

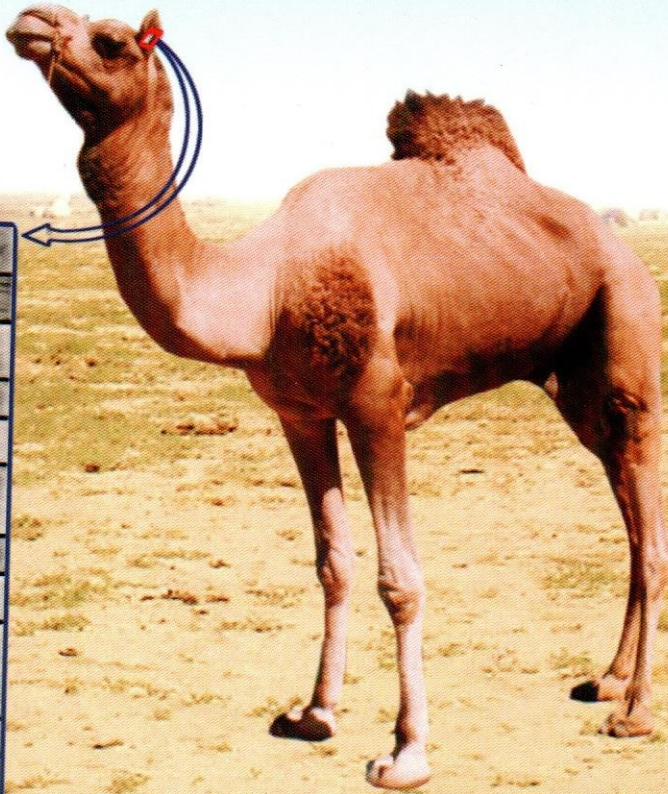
CHARACTERISATION AND CONSERVATION OF

JAISALMERI CAMEL



DR. S.C. MEHTA

PRINCIPAL INVESTIGATOR OF COOPERATING CENTRE
NATP MISSION MODE PROJECT



NATIONAL RESEARCH CENTRE ON CAMEL

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

BIKANER - 334 001 (RAJASTHAN)

CHARACTERISATION AND CONSERVATION OF

JAISALMERI CAMEL

National Agricultural Technology Project (MM)

MISSION: ANIMAL GENETIC RESOURCE BIODIVERSITY



By



DR. S.C. MEHTA

Senior Scientist & In-charge AGB
Principal Investigator of Cooperating Centre

Assisted by

Dr. Pankaj Thanvi & Sh. Ritu Raj

Principal Investigator

Dr. M.S. Tantia

Mission Leader

Dr. S.P.S. Ahlawat

Director

National Bureau of Animal Genetic Resources

Karnal-132 001



Dr. M. S. Sahani

Director

NATIONAL RESEARCH CENTRE ON CAMEL

(Indian Council of Agricultural Research)

BIKANER-334 001

Published under NATP (MM) by:

Dr. M.S. Sahani

Director

National Research Centre on Camel

Bikaner-334001 (Rajasthan)

Published:

November-2004

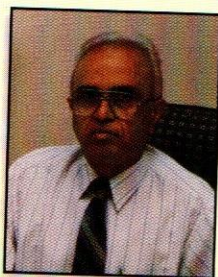
Printed by:

R.G. Associates

Bikaner

Tel. : 0151-2527323

FOREWORD

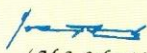


Characterisation of livestock species is of utmost importance for knowing the status of any breed in the breeding tract and for identification of superior sires of a breed for propagation, conservation and preservation of a breed.

Jaisalmeri breed of camel is being maintained by the National Research Centre on Camel, Bikaner for last 15 years. This centre has carried out basic and applied research on various aspects of camel husbandry and developed an elite herd of the breed. Using this herd of Jaisalmeri breed along with that of Bikaneri and Kachchhi various aspects of research on camel such as evaluation of draught potential, reproductive efficiency, milk and hair production potential, physiological and behavioural studies, nutritional studies, ploughing potential, molecular genetic studies, biotechnology, health etc. have been covered.

This NATP (MM) project entitle "Characterisation and conservation of Jaisalmeri camel" was focused on the present status of the breed but sincere efforts were made by Dr. Mehta and his team to collect and compile information on various aspects of this breed in its' native tract. All out efforts were made to compile every piece of information with special focus on the status of the Jaisalmeri camel in the breeding tract, cytogenetic and molecular genetic aspects, socioeconomic status of the camel breeders and overall utility of camel under changing scenario. Apart from this, 16 elite males of the breed were procured under this project and are being maintained for the improvement of the breed.

I believe this publication will be useful to field veterinarians, teachers, students, farmers and common men to know about the Bikaneri breed of camel and also to the policy makers, planner and researchers for the preparation of future strategies for its' conservation and improvement.


(M.S. Sahani)

PREFACE



Jaisalmeri camels are well known for riding and race potential. People of the Jaisalmeri breeding tract might have never thought of their life without a Pangal. For very long time it had been a companion of mankind in the most adverse climatic conditions. It has not only facilitated the life of men by assisting him in day to day activities but also played a significant role in the transportation of the goods across the hot desert when sea routes were not there and the material used to travel distances from various parts of this country to Bikaner, Jodhpur, Multan, Lahore, Kabul, Bagdad, Tehran and further.

Mankind by nature is not very kind. It has exploited the natural resources for its own use and has not cared about anything, living or non-living, that is not of any use to him. Due to the same nature of men, this age-old companion of men is facing sever danger for its own existence.

Conservation in present world is a difficult task but untiring efforts of men can make it possible. In this project I was entrusted with the responsibility to characterize the Jaisalmeri camel and suggest suitable conservation strategies. Fortunately, I had the facility to work in the laboratory as well as in the field and have characterized the Jaisalmeri camel right from the phenotypic appearance to the analysis of nucleotide sequences. I feel that this compilation will be of great use to the policy makers, scientists, students and common men in knowing about the Jaisalmeri camel and in execution of on-ground projects for conservation of this breed of camel.

I acknowledge my sincere thanks to Dr. K.P. Agarwal, PTU, NATP (MM), Dr. S.P.S. Ahlawat, Director, NBAGR and Mission Leader, Dr. M.S. Tantia, PI of the project and Dr. M.S. Sahani, Director, National Research Centre on Camel, Bikaner for providing financial support under the NATP and necessary cooperation in the execution of this project.


(S.C. Mehta)

JAISALMERI CAMEL

Jaisalmeri camels are gracious, lightly built, slightly lean and thin in appearance and well known for riding and race potential.

Habitat and Distribution

The breeding tract of Jaisalmeri breed encompasses the Jaisalmer, Barmer and part of Jodhpur district in Rajasthan. The breeding tract extends in east from $69^{\circ}30'$ to $73^{\circ}04'$ longitude and in north from $24^{\circ}37'$ to $28^{\circ}15'$ latitude with very poor vegetation and low rainfall. Average height of the tract from main sea level is about 250 metres. Sand dunes are the typical features of the tract. The tract has some open wells around which most of the livestock populations remain concentrated. Tube wells are quite successful in this area and are acting as the chief source of drinking water for the livestock. Further, human intervention has created Indira Gandhi Nahar in this tract, which is also facilitating the life of men and animals to some extent. The population of Jaisalmeri breed has been estimated to be about 0.118 millions with 0.0329 million breedable males and 0.0413 million breedable females (based on Livestock Census, 2003).

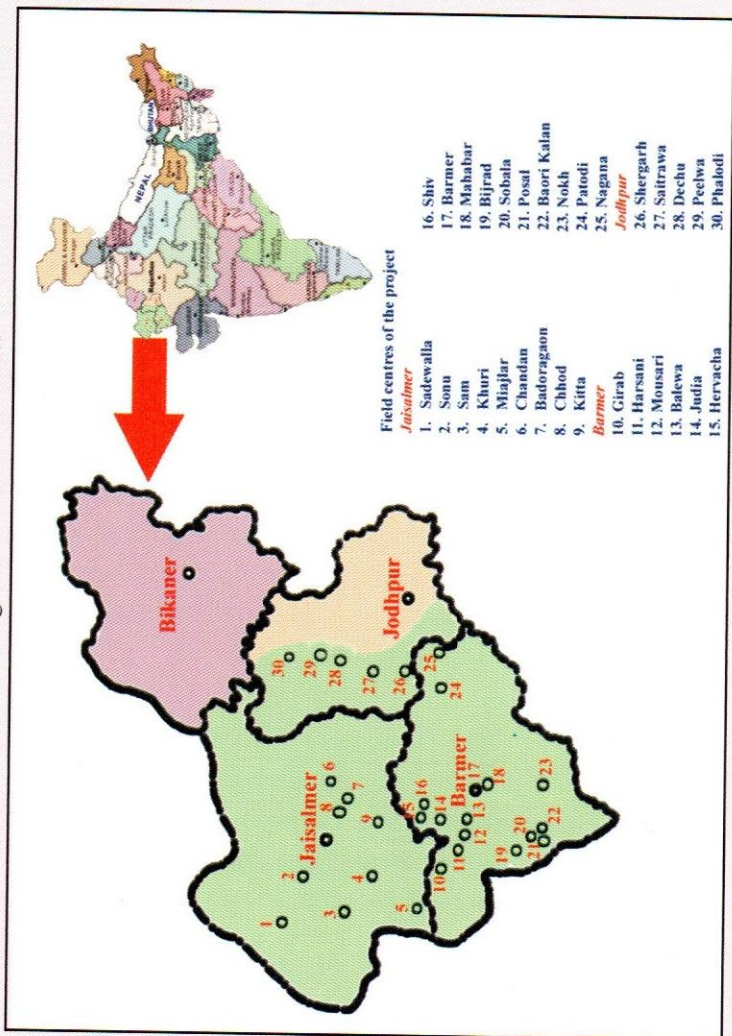
Features

The Jaisalmeri camels are of active temperament and are quite tall with long and thin legs. They have small head and mouth with narrow muzzle. The head is well carried on a thin neck and the eyes are prominent. The forehead is not dome shaped and is without any depression above eyes (*Stop*). Also, there is no luxuriant growth of hairs on their eyebrows, eyelids and ears as seen in Bikaneri. The body colour is predominantly light brown. The Jaisalmeri camels have thin skin and short hairs on body. The udder is mostly round in shape. It is a medium sized breed of camel. Though Jaisalmeri breed is a multipurpose breed of camel but the animals of this breed are preferred for traveling long distances, riding and racing.





Breeding tract of Jaisalmeri camel



BREED DESCRIPTOR

JAISALMERI BREED

I. General description

1. **Name of the breed** : Jaisalmeri
(Local name of camel-*Pangal*)
2. **Background for such name** : Place-Jaisalmer
3. **Since when breed is known** : For long time
4. **Communities responsible for breeding/rearing** : Rebaris (Raikas) are the traditional camel breeders, other communities are Meghwals, Rajputs, Mohammedans, Jats, Charans, Bheels, Jogis etc.

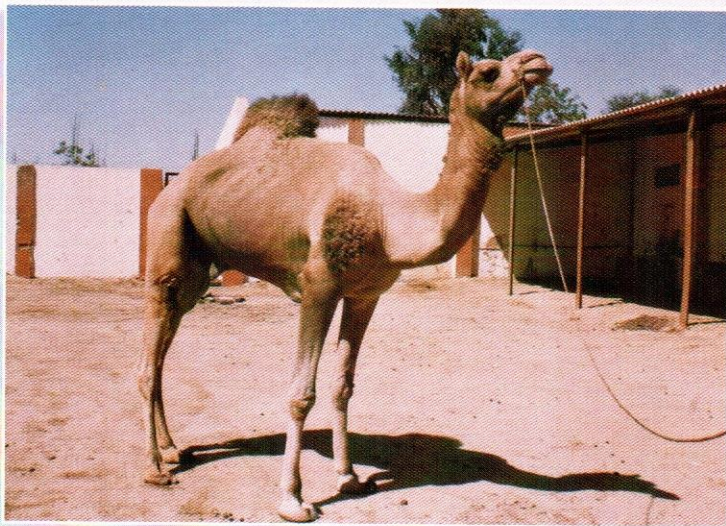
5. Native environment

- a. *Soil description* : Aridsols
- b. *Temperature range* : 2.5° C to 45.7° C
- c. *Mean minimum temperature* : 2.5° C
- d. *Mean maximum temperature* : 45.7° C
- e. *Mean relative humidity* : 48%
- f. *Annual rain fall* : 18.53 cm

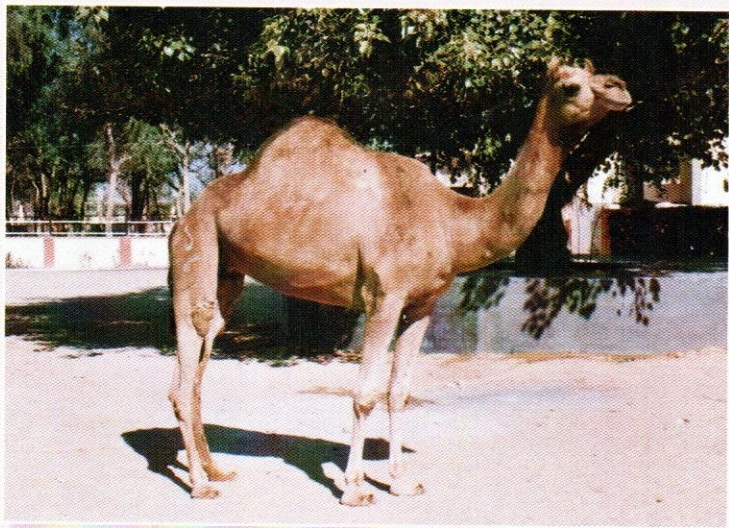
6. Feed and Fodder

- a. *Dry feeds* : Wheat straw (*Triti aestivum*), Guar Phalgati (*Cyamopsis tetragonoloba*), Moth chara (*Phaseolus aconitifolius*), Ground nut fodder (*Arachis hypogea*), Cadvi of Jowar (*Sorghum vulgare*), Bajra (*Pennisetum typhoideum*).
- b. *Green fodder* : Jowar (*Sorghum vulgare*) Bajra (*Pennisetum typhoideum*) and Jai.
- c. *Perennial Grasses* : Sewan (*Lasiurus sindicus*), Dachab (*Cyperus rotundus*).





Adult Jaisalmeri male camel



Adult Jaisalmeri female camel



- d. *Bushes* : Phog (*Colligonum pologonoides*), Ker (*Caparis deciduas*), Bui (*Areva tomentosa*) & Sinio (*Crotolaria burhia*)
- e. *Trees* : Khejri (*Prosopis cineraria*), Kikar (*Acacia tortlis*) & Jal (*Salvadora oleiodes*).
- f. *Others* : Groundnut oil, Gur, Salt.

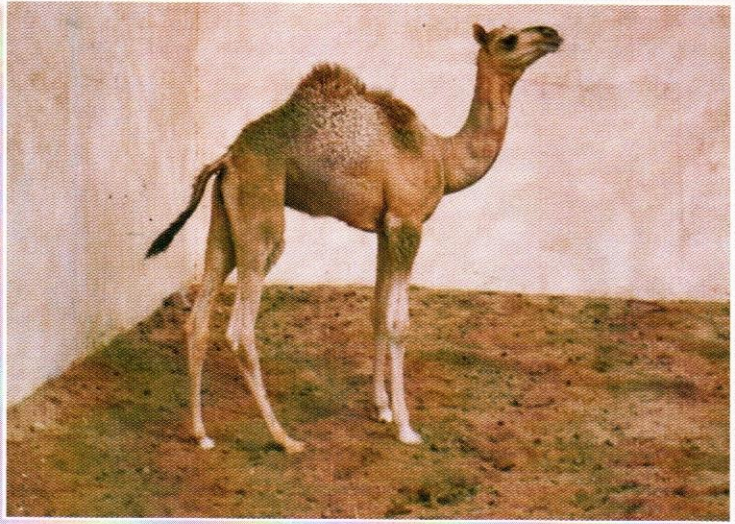
7. Housing

- a. *During nights only* : Mostly
- b. *Day and night* : None
- c. *Housed in kutchha* : Mostly
- d. *Housed in puckka* : None
- e. *Open house* : Mostly
- f. *Closed type house* : None
- g. *Intensive (%)* : 24.65
- h. *Semi-intensive (%)* : 65.22
- i. *Extensive (%)* : 10.11
8. *Mating method* : Natural service only

II. Physical characteristics

	Male	Female
1. Coat color		
a. Very Light brown (%)	: 02.92	01.09
b. Light Brown (%)	: 59.27	59.19
c. Deep Brown (%)	: 37.61	39.62
d. Black (%)	: 00.18	00.08
2. Body color		
a. Very Light brown (%)	: 02.92	01.09
b. Light Brown (%)	: 54.23	55.18
c. Deep Brown (%)	: 42.65	43.62
d. Black (%)	: 00.18	00.08
3. Hair on ears and eye lid (<i>Jheepra</i>)		
a. Absent (%)	: 100.0	100.0
b. Present (%)	: 00.00	00.00





Jaisalmeri calf



Jaisalmeri camel at a pond in the tract



4. Hair length

a. Small (%)	: 43.69	33.94
b. Medium (%)	: 53.42	63.45
c. Large (%)	: 02.88	02.59

5. Head

i. Size

a. Small (%)	: 18.64	16.35
b. Medium (%)	: 69.86	76.86
c. Large (%)	: 11.48	06.37

ii. Stop (well marked depression above the eyes)

a. Absent (%)	: 100.0	100.0
b. Present (%)	: 00.00	00.00

iii. Fore head

a. Normal (%)	: 100.0	100.0
b. Prominent (%)	: 00.00	00.00

<i>iv. Supra-orbital fossa</i>	: Normal	Normal
--------------------------------	----------	--------

v. Muzzle

a. Type	: Narrow	Narrow
b. Lips	: Normal	Normal

6. Body size

a. Small (%)	: 08.10	06.24
b. Medium (%)	: 80.45	86.32
c. Large (%)	: 11.44	07.43

7. Chest pad	: Developed	Developed
--------------	-------------	-----------

8. Hump size

a. Small (%)	: 15.09	13.10
b. Medium (%)	: 72.25	81.70
c. Large (%)	: 12.65	05.18

9. Udder

a. Round (%)	: -	79.94
b. Pendulous (%)	: -	20.05

10. Milk vein

a. Small (%)	: -	10.02
--------------	-----	-------



b. Medium (%)	: -	80.49
c. Large (%)	: -	09.47

11. Temperament

a. Active (%)	: 90.90	87.50
b. Dull (%)	: 09.10	12.50

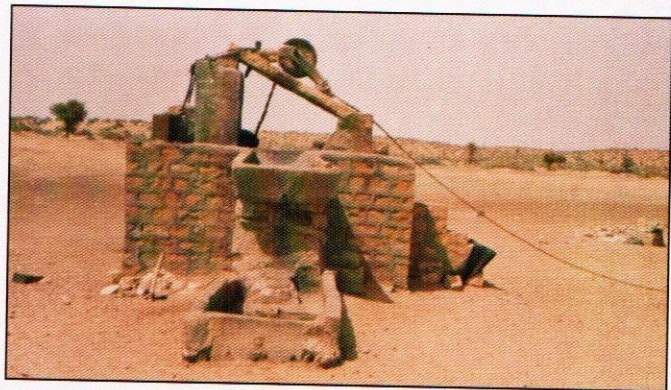
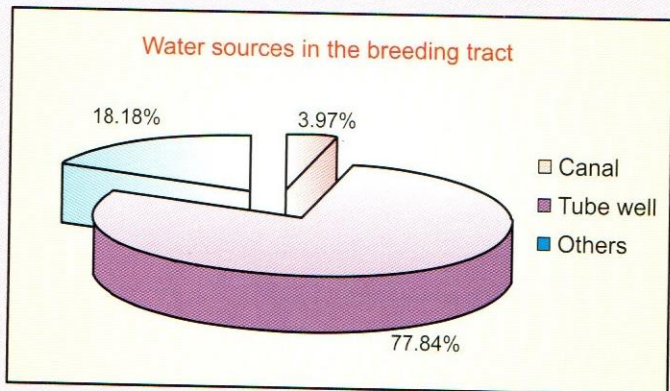
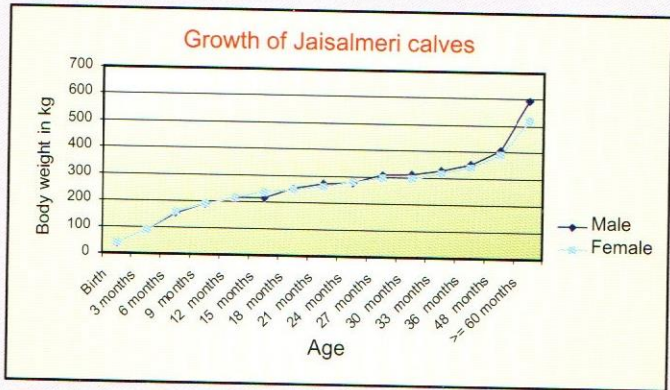
12. Biometry of adults in centimeter

a. Heart girth	: 212.80	209.93
b. Body length	: 157.99	154.16
c. Height up to wither	: 200.46	196.99
d. Length of tail	: 54.76	54.63
e. Length of neck	: 110.59	108.29
f. Distance between eyes	: 22.22	22.12
g. Length of ears	: 12.24	12.28
h. Distance between ears	: 19.08	18.36
i. Length of face	: 53.05	52.95
j. Circumference of hump (H/V)	: 103.96/46.80	95.49/43.39
k. Length of fore leg	: 146.78	145.03
l. Length of hind leg	: 155.40	152.71
m. Foot pad (L/W)		
i. Fore	: 18.96/18.90	19.02/18.63
ii. Hind	: 17.17/17.09	17.43/17.02

13. Body weight (Kg)

a. Birth	: 37.65	37.54
b. 3 months	: 84.90	86.85
c. 6 months	: 149.65	157.51
d. 9 months	: 189.85	188.14
e. 12 months	: 213.00	211.41
f. 15 months	: 214.12	231.40
g. 18 months	: 249.66	245.73
h. 21 months	: 269.15	256.48
i. 24 months	: 274.25	277.50
j. 27 months	: 308.09	295.48
k. 30 months	: 312.62	294.00





Open well in the breeding tract



l. 33 months	: 325.62	316.17
m. 36 months	: 352.34	338.97
n. 48 months	: 406.24	390.00
o. Adult	: 593.91	518.93

III. Performance

1. Draught	: Fair	Fair
2. Dairy performance		
a. Daily milk yield	: -	3.11±0.12 kg
b. Lactation length	: -	14-16 months
c. Milk composition		
Moisture	: -	89-91%
Total Solids	: -	8.5-11.4%
Fat	: -	1.5-3.1%
Solid Not Fat (SNF)	: -	7-8.3%
Protein	: -	2.1-3.9%
Lactose	: -	3.8-4.3%
pH	: -	6.3-6.6
3. Hair production (Annual)	: 0.781 kg	0.684 kg

IV Reproduction

1. Age at puberty	: 5.5-6 years	4.5-5 years
2. Age at first estrus	: -	4-4.5 years
3. Age at first mating	: 6-6.5 years	4.5-5 years
4. No. of calves in life time	: -	5
5. Age at first calving	: -	2088.79±70.78 days
6. Calving interval	: -	740.90±11.75 days
7. Gestation length	: -	389.52±0.98 days

V Other information

1. Water sources		
a. Canal (%)	: 03.97	
b. Tube well (%)	: 77.84	
c. Others (Pond etc.) (%)	: 18.18	



2. Fodder Production

a. Yes (%) : 18.23

b. No (%) : 81.76

3. Feeding

a. Single type fodder (%) : 05.63

b. Mixed Fodder (%) : 68.38

c. Concentrate (%) : 00.79

d. Concentrate and Fodder (%) : 11.82

e. Other (%) : 00.85

f. All (%) : 11.93

4. Uses

a. Load pulling (%) : 06.64

b. Domestic (%) : 05.96

c. Agricultural (%) : 02.84

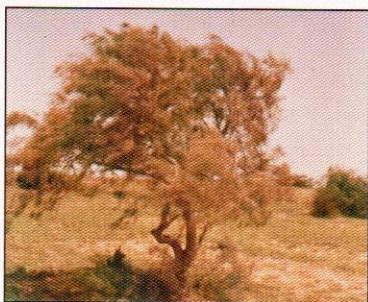
d. Multipurpose (%) : 84.54

Proximate composition of important feed and fodder of Jaisalmeri camel

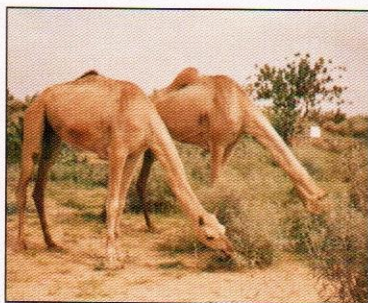
(Figures in %)

Plant	Dry matter	Crude protein	Ether extract	Crude fibre	Total ash	Nitrogen free extract
Bui	29.10	14.40	2.15	16.35	14.70	57.65
Khejri (vegetative stage)	38.78	12.42	4.60	20.67	20.83	41.48
Sewan	30.58	9.40	1.40	33.2	59.40	46.55
Guar phalgate	93.68	6.81	0.59	28.2	19.40	54.99
Moth Chara	93.47	9.00	2.60	13.00	16.05	59.35
Ground nut	29.59	12.27	1.80	14.00	10.75	16.18
Dachab	45.99	7.85	1.95	30.35	20.55	40.02
Phog	26.05	10.72	1.54	22.10	9.32	57.06
Jal	30.22	15.40	2.15	8.43	28.40	45.70





Khejri
(*Prosopis cineraria*)
Tree



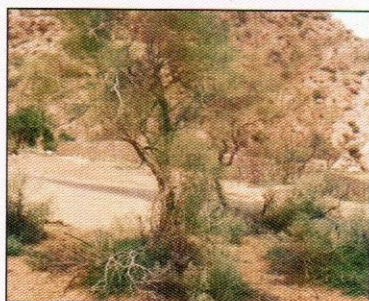
Bui
(*Areva tomentosa*)
Bush



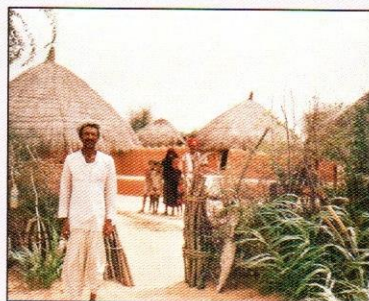
Sewan
(*Lasiurus indicus*)
Grass



Pala
(*Zizyphus numularia*)
Shrub



Phog
(*Colligonum polygonoides*)
Shrub



Bajara
(*Penniseteum typhoideum*)
Fodder crop





Body measurements of Jaisalmeri camel

(in cm)

Age	Sex	N	Body length	Heart girth	Height at wither	Leg length (F)	Leg length (H)	Foot pad length (F)	Foot pad width (F)	Foot pad length (H)	Foot pad width (H)
Adults (≥5 year)	Male	1408	157.99±0.37	212.80±0.31	200.47±0.31	146.79±0.22	155.41±0.22	18.97±0.04	18.91±0.04	17.18±0.04	17.09±0.04
	Female	1511	154.16±0.35	209.93±0.30	196.99±0.30	145.04±0.21	152.71±0.21	19.02±0.4	18.64±0.04	17.43±0.04	17.02±0.04
4 Years	Male	224	147.32±0.93	199.92±0.79	191.19±0.80	142.67±0.55	150.50±0.55	17.67±0.10	17.27±0.10	16.04±0.10	15.66±0.10
	Female	209	142.81±0.96	197.11±0.81	189.74±0.82	141.96±0.57	149.32±0.57	17.48±0.11	17.03±0.10	15.75±0.11	15.34±0.10
3 Years	Male	228	140.65±0.92	188.79±0.78	184.76±0.79	140.23±0.54	147.36±0.55	16.45±0.10	16.27±0.95	14.97±0.10	14.78±0.10
	Female	241	138.09±0.90	185.92±0.75	182.41±0.77	138.76±0.53	146.00±0.53	16.39±0.10	16.08±0.09	14.85±0.10	14.45±0.97
2 Years	Male	167	128.37±1.08	174.88±0.91	176.77±0.92	131.36±0.64	138.01±0.64	15.54±0.11	15.02±0.11	13.95±0.12	13.44±0.12
	Female	156	127.04±1.11	171.43±0.94	174.83±0.96	133.81±0.66	140.69±0.66	15.10±0.12	14.72±0.12	13.56±0.12	13.15±0.12
1 Year	Male	166	118.98±1.08	150.24±0.92	150.72±0.92	123.36±0.64	131.39±0.64	12.67±0.12	12.93±0.11	11.40±0.12	11.69±0.12
	Female	129	111.09±1.22	149.92±1.03	156.57±1.05	124.24±0.72	131.95±0.72	12.45±0.13	12.70±0.13	11.05±0.14	11.37±0.13
6 to 12 Months	Male	8	60.63±4.93	81.37±4.17	101.63±4.22	89.38±2.9	93.38±2.91	8.75±0.54	8.38±0.51	7.88±0.55	7.38±0.53
	Female	2	52.00±9.86	68.50±8.34	96.50±8.45	82.00±5.8	85.00±5.82	7.50±1.08	7.50±1.02	6.50±1.09	6.00±1.07
1 to 6 Months	Male	7	78.86±5.27	105.71±4.46	121.71±4.52	99.43±3.11	104.71±3.11	8.86±0.58	8.14±0.54	7.57±0.58	6.57±0.57
	Female	3	94.67±8.05	118.33±6.81	146.00±6.90	114.00±4.74	119.67±4.75	11.67±0.88	11.00±0.82	10.33±0.89	9.67±0.87
16 to 30 Days	Male	2	94.00±9.86	140.00±8.34	154.50±8.45	130.00±5.81	133.00±5.82	11.00±1.07	10.00±1.01	9.00±1.09	9.00±1.07
	Female	6	87.33±5.69	111.33±4.81	133.83±4.90	107.50±3.35	113.33±3.36	10.67±0.62	10.50±0.58	9.83±0.63	9.33±0.62
0 to 15 Days	Male	10	103.80±4.40	153.30±3.73	161.90±3.78	127.90±2.60	133.90±2.60	13.90±0.48	12.90±0.45	12.10±0.48	11.10±0.48
	Female	17	94.88±3.38	135.83±2.86	150.82±2.90	120.76±2.00	126.82±2.00	12.18±0.37	11.23±0.35	10.64±0.37	9.76±0.37



Body measurements of Jaisalmeri camel

(in cm)

Age	Sex	N	Neck length	Face length	Distance between eyes	Distance between ears	Ear length	Tail length	Hump circumference (V)	Hump circumference (H)
Adults (≥ 5 Years)	Male	1408	110.60±0.26	53.05±0.14	22.22±0.06	19.08±0.06	12.25±0.03	54.76±0.11	46.81±0.32	103.97±0.59
	Female	1511	108.29±0.25	52.96±0.13	22.13±0.06	18.37±0.05	12.28±0.31	54.63±0.11	43.40±0.31	95.50±0.57
4 Years	Male	224	105.44±0.65	49.45±0.34	21.52±0.15	17.08±0.14	11.92±0.08	52.82±0.29	39.91±0.81	90.24±1.48
	Female	209	103.09±0.67	48.17±0.35	21.06±0.15	16.98±0.15	11.86±0.08	52.72±0.30	37.46±0.83	84.79±1.53
3 Years	Male	228	100.89±0.65	47.03±0.34	20.33±0.15	16.14±0.14	11.25±0.08	51.38±0.28	37.30±0.80	83.25±1.47
	Female	241	100.97±0.67	47.27±0.33	19.80±0.14	15.95±0.14	11.26±0.08	51.17±0.28	35.50±0.78	77.25±1.43
2 Years	Male	167	93.72±0.75	44.95±0.40	19.13±0.17	15.44±0.16	11.05±0.09	48.05±0.33	33.72±0.93	77.36±1.71
	Female	156	94.47±0.78	44.62±0.41	18.21±0.18	14.65±0.17	10.58±0.10	47.41±0.34	31.44±0.97	73.03±1.77
1 Year	Male	166	86.51±0.76	38.40±0.40	16.28±0.17	13.10±0.16	9.80±0.10	43.13±0.33	30.11±0.94	67.02±1.72
	Female	129	86.46±0.86	39.20±0.45	16.41±0.20	12.90±0.19	9.68±0.11	42.59±0.38	29.58±1.06	63.47±1.944
6 to 12 Months	Male	8	47.50±3.44	22.00±1.80	11.63±0.06	8.38±0.74	6.50±0.43	23.63±1.51	5.38±4.3	17.50±7.82
	Female	2	43.00±6.89	20.00±3.61	9.50±1.58	8.00±1.49	5.50±0.87	19.50±3.02	4.00±8.53	8.50±15.66
1 to 6 Months	Male	7	60.57±3.68	29.57±1.93	13.43±0.85	10.00±0.80	7.86±0.46	36.87±1.61	5.86±4.56	14.71±8.37
	Female	3	78.33±5.62	39.33±2.95	13.00±1.30	10.33±1.21	8.67±0.71	39.67±2.47	24.00±6.97	42.33±12.78
16 to 30 Days	Male	2	84.500±6.89	36.50±3.61	14.00±1.58	11.00±1.49	8.50±0.87	38.50±1.57	12.00±8.53	30.00±15.66
	Female	6	75.67±3.98	36.50±2.09	13.67±0.91	10.33±0.86	8.83±0.50	35.50±1.74	19.83±4.93	48.33±9.04
0 to 15 Days	Male	10	90.30±3.08	41.80±1.62	15.80±0.71	12.70±0.67	9.68±0.39	46.10±0.82	25.50±3.82	56.00±7.00
	Female	17	84.18±2.36	39.71±1.24	15.18±0.54	11.70±0.51	8.94±0.30	42.24±1.04	26.24±2.93	52.17±5.37

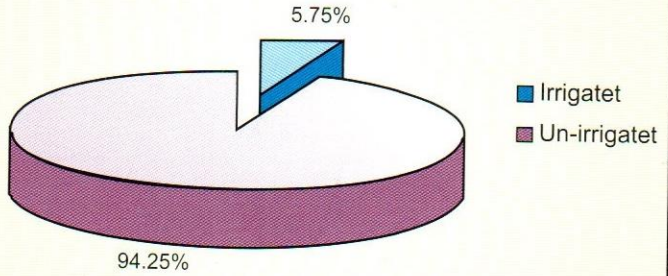
**Number of camel keepers and villages
covered in the investigation**

Districts	Tehsils	Villages	Camel keepers
Breeding tract	Over all	181	1760
Jaisalmer	Pooled (District)	65	627
	Jaisalmer	59	611
	Pokaran	6	16
Barmer	Pooled (District)	85	1034
	Barmer	11	109
	Chohtan	31	591
	Shiv	33	275
	Pachpadra	7	50
	Gudamalani	1	3
	Ramsar	2	6
Jodhpur	Pooled (District)	31	99
	Phalodi	9	38
	Shergarh	19	51
	Luni	3	10

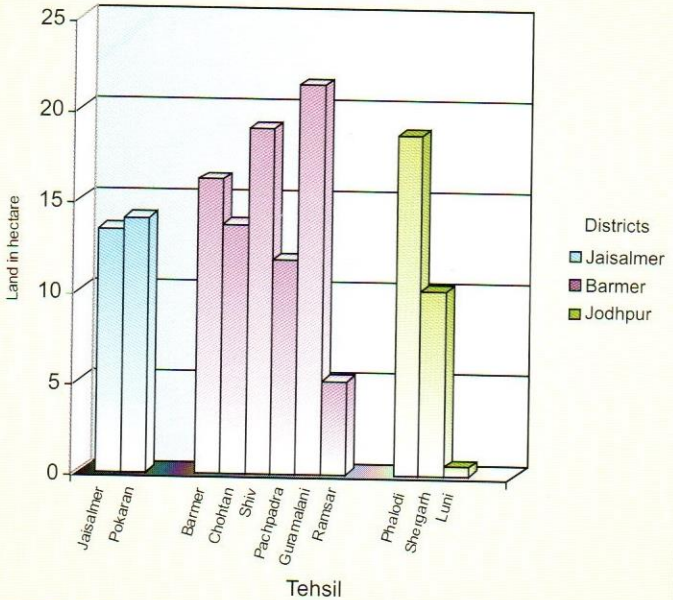
The whole breeding tract was divided into 10 strata for the purpose of characterisation and preparation of conservation strategies. The Jaisalmer and Barmer districts were divided into four strata each and the Jodhpur district into two strata. In all 30 field centres were opened for the characterisation work, of which 9 were in Jaisalmer, 16 were in Barmer and 5 were in the Jodhpur district. In all 1760 camel keepers cooperated and gave relevant information for investigation, of which 627, 1034 and 99 were from Jaisalmer, Barmer and Jodhpur district respectively. A total of 181 villages were covered, of which 65, 85 and 31 were respectively from eleven tehsils of the Jaisalmer, Barmer and Jodhpur districts.



Land irrigation status



Land holding in different tehsils of the breeding tract



Average land holding (in hectares)

Districts	Tehsils	Land holding		
		Overall	Irrigated	Unirrigated
Breeding tract	Over all	14.43	00.83	13.60
Jaisalmer	Pooled (District)	13.41	02.17	11.24
	Jaisalmer	13.39	02.23	11.17
	Pokaran	13.98	00.00	13.98
Barmer	Pooled (District)	15.23	00.02	15.21
	Barmer	16.19	00.16	16.03
	Chohtan	13.68	00.00	13.68
	Shiv	18.99	00.00	18.99
	Pachpadra	18.22	00.00	18.22
	Gudamalani	21.42	00.00	21.42
	Ramsar	05.17	00.00	05.17
Jodhpur	Pooled (District)	12.45	00.80	11.66
	Phalodi	18.70	01.18	17.51
	Shergarh	10.15	00.66	09.49
	Luni	00.50	00.00	00.50

The agricultural land in this region has very poor fertility and the natural water sources have saline water. Most of the land (94.25%) is unirrigated and rain fed crops, such as Jowar, Bajra and Moth are grown by the farmers. Now, the situation has changed a little due to the availability of palatable water through the tube wells and Indira Gandhi Nahar Pariyojana. The crops like Rapeseed, Mustard, Pulses, Sesame, Groundnut, Wheat, Gram and Red chilli are now being grown to a limited extent in some areas of the tract. For the sustenance of livestock some of the well known varieties of perennial grasses viz. Sewan (*Lesiurus indicus*), Dachab (*Cyperus rotundus*) and bushes like Phog (*Calligonum polygonoides*), Sinia (*Crotolaria burhia*) and Ker (*Caparis deciduas*) were abundant in past but now they are at the verge of extinction in the breeding tract. Also, there is a continuous decline in replacement rate of trees, especially the Khejri (*Prosopis cineraria*) in the breeding tract.



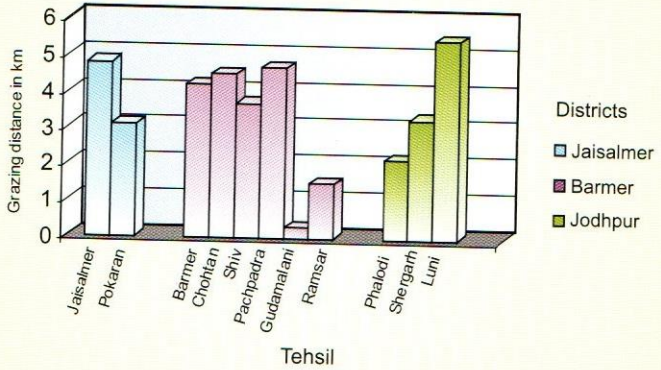
District and tehsil wise grazing distance and grazing time

Districts	Tehsils	Grazing distance (km)	Grazing time (hrs)
Breeding tract	Over all	4.4	7.5
Jaisalmer	Pooled (District)	4.8	8.1
	Jaisalmer	4.8	8.1
	Pokaran	3.1	9.1
Barmer	Pooled (District)	4.3	7.5
	Barmer	4.2	9.6
	Chohtan	4.5	7.9
	Shiv	3.7	5.9
	Pachpadra	5.2	6.8
	Gudamalani	0.3	1.3
	Ramsar	1.5	6.7
Jodhpur	Pooled (District)	3.1	3.7
	Phalodi	2.2	4.9
	Shergarh	3.3	2.9
	Luni	5.5	3.3

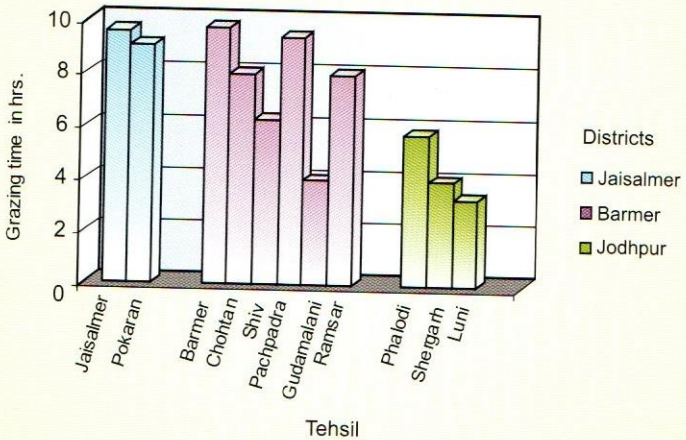
The grazing distance and time have widest possible range in this tract because there are some herds of camel, which are inhabitant of the grazing land itself. The camel owners live with them in the field. On the other hand, the camels that are used for pulling loads in the cart are stall fed and they may or may not be allowed to go out for grazing depending on the work load and availability of the vegetation in the near by area. However, excluding the camels on permanent migration, the average grazing distance was 4.4 km and average grazing time was 7.5 hrs a day in the tract. Camel accepts almost all types of grasses, bushes and trees that are available to it the tract. The camel owners offer sweet oil, which can be of Mustard, Groundnut, Sesame or Linseed. Offering of salt is a common practice. A few camel owners also offer concentrated feed in the form of feed pellets or blocks depending on the work requirement from the camel. The quantity and frequency of offering sweet oil, salt, concentrated feed and green fodder not only depends on the know-how



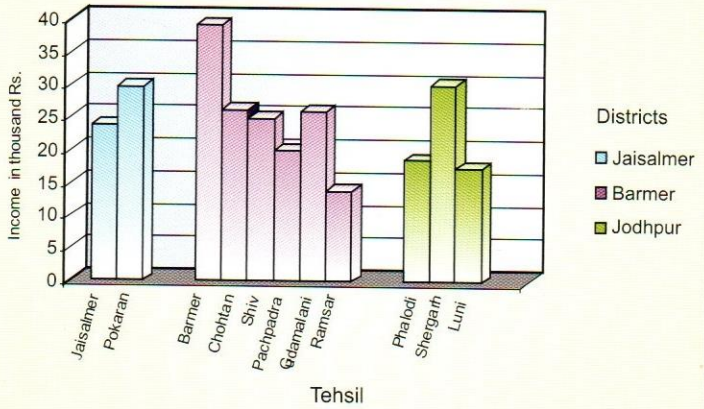
Average grazing distance



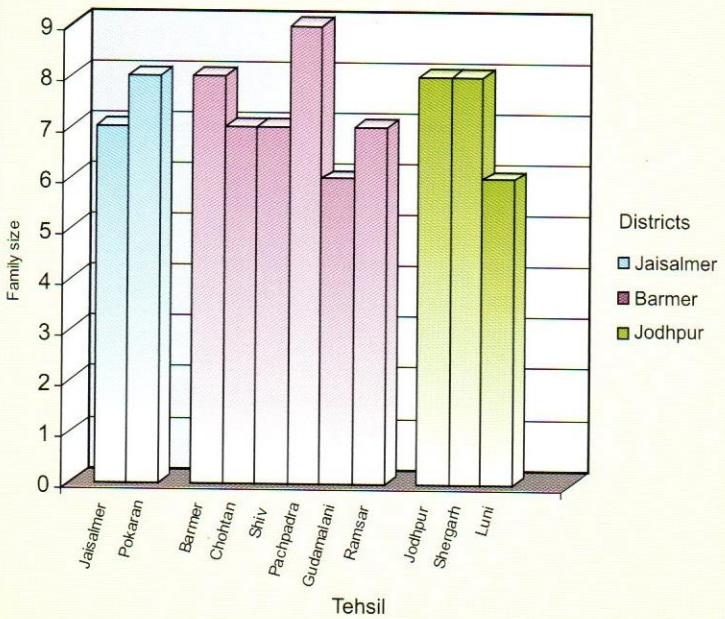
Average grazing time



Average income of camel breeders



Average family size



and economic status of the farmer but also on the physiological state of the individual animal and economic returns expected out of it.

Occupation wise income

Main occupation	Farmers (%)	Income (Rs.)
Agricultural	22.78	23936.00
Animal husbandry	09.82	17266.00
Agricultural & Animal husbandry	61.76	28489.00
Others with Agricultural & Animal husbandry	5.62	17581.00

Annual income and family size

District	Tehsil	Income (Rs.)	Family Size
Breeding tract	Over all	25735.00	7
Jaisalmer	Pooled (Dist.)	24073.00	7
	Jaisalmer	23923.00	7
	Pokaran	29813.00	8
Barmer	Pooled (Dist.)	26864.00	7
	Barmer	39147.00	8
	Chohtan	26214.00	7
	Shiv	24908.00	7
	Pachpadra	21436.00	9
	Gudamalani	26000.00	6
	Ramsar	14000.00	7
Jodhpur	Pooled (Dist.)	24465.00	7
	Phalodi	18684.00	8
	Shergarh	30157.00	8
	Luni	17400.00	6

Population of Jaisalmeri camel in the breeding tract

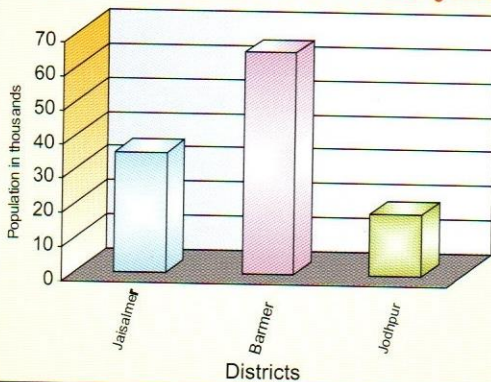
Districts	Total camel population*	Jaisalmeri camels		
		Total	Breedable	
			Males	Females
Jaisalmer	36952	35129	10560	11275
Barmer	69712	64835	16150	25799
Jodhpur**	20320	18119	6189	4275
Total	126984	118083	32899	41349

*as per Livestock Census 2003

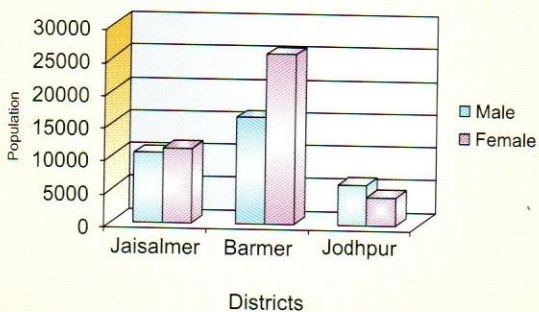
**part of Jodhpur district



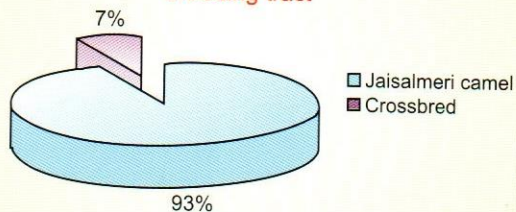
Population of Jaisalmeri camels in the breeding tract



Breedable males and females of Jaisalmeri breed



Status of Jaisalmeri camel in the breeding tract



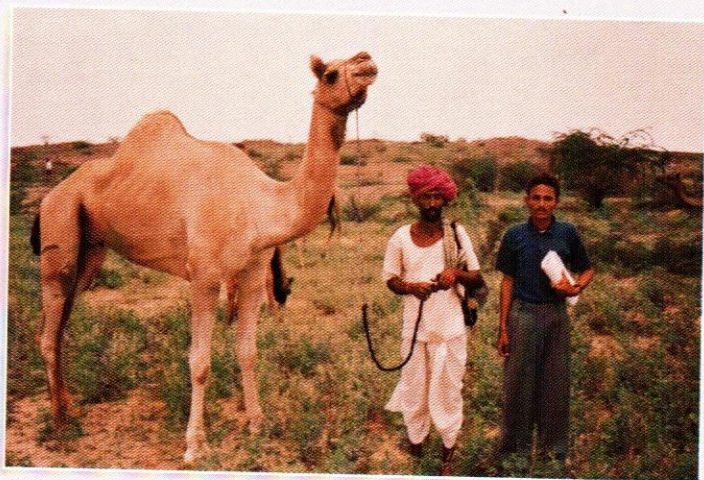
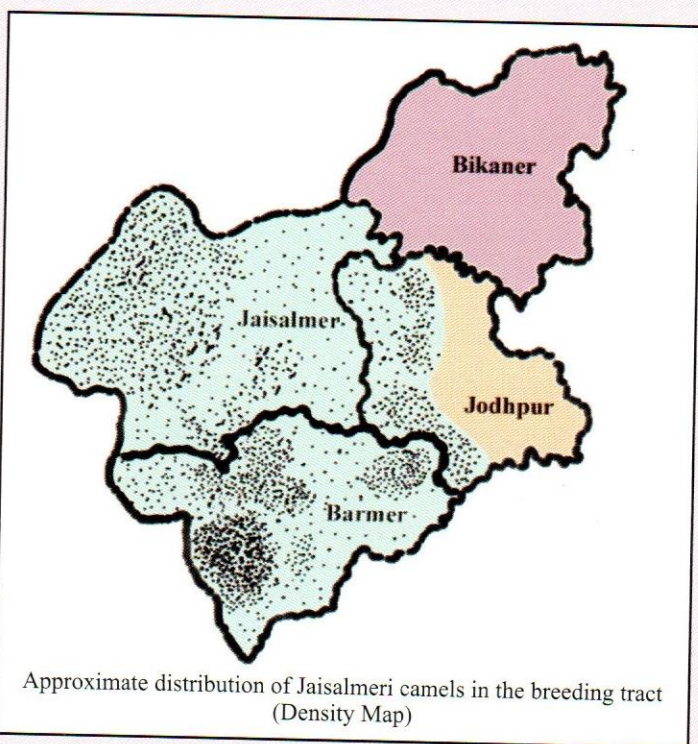
Availability of breedable Jaisalmeri camels in a herd

Districts	Average Herd size	Jaisalmeri camels in an average herd		
		Jaisalmeri camels	Breedable	
			Males	Females
Over all	3.74	3.49	0.97	1.23
Jaisalmer	4.20	3.99	1.20	1.28
Barmer	3.19	2.97	0.74	1.18
Jodhpur	6.43	5.74	1.96	1.35

STATUS OF JAISALMERI CAMEL

The population of the Jaisalmeri camel in the breeding tract has been estimated to be 118083 heads with 32899 breedable males and 41349 breedable females. The entire tract has 126984 camels. One very important feature noticed with the camel is that the sex ratio is not very much distorted, it is slightly in favour of females (1:1.25). In most of the livestock species very few breedable males are left as compared to the breedable females. In camel this is due to the preference of the camel keepers to use the male camels for almost all sorts of work. Females are not preferred for cart pulling, ploughing etc. Though this thinking is also changing and some villagers are now using females for draught due to their docile nature, especially during breeding season. Severe reduction in the number of breedable males accounts for inbreeding but in camel due to availability of good number of breedable males, this problem is not likely to play a major role in near future. The latest livestock census shows that there has been a decline in camel population. The magnitude of this decline (1997-2003) is about 30.93% in the breeding tract of Jaisalmeri camel with maximum decline in the Barmer district (37.69%) followed by part of Jodhpur district (30%) and Jaisalmer district (14.15%). This decline is about 25.61% at the state level and 29.67% at the national level. This decline can be attributed to the increased mechanization, severe reduction in the grazing land and vegetation therein, deforestation, diversion of more land to agriculture due to Indira Gandhi Nahar etc. Due to commercialisation and population pressure, the average herd size of camel has reduced to 3.74 whereas the range is still from 1 to 200.





Jaisalmeri camel in the grazing area



On an average about one stud is available in a herd but about 35.85% camel keepers are not having any male of the breed. Majority of them (75.28%) are keeping only one camel for work but about 4.6% camel keepers are maintaining more than 5 camels and not having any breedable male of the breed. This situation is not congenial for conservation and propagation of the breed.

DISQUALIFICATION CRITERIA OF THE BREED

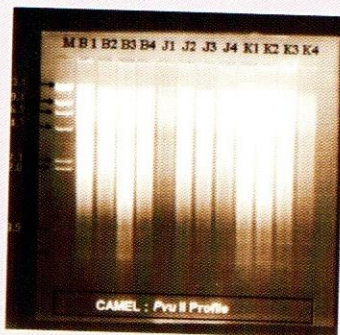
1. Presence of “STOP” (well marked depression above the eyes).
2. Presence of hairs on ears and eyelids (JHEEPRA).
3. Black colour (generally avoided).
4. Prominent forehead.
5. Deep supraorbital fossa.
6. Massive legs and body.
7. Droopy muzzle.

CHROMOSOME PROFILE

The diploid count of chromosome in Jaisalmeri breed is 74. The entire chromosome complement consists of 25 pairs of sub-acrocentric, 5 pairs of sub-metacentric, 6 pairs of true acrocentric and one pair of sex chromosomes.

SATELLITE DNA

The satellite DNA analysis of Jaisalmeri camels with restriction enzymes Hind III, Pst I and Pvu II revealed that camel probably has higher equimolar concentration of repetitive DNA in its genome with internal periodicity of about 100-200 bp.

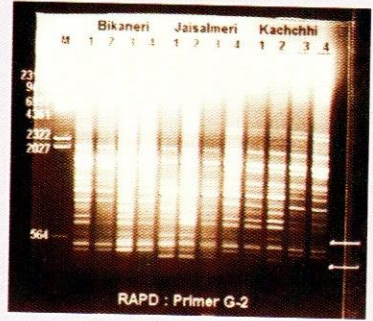


PCR-RAPD

The Polymerase Chain Reaction – Randomly Amplified Polymorphic DNA technique resolved reproducible polymorphic bands with varying frequencies in Jaisalmeri breed of camel. Six oligonucleotide primers viz. GT-10, GC-10, G-2, OP-08, G-1 and C-7 were used for investigation. A total of 75 bands (size

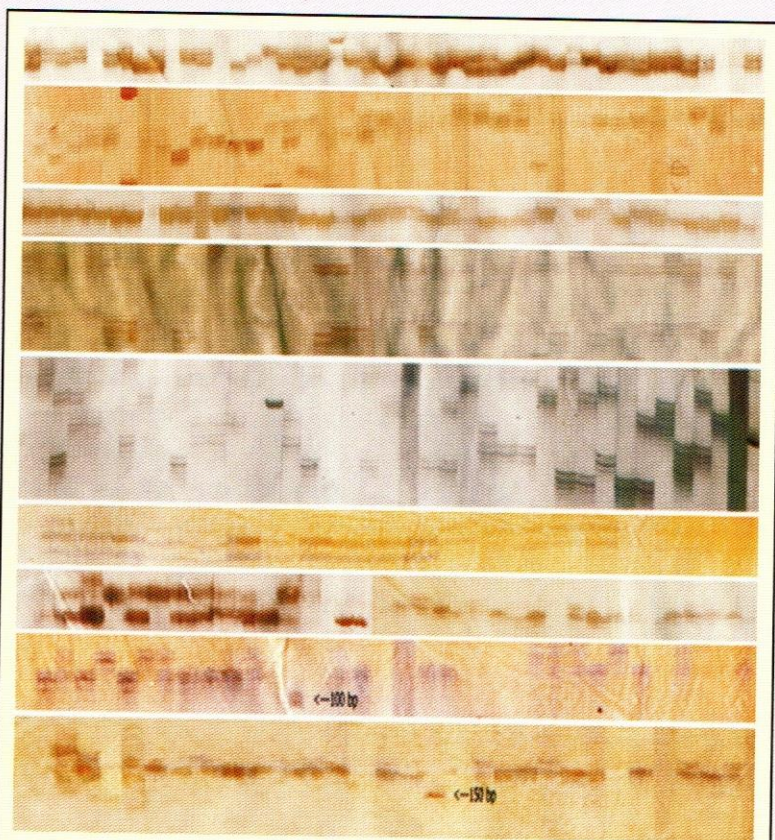


range, 0.3 - 3.5 kb) were amplified, of which 27 (36%) were polymorphic (size range, 0.36 - 2.51). The proportion of the polymorphic bands was highest with primer GC-10 (53.33 %) followed by GT-10 (41.18 %), OP-08 (37.50%) and G-2 (27.78%). The average number of bands in Jaisalmeri breed ranged from 9.00 to 15.75 in different primers. The mean population frequency of a band (q) ranged from 0.63 to 0.74. Likewise the mean probability of a band to be present in heterozygous state (h) ranged from 0.41 to 0.54. The probability of obtaining identical fingerprints was observed to be lowest in primer GC-10 (4.1×10^{-2}) followed by G-2 (9.4×10^{-2}), GT-10 (10.7×10^{-2}) and OP-08 (11.7×10^{-2}). Breed informative and bands showing probable specificity for Jaisalmeri breed were amplified. The 0.5 kb band in GT-10 was amplified in Jaisalmeri breed with a frequency of 0.93, whereas it was amplified in the Bikaneri and Kachchhi breeds with a very low frequency of 0.04 and 0.18. Likewise, 0.48 kb band in G-2 and 1.08 kb band in OP-08 were amplified in Jaisalmeri breed with a frequency of 0.71 and 0.92, whereas they were amplified in Bikaneri and Kachchhi breeds with a very low frequency of 0.04 & 0.19 and 0.07 & 0.25, respectively. The within breed similarity in Jaisalmeri breed was estimated to be 0.87 ± 0.05 and 0.93 ± 0.02 respectively when band frequency (W^f) and band sharing (W^s) method was used. The between breed genetic similarity, when estimated using band frequencies, indicated close relationship between Jaisalmeri and Kachchhi ($B^f = 0.901$) breeds followed by Bikaneri and Jaisalmeri ($B^f = 0.879$) breeds. Similarly the genetic distance (D^f) between Jaisalmeri and Kachchhi was estimated to be 0.106 and between Jaisalmeri and Bikaneri was estimated to be 0.132. When the three camel breeds were considered as three sub-populations and the degree of subdivision was measured as S_{ij} . The S_{ij} value between Jaisalmeri and Kachchhi was 0.980 and between Jaisalmeri and Bikaneri was 0.978.



MICROSATELLITE

Nineteen New World Camelidae microsatellite primer pairs were used to investigate the genetic polymorphism in Jaisalmeri camel. The PCR amplification products were resolved in 6% (denaturing) urea PAGE and stained with 0.1% silver nitrate. Thirteen microsatellite loci were found polymorphic in Jaisalmeri camel. The number of alleles ranged from 2 to 7. The expected heterozygosity ranged from 0.320 to 0.816 and the polymorphic information content ranged from 0.268 to 0.791. The results indicated the potential use of microsatellite study for discerning genetic polymorphism in dromedary breeds.



Profile of Jaisalmeri camel at various microsatellite loci



Amplification of microsatellite loci in Jaisalmeri camel

Locus	Alleles (n)	Size (bp)	Temp(0°C)	H _o	H _e	PIC
VOLP-08	3	142-146	50	0.300	0.605	0.526
VOLP-10	5	250-264	55	0.581	0.686	0.629
VOLP-67	6	151-195	53	0.680	0.682	0.645
YWLL-08	7	132-162	55	0.800	0.816	0.791
YWLL-09	2	160-162	53	0.320	0.320	0.268
YWLL-44	3	96-106	55	0.343	0.374	0.314
YWLL-58	3	173-177	51	1.000	0.601	0.521
YWLL-59	2	115-117	53	0.660	0.444	0.345
LCA-56	2	134-138	55	0.400	0.385	0.311
LCA-63	5	196-220	58	0.380	0.633	0.587
LCA-66	3	234-238	58	0.480	0.635	0.558
VOL-03	3	148-168	64	0.466	0.573	0.522
YWLL-38	3	180-186	55	0.660	0.570	0.475

H_o = observed heterozygosity; H_e = expected heterozygosity

DISEASE PROFILE

The information on important diseases prevalent in the herd and preference of the line of treatment was collected from 1760 camel owners. Mange was reported to be the major health problem (49.82%). Digestive disorders were a cause of worry for about 37.54% of the camel keepers. The digestive disorders included tympany (11.36%), constipation (8.01%), diarrhoea (7.78%), abdominal pain (9.94%) and gastrointestinal obstruction (0.45%). Trypanosomiasis was reported by 6.87% of the camel keepers. Reproductive diseases were also reported by 30.90% of the camel keepers. Other health problems included wound & abrasions (2.44%), saddle gall (4.2%), cataract (1.64%), kumari, i.e. neuromuscular weakness of hind legs, (1.13%), pneumonia (0.9%), lameness (1.07%), pica (0.45%), ectoparasite excluding mange (03.23%), tumour (0.90) and poisoning (0.28%).



Disease profile of Jaisalmeri camel in the breeding tract

(Figures in %)

S.No.	Name	Overall	Jaisalmer	Barmer	Jodhpur
1	Digestive System	37.54	38.88	32.68	86.79
	Tympany	11.36	14.87	9.25	10.98
	Constipation	8.01	8.83	8.00	5.49
	Diarrhoea	7.78	4.90	8.39	20.88
	Abdominal pain	9.94	10.28	6.65	45.05
	G.I.T. obstruction	0.45	0.00	0.39	4.39
2	Respiratory System	0.90	0.32	1.35	0.00
	Pneumonia	0.90	0.32	1.35	0.00
3	Circulatory system	6.87	15.66	1.83	3.2
	Trypanosomiasis	6.87	15.66	1.83	3.29
4	Urinary System	-	-	-	-
5	Reproductive System	30.90	25.32	32.89	47.25
	Dystokia	14.88	14.72	14.18	24.18
	Retained Placenta	16.02	10.60	18.71	23.07
6	Nervous System	1.13	1.11	1.25	0.00
	Kumri	1.13	1.11	1.25	0.00
7	Other Systems	72.49	87.30	59.20	124.15
	Mange	49.82	67.08	36.93	76.92
	Saddle gall	4.20	2.37	5.68	0.00
	Cataract	1.64	0.32	2.50	1.09
	Wound	2.44	0.47	2.31	17.58
	Lameness	1.07	0.47	1.44	1.09
	Ecto-parasite	3.23	0.31	4.53	8.79
	Tumor	0.90	0.79	1.60	0.00
	Poisoning	0.28	0.15	0.38	0.00
	Pica	0.45	0.00	0.45	0.00
	Other Diseases	8.46	15.34	3.37	18.68

Of the 1525 camel keepers, 52.13% first go for local treatment, 41.36% and 6.49% first go for allopathic and herbal treatment respectively. The choice of line of treatment was observed to depend on the nature and severity of the disease and economic status of the farmer.



UTILITY AND ECONOMIC ASPECTS

DRAUGHT AND RACE

The Jaisalmeri camels have better race potential than Bikaneri and Kachchhi camels. The efficiency of Jaisalmeri camels has been judged to be better than Bikaneri and Kachchhi breeds of camel on the basis of duration of strides, stride per second and speed during trot and gallop. The camels of this breed have slightly lower potential to carry loads as compared to Bikaneri camels, which can haul 1.5 to 2 tones of load on two-wheel cart for 8 hrs a day with rest of about 3-4 hours in between, covering an average distance of 35 km per day and produces about 17-22 percent of draught force to its body weight.

MILK

The camels of this breed are poor in milk production with average daily production of 3.11±0.12 kg. The milk production was highest in 2 teat stripping followed by 4 teat stripping and machine milking. The lactation length can continue up to 14 -16 months. The milk production data indicated increasing trend up to 6th month of lactation and thereafter a decreasing trend. Morning production was 10-27% higher than that of evening and production from rear teats was significantly higher than that of front teats. The chemical composition of milk indicated higher values of pH, fat, SNF and total solids in late phase of lactation as compared to early phase. The camel milk is suitable for the preparation of tea and coffee. Preliminary trials have indicated beneficial effects of camel milk in the treatment of diabetes and tuberculosis. Camel milk is rich in vitamin C and some of the protective proteins.

HAIR PRODUCTION

The hair production data analysis indicated the annual hair production to be 0.733±0.016 kg with males producing 0.781±0.02 kg and females producing 0.684±0.023 kg. Hair production is highest at 2-3 year of age and thereafter it has a declining trend. Males are superior to females in hair production. Least squares analysis indicated significant effect of ($P<0.01$) breed, sex, site and age.



Hair quality analysis indicated 6.06 ± 0.39 cm staple length in Jaisalmeri breed. The mean staple length of hair from hump region has highest length. The hair diameter in Jaisalmeri ($45.84 \pm 1.46 \mu$) is intermediate between Bikaneri and Kachchhi. The percentage of pure, hetero, hairy and kemp type hairs in Jaisalmeri camels is 27.54 ± 1.26 , 38.68 ± 1.01 , 31.20 ± 1.18 and 2.51 ± 0.31 . Calf hair is superior in terms of hair diameter and presence of pure type hairs with minimum kemps. Camel hair is being used under village cottage industry by the camel keepers and weavers in making shawls, blankets, ropes, carpets and other items of daily use.

CAMEL CARTS

A good number of camel carts are being used in whole breeding tract for transportation of various goods (grains, fuel wood, fodder, construction material, water and LPG cylinders etc.) and a camel owner earns on an average Rs. 150 to 200 per day depending on the location.

SAFARI

Camels of Jaisalmeri breed are preferred for safari. A good number of safari operators are there in Jaisalmer, Jodhpur, Bikaner and other cities. They organize safari for a distance of 80 to 300 km (variable) depending on the availability of tourist and time. About 15-30 (variable) tourists are sent at a time for such tours. About 300 camels (variable) in each city are being used for this purpose. A camel owner earns Rs. 100- 300 per day depending on the availability of tourists. Apart from this, the individual camel owners are making a good number of camels available for small rides at various locations in the breeding tract. The famous sand dunes of *Sam* and *Khudi* are located in this tract, where about 50 to 300 camels are generally available at any time for such smaller rides.

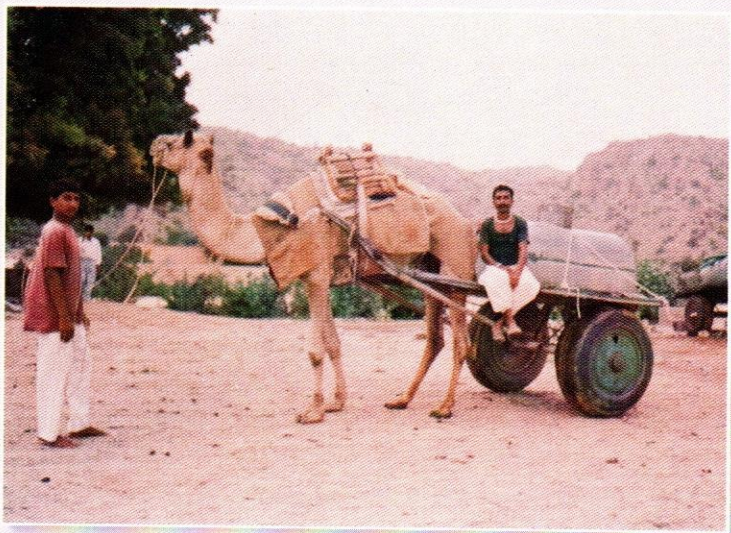
STRATEGIES FOR CONSERVATION

Rajasthan state has about 78 % of the camel population of this country. It is also the largest state of the country and encompasses almost entire Indian part of *Thar* desert. Low fertility of soil, low rainfall & humidity, poor vegetation and scanty water resources are the typical features of this tract. Due to international





Carrying water for his master



Transportation of water



Indo-Pak border, the road connectivity between important places have improved but still there are several villages, which do not have proper road connectivity. Camel in this part of the country is used for safari, riding, travel, transportation of goods, ploughing etc. Due to various reasons discussed earlier, the population of camel in this tract is declining very fast. In last five years, i.e. from 1997 to 2003, 30.93% decline in the population of camel in the breeding tract has been noticed. The average size of herd has reduced to only 3.74 camels per herd and a good number of herds (4.6%) were not having even a single stud of the Jaisalmeri breed.

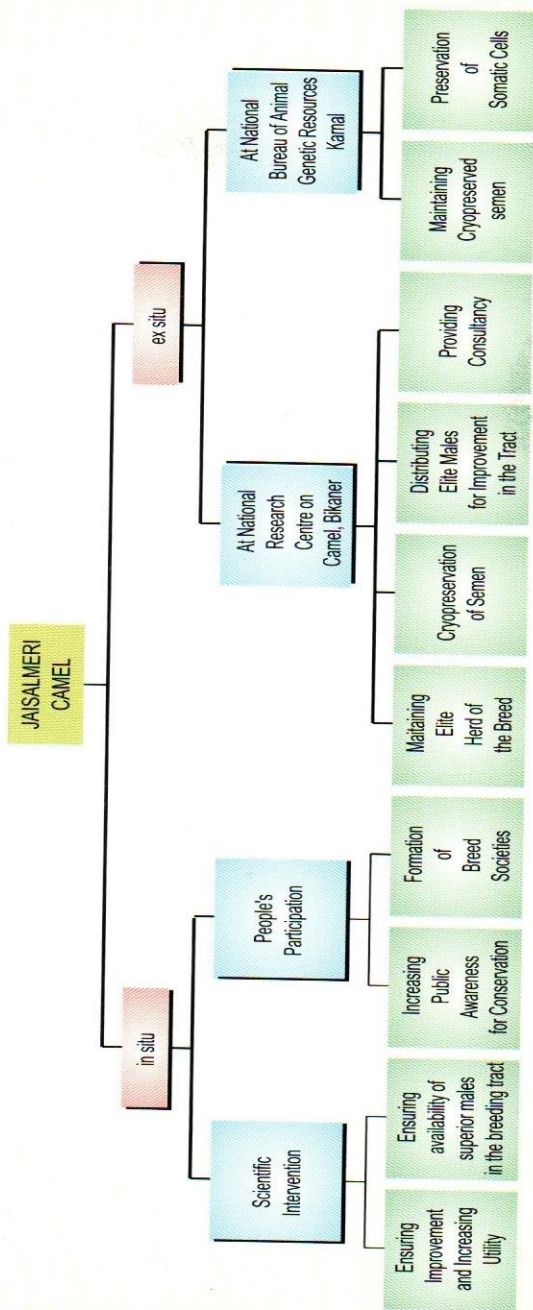
On the other hand, due to continuous increase in the price of fossil fuel, increase in pollution, severe consecutive droughts, reduction in under ground water availability etc., the community is forced to make use of some eco-friendly machines i.e. animals in general and camel in particular in the desert region.

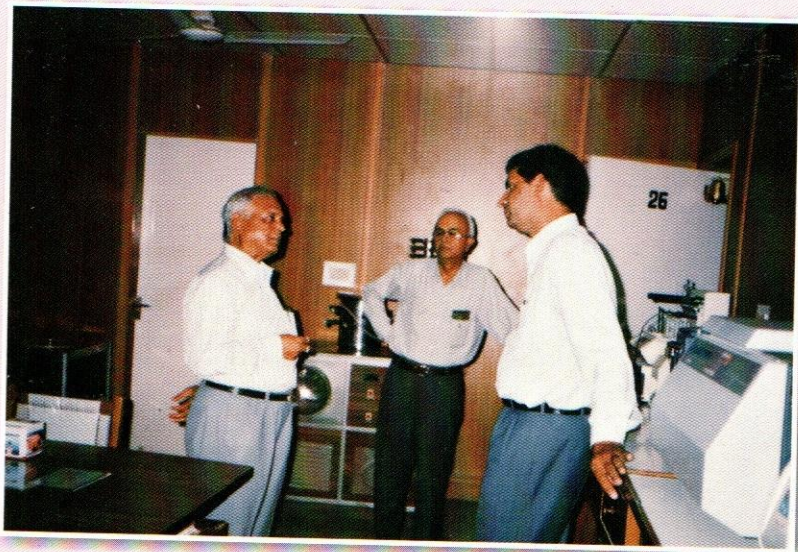
To sustain this breed in the breeding tract itself (*in situ*) there is need to ensure improvement, increase utility of the breed, ensure availability of elite males for breeding in all the strata of the tract, increase public awareness for conservation and formation of breed societies. Under *ex situ* situations, the National Research Centre on Camel, Bikaner is maintaining a herd of this breed with elite studs purchased under the National Agricultural Technology Project and is doing cryo-preservation of the semen from certified camels of the breed. This Centre is also distributing breedable males through state government for genetic improvement in the field and providing consultancy services for conservation. The National Bureau of Animal Genetic Resources, Karnal is a premier institute for conservation of biodiversity in this country and is maintaining the cryopreserved semen of the livestock species including that of the Jaisalmeri camel. It is also preserving the somatic cells of the Jaisalmeri breed for future use. This Bureau is also the headquarter of Society for Conservation of Domestic Animal Biodiversity, which provides a platform to the government organisations, NGOs, public leaders, animal husbandry men, social workers and common men to think and work for the conservation of domestic animal biodiversity.



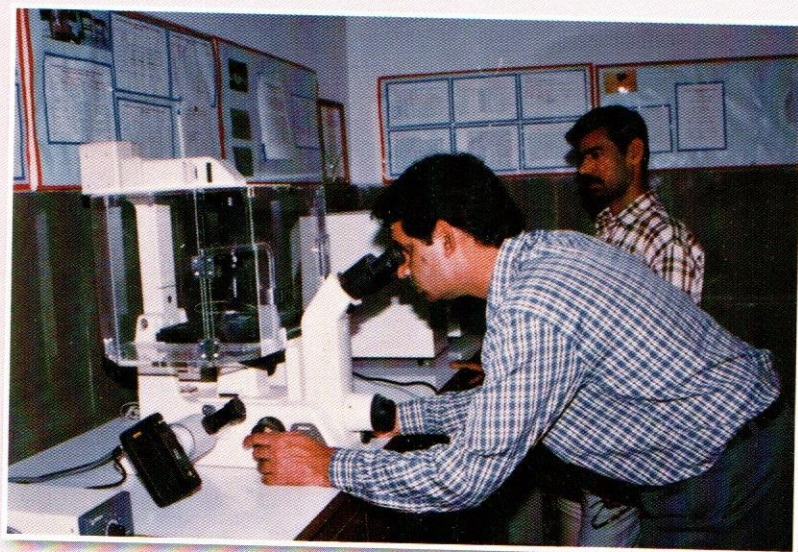


CONSERVATION STRATEGIES

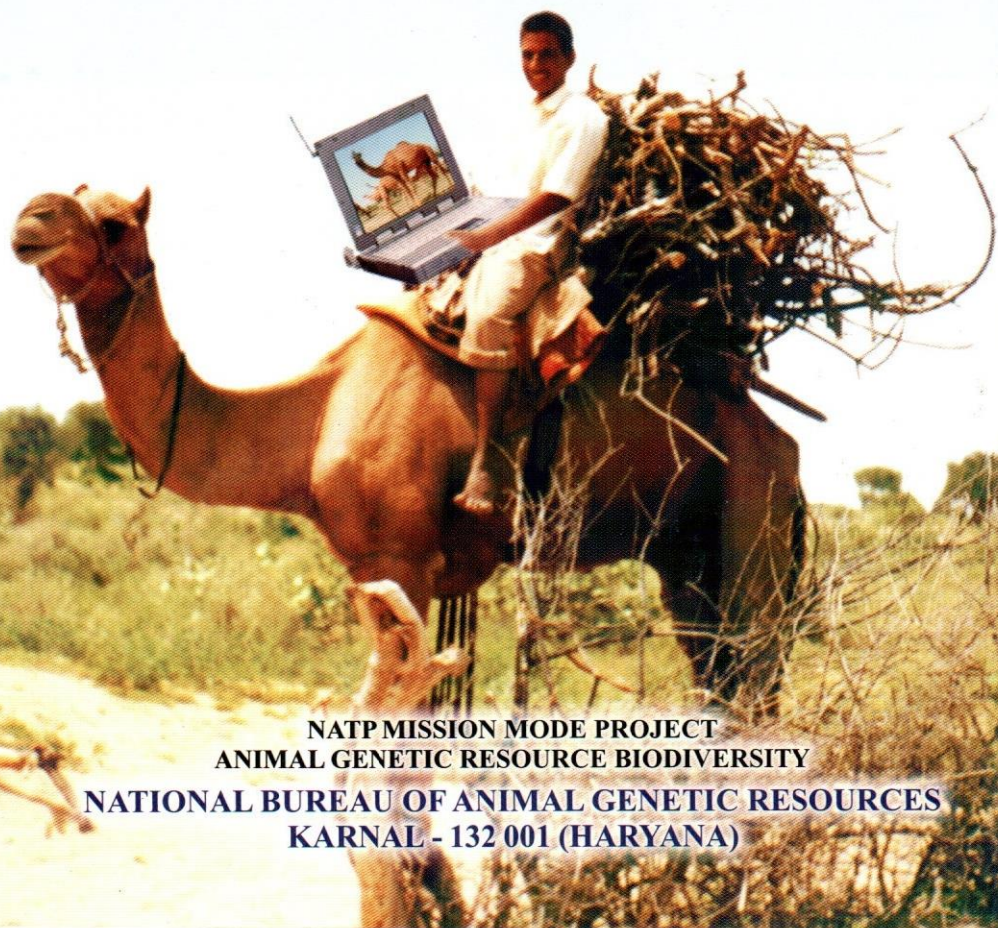
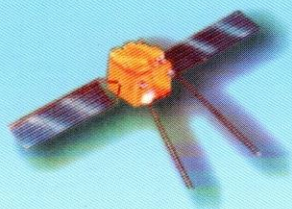




Discussion with Dr. A.E. Nivsarkar, Former Director, NBAGR, Karnal
on conservation strategies



Examination of Jaisalmeri camel semen



**NATP MISSION MODE PROJECT
ANIMAL GENETIC RESOURCE BIODIVERSITY
NATIONAL BUREAU OF ANIMAL GENETIC RESOURCES
KARNAL - 132 001 (HARYANA)**