 months ^(Ref-02)

Average milk yield per lactation:
326.87 kg ^(Ref-02)

Average milk fat percentage:
3.39% ^(Ref-02)

Average litter size born:
1.38 ^(Ref-02)

Average dressing percentage:
52% ^(Ref-02)

Estimated Population: 6,896 ^(Ref-162)
Population Status: Endangered ^(Ref-233)

Native tract and ecosystem:

The Kahmi breed is found in the Rajkot, Jamnagar, Junagadh and Dwarka districts of Gujarat and Bareilly, and the Badaun, Pilibhit and Shahjahanpur districts of Uttar Pradesh ^(Ref-02)

Phenotypic and molecular characteristics:

This species is a medium sized and their coat colour is unique –the face and neck are reddish brown while the rear abdominal part is black. The muzzle, eyelids and hooves are also black. The horns are curved upwards and backwards and the ears are long, tubular and coiled. Wattles are present in a majority of the species ^(Ref-02). No documented evidence on genetic characterization of this breed has been found.

Special and unique characters:

Kahmi animals have an excellent migratory capacity ^(Ref-02).

Communities rearing the breed:

The Bharwad and Rabari communities ^(Ref-163)

Main values:

Kahmi animals are reared both for milk and meat. They are kept for milk production as they have a good milk yield. Male kids of 3 to 6 months are sold for their meat ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The state government of Gujarat provides a subsidy scheme for the establishment of goat units (10+1, 10 goats and 1 male goat) to Scheduled Castes, Scheduled Tribe women and general category persons. The scheme aims at supplementary incomes with the sale of milk from goats and by rearing and selling them. In this scheme, the beneficiary is given a subsidy of 50% of unit cost or a maximum Rs. 30,000 (Ref-150).

Important documentation on pastoralism:

- a — The majority of Kahmi goat breeders live a nomadic lifestyle. Continuous migration is part of their lives. Pastoralists of Junagadh and Rajkot move to the periphery of their villages and districts while the pastoralists of Jamnagar and Devbhoomi Dwarka are nomadic/semi-nomadic in nature and migrate to a couple of districts in Saurashtra (Ref-02).
- b — Mr. Dabhisavjibhai of Chichod village in Gujarat has been conferred with the Breed Saviour Award 2016 for conservation of the Kahmi goat breed. He has seven members in his family and his main occupation is livestock keeping. As a family, they rear goats of the Kahmi breed, which is native to the state of Gujarat and found in three districts: Rajkot, Jamnagar, and Junagadh. They are pastoral people and belong to Bharwad communities. They follow their tradition for many years, preserving their culture and rituals (Ref-164).
- c — Pastoralists of Junagadh and Rajkot move only around the periphery of their villages and districts while those of Jamnagar and Dwarka migrate around a couple of districts of Saurashtra. Here the Rabaris and Bharwads keep only Kahmi goat and are nomadic/semi-nomadic in nature. Generally, the whole family travels widely with their Kahmi goat flock for a maximum period of 6 to 7 months every year. For 5 to 6 months of the monsoon and winter season, they stay at their native place and during the rest of the year they migrate. The pastoralists of Jamnagar and Dwarka districts regularly migrate to another district. They use Halari donkeys as pack animals to carry their luggage during migration. They start to migrate in late November and travel across several districts until June. They reach their native tract after the first monsoon showers. Migration is divided into two halves: during the winter season, from November to March, they continuously move from one location to another in search of agricultural areas and crop residues for grazing. During summer, they settle down along the periphery of big rivers and graze their goats in common grazing areas, gauchars and forests (Ref-164).



GOAT



Female

BHAKARWALI

Production and Reproduction parameters

Average age at first kidding:
24.43 months (Ref-02)

Average kidding interval:
12.36 months (Ref-02)

Average milk yield per lactation:
140.65 kg (Ref-02)

Average milk fat percentage:
3.04% (Ref-02)

Average litter size born:
1.08 (Ref-02)

Average fleece weight (kg/year):
0.75 (Ref-02)

Average staple length (cm):
20.1 (Ref-02)

Average fibre diameter (μ):
64.57 (Ref-02)

Average dressing percentage:
53% (Ref-02)

Estimated Population: 8,80,000 (Ref-165)

Population Status: Not at risk (Ref-233)

Native tract and ecosystem:

The Bhakarwali breed of goat has Poonch, Rajouri, Udhampur, Jammu, Kathua, Doda, Reasi, Kishtwar and Ramban districts of Jammu and Kashmir as its native tract (Ref-02).

Phenotypic and molecular characteristics:

Bhakarwali goats are large sized with convex heads. They are generally white in colour, though some animals have a black face or hind quarters. The horns are curved and screwlike, directed upwards and backwards. The body is covered with very long hair and the udder is medium in size and pendulous (Ref-02). No references regarding the genetic characterization of the breed were available.

Communities rearing the breed:

The tribal Bhakarwal community is involved in rearing this breed (Ref-02)

Main values:

Bhakarwal goats are mainly reared for their meat, milk and hair (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The Jammu and Kashmir government runs the centrally sponsored 'National Control Programme on PPR' to provide goats with vaccination against PPR ^(Ref-166).
- b — Under state plan schemes, the J&K government runs one for the improvement of goats in the private sector for its mutton and milk yield ^(Ref-167).

Important documentation on pastoralism:

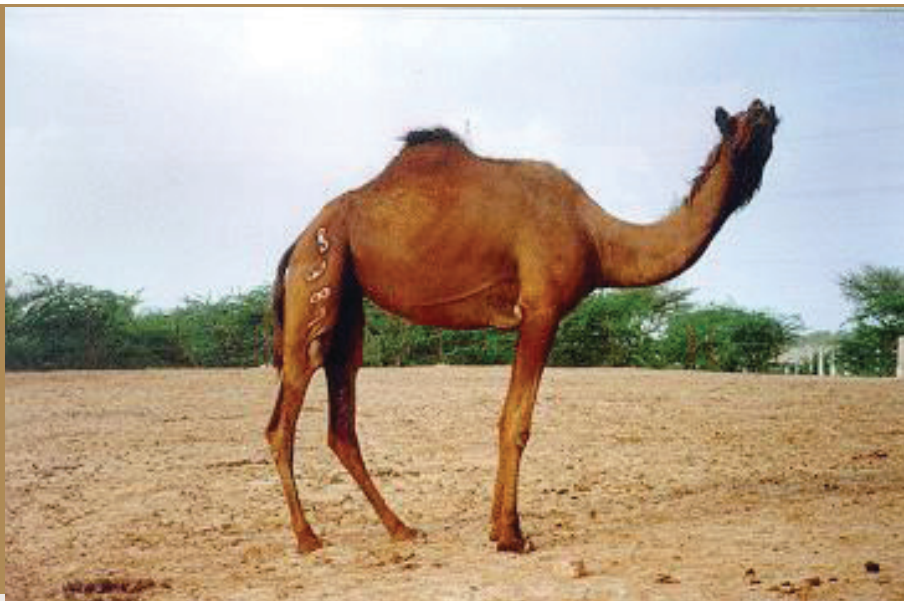
- a — The Gujjar-Bakarwal community roughly constitutes about 20 percent of the population of Jammu and Kashmir. Whereas the Gujjars primarily tend buffaloes, the Bakarwals mainly rear sheep and goats. The word Bakarwal is derived from "Bakri/Bakar" meaning "goat/sheep" and "Wal" meaning "one who takes care of". The nomadic Bakarwals biannually move between Jammu Division and Kashmir Valley in search of lush green pastures and a favourable climate for their livestock. They graze their livestock in the alpine and sub-alpine pastures of the State across the Pir Panchal range of the Valley in summer and the Shiwalik hills of Jammu in the winter. They have been practicing this pattern of migration over centuries and even Sir Walter Lawrence in his book 'The Valley of Kashmir' (written in 1895) has taken a note of them. The movement of the Bakarwals offers a wonderful example of commensalism amidst the lap of nature. They rear a variety of animals to meet the varied and diverse demands of their migratory lifestyle ^(Ref-168).
- b — The herds are semi-migratory. They move from place to place in search of browsing sources especially near jungles and the hillock sides of unreserved forest areas. The goats are kept housed and provided shelter only at night. In highland pastures, they remain out in the open ^(Ref-02).



CAMEL

BIKANERI	126
JAISALMERI	128
JALORI	130
KACHCHHI	132
KHARAI	134
MALVI	136
MARWARI	138
MEWARI	140
MEWATI	142

CAMEL



Female

BIKANERI

Production and Reproduction parameters

Average age at first calving:
62 months (Ref-02)

Average calving interval:
24.5 months (Ref-02)

Average milk fat percentage:
3.56% (Ref-02)

Average fleece weight (kg/year):
0.967 (Ref-02)

Milk production is about
4-5 kg/day
in a lactation of about
14 months

Estimated Population: 1,55,058 (Ref-02)
Population Status: Declining

Native tract and ecosystem:

The Bikaneri breed of camel is found in the districts of Bikaner, Ganganagar, Jhunjhunu, Nagaur, Sikar, Churu and the Hanumangarh districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

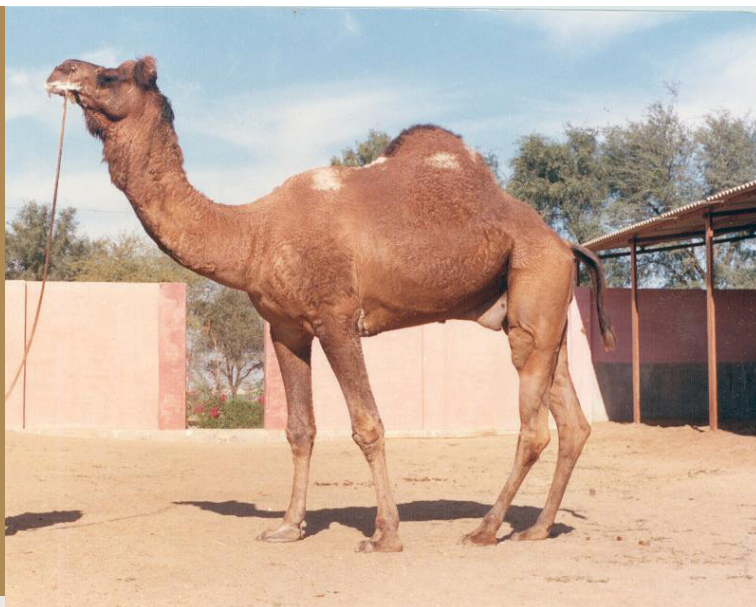
These camels usually have a reddish brown coat but other shades from dark to light red, red and sandy are also found. The animals have a symmetrical body, a slightly dome shaped head and a characteristic well-marked depression above the eyes. Black hair is seen on the eyes, ears and throat. Such animals are locally known as "Jheepas" and have a greater demand in the market. The hair of the animal is used for making coarse or carpet fibre (Ref-02). Genetic diversity studies reveal the highest genetic variability in the breed among other camel breeds and it bears the closest relationship with the Kachchhi breed of camels (Ref-106).

Special and unique characters:

The Bikaneri is one of the main camel breeds of India and has been developed by selective interbreeding of breeds like the Sindhi, Baluchi, Afghan and local camels. It is adapted to arid and sandy tracts with extreme hot and cold seasons, the temperatures ranging from 1-49°C (Ref-02).

Communities rearing the breed:

The Raika pastoralists are involved in the rearing this breed (Ref-112).



Male

Main values:

The Bikaneri is a good draught breed and has multiple utilities in the form of draught, milk, hair and manure (Ref-02).

Breed Association, plans and state schemes, any unique products:

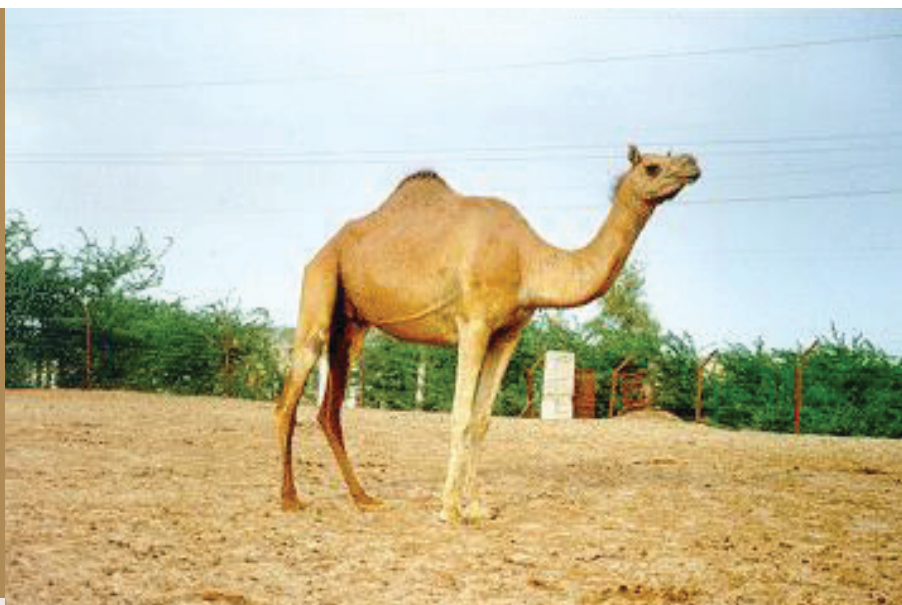
- a — Surra Surveillance and Treatment camps are being organized by the Rajasthan state government under the Rashtriya Krishi Vikas Yojana (RKVY) in which laboratory tests and treatment are provided free of cost to affected camels (Ref-107).
- b — The Rajasthan state livestock development board provides livestock insurance to camel owners for one year and three years at subsidized interest rates in order to cover their losses due to any untoward incidents or mishaps (Ref-108).
- c — The Pushkar camel fair is a multi-day livestock fair for camel, horse and cattle. It attracts visitors from throughout the world and is the largest marketplace for the sale and trade of camels in the country (Ref-109).

Important research papers and documentation on pastoralism:

- a — The development of the Bikaneri camel into a distinct breed can be attributed to the active interest of the Maharajahs of Bikaner who established their kingdom in 1489, after seceding from Jodhpur (Marwar). It is said that its founder Rao Bika brought with him some Raika families who settled in the village of Godhwala to take charge of the royal camel breeding herd. The Raikas (pastoralists) from Godhwala still own about 500-600 camels. Some of the men are employed as camel handlers by the National Research Centre on Camels in Bikaner (Ref-110).
- b — The Raika's knowledge on all aspects of the camel's behaviour, breeding and health care is legendary. Rajasthan's camel population has dropped from seven lakh to two lakh in 18 years. And the community which has been most affected is the Raika who are the traditional camel rearers. The Raikas are a pastoral community in Rajasthan herding camels, goats and sheep. They live in groups on the outskirts of villages and combine crop production during the summer rains with pastoralism during the autumn-spring dry season. The Raikas are mostly non-migratory and live with small herds of about 100 animals with a rich variety of breeds (Ref-111). The Bikaneri camels are reared by Raikas (Ref-112).



CAMEL



Female

JAISALMERI

Production and Reproduction parameters

Average age at first calving:
69 months (Ref-02)

Average calving interval:
24 months (Ref-02)

Average fleece weight (kg/year):
0.733 (Ref-02)

Milk production is about
2.5-4.0 litres per day

Lactation length is
14-16 months

Gestation period is
389 days (Ref-02)

Estimated Population: 1,09,476 (Ref-02)
Population Status: Declining

Native tract and ecosystem:

The Jaisalmeri breed of camel is native to the Barmer, Jaisalmer and Jodhpur districts of Rajasthan (Ref-02).

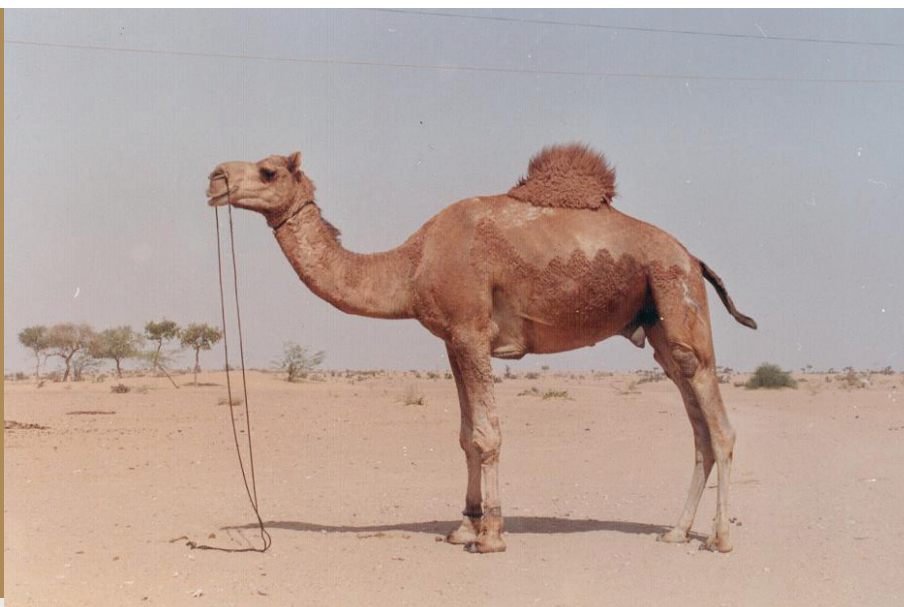
Phenotypic and molecular characteristics: The breed is lightly built and comparatively lean and thin in appearance with a light brown body coat. There are short hairs on the body but the eyebrows, eyelids and ears are hairless. The hairs of this breed are used for coarse or carpet quality fibre (Ref-02). Genetic diversity and structure studies reveal a close similarity between Jaisalmeri and Mewari camel (Ref-112).

Special and unique characters:

The camels are housed mostly at night. They can thrive on sparse vegetation available in the Thar desert. The presence of a 'stop' (well marked depression above eyes), hair on the ears and eyelids (jheepira), black colour, a large body size and a droopy muzzle are considered as disqualification criteria while selecting animals of this breed (Ref-02).

Main values:

The Jaisalmeri breed is well known for its riding and race potential. Besides, it is used for work and transport purposes along with milk production. It is in great demand by security forces like the BSF, and RAC to keep vigilance on the long desert border with Pakistan (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The NGO Lokhit Pashu-Palak Sansthan supports the Jaisalmer Camel Breeders Association to develop their Biocultural Community Protocol under the United Nations Convention on Biological Diversity. In this, they put on record their role in conserving local camel breeds as well as the associated rangeland biodiversity – many traditional practices exist or existed to conserve the environment ^(Ref-113).
- b — The Rajasthan government has launched the ‘Ushtra Vikas Yojana’ (Camel Development Plan) to contain the dwindling camel population trend. Under this, the government provides a Rs. 10,000 cash incentive to camel farmers on the birth of each calf. Also, medical camps are organised for camels suffering from ‘surra’, a dangerous disease which infects its blood and often proves fatal. Awareness on better husbandry practices is also provided to farmers. To avail of the benefits of the newly introduced scheme, a farmer needs to register the female camel at a local veterinary hospital and must have a bank account ^(Ref-114).

Important research papers and documentation on pastoralism:

The management system differs between places. In the low rainfall zones in Barmer and Jaisalmer districts where agriculture is practiced only during the monsoon, the camels are left to range unsupervised during part of the year. In areas where crop cultivation is important, for instance in Pali district, the camels are herded throughout the year ^(Ref-115).



JALORI

Production and Reproduction parameters

Average calving interval:

24 months ^(Ref-117)

Average milk fat percentage:

3.7% ^(Ref-117)

Average annual hair production:

700 gm ^(Ref-117)

Average fibre length:

6.69 cm ^(Ref-117)

Milk production is about

4.86 ltrs/day ^(Ref-117)

Estimated Population: 9,235 ^(Ref-117)

Population Status: Declining

Native tract and ecosystem:

The Jalori breed of camel is geographically distributed in the Jalore and Sirohi districts of Rajasthan ^(Ref-116)

Phenotypic and molecular characteristics:

The breed is medium sized, predominantly brown in colour although variations from light brown to dark brown are seen. No stop is seen in this breed and the muzzle is narrow and mostly pointed. The 'jheepra' is absent in Jalori camels. Body hairs are coarse in quality and medium in length ^(Ref-116). No genetic bottleneck and significant amount of genetic variability was found in the Jalori camel population ^(Ref-117).

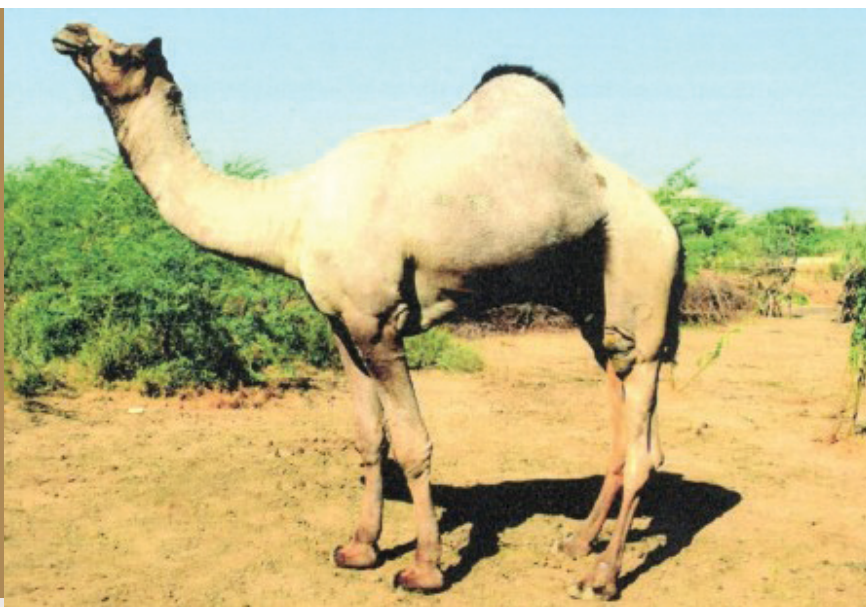
Special and unique characters:

The typical adaptive feature of the desert camel, the 'jheepra' is absent in Jalori camels ^(Ref-02).

Communities rearing the breed: The Jalore communities ^(Ref-106).

Main values:

This is a multipurpose breed used for milk production, tourism, riding and safaris ^(Ref-116).



Male

Breed Association, plans and state schemes, any unique products:

- a. Surra Surveillance and Treatment camps are being organized by the Rajasthan state government under the Rashtriya Krishi Vikas Yojana (RKVY) in which laboratory tests and treatment are provided free of cost to affected camels ^(Ref-107).
- b. The Rajasthan state livestock development board provides livestock insurance to camel owners for one year and three years at subsidized interest rates in order to cover their losses due to any untoward incidents or mishaps ^(Ref-108).
- c. The Pushkar camel fair is a multi-day livestock fair for camel, horse and cattle. It attracts visitors from throughout the world. It is the biggest event for the sale and trade of camels in the country ^(Ref-109).

Important research papers and documentation on pastoralism:

Camels are mostly reared under an extensive system of management. No housing is provided during the day or night except to those which are reared for transportation, tourism or entertainment. Generally, camel owners identify a place of temporary shelter for a period of about 4-5 days or longer, depending on the availability of vegetation in the area. This place is called Dera and the animals move out of here to graze and return in the evening. The average daily grazing distance is around 5 km and grazing hours are 9-10 depending on the season and feed and fodder availability in the tract. However, migratory camels travel longer distances and hence, the average grazing distance is around 9 km per day ^(Ref-117).



CAMEL



Female

KACHCHHI

Production and Reproduction parameters

Average calving interval:

24.79 months (Ref-02)

Average Age at first calving:

52.68 months (Ref-02)

Average milk yield per lactation:

1134 kg (Ref-02)

Average fleece weight (kg/year):

0.624 kg (Ref-02)

*Most of Kachchhi camels yield
more than*

5 kg of milk per day
(Ref-02)

Estimated Population: 20,653 (Ref-02)

Population Status: Declining

Native tract and ecosystem:

The breeding grounds of the Kachchhi camel are Banaskantha, Mehsana, Kachchh and Patan districts of Gujarat (Ref-02).

Phenotypic and molecular characteristics:

Kachchhi camels are heavily built, dark brown or red in colour with a dull appearance. The hairs are used as coarse fibres and for carpet making (Ref-02). Genetic characterization has revealed a close similarity between Jaisalmeri and Kachchhi breeds owing to their similar habitat while the Mewari was genetically distant from both these breeds (Ref-118).

Special and unique characters:

Kachchhi camels can thrive without water for 2-3 days. These camels are adapted to a harsh climate and the salty and marshy land of the Kachchh region of Gujarat (Ref-02).

Main values:

These are mainly used for draught purposes (Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — The government of Gujarat has set up a camel breeding farm at Dhor, in Kachchh district for the conservation and propagation of the Kachchhi breed. Good camels are provided to the army and police force and also to private farmers for camel carts. Efforts are being made to conserve the breed characteristics of this species in these farms ^(Ref-119).
- b — The NGO Sahjeevan, with the support of the Department of Animal Husbandry, Gujarat, has facilitated camel breeders of the Kachchh region to organize and negotiate with the state under the Kachchh Unt Uchherak Maldhari Sangathan (KUUMS) with camel pastoralists being members of the society. The objectives of this society include conservation, protection and restoration of grazing areas which are traditionally being used by camel pastoralists ^(Ref-120).

Important research papers and documentation on pastoralism:

Camel milk chocolate was recently launched by Amul. It would be important to strengthen this process to ensure a regular supply of camel milk to Amul Dairy. At least 100 pastoral families rearing camels, both Kachchhi and Kharai, will be incorporated in milk collection system. The Sahjeevan and Kachchh Unt Uchherak Maldhari Sangathan (KUUMS) will play a key role in back-end support, whereas the Sarhad dairy will take care of forward integration. Amul has also indicated it would be in a position to procure vastly higher quantities of camel milk than currently available from Kachchh ^(Ref-121).



CAMEL



Female

KHARAI

Production and Reproduction parameters

Average calving interval:

33 months (Ref-02)

Average age at first calving:

51.72 months (Ref-02)

Average milk yield per lactation:

1444 kg (Ref-02)

Average milk fat percentage:

3.62% (Ref-02)

Average fleece weight (kg/year):

0.8 kg (Ref-02)

Average staple length (cm):

3.19 cm (Ref-02)

Average fibre diameter (μ):

37.5 μ (Ref-02)

Estimated Population: 4,110 (Ref-122)

Native tract and ecosystem:

The native tract is the Kachchh district of Gujarat (Ref-02).

Phenotypic and molecular characteristics:

Kharai camels have a medium body size and come in different colours – grey, dark brown, light red, light brown, black and dark red. They have typically a thicker neck region than the Kachchhi species.. The chest pad is short and does not touch the humerus of the fore legs while walking. They yield a smooth, soft and long wool (Ref-02). The breed has been genetically characterised and its genetic distinctiveness has been studied (Ref-123).

Special and unique characters:

Kharai camels produce smooth, soft and long hair used in the manufacture of soft clothes/stoles. They are also well adapted to both the dryland as well as the coastal ecosystems in the Kachchh region. They have excellent swimming ability in sea water and are consequently called 'swimming camels'. They can tolerate water with high TDS up to 10,000 ppm and are resistant to common camel skin diseases including dermatitis (Ref-02).

Communities rearing the breed:

The nomadic pastoralist communities of Rabaris and Jats breed this species (Ref-124).



Male

Main values:

The breed is mainly reared for milk. Besides, it is also used for draught purposes, transportation, border security, police services and tourism ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — The NGO Sahjeevan, with the support of the Department of Animal Husbandry, Gujarat, has facilitated camel breeders of the Kachchh region to organize and negotiate with the state under the Kachchh Unt Uchherak Maldhari Sangathan (KUUMS) with camel pastoralists being made members of the society. The society is working to conserve and promote the Kharai breed and to establish market linkages for sale of the produce from this breed ^(Ref-120).
- b — The Gujarat Cooperative Milk Marketing Federation which sells products under the brandname Amul markets camel milk after procuring it from the Kachchh District Cooperative Milk Producers Union, popularly known as Sarhad Dairy ^(Ref-125).
- c — The Gujarat government provides interest assistance at 50% or interest at 5% per annum to breed milking animals including camels and for the purchase of camel carts ^(Ref-119).

Important research papers and documentation on pastoralism:

- a — In Kachchh, the nomadic pastoralist communities of Rabaris and Jats (pronounced 'Jaath', and not to be confused with the Jats of northern India) keep a local camel breed called Kharai (salty) that feed on the mangroves. They swim across the coastal waters to small forest islands to graze. Studies show that the number of Kharai camels (along with the inland breed of Kachchhi camels) have dwindled as their grazing grounds have shrunk ^(Ref-126).
- b — Generally, during the monsoon, the Kharai camel live in an island (locally called as bets). 3-5 km away from the mainland for 2-3 months at a stretch as sweet rain water is stored there. They graze primarily on mangroves in the island. In summer and winter, Kharai camels are taken to nearby creeks to graze on mangroves for 2-3 days and then to the mainland for watering. During low tide, camels swim through sea water to make it to the island. Besides mangroves, Kharai camel feed on other saline trees, shrubs and grass species like the Kharijar (*Salvadora persica* and Lano (*Suaeda* sp.)) ^(Ref-02).



CAMEL



Female

MALVI

Production and Reproduction parameters

Average calving interval:
24 months ^(Ref-02)

Estimated Population: 1,062 ^(Ref-02)
Population Status: Declining

Native tract and ecosystem:

The Malvi breed of camel is native to the Mandsaur district of Madhya Pradesh ^(Ref-02).

Phenotypic and molecular characteristics:

Animals of this breed are off white in colour and this is their most typical external characteristic. Whole herds virtually shows no colour variations. Another typical feature is its small body size. It is probably the smallest of all India breeds ^(Ref-02). Molecular characterization using microsatellite markers revealed no genetic bottleneck in the population and that the breed exists as a separate cluster different from the rest of the Indian dromedary breeds (Ref-127, Ref-132).

Special and unique characters:

As the breed hails from fairly humid areas, it may be better suited for export to high rainfall areas of India. It is also known to have higher resistance to trypanosomiasis ^(Ref-02).

Communities rearing the breed:

The Malvi camel is reared by the Rebaris of Madhya Pradesh ^(Ref-127).



Male

Main values:

The males are mostly reared to carry loads while females are reared for milk ^(Ref-02).

Important research papers and documentation on pastoralism:

Camels are kept exclusively in extensive management systems and fed on natural grass only. Herd size range between 50 and 100 camels. Breeding herds are composed almost entirely of female camels, each herd containing only one male camel for mating. In addition, there may be one or two young male camels serving as mounts or beast of burden for the herdsmen. Herds migrate between three locations. From April to June, they graze in the vicinity of their home village in Mandsaur district. With the onset of the rainy season in July, they migrate to the area around Kotah and Jhalawar Patan in Southeastern Rajasthan. In September, they start moving into the vicinity of cities in Madhya Pradesh including Bhopal, Indore and Ujjain, to take advantage of opportunities for the sale of milk ^(Ref-02).



MARWARI

Estimated Population: 1,073 ^(Ref-02)

Population Status: Declining

Native tract and ecosystem:

Barmer, Jalore and Jodhpur districts of Rajasthan are considered as the home tract of the Marwari breed ^(Ref-02).

Phenotypic and molecular characteristics:

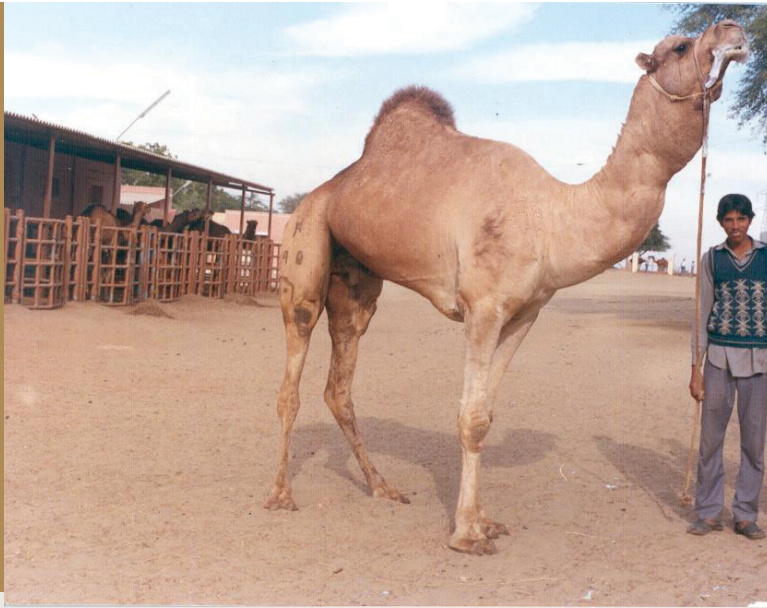
The camels are dark brown with a long and narrow face is devoid of a stop. The head is small but well set on the neck. The muzzle is slightly loose and the lower lip drops a bit. The neck is long and thin and its curvature is not as pronounced as in the Bikaneri species ^(Ref-02). No documented evidence of molecular studies for characterization of the breed has been found.

Special and unique characters:

These camels are short-statured and light in weight ^(Ref-02).

Main values:

These animals are used for carrying heavy loads and performing heavy agricultural operations ^(Ref-02)



Male

Breed Association, plans and state schemes, any unique products:

- a — Surra surveillance and treatment camps are being organized by the cRajasthan state government under the Rashtriya Krishi Vikas Yojana (RKVY) in which laboratory tests and treatment are provided free of cost to affected camels ^(Ref-107).
- b — The Rajasthan state livestock development board provides livestock insurance to camel owners for a year and three years at subsidized interest rates in order to cover their losses due to any untoward incidents or mishaps ^(Ref-108).
- c — The Pushkar camel fair is a multi-day livestock fair for camel, horse and cattle. It attracts visitors from throughout the world. It is the biggest forum for the sale and trade of camels in the country ^(Ref-109).
- d — The Lokhit Pashu Palak Sansthan (LPPS) organizes the Marwar Camel Culture Festival annually as a means to bring together members of pastoralist communities with environmentalists, scientists and international experts ^(Ref-128).

Important research papers and documentation on pastoralism:

The Kumbhalgarh species are one-humped or dromedary camels (*Camelus dromedarius*). Kumbhalgarh camels may not represent a distinct breed, but they could be classified as a sub-set of the 'Marwari' breed, extant in the districts that once constituted the kingdom of Marwar, which was ruled by the Maharajah of Jodhpur. They are extraordinarily tall, sometimes with a withers height of more than two metres, and may actually represent the tallest camels in the world. These herds are managed in migratory systems. For up to nine months of the year (in winter and summer) they browse and graze on trees and shrubs in agricultural fields. During the three months of the rainy season (July, August, September) they depend entirely on the forest for feeding ^(Ref-129).



MEWARI

Production and Reproduction parameters

*Milk production is
5-7 kg per day* ^(Ref-02).

Estimated Population: 16,221 ^(Ref-130)
Population Status: Declining

Native tract and ecosystem:

The Mewari camel is native to Chittorgarh, Dungarpur, Kota, Udaipur and Rajsamand districts of Rajasthan ^(Ref-02).

Phenotypic and molecular characteristics:

The animals are light brown in colour with strong hindquarters, heavy legs, hard and thick pads, coarse body hair, loose muzzle, a drooping lower lip, short and thick ears, and a long and thick tail. The stop is absent. The animal looks very dull and sluggish in appearance. These camels are stouter and a little shorter than the Bikaneri. The hair is utilized in the making of coarse fibres and carpets ^(Ref-02). Genetic characterization has revealed enough genetic variability in the population ^(Ref-131).

Special and unique characters:

The animals are short-statured and light in weight ^(Ref-02). The Mewari camel is capable of moving on small hills. These animals have been developed to suit the hot climate of hilly areas infested with honeybees ^(Ref-02).

Main values:

Milk is the main source of income from these animals. Besides, they are also used for carrying baggage ^(Ref-02).



Male

Breed Association, plans and state schemes, any unique products:

- a — Surra surveillance and treatment camps are being organized by the Rajasthan state government under the Rashtriya Krishi Vikas Yojana (RKVY) in which laboratory tests and treatment are provided free of cost to affected camels ^(Ref-107).
- b — The Rajasthan state livestock development board provides livestock insurance to camel owners for one year and three years at subsidized interest rates in order to cover their losses due to any untoward incidents or mishaps ^(Ref-108).
- c — The Pushkar camel fair is a multi-day livestock fair for camel, horse and cattle. It attracts visitors from throughout the world. It is the biggest event for the sale and trade of camels in the country ^(Ref-109).



CAMEL



Female

MEWATI

Estimated Population: Not reported
Population Status: Declining

Native tract and ecosystem:

The Mewati camel is found in the Alwar and Bharatpur districts of Rajasthan ^(Ref-02).

Phenotypic and molecular characteristics:

This breed is hard footed and slightly shorter in stature than Bikaneri camels ^(Ref-02). Genetic characterization puts the Mewati along with Mewari in the same population cluster with a lesser genetic distance between them ^(Ref-132).

Main values:

These camels are used for riding, baggage and draught purposes ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

A Camel Development Scheme was launched on 2nd October, 2016 by the State Government under the Rashtriya Krishi Vikas Yojna (RKVY) to create positive economic incentives for the traditional guardians of the camel, especially the Raika, but also the other camel breeding communities ^(Ref-133). Camel trypanosomiasis (SURRA) is the most destructive disease, causing economic losses



Male

particularly in the camel rearing areas. Awareness programmes and the organisation of free veterinary health camps in highly populated area of camels and during the cattle fairs are organised by the department of Animal Husbandry. During the camps, medicines to treat the animals are provided free of cost under the Pashudhan Nisulk Arogya Yojana ^(Ref-133).

- a — Taking cognizance of the dwindling number of camels, the state government has come up with a new camel development scheme to encourage camel breeding. A Camel Development Scheme (Ushtra Vikas Yojana) was launched on 2nd October, 2016. Under this scheme, the camel farmer will be paid a total Rs.10,000 on each calf born irrespective of any breed of camel, in three installments ^(Ref-133).
- b — The department of Animal Husbandry has started an awareness and training campaign through the National Research Centre on Camels in Bikaner to encourage rearers in better practices of camel management, feeding and Breeding. This is an effort to check the dwindling numbers of the state animal of Rajasthan. The objective of the training programme is close interaction with camel farmers and to expose them to the latest scientific advancements in the field of raising livestock, thereby improving their income and standard of living ^(Ref-133).
- c — The Government of Rajasthan has also initiated the “Bhamashah Pashu Beema Yojana” under which camels are covered under life insurance plans. Under this scheme, people belonging to the Scheduled Caste, Scheduled Tribes and the BPL category will have to deposit only 30 percent of the total premium amount and the rest of the 70 percent amount will be paid by the government. On the other hand, people belonging to the general category would have to pay 50 percent of the premium amount with the rest taken care of by the government ^(Ref-133).



HORSE

PIG

DONKEY

YAK

SPITI	146
KACHCHHI-SINDHI	148
DOOM	150
HALARI	152
KACHCHHI DONKEY	154
ARUNACHALI	156



Female

SPITI

Production and Reproduction parameters

Average age at first foaling:
43.68 months ^(Ref-02)

Average foaling interval:
12.23 months ^(Ref-02)

Estimated Population: 1,010 ^(Ref-91)

Native tract and ecosystem:

The Spiti breed of horses is native to Kinnaur and the Lahaul-Spiti regions of Himachal Pradesh ^(Ref-02).

Phenotypic and molecular characteristics:

These horses are variable in colour, ranging from chestnut to black. Grey is the most predominant colour followed by brown and black. The colour of the limbs and muzzle is the same as the rest of the body ^(Ref-02). Microsatellite based genetic characterization has revealed a high genetic variability in the Spiti horse population ^(Ref-94).

Special and unique characters:

The nuchal ligament in Spiti ponies is a very powerful elastic apparatus, which assists the extensor muscles of the head and neck. It is longer in comparison to other breeds of horses and helps the animal to walk and carry a load on steep mountains. Horses thrive well in the height range of 5000-15000 feet above mean sea level. A majority of these areas are adjacent to the permanent snowline with its arid cold climate sans large vegetation ^(Ref-02).

Communities rearing the breed:

The Kannait community rears this breed ^(Ref-02).



Male

Main values:

These horses are mainly used for transport, riding and draught purposes. They are used as transport carriers by shepherds who move along with their sheep and goat flocks ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — For the conservation of Spiti ponies which was almost on the verge of extinction, the Animal Husbandry department, Himachal Pradesh has established the Chamurthi Horse Breeding Farm at Lari (Spiti) ^(Ref-95).
- b — Under “Network Project on Animal Genetic Resources – Spiti Horse”, elite females are registered for in situ conservation. Each owner of the selected brood mares are provided incentives to the tune of Rs. 300 per mare as maintenance cost so as to facilitate the birth of healthy progeny. Also, the owners of selected male foals are provided incentives to the tune of Rs. 10,000 per male so that healthy stallions can be reared for subsequent breeding ^(Ref-96).

Important documentation on pastoralism:

- a — In the main breeding tract, all the horses are stationary from December to May. In June, all horses, except young ones and pregnant females, are shifted to high land pastures for almost five months till they are taken back to homes when heavy snowfall occurs ^(Ref-02).
- b — The Spiti horses are maintained both under the migratory and stationary system. In the main breeding tract, the horses are stationary from December to May. During April-May, foaling occurs which is followed by rebreeding of all the brood mares mostly in foal-heat. In June end, all horses except the young ones are shifted to high land pastures for almost five months till they are taken back home when snowfall occurs in the beginning of winter. The migratory horses kept by the traders and shepherds descend to the lower hills in winter and return the higher altitude in summer, along with sheep and goat flocks. These horses are used as transport carriers and for riding ^(Ref-96).





Female

KACHCHHI-SINDHI

Production and Reproduction parameters

Average age at first foaling:
42.8 months (Ref-02)

Average foaling interval:
13.96 months (Ref-02)

Estimated Population: 4,359 (Ref-97)

Native tract and ecosystem:

The breed is found in Surat, Kachchh and Navsari districts of Gujarat and the Barmer and Jaisalmer districts of Rajasthan (Ref-02).

Phenotypic and molecular characteristics:

The coat color is mainly bay. Unique features of the breed include a Roman nose appearance of the face. The ears are curved at the tips but do not touch each other. Other characteristics include a short back, short pastern bone length and broader hoofs for better grip, and a docile temperament (Ref-02). No documented proof of genetic diversity studies on the breed has been found.

Special and unique characteristics:

Kachchhi-Sindhi horses have a special type of gait called the 'Rewal Chal'. A rider can carry buttermilk on the back of the horse in an open vessel for a long distance without a drop spilling out. A short pastern bone length and a broader hoof are responsible for the better grip and for covering long distances. These attributes possibly protect the horse from limb problems (Ref-02).

A majority of the Kachchhi-Sindhi horse owners maintain and keep these horses for riding. These horses are excellent for long distance riding because of their special type of gait called "Rewal Chal". The horses are also used on safaris and for the transportation



Male

of goods or other materials like fodder or raw construction materials. This breed has a high drought and heat tolerance capacity in arid and semi arid regions. It adapts itself well to o both extensive and intensive management systems ^(Ref-02).

Main values:

These horses are generally used for transportation of goods or other materials like fodder and raw construction materials. Besides, they are also used for riding, sports and horse safaris ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — The Ram Rahim Kachchhi Sindhi Ashwaplak Sahkari Mandali Ltd, Anjar (Gujarat) is a breed cooperative society meant for the promotion and conservation of the Kachchhi Sindhi breed of horses ^(Ref-02).

Important documentation on pastoralism:

- a — Kachchhi horse breeders follow specific feeding and rearing practices as the owners who are basically farmers by occupation maintain horses in intensive systems of rearing, But but in the same area, owners who are livestock breeders/pastoralists by occupation maintain horses in a semi-intensive system. In the Banni area most horse owners are pastoralist and they follow the extensive pattern of horse rearing and management ^(Ref-02).





Female

DOOM

Production and Reproduction parameters

Average age at first farrowing:
11.1 months ^(Ref-02)

Average farrowing interval:
7.1 months ^(Ref-02)

Average litter size:
6.29 ^(Ref-02)

Dressing percentage:
62% ^(Ref-02)

Estimated Population: 3,000 ^(Ref-91)

Native tract and ecosystem:

The Doom is an indigenous pig breed of Assam native to Dhuburi, Kokrajhar and Bongaigaon districts of Assam ^(Ref-02).

Phenotypic and molecular characteristics:

Pigs of this breed are black in colour, have a short concave snout, short erect ears and a flat belly. The top line is straight with long bristles extending up to the thoraco-lumber area ^(Ref-02). Molecular characterization has revealed no genetic bottleneck and a high genetic diversity in the population ^(Ref-92).

Special and unique characteristics:

The breed is adapted to a special management system – a migratory scavenging system with minimum inputs ^(Ref-02).

Communities rearing the breed:

An indigenous Doom community has been rearing this breed for several generations ^(Ref-02).



Male

Main values:

The breed is mainly bred for pork. The meat is lean and considered palatable by consumers and thus fetches a higher price in the market ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

The government of Assam has planned to set up a nucleus farm for the Doom breed for its conservation and genetic improvement ^(Ref-93).

Important research and documentation on pastoralism:

Farmers rearing the breed take their pigs from one place to another in search of food and hence follow a nomadic way of living ^(Ref-02).

DONKEY



Female

HALARI

Production and Reproduction parameters

Average age at first foaling:
36.93 months ^(Ref-02)

Average foaling interval:
12.15 months ^(Ref-02)

Estimated Population: 1,112 ^(Ref-98)

Native tract and ecosystem:

The breeding tract of the Halari breed of donkey is Jamnagar and the Devbhoomi Dwarka districts of Gujarat ^(Ref-02).

Phenotypic and molecular characteristics:

The Halari donkey is a strongly built, large sized animal white in colour. The muzzle and hooves are black with a white mane. The forehead and nasal bone are mostly convex. The ears are mostly erect ^(Ref-02). There is no published literature on genetic characterization studies carried out on Halari donkeys.

Special and unique characteristics:

The breed has an excellent drought and heat tolerance capacity, walking ability, and adaptability to an extensive pattern of rearing and management ^(Ref-02).

Communities rearing the breed:

The Bharwad and Rabari pastoralists are the main communities which use this donkey as a pack animal to carry luggage during migration with small ruminants. The Kumbhar (potter) community also uses this animal for pottery work in Dwarka in the, Jamnagar region. The Bharwad pastoralists maintain the Halari donkey herd with a few elite jacks for breeding. They sell young foals and



Male

surplus donkeys at the Vautha donkey fair, an annual event organized in Vautha village of Dholka Taluka in Ahmedabad District. The fair attracts buyers from different regions of Gujarat and other states ^(Ref-02).

Main values:

The donkey is mainly used as a pack animal and for donkey carts ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — For the revival of donkey keeping and recognition and registration of this breed, breeders have initiated a Halari Ddonkey registration process under a special scheme of the Government of Gujarat (Department of AH, Gujarat). The scheme is called “Characterization and registration of lesser known livestock population of Gujarat” ^(Ref-99).
- b — The Breed Saviour Award 2017 was awarded to a farmer named Bupathbhai Jadhavbhai for the conservation of Halari donkeys in their home tract ^(Ref-99).

Important documentation on pastoralism:

- a — A majority of Halari donkey owners are pastoralists and they follow the extensive pattern for donkey rearing and management. These pastoralists regularly migrate to other districts. Pastoral women, generally, take care of Halari donkeys ^(Ref-02).
- b — The Bharwad and Rabari communities rear Halari donkeys to carry luggage during migration with small ruminants. The animals migrate for around 8-10 months soon after the monsoon season. The donkeys are well adjusted to the management style of the Dumba/Panchali sheep breeders and the Kahami goat breeders who live a nomadic lifestyle and follow the extensive grazing system ^(Ref-99).
- c — Ranabhai and Daiben were recently awarded the Breed Saviour Award for their efforts in conserving two native pastoral animal breeds – the Halari donkey and the Kahami goat. Halari donkeys have been bred for over thirty generations in Ranabhai’s family. Since they were little, they have spent months on the move every year, walking with their ‘children’, the goats and the donkeys. On being asked if their real children would continue their profession of pastoralism, Ranabhai thought for few seconds and said, “Who knows? They all go to schools now – unlike us who were always with the animals on the move” ^(Ref-100).



DONKEY



Female

KACHCHHI DONKEY

Production and Reproduction parameters

Age at puberty in male (months):

14.08+0.44 (Ref-243)

Age at first oestrous in female (months):

13.42 +0.17 (Ref-243)

Service period (days):

7.50+ 0.50 (Ref-243)

Foaling interval (months):

12.09 + 0.05 (Ref-243)

Average load carrying capacity (kg):

185.30+ 7.02kg (Ref-243)

Draught tolerance:

Grade 1: 100% (Ref-243)

Heat tolerance:

Grade 1: 100% (Ref-243)

Average work duration/day (hrs.):

4.24+ 0.12 Hrs (Ref-243)

Average distance covered (km):

12.12+0.34km (Ref-243)

Estimated Population: 1,733 (Ref-243)

Population Status: Endangered (Ref-233)

Native tract and ecosystem:

The breed is found in approximately 45,654 sq. km area in the Kachchh district of Gujarat (Ref-243).

Phenotypic and molecular characteristics:

The coat colour is mainly grey (dorsal surface grey and ventral surface white) followed by white, brown and black. The forehead is convex and the nasal bone is straight. The height at wither ranges from 77 to 115cm. It is docile in temperament (Ref-244). As of now, no documented information is available on the molecular characterization of the Kachchhi donkey.

Communities rearing the breed:

The Muslim Sama community in Khavda, the Sindhi pastoralist community of Banni, Kumbhar, Vagher, Koli and the Bharwad communities of Kachchh are involved in the rearing of this breed (Ref-243).

Main values:

Different communities rearing the breed use it for different purposes. The Muslim Sama community use it for agricultural operations like inter cultivation and weed removal. The Sindhi pastoralists of Banni use it for transportation of wood, the Kumbhar community



Male

for lifting raw materials for construction, and the Hindu Koli, Vagher and fisherman communities use it for coal making and fish transportation. The Bharwad and Rabari communities use it as a pack animal during migration post-monsoon ^(Ref-243).

Breed Association, plans and state schemes, any unique products:

Sahjeevan has worked earnestly to get the Kachchhi donkey registered as a distinct breed. With support from the Department of Animal Husbandry, Bhuj, Gujarat, Sahjeevan organized a donkey fair for Kachchhi and Halari donkeys in 2015 at Vautha village in Ahmedabad ^(Ref-246) and a similar donkey mela was organized at Dhrang, Kachchh in 2018 ^(Ref-247).

Important research papers and documentation on pastoralism:

- a — The NGO Maldhari Rural Action Group (MARAG) hold the following opinion: “When the government announces package for relief and rehabilitation, it is land based; or when it distributes grass cards and sets up cattle camps, it is aimed towards farmers or semi-pastoralists. Maldharis own little or no land, and there’s no aid aimed at sheep, goat, or camel.” The Animal Husbandry department, on its official website, is in concurrence with this and has expressed that, “Cows and buffalos are reared.. mainly by farming community...Sheep, camel, goat, donkey and horse are reared mainly by nomadic tribes of Kachchh.” ^(Ref-154).
- b — The pastoralists of Banni keep donkey for use as pack animals to lift luggage during migration along with their cattle. The Kachchhi donkey is well adapted to the desert and an arid climate ^(Ref-245).
- c — The Sama, Sindhi, Koli, Rabari and Bharwad communities rearing the Kachchhi donkey breed are traditionally nomadic or semi-nomadic who use these animals for different purposes ^(Ref-243).



YAK



Female

ARUNACHALI

Production and Reproduction parameters

Average calving interval:

16.8 months (Ref-02)

Average milk yield per lactation:

185 kg (Ref-02)

Average milk fat percentage:

7.45% (Ref-02)

Average litter size born:

1 (Ref-02)

Average fleece weight (kg/year):

1.5 (Ref-02)

Estimated Population: 14,061 (Ref-101)

Native tract and ecosystem:

Arunachali yak are usually found in West Kameng and Tawang districts of Arunachal Pradesh at an altitude of 3000-6000 m above mean sea level and can sustain themselves in temperatures of -400C to 100C (Ref-02).

Phenotypic and molecular characteristics:

A majority of the animals are black with a few marked by a white forehead/white face/white strip from hump to tail. The horns are mostly curved forward, then backwards with pointing tips. These yaks have medium sized, compact bodies with short, stocky legs. The horizontal ears are typical to the Arunachali yak. The poll is prominent with a convex head. The udder is usually trough shaped with cylindrical teats. The brisket, belly, ribs, lateral parts and the legs are covered with long hair. The hair and down coat are used to produce coarse or carpet quality fibre (Ref-02). Bovine microsatellite markers were successfully used for the characterization of the yak population. The Arunachali yak gene pool was found to have a moderate level of diversity with some inbreeding (Ref-102).

Special and unique characteristics:

The yak breed is well adapted to extreme cold and hypoxic conditions in high altitudes. It has been observed that the adult weight of both the male and female declines by 20-30% during winter food scarcity. The down-fibres are more important than the coarse fibres and are more in demand. 0.25-0.5% twinning has been observed (Ref-02).



Male

Communities rearing the breed:

The Monpa community in West Kameng and Tawang districts has been rearing this breed. It is closely associated with the culture, religion and social life of the Monpa people ^(Ref-02).

Main values:

These animals are used for diverse purposes including milk, meat, hair and fibre, besides for transportation and manure ^(Ref-02).

Breed Association, plans and state schemes, any unique products:

- a — With the initiative of NRC, breeders called Brokpas have been educated on the nutritional interventions to be made in the winter months to ensure their nutritional security and economic upliftment ^(Ref-103).

Important research and documentation on pastoralism:

- a — These Brokpas migrate their herds during the summer season, along the mountain ridges away from their homestead for grazing. One attendant stays all along at the pasture land to take fulltime care of the herds as well as for milking and preparing butter, ghee and churpi (fermented butter) for home consumption and commercial purposes. In the winter season, when heavy snowfall occurs, the entire herd is brought back towards their homestead ^(Ref-02).
- b — Pastoral communities like the Brokpa, a semi-nomadic tribe belonging to the northeastern Indian state of Arunachal Pradesh that borders China, Bhutan, and Tibet, have thrived. But these totemic yaks of the Himalayas and their Brokpa herders are increasingly being affected by climate change and this has forced them to change their traditional ways of living. The Brokpa yak pastoralists face multiple challenges like the rising temperature, the degradation of high-altitude pastures, the dwindling of the pure yak population, and a gradually shortening winter ^(Ref-104).
- c — In Arunachal Pradesh, yaks are being raised along the border of West Kameng and Tawang districts, mainly between elevations of 1981.2 m (6438.9 ft) to 4260.72 (1384.34 ft) m above sea level. The Brokpa are the transhumance pastoralists of the Monpa tribe, whose profession and livelihood is dependent on yak rearing and the use of resources like high mountain pastures, characteristically in mobility patterns. Mobility is one of the main characteristics of the Brokpas, enabling them to move along with their herds at different points in time, exploring greener pastures at different ecological zones, and efficiently utilizing available resources. Mobility is strictly followed with the arrangement of institutional regulations of seasonal use. It is one of the main strategies used by transhumants in mountain environments that have developed diverse strategies to utilize natural resources such as pasture and water ^(Ref-105).

REFERENCES

No.	
1	Estimated Livestock Population Breed Wise Based on Breed Survey 2013. Department of Animal Husbandry, Dairying & Fisheries, Government of India, New Delhi
2	http://14.139.252.116/agris/bridDescription.aspx
3	https://krishikosh.egranth.ac.in/displaybitstream?handle=1/80828
4	Palanisamy, Ganapathi (2013). Production and Reproduction Performance of Endangered Bargur Cattle under the field condition in Tamil Nadu International Journal of Food, Agriculture and Veterinary Sciences, 3, 207-209.
5	http://www.tanuv.ac.in/bcrs.html
6	https://www.thehindu.com/news/national/tamil-nadu/bargur-breed-the-most-soughtafter-cattle/article7548704.ece
7	http://www.pastoralpeoples.org/docs/lingayat_biocultural_protocol.pdf
8	http://www.sevango.in/pdf/community_conservation.pdf
9	https://leisaindia.org/livestock-keepers-rights-and-biocultural-protocols/
10	http://www.aau.in/departments/pages/1674
11	A Report on “The Study of 24 Registered Livestock Breeds of Gujarat” by Dr. Shersinh J. Chauhan, Sahjeevan, Bhuj, Gujarat
12	https://ahd.maharashtra.gov.in/breeding-policy-indigenous-cattle#
13	https://www.business-standard.com/article/pti-stories/maha-govt-to-distribute-desi-cows-to-farmers-119012301485_1.html
14	https://epashuhaat.gov.in/documents/rashtriyagokulmissionnote.pdf
15	http://www.pastoralpeoples.org/docs/keepersofgenes_web.pdf
16	http://www.pastoralpeoples.org/wp-content/uploads/2011/11/ikab.pdf
17	http://www.fao.org/3/an469e/an469e05.pdf
18	https://www.downtoearth.org.in/news/a-pair-too-rare-44759
19	Chaudhari, M. V., Parmar, S. N. S., Joshi, C. G., Bhong, C. D., Fatima, S., Thakur, M. S. & Thakur, S. S. (2009). Molecular characterization of Kenkatha and Gaolao (Bosindicus) cattle breeds using microsatellite markers. Animal Biodiversity and Conservation, 32.2: 71–76.
20	https://www.freepressjournal.in/mumbai/maharashtra-government-plans-to-allocate-farmers-desi-cows-instead-of-jersey
21a	http://www.sevango.in/pdf/breedsaviourawardees_2016.pdf
21b	http://www.indiancattle.com/gaolao-cattle-breed-research-project/
22	http://www.fao.org/3/an469e/an469e04.pdf
23	http://www.fao.org/3/y4924t/y4924t07.htm
24	Jarina Joshi, R.K. Patel, K.M. Singh, K.J. Soni, J.B. Chauhan, D.N. Rank, C.G. Joshi and K.R.S. SambasivaRao (2007) Genome Identity and Diversity Study in Gir and Kankrej (Bosindicus) Cattle Breeds using RAPD Fingerprints. Biotechnology, 6 (3):322-327.
25	Kale, D., Rank, D.N., Joshi, Chaitanya, Yadav, B. R., Koringa, Prakash, Thakkar, K.M., Tolankhomba, T. and Solanki, J.V. (2010). Genetic Diversity among Indian Gir, Deoni and Kankrej Cattle Breeds based on Microsatellite Markers. Indian Journal of Biotechnology. 9. 126-130.
26	http://gircowbreeders.com/aboutus.php
27	https://pib.gov.in/newsite/PrintRelease.aspx?relid=148601
28	https://www.nddb.coop/sites/default/files/Booklet-Development-of-Gir-Eng%20-low.pdf
29	http://gircowbreeders.com/aboutgir.php
30	https://www.india-seminar.com/2006/564/564_c_bharwada_&_v_mahajan.htm

31	Gaur, Gyanendra, Kaushik, S. and Garg, R. (2003). The Gir cattle breed of India - characteristics and present status. <i>Animal Genetic Resources Information</i> . 33. 10-17
32	https://assets.publishing.service.gov.uk/media/57a08ce2e5274a31e00014fa/ZC0181b.pdf
33	Sodhi, Monika, Mukesh, Manishi, Prakash, B, Mishra, Bishnu, Sobti, Ranbir, Singh, Kunwar and Ahlawat, Sonika (2007). Microsatellite Marker Based Characterization of Genetic Diversity in Kankrej Cattle. <i>Journal of Applied Animal Research</i> 31, 153-158.
34a	https://www.roysfarm.com/kankrej-cattle/
34b	http://www.pastoralpeoples.org/docs/06VivekanandanSEVA.pdf
35a	https://gldb.gujarat.gov.in/cattle-breeding-farm-bhuj.htm
35b	Vohra, Vikas, Niranjana, Saket, Singh, Pramod, Sadana, D. K. and Joshi, B. K. (2011). Pastoral Management of Kankrej Cattle during Migration between Western Dryland and Trans-Gangetic Plain of India. <i>Indian Journal of Dairy Science</i> . 66. 501-507.
36	Sharma, Amit Kumar, Bhushan, Bharat, Kumar, Sanjeev, Kumar, Pushpendra, Sharma, Arjava and Kumar, Satish (2004). Molecular Characterization of Rath and Tharparkar Indigenous Cattle (Bos indicus) Breeds by RAPD-PCR. <i>Asian-Australasian Journal of Animal Sciences</i> . 17. 10.5713/ajas.2004.1204.
37a	https://www.nddb.coop/sites/default/files/NDDB_Rajasthan_21-9-16_Final.pdf
37b	http://animalhusbandry.rajasthan.gov.in/StateLiveStockPolicy/state_LS_dev_policy.pdf
38	https://pib.gov.in/newsite/PrintRelease.aspx?relid=174997
39	https://joshuaproject.net/people_groups/20426/IN
40	https://en.wikipedia.org/wiki/Rath_tribe
41	https://www.dairyknowledge.in/article/rathi
42	M. Sodhi, M. Mukesh, B. P. Mishra, B. Prakash, S. P. S. Ahlawat and K. R. Mitkari (2005). Evaluation of Genetic Differentiation in Bos indicus Cattle Breeds from Marathwada Region of India Using Microsatellite Polymorphism, <i>Animal Biotechnology</i> , 16:2, 127-137
43	https://timesofindia.indiatimes.com/city/nagpur/state-govt-extends-cattle-purchase-subsidy-scheme-to-indian-cow-breeds/articleshow/67679354.cms
44	http://14.139.252.116/Result_BCA_2017.pdf
45	http://www.ilse-koehler-rollefson.com/?p=914
46	Karthickeyan, S.M.K., Sivaselvam, S.N., Selvam, R, Raja, T.V., Rajendran, R. and Thangaraju, P. (2007) Umblachery Breed of Cattle in South India: Genetic Assessment Through Microsatellite Markers. <i>Asian Journal of Animal and Veterinary Advances</i> , 2 (4):218-222
47	http://agritech.tnau.ac.in/animal_husbandry/pdf/ah_e_pn_2015_16.pdf
48	http://www.tanuv.ac.in/vcri_ond_genetics.html
49	http://www.lrrd.org/lrrd20/3/raje20040.htm
50	https://www.dairyknowledge.in/article/kharia
51	http://fardodisha.gov.in/sites/default/files/misc/StatePlanSchemes.pdf
52	https://olrds.nic.in/upload/files/Annual%20Activity%20Report%202015-16_02_05_14pm2aacc0519e983db9f4b32997d23f2b0e.pdf
53	https://olrds.nic.in/upload/files/Kharia.pdf
54	file:///h:/ssd%20thesis%20progress%20folder/december%202019/18-12-2019/kharia.pdf
55	Barani, A., Rahumathulla, P. R., Rajendran, R., Kumarasamy, P., Ganapathi, P. and Radha, P. (2015). Molecular characterization of Pulikulam cattle using microsatellite markers. <i>Indian Journal of Animal Research</i> . 49 : 36-39
56	https://www.scribd.com/document/181444658/Pulikulam-cattle-approved-as-indigenous-breed-doc
57	https://cms.tn.gov.in/sites/default/files/documents/ah_e_pn_2018_19.pdf
58	https://www.thehindu.com/news/national/tamil-nadu/efforts-on-to-protect-pulikulam-breed/article7042733.ece

59 Singh, Pramod, Pundir, Rakesh, Kumarasamy, Peria, Vivekanandan, P, Madu, Palingu, Madu, Nattu, Manimadu, and Kilakattumadu, Kilakad (2013). Management and physical features of migratory Pulikulam cattle of Tamil Nadu. *Indian Journal of Animal Sciences*. 82, 1587-1590.

60 Thesinguraja, S., Mathialagan, P., Thilakar, P., Devendran, P. and Palanichamy, V. (2017) Socio-Economic Profile of Pulikulam Cattle Rearers in Madurai and Sivagangai Districts of Tamil Nadu, India. *International Journal of Current Microbiology and Applied Sciences*, 6(12) 424-429

61 <https://www.facebook.com/1618454338408442/posts/pulikulam-cattle-are-maintained-as-migratory-herd-with-herd-size-of-about-150-40/1753837204870154/>

62 NBAGR Survey Project, 2012-13

63 Vohra, V., Sodhi, Monika, Niranjana, S. K. Mishra, A. K., Chopra, Alka, Kumar, Manoj and Joshi, B. K. (2017) Characterization of rare migratory cattle and evaluation of its phylogeny using short tandem-repeat-based markers. *Journal of Applied Animal Research*, 45 (1), 355–363

64 http://pashudhanharyana.gov.in/sites/default/files/documents/Schemes_17-18/Scheme%20for%20the%20conservation%20and%20development%20of%20indigenous%20cattle%20_Gausamvardhan_%202017-18.pdf

65 <https://saveindiancows.org/belahi/>

66 <http://14.139.252.116/newsletter/newslettermarch2015.pdf>

67 <http://allpaedia.com/livestock/breeds/cattle-breeds/11923-belahi-cow-%E2%80%93-the-unique-cattle-of-shivalik-foothills.html>

68 Mishra, Bishnu, Kataria, Ranjit, Periasamy, Kathiravan and Sadana, D. K. (2009). Microsatellite based genetic characterization of Jaffarabadi buffaloes. 86. 376-379.

69 Mishra, B.P., Kataria, R.S., Kathiravan P, Singh, K.P., Sadana, D.K. and Joshi, B.K. (2010) Microsatellite based genetic structuring reveals unique identity of Banni among river buffaloes of Western India. *Livestock Science* 127: 257–61.

70 SoumiSukla, Yadav, B.R. and Bhattacharya, T.K. (2006) Characterization of Indian Riverine Buffaloes by Microsatellite Markers. *Asian-Aust. J. Anim. Sci.* 19, 11 : 1556 – 1560

71 <https://pib.gov.in/newsite/mbErel.aspx?relid=148601>

72 https://gldb.gujarat.gov.in/Portal/Document/11_1366_3_Livestock-Bovine-Breeding-Policy-2018.pdf

73 http://www.agritech.tnau.ac.in/expert_system/cattlebuffalo/Breeds%20of%20cattle%20&%20buffalo.html

74 http://www.pastoralpeoples.org/docs/keepersofgenes_web.pdf

75 Kataria, Ranjit&Bulandi, Shyam& Malik, G & Mukesh, Manishi&Periasamy, Kathiravan&Mishra, Bishnu. (2009). Genetic diversity and bottleneck analysis of Nagpuri buffalo breed of India based on microsatellite data. *Genetika*. 45. 941-8. 10.1134/S1022795409070102.

76 <http://ahd.maharashtra.gov.in/breeding-policy-buffaloes>

77 Kumar S, Gupta J, Kumar N, Dikshit K, Navani N, Jain P, Nagarajan M: Genetic variation and relationships among eight Indian riverine buffalo breeds. *Mol Ecol*. 2006, 15: 593-600. 10.1111/j.1365-294X.2006.02837.x.

78 http://www.fao.org/ag/againfo/programmes/en/genetics/documents/Interlaken/sideevent/6_3/Vivekanandan.pdf

79 http://cms.tn.gov.in/sites/default/files/documents/ah_e_pn_2019_20.pdf

80 <http://www.fao.org/tempref/docrep/fao/010/ah847e/ah847e01.pdf>

81 Source: 19th Livestock Census, A.H. & Vety. Deptt., Assam

82 Mishra, B.P., Dubey, P.K., Prakash, B., Kathiravan, P., Goyal, S., Sadana, D. K., Das, G. C., Goswami, R. N., Bhasin, V., Joshi, B. K. and Kataria, R. S. (2015) Genetic analysis of river, swamp and hybrid buffaloes of north-east India throw new light on phylogeography of water buffalo (*Bubalus bubalis*). *J. Anim. Breed. Genet.* 132, 454–466

83 https://animalhusbandry.assam.gov.in/sites/default/files/swf_utility_folder/departments/ahvetdept_webcomindia_org_oid_3/portlet/level_1/files/cattle_buffalo.pdf

84	http://ibic.lib.ku.ac.th/e-Bulletin/2007-25.htm
85	http://www.sevango.in/pdf/breedsaviourawardees_2009.pdf
86	https://www.sahjeevan.org/images/files/animal_husbandry/01_Banni%20buffalo.pdf
87	https://leisaindia.org/joining-hands-to-revive-pastoral-economy/
88	https://www.revolutionarydemocracy.org/rdv19n1/kutch.htm
89	https://foodtank.com/news/2015/04/together-we-can-how-indias-banni-buffalo-support-pastoral-activis/
90	Survey conducted by NBAGR, Karnal
91	GOI project on 'Conservation of Doom pig of Assam' at AAU, Khanapara
92	Zaman, G., Laskar, S., Ferdoci, A., Chandra Shekar, M. and Chetri, A. J. (2014). Molecular characterisation of Doom pigs using microsatellite markers. <i>African Journal of Biotechnology</i> 13(30):3017-3022.
93	https://animalhusbandry.assam.gov.in/sites/default/files/swf_utility_folder/departments/ahvetdept_webcomindia_org_oid_3/portlet/level_1/files/piggery.pdf
94	Chauhan, Mamta, Gupta, Ashok and Dhillon, Santosh (2005). Genetic characterization of Indian Spiti horses. <i>Journal of Genetics</i> 83 291-95
95	http://himachalservices.nic.in/tribal/pdf/PlanChapters_2017_18.pdf
96	http://hpagrisnet.gov.in/hpagris/Fisheries/animal%20hus/chamurthi.pdf
97	Source: Kachchh - Census made by Ram Rahim Kachchhi Sindhi AshwapalakSahkariMandali Ltd. Anjar and Sahjeevan in 2014. Rajasthan - Based on Livestock Census 2012.
98	Source: Field Survey made on Halari donkey breeders by Sahjeevan, Bhuj, Gujarat
99	http://www.sevango.in/pdf/breedsaviourawardees_2017.pdf
100	http://pastoralism.org.in/wp-content/uploads/PDFs/Pastoral-Times-Edition-II.pdf
101	Source: 19th Livestock Census, A.H. Deptt., GoI
102	Sharma, Himani, Sharma, Rajender, Ahlawat, Sonika, Das, Pranab, Jayakumar, Sivalingam and Tantia, Madhu(2018). Cattle microsatellite markers successfully established diversity status of Arunachali yak (only registered yak breed of India). <i>The Ind Journal of AnimSci.</i> 88 1051-1057.
103	http://www.kiran.nic.in/nrc_yak.html
104	https://thediplomat.com/2017/12/the-brokpa-yaks-a-dying-breed/
105	http://internationaljournalcorner.com/index.php/ijird_ojs/article/viewFile/135611/94735
106	http://www.fao.org/tempref/docrep/fao/010/a0806t/a0806t07.pdf
107	http://animalhusbandry.rajasthan.gov.in/DepartmentalSchemes/Surra_Control_Program.pdf
108	file:///C:/Users/acer/Downloads/Bhamashah%20Bima%20Guideline.pdf
109	https://en.wikipedia.org/wiki/Pushkar_Fair
110	http://www.fao.org/3/u8945t/u8945t03.pdf
111	https://www.dailypioneer.com/2015/vivacity/from-the-land-of-raikas.html
112	Vijh, R. K., Tantia, M. S., Mishra, Mishra, B. P. and Bharani Kumar, S. T. (2007) Genetic Diversity and Differentiation of Dromedarian Camel of India. <i>Animal Biotechnology</i> , 18: 81–90
113	http://www.ilse-koehler-rollefson.com/?p=447
114	https://www.dailymail.co.uk/indiahome/indianews/article-3817607/Rajasthan-government-introduces-innovative-plan-camel-breeding-BSF-faces-shortage-animal.html
115	http://www.pastoralpeoples.org/wp-content/uploads/2017/11/BCP-of-Rajasthans-camel-breeders-final_28-Oct_2017.pdf
116	https://nrccamel.icar.gov.in/camelbreed.php
117	file:///C:/Users/acer/Downloads/Jalori%202017.compressed.pdf
118	Vijhet al. (2007) #112 cited above.
119	https://doah.gujarat.gov.in/horse-camel-development.htm
120	https://kuums.org/about-kachchh-unt-ucherak-maldhari-sangathan/
121	https://kuums.org/livelihood/

122	Source:Kharai Camel - Amazing Camel Breed of Kachchh, Census made by Camel breeders Association and Sahjeevan
123	Patel, A.C., Jisha, T.K., Upadhyay, Disha, Parikh, Rakesh, Upadhyay, Maulik, Thaker, Riddhi, Das, S., Solanki, J.V. and Rank, D. (2015). Molecular Characterization of Camel Breeds of Gujarat using Microsatellite Markers. <i>Livestock Science</i> . 181: 85-88.
124	https://www.financialexpress.com/lifestyle/travel-tourism/the-swimming-camels-of-kutch-how-to-protect-natures-unique-miracle/1789977/
125	https://www.thehindubusinessline.com/economy/agri-business/amul-camel-milk-from-kutch/article20627355.ece1
126	https://steps-centre.org/general/livelihoods-on-the-edge-contested-mangroves-in-kachchh/
127	Sushma Prasad, Sharique, Ali, Banerjee, Priyanka, Joshi, Jyoti, Sharma, Upasna and Vijh, R. K. (2014) Genetic Characterization of Malvi camel using Microsatellite markers. <i>DHR International Journal of Biomedical and Life Sciences (DHR-IJBLS)</i> ISSN 2278-8301,5(1) Special Issue.
128	https://www.marwarcamelculturefestival.org/
129	http://www.lpps.org/wp-content/uploads/2013/10/Camels_Of_Kumbhalgarh_web.pdf
130	Source - Mehta et. al. <i>AGRI</i> , 40, 2007.
131	Mehta, S. (2013). Molecular characterisation of Mewari breed of camel. <i>Veterinary Practitioner</i> . 14: 212-215.
132	Sushma Prasad, Sharique, Ali, Banerjee, Priyanka, Joshi, Jyoti, Sharma, Upasna and Vijh, R. K. (2015) Population Genetic Structure of the Camel, <i>Camelus dromedarius</i> based on microsatellite loci: Knock-on effect for conservation. <i>Genetic Communication Biosci. Biotech. Res. Comm.</i> 8(2): 153-160
133	https://rkvy.nic.in/Uploads/SucessStory/Rajasthan/2018/2018105748Camel%20breeding%20scheme%20-%20PDF.pdf
134	https://en.wikipedia.org/wiki/Changthangi
135	Mishra, Priyanka, Verma, N., Aggarwal, Rajeev and Dixit, S. P. (2010). Breed characteristics and genetic variability in Changthangi goats. <i>Indian Journal of Animal Sciences</i> . 80: 1203-1208.
136	http://woolboard.nic.in/download/scheme_2017.pdf
137	http://jksheephusbandrykashmir.nic.in/breeding_policy.html
138	http://jksheephusbandrykashmir.nic.in/Pashmina_Wool.html
139	Imtiyaz Ahmad Malik and Feroz A. Wani (2017). Pashmina Goat Farming in Cold Arid Desert of Ladakh: A Geographical Study of Changthang Region. <i>International Journal of Advanced Scientific Research and Management</i> , 2 (11): 110-119.
140	https://www.indianjournals.com/ijor.aspx?target=ijor:ijsr&volume=14&issue=1&article=004
141	Singh, G, Thakur Y. P., Kour A., Sankhyan, V, Katoch, S (2015) Genetic characterization of Gaddi goat breed of Western Himalayas using microsatellite markers, <i>Veterinary World</i> 8(4); 527-531.
142	http://sheepjammu.nic.in/Livestock%20Breeding%20Policy%202019.pdf
143	http://hpagrisnet.gov.in/Agrisnet/AnimalHusbandry/pdf%20files/Dept_Activities__July_2017.pdf
144	Dogra, P, Sankhyan, Varun, Kumari, Anjali, Thakur, Ankaj and Kumar, Narender (2018). Enhancing profitability of nomadic Gaddi goat production system for augmenting farmer's income. Pp36-39. Sharma, Rajender, Pandey, Ashwani, Prakash, B., Mishra, Bishnu, Singh, Pramod and Singh, Gursanam (2009). Genetic Diversity of Ganjam goat by microsatellite markers. <i>Indian Veterinary Journal</i> . 86: 275-277.
145	http://www.fardodisha.gov.in/sites/default/files/misc/National%20Mission%20For%20Protein%20Supplementation_Goat.pdf
146	http://fardodisha.gov.in/sites/default/files/misc/StatePlanSchemes.pdf
147	https://news.ilri.org/2016/05/09/odisha-odyssey-the-arcadian-landscapes-and-tribal-goat-keepers-of-mayurbhanj/
148	

149 Shadma, Fatima, Bhong, C. D., Rank, D. N. Joshi, C. G. (2008) Genetic variability and bottleneck studies in Zalawadi, Gohilwadi and Surti goat breeds of Gujarat (India) using microsatellites. *Small Ruminant Research*. 77 (1): 58-64

150 <https://doah.gujarat.gov.in/Images/animalhusbandary/pdf/sgv-dev-en-310718.pdf>

151 Singh, M.K., Kumar, Ashok, Sisodiya, H.S. and Singh, N.P.(2009). Production performance of Gohilwadi goats under range conditions. *The Indian journal of animal sciences*. 79: 587-593.

152 http://www.sevango.in/pdf/breedsaviourawardees_2016.pdf

153 Source: monograph- Kutchi goat, NBAGR

154 <https://india.mongabay.com/2019/06/the-invisible-victims-of-drought-hit-kutch/>

155 Source: monograph- Marwari goat, NBAGR

156 <https://cbp.icar.gov.in/Data/Coordinator/34047/Compendium%20draft%20new1.pdf>

157 Shadma et al. (2008) #149 cited above.

158 <http://agtr.ilri.cgiar.org/zalawadi>

159 Source: monograph- KonkanKanyal goat, NBAGR

160 <https://timesofindia.indiatimes.com/city/goa/konkan-kanyal-breed-to-boost-goat-rearing-in-state-say-experts/articleshow/59241336.cms>

161 <http://www.ccari.res.in/Technical%20Bulletin%20No.%2063.pdf>

162 Source: Survey by Kahmi goat breeders and Sahjeevan

163 http://www.sapplpp.org/files-repository/information-hub/bengaluru-regional-workshop-presentations/rbhatti-sahjeevan-sr-workshop/at_download/file

164 http://www.sevango.in/pdf/breedsaviourawardees_2016.pdf

165 Source: J&K State Govt. Agency

166 <http://jkash.nic.in/>

167 <http://jkash.nic.in/stpshj.htm>

168 <http://www.risingkashmir.com/news/gujjarbakarwals-the-custodian-of-our-livestock>

169 Sharma R, Ahlawat S. and Pandey A. K. (2011). Assessment of genetic diversity in Balangir sheep breed by microsatellite DNA profiling. *Journal of Livestock Biodiversity* 3(2): 73-78.

170 <https://odishaahvs.nic.in/upload/files/Odisha%20State%20Livestock%20Sector%20Policy.pdf>

171 Source: monograph- Bellary sheep, NBAGR

172 [https://www.karnataka.gov.in/kswdcl/english/RTI%20ACT/RTI%204\(1\)\(B\)Eng.pdf](https://www.karnataka.gov.in/kswdcl/english/RTI%20ACT/RTI%204(1)(B)Eng.pdf)

173 https://shodhganga.inflibnet.ac.in/bitstream/10603/62903/10/10_chapter%202.pdf

174 Chakraborty, Dibyendu (2015). Genetic characterization of regional sheep (Purky) of Kargil District by RAPD markers. *Indian Veterinary Journal*. 92: 26-28.

175 <https://en.wikipedia.org/wiki/Bakarwal>

176 <http://www.sapplpp.org/interactive-maps/registered-sheep-breeds-of-india/bakharwal.html#.XgHzOVUzbIU>

177 Pandey, Ashwani, Sharma, R., Prakash, B and Mishra, Bishnu (2009). Genetic diversity study in Bonpala sheep breed of North-East India. 86. 151-154.

178 http://www.sikkim-ahvs.gov.in/banpala_sheep.pdf

179 <http://www.fao.org/3/X6532E/X6532E05.htm>

180 <http://www.fao.org/3/y4924t/y4924t0c.htm>

181 Mishra, Priyanka, Verma, N. K., Aggarwal, Rajeev and Dixit, S P. (2010). Breed characteristics and genetic variability in Changthangi goats. *Indian Journal of Animal Sciences*. 80: 1203-1208.

182 http://jksheephusbandrykashmir.nic.in/breeding_policy.html

183 <http://agris.fao.org/agris-search/search.do?recordID=IN2015000182>

184 <http://www.fao.org/3/X6532E/X6532E06.htm>

185 Source: monograph- Chokla sheep, NBAGR

186 Sodhi, M, Mukesh, M and Bhatia, S. (2006) Characterizing Nali and Chokla sheep differentiation with microsatellite markers. *Small Ruminant Research* 65: 185–192

187 <https://www.cswri.res.in/>

188	Kushwaha, B. P., Kumar, S. Kumar, R. and Mehta, B. S. (1997) The Chokla Sheep in India. Cambridge Core, 22:19-27
189	Arora, Reena, Sehrawat, Archana and Dron, A. K. S. (2008). Genetic diversity of Chhotanagpuri sheep- A mutton breed of eastern agro-ecological zone of India. Indian Journal of Dairy Science. 61: 198 -201
190	Kumarasamy, Peria, Prema, S., Palanisamy, Ganapathi, S. M. K., Karthickeyan and Kanakaraj, P. (2009). Molecular Characterization of Coimbatore Breed of Sheep (Ovis Aries) in South India. The Icfai University Journal of Genetics & Evolution, Vol. II (3). https://www.researchgate.net/publication/256002480
191	https://www.researchgate.net/publication/273444529_Pattern_of_Sheep_migration_in_Southern_Tamil_Nadu
192	Amareswari, P., GnanaPrakash, M., Ekambaram, B., Mahendar, M. and Hari Krishna (2017) Molecular Genetic Studies on Nellore and Deccani Sheep using Microsatellite Markers. Indian J. Anim. Res., DOI: 10.18805/ijar.B-3300
193	https://www.newindianexpress.com/states/telangana/2018/jan/07/telangana-governments-sheep-scheme-pushing-gongadi-weavers-to-brink-1746598.html
194	https://www.ahd.maharashtra.gov.in/sheep-wool
195	http://www.sapplpp.org/interactive-maps/registered-sheep-breeds-of-india/deccani.html#.XgIW9VUzbIU
196	https://www.business-standard.com/article/news-ians/himachal-promoting-sheep-angora-rabbit-rearing-113090100518_1.html
197	https://www.livemint.com/Leisure/Wzkj0Wad8pumyLNu5nkfGK/A-journey-with-Gaddi-pastoralists.html
198	http://hpagrisnet.gov.in/hpagris/AnimalHusbandry/Default.aspx?SiteID=3&PageID=368&Language=En
199	Dogra, P., Sankhyan, Varun, Kumari, Anjali, Thakur, Ankaj, Kumar, Narender (2018). #144 above.
200	Source: monograph- Ganjam sheep, NBAGR
201	http://agriodisha.nic.in/Content/pdf/DRAFT%20AGRICULTURE%20POLICY%202019.pdf
202	Source: monograph- Gurez sheep, NBAGR
203	Source: monograph- Hassan sheep, NBAGR
204	Source: monograph- Jaisalmeri sheep, NBAGR
205	http://animalhusbandry.rajasthan.gov.in/activities.aspx
206	http://animalhusbandry.rajasthan.gov.in/DepartmentalSchemes/Peste_Des_Petitis_Ruminants_Control_Programme_(PPR-CP).pdf
207	Source: monograph- Karnah sheep, NBAGR
208	http://jkash.nic.in/rti4.pdf
209	Source: monograph- Magra sheep, NBAGR
210	http://www.sapplpp.org/files-repository/information-hub/jaipur-regional-workshop-presentations/dah-rajasthan/at_download/file
211	http://www.rldb.nic.in/pdf/Sheep%20beeding%20policy%20rajasthan.pdf
212	Source: monograph- Mandya sheep, NBAGR
213	Source: monograph- Marwari sheep, NBAGR
214	http://rajuvas.org/research-project/
215	Source: monograph- Nali sheep, NBAGR
216	https://spsnellore.ap.gov.in/animal-husbandry-2/
217	http://krishikosh.egranth.ac.in/displaybitstream?handle=1/5810030366
218	Jyotsana, Basanti, Jakhesara, Subhash, Prakash, Ved, Rank, D.N. and Vataliya, Pravin (2010). Genetic features of Patanwadi, Marwari and Dumba sheep breeds (India) inferred by microsatellite markers. Small Ruminant Research. 93. 57-60.

219 Taggar, R.K., Chakraborty, D, Kumar, D., Vohra, V., Tantia, M.S. and Sharma, Arjava (2018) Wool characteristics of Poonchi sheep. *International Journal of Fauna and Biological Studies* 5(2): 133-135

220 Raja, K. N., Jain, A., Singh, G., Kumar, Luv, Yadav, Harikesh and Arora, Reena. (2012). Ramnad White sheep- Phenotypic and Genetic Characterization. *Indian Journal of Animal Sciences*. 82: 1082-1086.

221 http://cms.tn.gov.in/sites/default/files/documents/ah_e_pn_2018_19.pdf

222 Pandey, Ashwani, Sharma, Rajender, Singh, Yash and Mishra, Bishnu (2008). Genetic variability in Rampur-Bushair sheep breed using microsatellite marker. *Indian J. Anim. Sci.* 78: 623-626.

223 <http://hpagrisnet.gov.in/Agrisnet/AnimalHusbandry/pdf%20files/Annual201718.pdf>

224 Source: monograph- Sonadi sheep, NBAGR

225 http://animalhusbandry.rajasthan.gov.in/DepartmentalSchemes/Centrally_Sponsored_Schemes.pdf

226 <https://sikkim.gov.in/scheme/scheme-info/30043?Scheme=Border%20Area%20Development%20Programme>

227 Sharma, Rekha, Kumar, Brijesh, Arora, Reena, Ahlawat, Sonika, Mishra, A.K. and Tantia, Madhu (2016). Genetic diversity estimates point to immediate efforts for conserving the endangered Tibetan sheep of India. *Meta Gene* (2016), doi:10.1016/j.mgene.2016.01.002

228 Kavitha, S. T., Subramanian, A., Sivaselvam, S. N., Thiagarajan, R. and Balasubramanian, S. Genetic characterisation of Tiruchy Black sheep of Tamil Nadu using microsatellite markers *Indian J. Anim. Res.*, 49 (3) 2015 : 320-324

229 Selvaraju, G. and Balasubramaniam, G. A. (2014) .Seroepidemiology of sheep pox in Tamil Nadu. *The Indian Journal of Small Ruminants* 20(1): 123-125

230 http://www.spc.tn.gov.in/12plan_english/3c_AGRI_and_allied.pdf

231 Ravimurugan, T. (2017) Chevaadu – A New Registered Sheep Breed of Tamil Nadu, India. *International Journal of Current Microbiology and Applied Sciences* 6(9) :1553-1557

232 Source: 18th Livestock Census Gujarat State

233 Guidelines for Management of Animal Genetic Resources in India 2016, NBAGR (www.nbagr.res.in)

234 Rajendran, R., Raja, T. V., Thiruvankadan, A. K. Mahalinga Nainar, A., and Thangaraju, P (2008) Morphobiometrical characteristics and management of Umblachery cattle from coastal region of Tamilnadu, India. *Livestock Research for Rural Development* 20 (3) 2008

235 http://www.buffalopedia.cirb.res.in/index.php?option=com_content&view=article&id=138%3Apopulation&catid=51%3Aamharashtra&Itemid=72&lang=en

236 <https://www.thehindu.com/news/cities/Coimbatore/lack-of-grazing-grounds-could-halt-rise-in-toda-buffalo-population-in-the-nilgiris/article26936195.ece>

237 https://www.researchgate.net/publication/332142631_Livestock_population_dynamics_in_Banni_grasslands_of_Gujarat

238 <http://www.fao.org/tempref/docrep/fao/010/a1128t/a1128t07.pdf>

239 <https://nrccamel.icar.gov.in/camelbreed.php>

240 <https://economictimes.indiatimes.com/news/environment/flora-fauna/kharai-camels-to-get-protection-as-endangered-species/articleshow/46980354.cms?from=mdr>

241 Mandal, Ajoy, Karunakaran, M., Rout, P. K. and Roy, R. (2014) Conservation of threatened goat breeds in India. *Animal Genetic Resources* 55: 47–55. © FAO

242 <http://agris.fao.org/agris-search/search.do?recordID=IN2015000182>

243 Breed Descriptor for Kachchhi breed of donkey, NBAGR

244 http://14.139.252.116/New_Breeds_Registered.pdf

245 http://www.sevango.in/pdf/breedsaviourawardees_2015.pdf

246 <https://timesofindia.indiatimes.com/city/ahmedabad/Gujarat-donkeys-may-be-a-breed-apart/articleshow/49867286.cms>

247	https://counterview.org/2018/05/12/donkey-fair-and-seminar-celebration-of-world-donkey-day-at-dhrang-kutch-gujarat/
248	Breed Descriptor for Nari cattle, NBAGR
249	https://www.portalces.org/sites/default/files/migrated/docs/IKAB.pdf
250	http://www.sevango.in/pdf/breedsaviourawardees_2010.pdf
251	http://www.pastoralpeoples.org/docs/Raika_Biocultural_Protocol.pdf
252	http://14.139.252.116/annualreport/annualreport14.pdf
253	Singh, N. P., Vohra, V., Das, R., Verma, N. K., Tania, M. S. and Kataria, R S. (2019) Elucidating the genetic diversity using SSR based markers in Gojri buffalo. Indian Journal of Animal Sciences89(5):522-527
254	http://www.sevango.in/pdf/breedsaviourawardees_2013.pdf
255	Vohra, Vikas, Nirajan, S. K. and Joshi, B. K.(2012) Gojri– A novel migratory buffalo germplasm in Punjab and Himachal Pradesh. Journal of Animal Research2:317-321
256	https://www.tribuneindia.com/news/archive/features/tick-resistant-gojri-adds-to-buffalo-breed-514431
257	https://telanganatoday.com/telanganas-thurupu-close-to-getting-genetic-recognition
258	https://ruralindiaonline.org/articles/sturdy-cattle-that-sustain-fragile-communities/
259	https://www.deccanchronicle.com/151207/nation-current-affairs/article/telangana-recognise-its-first-native-cattle-%E2%80%98thurupu%E2%80%99
260	http://14.139.252.116/Journals/2019Volume9No1.pdf
261	https://www.thehindu.com/news/cities/Hyderabad/conservation-now-assured-for-thurpu-cattle-of-amrabad/article30873963.ece

INDEX - 1

Species, then breed within species

Cattle

	Page
Bargur	2
Belahi	22
Dangi	4
Gaolao	6
Gir	8
Kankrej	10
Khariar	18
Nari	26
Poda Thurpu	24
Pulikulam	20
Rathi	12
Red Kandhari	14
Umblachery	16

Buffalo

	Page
Banni	36
Chhattisgarhi	40
Gojri	42
Jaffarabadi	30
Luit (Swamp)	38
Nagpuri	32
Toda	34

Sheep

	Page
Balangir	46
Bellary	48
Bhakarwal	50
Bonpala	52
Changthangi	54
Cheevadu	100
Chhotanagpuri	58
Chokla	56
Coimbatore	60
Deccani	62
Gaddi	64
Ganjam	66
Gurez	68
Hassan	70
Jaisalmeri	72
Karnah	74
Magra	76

Mandya	78
Marwari	80
Nali	82
Nellore	84
Panchali	102
Pattanwadi	86
Poonchi	88
Ramnad White	90
Rampur Bushair	92
Sonadi	94
Tibetan	96
Tiruchi Black	98

Goat Page

Bhakarwali	122
Changthangi	106
Gaddi	108
Ganjam	110
Gohilwadi	112
Kachchhi	114
Kahmi	120
Marwari	116
Zalawadi	118

Camel Page

Bikaneri	126
Jaisalmeri	128
Jalori	130
Kachchhi	132
Kharai	134
Malvi	136
Marwari	138
Mewari	140
Mewati	142

Horse Page

Kachchhi-Sindhi	148
Spiti	146

Pig Page

Doom	150
------	-----

Donkey Page

Halari	152
Kachchhi Donkey	154

Yak Page

Arunachali	156
------------	-----

INDEX - 2

Breed index

Name	Specie	Page
Arunachali	- Yak	156
Balangir	- Sheep	46
Banni	- Buffalo	36
Bargur	- Cattle	2
Belahi	- Cattle	22
Bellary	- Sheep	48
Bhakarwal	- Sheep	50
Bhakarwali	- Goat	122
Bikaneri	- Camel	126
Bonpala	- Sheep	52
Changthangi	- Sheep	54
Changthangi	- Goat	106
Cheevadu	- Sheep	100
Chhattisgarhi	- Buffalo	40
Chhotanagpuri	- Sheep	58
Chokla	- Sheep	56
Coimbatore	- Sheep	60
Dangi	- Cattle	4
Deccani	- Sheep	62
Doom	- Pig	150
Gaddi	- Sheep	64
Gaddi	- Goat	108
Ganjam	- Sheep	66
Ganjam	- Goat	110
Gaolao	- Cattle	6
Gir	- Cattle	8
Gohilwadi	- Goat	112
Gojri	- Buffalo	42
Gurez	- Sheep	68
Halari	- Donkey	152
Hassan	- Sheep	70
Jaffarabadi	- Buffalo	30
Jaisalmeri	- Sheep	72
Jaisalmeri	- Camel	128
Jalori	- Camel	130
Kachchhi	- Goat	114

Kachchhi	- Camel	.....	132
Kachchhi	- Donkey	.....	154
Kachchhi-Sindhi	- Horse	.....	148
Kahmi	- Goat	.....	120
Kankrej	- Cattle	.....	10
Karnah	- Sheep	.....	74
Kharai	- Camel	.....	134
Khariar	- Cattle	.....	18
Luit (Swamp)	- Buffalo	.....	38
Magra	- Sheep	.....	76
Malvi	- Camel	.....	136
Mandya	- Sheep	.....	78
Marwari	- Sheep	.....	80
Marwari	- Goat	.....	116
Marwari	- Camel	.....	138
Mewari	- Camel	.....	140
Mewati	- Camel	.....	142
Nagpuri	- Buffalo	.....	32
Nali	- Sheep	.....	82
Nari	- Cattle	.....	26
Nellore	- Sheep	.....	84
Panchali	- Sheep	.....	102
Pattanwadi	- Sheep	.....	86
Poda Thurpu	- Cattle	.....	24
Poonchi	- Sheep	.....	88
Pulikulam	- Cattle	.....	20
Ramnad White	- Sheep	.....	90
Rampur Bushair	- Sheep	.....	92
Rathi	- Cattle	.....	12
Red Kandhari	- Cattle	.....	14
Sonadi	- Sheep	.....	94
Spiti	- Horse	.....	146
Tibetan	- Sheep	.....	96
Tiruchi Black	- Sheep	.....	98
Toda	- Buffalo	.....	34
Umblachery	- Cattle	.....	16
Zalawadi	- Goat	.....	118

Summary

This publication represents the first ever compilation of the pastoral breeds of India, those animal populations that have been bred and managed by nomadic or semi-nomadic pastoralist communities. Pastoralism has carefully crafted animal breeds with unique characteristics in sync with the ecology of their region. The report identifies 73 such populations -- including goats, sheep, cows, buffaloes, camels, horses, donkeys, pigs and yak. The fact that these 73 breeds represent close to 40% of the 197 recognized breeds in the country today, points to the remarkable contribution that pastoral communities have made in building and maintaining India's domesticated genetic diversity, a contribution that is rarely recognized. This report provides details on these 73 pastoral breeds, including photographs where available, an assessment of the population's status - whether or not it is endangered; details on its native tract and the ecosystem it grazes in; phenotypic and molecular characteristics, production and reproduction parameters, details on the communities that rear and manage the breed, and existing government or other plans to maintain the breed. While the report serves to document these breeds, and calls for attention to the pastoral systems that have bred them, it also serves as a field guide, for those interested in our domesticated animal genetic diversity.



Centre for
Pastoralism

Sahjeevan, 175, Jalaram Society,
Vijaynagar, Bhuj Kutch (Gujarat) INDIA
Phone: 02832 251814

www.centreforpastoralism.org