

CHAPTER VI

ABOUT BANNI GRASSLANDS

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Banni is Asia's largest grassland (in) the study area. This grassland is now in a highly degraded state. An attempt has been made here to highlight about this grassland viz. Banni. The detailed objectives of these studies, therefore, were as follows.

The Banni pasture land of Kachchh spread over 3,000 sq. km and located between mainland of Kachchh and the great Rann of Kachchh. Owing to its potential fodder resources and cultural magnanimity of its inhabitants it is pride of Kachchh. This vast range land with flat topography and absence of any defined basin or storage site makes entire surface water resource available for the growth of grasses. These characteristics make it to be one of the best pasture lands of the world.

Once upon a time, the area recognised as the best for best varieties of grass known as are of "Banni", which is spread over on the northern side of Kachchh District of Gujarat, in the form of desert of Kachchh, extending mainly over Bhuj and Nakhatrana talukas. It is situated between latitude 23° 19' – 23° 52' N and longitude 68° 56' – 70° 32' E. The area covering nearly 46 small villages (mainly 17 villages and other the hamlets) extends over 186847.52 hectare.

It is said that the area of Banni is formed by replacement of oceanic area from that place, which substituted island type area. That is why, the so formed area is known as "Banni" (i.e. built up area, in Hindi – Bani hui hay). It is also said that, years

ago, the branch of river Sindhu was passing through this area and the cultivation of paddy crop was in huge proportion in this area. Even today, the paddy fields of Sindh area are named as "Banni area". During the course of time; due to earthquake and other natural calamities, the central portion of this area being diverted on one side, the flow of water of the river diverted on the opposite side and this fertilised area was converted into arid region.

SOIL

The land of Banni is formed out of ocean clay, so it includes an element of salt from very beginning. This land is formed out of alluvial and clayey sand. The upper layer of the soil is formed out the clay and nutrient elements from the flow of water of Sindhu and several other small rivers, and is used for growing grass.

Out of the total estimated area of 1,71,500 ha only 1/3rd portion is useful for the cultivation of grass. The rest of the portion of the land is converted into desert, where there is no vegetation. On the whole, the entire land of Banni is saline. Only 10.8% of the total land can be estimated to be free from salt.

Legally, Banni pasture land is a governem^e_{nt} wasteland. Efforts to transfer its management to forest department normally meets with the opposition. It is *de facto* owned by the revenue department without any management design. Recently it has been transferred to the revenue department by the government of Gujarat.

In the last three decades, the construction of irrigation dams in the neighbouring mainland of Kachchh and construction of roads in Banni proper have adversely altered the drainage and sedimentation system. The introduction of *Prosopis juliflora* in mid sixties and its subsequent wide spread through excreta of cattle, competes heavily with grasses in nutrition and moisture. All the rich grass-

growing areas are invaded by *Prosopis*. There is also increase in salinity, mainly on account of floods from the desert in the north. The study aims as:

1. To identify the major problems and factors affecting grass spread.
2. To know the socio-economic pattern.
3. To find out the grass production in grazing plots
4. To collect the data on meteorology and correlate them with the status of grassland.
5. To determine the carrying capacity of Banni grassland.

(Remote sensing techniques were also applied –Alpana Shukla, 1992; Vaishali Patel, 1992). From this Department/Laboratory many reports have appeared on Banni grasslands from time to time (Alpana Shukla, 1992; Vaishali Patel, 1992, Kamini Purohit, 1994 and Kadikar, 1994).

Cultivation of improved varieties of high yielding fodder crops needs to be popularised. The feeding of green fodder to animals is essential if the production performance and breeding efficiency are to be improved.

PROBLEMS

With the degradation of ecology of Banni, the local pastoral community is worst affected. The famous breed of cows, is replaced by buffaloes. The migration is frequent. The pastoral activity is being replaced by previously unknown, labour for manufacture of charcoal and collection of gums and pods of *Prosopis* all leading to cultural breakdown. The production of milk has reduced. The forced closure of the area prohibiting grazing, is the single dominant factor, which appears to have retained the productivity of the area. The protection in grass-vidis and rakhals against grazing is becoming increasingly difficult in the areas adjoining the pastoralist habitat.

So far as the management of pasturelands allotted to village panchayats is concerned, it is observed that there is no specific programme with panchayats to develop this land resource

Some afforestation has been attempted under the state's social forestry programme. The success of afforestation programme is heavily subjected to droughts, sterility of soils and biotic influences. The saplings planted cannot be in general expected to grow as trees without proper protection and after care and the objectives of afforestation and incidental growth of grass remain unfulfilled. Some practice of development of silvi pasture has recently been introduced by the Forest Department but may have to mature to meet the level of ecological needs

GRASS VEGETATION

The management of grasslands mostly takes care of dominant grass species. The distribution of each grass spp. is determined by topography, soil depth, soil moisture, salinity and biotic influences. It becomes necessary to understand the plant physiology of native nutritive grasses of the region. The dominant grass spp. of Saurashtra and Kachchh region are listed as under :

Dominant grass sps. of Saurashtra

No.	Local name	Botanical name
1	Saniyar	<i>Sehima sulcatum</i>
2	Jhinjvo	<i>Dicanthium annulatum</i>
3	Moshti	<i>Iseilema prostratum</i>
4	Dharabdo	<i>Bothriochloa intermedia</i>
5	Lapdo	<i>Aristida adscensionsis</i>
6	Ratad	<i>Themeda cymbaria</i>
7	Bhagoru	<i>Apluda mutica</i>
8	Kagdo (Dabh)	<i>Heteropogon contortus</i>
9	Gandharu	<i>Cymbopogon jwarancus</i>
10	Baru	<i>Sorghum halepense</i>
11	Ghaunlu	<i>Iseilema laxum</i>
12	Lasmpdu	<i>Aristida funiculata</i>

Grass spp. at serial number 1 to 4 above are palatable and nutritive. The grass bio-diversity in Kachch includes the following dominant spp.

Dominant grass sps. of Kachchh

No.	Local name	Botanical name
1	Lampdu	<i>Aristida adscendense</i>
2	Kharo	<i>Dinebra retroflexa</i>
3	Ratad	<i>Themeda cymbaria</i>
4	Gandhara	<i>Cymbopogon jwaracusa</i>
5	Bhangaro	<i>Apluda mutica</i>
6	Lamp	<i>Aristida histricula</i>
7	Jhinjhio	<i>Dicanthium annulatum</i>
8	Saniyar	<i>Sehima sulcatum</i>
9	Moshti	<i>Iseilema prostratum</i>
10	Dabh	<i>Desmotachya bipinnata</i>

In the region of Banni (saline vast) the grass spp. include,

Grass spp. of Banni area

No.	Local name	Botanical name
1	Zinzvo	<i>Dichanthium annulatum</i>
2	Khevai	<i>Sporobolus helvolus</i>
3	Dhrabad	<i>Sporobolus diander</i>
4	Kharuo	<i>Eragrostis spp.</i>
5	Gandhir	<i>Eleusine spp.</i>
6	Shiyal puch	<i>Chloris barbata</i>
7	Dhaman	<i>Cenchrus setigerus</i>

A survey of grassland vegetation of western Rajasthan adjoining Kachchh and Bhandari region by Gupta (1965) revealed following references of soils:

1. *Sehima nurvosum* type: on hills and pediment plains.
2. *Dicanthium annulatum* type: on old alluvium with sandy clay loam to clay soils.
3. *Cenchrus* type: on well drained sandy alluvial soils.
4. *Lasirus* type: on well drained sandy alluvial soils.
5. *Desmotachya bipinnata* on young alluvium
6. *Sporobolus marginatus* – *Dicanthium* type on low lying saline soils.
7. *Panicum turgidum* type on sand dunes.

In the fifties, under a scheme to check the little Rann from spreading about 3000 acres of *Prosopis* were planted annually on the edges of Rann. Interestingly, the forest department here considered cattle as their ally, because by eating the *Prosopis* pods and excreting its seeds they helped to spread the plant further in the vast expanses of the Rann. In Banni grassland, the *Prosopis* has gone berserk,

where its presence is totally unwanted. (Hornbill, 1993; Bombay Natural History Society; An article on Gando Baval : story of an alien by S. Asad Akhtar and J. K. Tiwari). It has spread over at a rate of 4000 ha/year.

Gujarat is one of the fodder deficit states in India which during the drought years, about 7 in 10 years, has to bring fodder from northern states like Punjab and from assured rainfall areas of South Gujarat. Cattles are saved but become too weak to be productive.

It seems that both human and animal population are competing in increasing their population. Therefore, the pressure of livestock population on grazing land is so much that, even if the grazing lands were not in the deteriorated conditions that they are, it would still not be possible, to feed the present livestock population.

Prosopis is invading areas suitable for palatable grass growth (Jadhav, Kimothy and Kandya, 1991).

About Grasses and Fodder

Since most of the study area lies in arid & semi-arid zones, some of the fodder sps. are highlighted in the following paragraphs.

Nature has endowed the desert areas with hardy grasses and shrubs which are able to survive in arid conditions with deep root systems. Grasses like Anjaan (*Cenchrus setigerus*) Dhaman (*Cenchrus ciliaris*) and Sewan (*Lasiurus indicus*); which grow in these areas have a fairly high protein content and are relished by the livestock. The shrubs yield edible berries. A few tree species; notable Khejri (*Prosopis cineraria*), provide top feed for camels, sheeps, and goats. These are heavily lopped for fodder and fuel. The phog (*Calligonum polygonoides*) is a valuable bush in the desert. The proteins of it above the ground provide fodder and the roots

below are dug out for fuel. Digging of Phog has become a regular vocation and provides employment to a large number of people. The digging up of Phog roots loosens the soil resulting in accelerated weed erosion and dune formation. To check such activities alternative sources of fuel and livelihood need to be provided.

It is recommended that at places of cattle concentration, farmers and cattle breeders should be encouraged to install cow-dung gas plants to ease the fuel problem and to ensure availability of the residue as manure.

Green grass forms the most natural food for cattle and year long supply of green, nutritious, lush and succulent fodder to the cattle is the mark of an intelligently chalked out cropping scheme. Cropping scheme and the amount of supply of green fodder to cattle are governed by the following factors:

1. Number of Adult units and breed.
2. Average body weight and dry matter requirements of the animals.
3. Amount of concentrates and their dry matter contents.
4. Types and kinds of fodder.
5. Soils and climatic conditions.

For successful managements of pasturelands, rotational grazing can be recommended as the best method. In such a system there are two, three or more fields, each of which is separated and is pastured one after another. After an area is grazed over, the animals are taken to another area and forage is allowed to grow to a height of 4 to 6 inches in the first field before it is grazed again. Most of the field is, therefore, eaten when it is rich in proteins and digestible nutrients and before it becomes less palatable.

A system of grazing, known as "Hebenhen system" was developed in Germany. In this system, the pasture is divided into 4 to 6 paddocks of equal size and the herd is also divided in 2 or more groups. The first group consisting of cows in milk are pastured first for a few days in each plot in succession, thus getting the most liberal supply of forage. Then the dry cows and the heifers are turned into the plot to complete the grazing (Bannerjee, 1970).

The Banni area being an excellent grazing land, can be a boon for the development of dairy industry on a sound and sustainable footing in the district. Of course, there are potential constraints and dependent upon the availability of water, technology, proper ecological information on its primary production and climate.

There are 27 rivers in the area, none of them is perennial, five rivers merge
into the Banni area (Paroda, 1978)

Importance of forage in India's agricultural economy is obvious from the very fact that inspite of the largest cattle wealth i.e. 343 million, the animal performance is about the lowest in the world due to lack of proper technologies, management etc

The available feed stuffs are not sufficient to support the existing cattle population. During this period, cut forage can be fed green (soiling crops) or after drying (hay) or ensiled (silage). Forages are the principal source of energy for the growth and maintenance of livestock and hence for the production of milk, meat, wool, and animal work (Alam Singh and Choudhari, 1985).

Effective limitation and full control over the number of cattle admitted to graze are essential preliminaries to any proper management of grazing, either in forests or in pasture lands and that until this can be enforced, none of the benefits can be

achieved which should be obtainable by better methods of management tested and proved by research (Whyte, 1964).

Range is normally considered to be a naturally vegetated unfenced land, i.e. unprotected in low rainfall areas grazed by domestic livestock and game animals, while pasture normally refers to the improved and often irrigated, fertilized and fenced grazing lands in more favourable precipitation zones which are seeded to domesticated forest plants.

Usually, forage or pastureage refers to all vegetation on which grazing animals subsists such as grasses and grass like plants, forbs or weeds, palatable portion of weeds and shrubs.

Grazing behaviour of desert animals:

Camel is one of the most striking animals of the area and is rightly designated as "ship of the desert". It can browse on the top branches of the trees and herbs close to the ground with the help of its long neck. Similarly, the sheep can graze closer to the ground and can survive on even small ephemerals and low, prostrate, annual herbs like *Indigofera* species or *Oropetinum*. It can even suck out the small animals and foliage out of the sand due to the very structure of its mouth. Goat is also the browsing animal of the desert. It generally browses on spiny bushes of *Ziziphus*, *Capparis*, but it often browses small *Acacia* tree, with its forelegs on the trunk of the tree (Kanoria and Patil, 1989).

Apart from these, the invasion of some of the salt tolerant species like *Prosopis* is also found at Banni. All these kinds of species are growing together on the same grassland. Hence, the area under palatable grass cover and *Prosopis*-grass association are differentiated. The report on Grassland Mapping and

Monitoring of Banni, produced by Space Application Centre, Ahmedabad helps in obtaining a ready-made data of these types of grass cover. These figures are also tallied with the rainfall and grass collection data. During the year 1981, the palatable grass cover was 40,932 ha and the grass collection was 8,90,000 kg. In this order, the grass production from the area is obtained for the years 1981 to 1992 and the figures are tabulated as shown in Table 6.1

Table 6.1 : Harvesting and Collection of grass

Year	Rainfall (mm)	Total rainy days	Grass collection (Kg)
1975	523	23	3,37,650
1976	496	21	2,98,305
1977	278	14	5,45,500
1978	345	20	3,50,000
1979	821	20	2,00,000
1980	565	16	6,66,000
1981	602	21	8,90,000
1982	176	14	--
1983	236	22	96,115
1984	309	16	1,19,850
1985	123	13	13,500
1986	126	14	16,500
1987	5	2	--
1988	657	24	8,30,260
1989	563	18	--
1990	281	10	--
1991	82		--
1992	507		7,50,000

Source. Animal Husbandry Department, Ahmedabad,
Indian Meteorological Department, Ahmedabad.

Table 6.2 : Banni Grass Cover

Year	Rainfall (mm)	Palatable grass area (P. ha.)	Prosopis and grass area (PG ha)	P + PG ha	Grass production (dry matter) A Kg
1981	602	40,932	56,550	97,482	8,90,000
1985	123	20,120	31,930	52,050	13,500
1988	657	38,162	56,781	94,943	8,30,260
1992	507	38,162	56,781	94,943	7,50,000

Source

Table 6.3 : Gaucher plots developed under Banni Development Scheme – 1990-91

Year	No. of Gaucher plots developed		Area under Gaucher plots	Grass (000 Kg)		Fodder seeds (Kg)		
	Developed	Abandoned due to salinity ingress		Collected	Distributed	Collected	Sold	Distributed Broadcasted
Upto 1979-80	11	1	400	1731	370	800	560	240
1980-85 (6 th Plan)	6	1	688	1772	3133	24762	184	14536
1985-90 (7 th Plan)	49	--	2834	861	56	12240	175	21704
1990-91 (Annual)	9	--	3224	--	434	--	--	--

Source : Animal Husbandry Department, Ahmedabad.

Sour. S.

According to Kamini Purohit (1994), considering only the carrying capacity of Banni for the year 1988, as the sampling year; it was worked out to be 96,930 kg green matter and 32,310 kg dry matter was required per day for 6,462 cattle. Same way, for 13,026 buffaloes, 2,60,520 and 91,182 kg green as well as dry fodder was needed; for 4,918 numbers of goat and sheep, 9,836 kg green grass and 4,918 kg dry grass was required. For other 416 grazing animals, 6,240 kg and 1,664 kg green and dry matter was required. Total requirement for 24,822 grazing animals is 3,73,526 kg green grass and 1,30,074 kg dry grass. This figure of dry matter consumption is multiplied by 30 x 12 to get the consumption per day and it is 4,68,26,640 kg i.e. 46,826 tone; whereas the production of the dry grass collection during the year 1988 was only 8,30,260 kg i.e. 830 tonnes from 38,162 hectare palatable grass area. Thus by subtracting the figures we get 45,996 Tonne deficit of grass for the year 1988 (Table 6.2).

Thus, it is resulted that as comparing the grass production with the livestock production at Banni there is a severe deficit of grass and very low carrying capacity of Banni grassland is proved. Due to some important reasons aggravating the situation like high livestock pressure, low rainfall, drought years and less grass production, the grassland area is facing unbelievable deficit of grass which should be concentrated on. Otherwise it is apprehended or feared that the well known grassland of Asia will gradually diminish or lose its existence.

As for the socio-economic pattern at Banni is concerned the main sources of economy are: grass collection, cattle breeding, dairy farming, *Prosopis* wood as a fuel, cattle dung as fuel and as manure, *Prosopis* pods as cattle feed, gum and latex from *Prosopis*, meat and wool production from goat and sheep, embroidery work as a local art etc.

SOCIO ECONOMIC PATTERN

Since Banni is the only grassland unique in many ways, the socio-economic pattern also needs to be emphasized. Some important products are obtained from *Prosopis*, i.e. wood, charcoal, gum, pods etc., which have been estimated as under (Shalin Kadikar, 1994):

Table 6.4 : Socio-economic Pattern at Banni

Source of Economy	Income in Rs.
Charcoal production from <i>Prosopis</i>	3,03,76,658
Charcoal production from <i>Prosopis</i> & grass	2,88,04,599
Total	5,61,81,255
<i>Prosopis</i> pods production (Rs.300/MT)	19,45,20,803
<i>Prosopis</i> gum production	1,36,80,000
Total labour employment (Rs.30/worker)	2,80,90,628

Source

WOOD PRODUCTION:

From 68,433 hectare *Prosopis* cover, 6,84,330 MT wood was produced during the year 1992 from 58,133 hectare *Prosopis* and grass area, 58,133 MT wood production was noted. The total wood production is 7,42,436 MT.

CHARCOAL PRODUCTION:

From *Prosopis* area, 2,27,882 MT and from *Prosopis* and grass area 1,93,583 MT charcoal is produced as per the government rate of coal i.e. Rs.1,333 per MT; the income of Rs.3,03,76,656 and Rs.2,88,04,599 is to be gained. The total income from coal would be Rs.5,61,81,255.

PODS PRODUCTION:

The pods of *Prosopis* are utilized by cattle for fodder for nutritive content. If the production of 18.95 Kgs of pods is estimated per tree per hectare, then the estimated produce would be 9,475 MT per hectare and 6,48,403 MT per total area. At the rate of Rs.300 per MT the income from pod is Rs.19,45,20,803.

GUM PRODUCTION:

One *Prosopis* tree is estimated to give 40 gms of gum. Considering 500 trees per hectare, 20 kgs of gum would be obtained per hectare. This amount to 13,68,660 kg i.e. 1,368 MT from 68,433 hectares *Prosopis* area. Considering the present cost at Rs.10,000 per MT, the calculated income would be 1.368 crore annually.

LABOUR EMPLOYMENT:

The net income from the total coal production is Rs.5,61,81,255 as per the calculated value stated in Table 6.4. If half of the total income is kept for labour, the total labour income would be Rs.2,80,90,628. If the rate of Rs.30 per day per worker is considered, then 2,565 workers can be employed for the year 1992.

Despite these obvious benefits accrued from *Prosopis*, it has now become a pest like sps. encroaching the Banni grasslands. This spread together with low rainfall or recurring draught, salinity ingress, a dam construction of Punjabi & Luni rivers, etc. have highly adversely affected Banni.

MILK PRODUCTION:

As per the present data, 4,933 cows (cattle) are reported in 1992. Considering the milk production of 7.5 ltrs per cow, 36,998 ltrs of total milk produced is gained for 1992. Similarly 16,875 buffaloes, 2,10,937 litres milk is to be produced at an average of 12.5 litres per buffalo. Thus totally, 2,47,935 liters milk is obtained per day and at

the rate of Rs.10 per litre; Rs.24,79,350 can be the income out of milk production per day.

CARRYING CAPACITY:

The upper level growth forms, beyond which no major increase in population can occur is referred to as “the carrying capacity” of a population; which is defined as “the maximum number of individuals that can be supported in a given habitat”. Once a population reaches at the carrying capacity level, its size fluctuates around it, either above or below the level. This fluctuations in population, may be due to the change in the physical environment or due to interaction within the population or both or due to interactions between closely interrelated populations. In some cases it may be followed by a “Population crash” before the size of population reaches some sort of equilibrium with the environmental conditions (Shukla, 1992).

Table 6.5 : Estimated Values for Carrying Capacity of Banni Grassland

Subject matter	Status of the year 1988
Total geographical area of Banni	1,86,847 ha
Palatable grass cover	38,162 ha
Total grass cover	76,786 ha
Total livestock pressure	24,822 no
Consumption per day (130 tonn)	1,30,074 kg
Consumption per year (46,826 tonn)	4,68,26,640 kg
Grass (dry matter) collection (830 tonn)	8,30,260 kg
Resulting Remark :Deficit of (45,996 tonn)	4,59,96,380 kg
Carrying capacity (the available quantity lasts only for 8 days)	VERY LOW

Table 6.6 : Grassland monitoring status in Barani during 1980, 1985 and 1988 using multitemporal satellite data

(Alpana Shukla, 1992)

Categories	Observed changes					
	1980 (563 mm)		1985 (123 mm)		1988 (657 mm)	
	Area in		Area in		Area in	
ha	%	ha	%	ha	%	
Palatable grass	(-) 20812	(-) 5.41	4162	(+) 18042	(+) 4.69	6014
Total grass	(-) 38894	(-) 10.11	7779	(-) 14581	(-) 3.79	4860
Total Prosopis	(-) 2847	(-) 0.74	569	(+) 41740	(+) 10.85	13913
Prosopis & Grass	(-) 26420	(-) 6.40	4924	(+) 24851	(+) 6.46	8284
Saline area	(-) 32161	(-) 8.36	6432	(-) 19273	(-) 5.01	6424
Total vegetation	(-) 66361	(-) 17.25	13272	(+) 63668	(+) 16.55	21222
Other land use	(+) 34201	(+) 8.89	6840	(-) 44393	(-) 11.54	8879

Grass production

Table 6.7 : Distribution of grass spread, prosopis and salinity ingress in Banni using multitemporal satellite data of 1980, 1985 & 1988 (Normal, Drought and normal) year (Total Banni area = 384687 ha) (Alpana Shukla, 1992)

Categories	Good Year (565 mm)			Drought year (123 mm)			Good Year (657 mm)			Changes ha/year
	1980			1985			1988			
	Area in		%	Area in		%	Area in		%	
ha	%	ha		%	ha		%			
Palatable grass	40932	10.64	20120	5.23	38162	9.92	(-) 2770	(-) 0.72	346	
Total grass	101099	26.28	62205	16.17	76786	19.96	(-) 24313	(-) 6.32	3039	
Total Prosopis	37893	9.85	35046	9.11	76866	19.96	(+) 21389	(+) 5.96	2673	
Prosopis & Grass	56550	14.70	32930	8.30	56781	14.76	(+) 231	(+) 0.06	29	
Saline area	82710	21.50	114871	29.86	95598	24.85	(+) 12888	(+) 3.35	1666	
Total vegetation	195542	50.83	129181	33.58	192847	50.13	(-) 2693	(-) 0.70	336	
Other land use	106435	27.67	140636	36.56	96240	25.02	(-) 10195	(-) 2.65	1274	

Check the consistency of the data.

From the Banni grasslands it is evident that fodder availability is highly dependent on water, land is otherwise fertile. Due to ingress of salinity and spread of *Prosopis* has taken a heavy toll on palatable grass of Banni as also in other Kachch rakhals except Dahisara near Bhuj-Mandvi. According to Alpana Shukla (1992), the changes in grass cover, spread of *Prosopis* and salinity ingress etc. are given in Table 6.6, she has interpreted salinity ingress. But water is a factor which is a constant constrain everywhere whether Kachchh or Saurashtra. Further, instead of harvesting or cutting grass at the end of the season, in October-November, if 2 or 3 cuttings or clippings are made fodder availability can be improved. Thus for example, according to Stoddart and Smith (1955) frequent harvesting may be followed by a regrowth of forage of high protein content and relatively low fibre, of course, the herbage yield declines with frequent harvesting, total protein yield may increase because of increased percentage (Table 6.7).