Process of Desertification in Kachchh and Banaskantha Districts of Gujarat, India

(1961-1991)

Gujarat Ecology Commission

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1996

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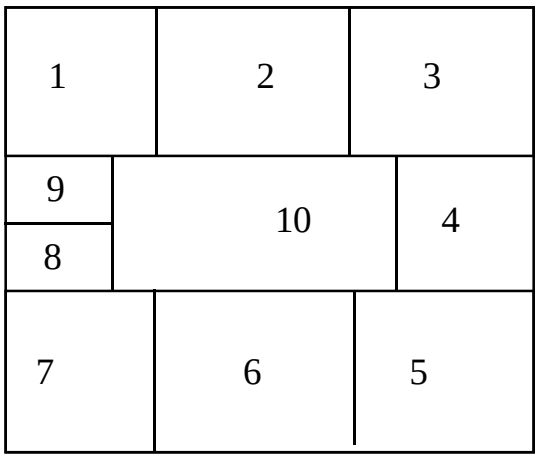
Cover : Cause of Desertification



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(1961-1991)

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Bhuj (Kachchh)
1996

FOREWORD

Desertification results from over exploitation of natural resources through over cultivation, over grazing, over irrigation practices, deforestation and poor natural resource management. This is especially true of desert and its margins where the climatic conditions paticulary rainfall, are highly variable. In a developing country like India, where population growth and poverty combine to place severe pressure on natural resources, the problem of desertification acquires serious magnitude. It has been estimated that about 50% of the total geographic area of India has been under various degradation hazards and about 2.1 million ha of land is getting degraded and deforested annually.

Ecological restoration of this area is a stupendous task. It involves dealing with complex issues often seeking to balance diverse interests. The problem needs to be carefully analysed; the cause-effect relationship established; and comprehensive management strategies need to be developed.

Surprsingly, the data on the process of desertification of Gujarat state are few and fragmentary. The remote sensing data reveal that about 40% of the area is degraded. Out of 183 talukas, 43 are drought prone and another 9 reduced to desert. The groundwater is being depleted rapidly and the water falls by 1 to 1.5m even in a normal year. Acute drinking water shortage and scarcity relief are the common features year after year. The expenditure incurred on scarcity relief during the scarcity years of 1985 to 1988 exceeded Rs. 1,300 crores. In addition large sums were spent under different heads by the state goverment and contribution of business, industry and people in general, was enormous in terms of cash and voluntary effort. Thus an urgent need to halt and even reverse the process of desertification in the state can not be overstressed.

The establishment of the Gujarat Institute of Desert Ecology (GUIDE) is the first step in this direction. The Institute was set up at Bhuj under the auspices of the Gujarat Ecology Commision (GEC) and became operational in May, 1995. The present status report is the Institute's maiden attempt to study the process of desertification in Kachchh and Banaskantha districts. The objectives of this report are to create greater awareness of the desertification process and to discuss the broad range of important issues involved in combating it. The study has also raised several issues which need further in-depth studies.

Further, the vast area of Kachchh and Banaskantha is not homogenous. It is made up of several diverse micro environments. Therefore, it is most unlikely that a single method of utilizing it successfully can every bedevised. In such a situation, it is advisable to implement smaller, site-specific packages eventhough initially these packages may be slightly expensive.

Based on the present report, the GUIDE has planned to identify a few representative sample villages in the two districts and conduct intensive studies to evolve site-specific eco-friendly packages. It would also be interesting to do mathematical modelling and give future projections. Although such exercise would require hard work and is time consuming, I am sure, that these studies to be undertaken by GUIDE would be important for better management of these fragile ecosystems.

It seems quite apparent that we have to encourage multiple land use, utilize natural diversity of the desert and its margins and at the same time exercise restraint in the size and scale of developmental projects in these ecosystems.

I have pleasure in presenting GUIDE's first of the three reports, on desertification of some of the districts of Gujarat. I hope that this report will useful to researchers, planners and development agencies to evolve and implement eco-friendly technologies in our overall pursuit to combat desertification.

June 15,1996 H a s m u k h Shah

Chairman

PREFACE

Deserts and their margins are generally characterised by low and erratic precipitation, diurnal fluctuations in temperature and low humidity. Strong winds, very bright and sunny days and unpredictable periods of drought are common. These lands have low threshold for sustainability and whenever the threshold is exceeded, due to human and animal pressures, the result is desertification.

Gujarat state has second largest arid and semi-arid land in our country. Its human and livestock population is more than 4.1 crores (1991 Census) and around 2.0 crores(1992 Livestock Census) respectively. The gap between demand and supply of fodder is estimated at about 8 million tonners in a normal year. The state produces 0.13 million tonnes of fuelwood and 0.16 million m^3 of timber as against the estimated requirement of 5.87 million tonnes of fuelwood and 0.802 million m3 of timber. Drought and drought relief are common features and a large number of villages in the state are affected by the drinking water problem. The groundwater resources have been receding all over the state due to over exploitation and increasigly deficient recharge. Thus, threshold for sustainability- carrying capacities- of natural resources are substantially exceeded and a large part (40%) of the state is under the grip of desertification.

Realising the magnitude of the problem, the Gujarat Ecology Commission (GEC), Baroda signed a Memorandum of Understanding (MOU) with the Jacob Blaustein Institute for Desert Research, Israel(JBIDR) in September,1993. One of the terms of reference (TOR) of this MOU was that the JBIDR would assist the GEC in the planning and setting up an Institute of Desert Ecology in Kachchh. The main goal of this Institute is to provide ecological knowledge to achieve and maintain sustainable development in arid and semi-arid ecosystems. In pursuance of the TOR, the GEC set up an autonomous Institute, the Gujarat Institute of Desert Ecology (GUIDE) at Bhuj in May, 1995.

The present report on "Process of Desertification in Kachchh and Banaskantha Districts of Gujarat, India" is the Institute's first attempt to identify and understand the complex problems of desertification. The two districts selected for the study are located on the margins of the Greater and Little Ranns of Kachchh hence, they are highly fragile and prone to desertification. In this report, a number of broad based measures to combat desertification have also been suggested, realising well that rehabilitation of degraded arid ecosystems is a challenging task and needs diversified, yet special and time tested technologies. Further, It is important to understand that controlling desertification is not only a technological problem but social, demographic, economic and, most important of all, political factors will determine the future success of anti-desertification efforts. Decision makers will have to change their present perspectives and integrate anti-desertification decisions with policies and Institutions that deal with different aspects of the problem.

Y.D. SINGH
Director

ACKNOWLEDGEMENT

This report on the "Process of Desertification in Kachchh and Banaskantha districts of Gujarat State", has been prepared by the Gujarat Institute of Desert Ecology, Bhuj under the guidance of the Chairman and members of Gujarat Ecology Commission.

We are grateful to the officials of the Gujarat government and all its departments who are too numerous to mention in entirety here.

The preparation of this report has been made possible through the valuable help and co-operation of various officials from Salinity Ingress Prevention Circle, Bhuj; Kachchh Irrigation Circle, Bhuj; Gujarat Water Resource Development Corporation, Bhuj; and Palanpur, Banni Development Scheme, Bhuj; Panchayat Irrigation Division, Bhuj; Gujarat State Land Development Corporation, Bhuj. State Forest Department, Bhuj and Palanpur, District Statistical Office, Bhuj and Palanpur, District Agricultural Office, Bhuj and Palanpur; District Panchayat Office, Bhuj and Palanpur; District Panchayat Office, Bhuj and Palanpur, District Rural Development Agency, Bhuj and Palanpur and Directorate of Agriculture, Ahmedabad.

We acknowledge with gratitude help extended by Dr. A. K. Varshney, Dy. Conservator of Forest B. K. Division, Palanpur and his staff for providing various supports and suggestions, during the data collection at Palanpur (Banaskantha).

We appreciate the help given by Dr. S. V. Chanda, Department of Bioscience, Saurashtra University, Rajkot for editing the manuscript.

We also appreciate the secretarial assistance provided by Mr. Naresh K. Maheshwari.

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EXECUTIVE SUMMARY

Desertification is the result of a complex process of maladjustment of interacting forces between the physio-biotic environment and its users. It threatens the future of more than 785 million people (18%) of the world's population who live in the drylands. In India, the arid zones cover an area of 3,20,000km^2 (12% of country's geographical area) of which 20% of the area (62,180 km^2) is located in eight districts of the Gujarat state.

In Gujarat state the spread of the arid zone was in the entire region of Kachchh district and is followed by Jamnagar (80%), Surendranagar (29%), Junagadh (20%), Banaskantha (18%), Mehsana (7%), Ahmedabad (6%) and Rajkot (6%). The Kachchh and Banaskantha districts are located along the fringes of the Rann of Kachchh and the Great Indian Desert and are highly fragile. Due to unplanned human activities large areas of these districts are severely desertified. Ironically, very little scientific work has been carried out to understand the dynamics of desertification in these areas. Keeping this in view, the present report is prepared to highlight the current status and magnitude of desertification in Kachchh and Banaskantha districts.

Secondary data were collecte from various Government and non-government agencies and were analyzed for the preparation of this report. However, the Rann areas were excluded in all the analysis, because, these areas are uninhabited and there is paucity of secondary information. This report contains information on various parameters which directly or indirectly induce the process of desertification.

The rainfall is one of the most important factors limiting the biomass productivity in arid and semi arid areas. Hence, a thorough study of rainfall and its distribution is an essential component for any planning and developmental actions. Rainfall data of Kachchh district (1972-1994) showed that the district received an average annual rainfall of 326 mm and is classified as an arid district. The distribution of this meager rainfall is highly variable and erratic, leading to protracted droughts. Within a span of 23 years, six severe, three moderate and five mild meteorological droughts (IMD classification) were recorded. In contrast to this, Banaskantha district received higher annual average rainfall of 544 mm and is classified as semi-arid district. The district experienced five severe, one moderate and four mild droughts between 1970 and 1992.

The population increase in these areas is another important factor of desertification. The population of Kachchh district is over 12.6 lakhs (1991 census) with an average density 65 persons /km^2 showing an increase of 159% (1901-1991) whereas in Banaskantha district the increase was 345%, with a density of 175 persons/km^2. The urban population in Kachchh and Banaskantha districts has increased by 187% and 212%, respectively, which is higher than the Gujarat state (168%).

Livestock population has played a prominent role in the economy of arid and semi-arid areas. The livestock population of Kachchh district increased from 9.40 lakhs (48 animals/km^2) in 1962 to 14.13 lakhs (73 animals /km^2) in 1992 showing an increase of 50%. Amongst the main herd species, sheep recorded maximum increase (163%) followed by goats (122%) and buffaloes (43%) whereas a decline of about 25% was recorded in the cattle population. Changes in species composition are generally indicative of increased stress among the species which are less drought resistant and are un-economic to maintain. The increse in sheep and goat population is an indicator of desertification. In Banaskantha district the livestock population increased by 20% within a span of 30 years (1961-1992), eventhough it seems to be very low as compared to Kachchh district, in 1961 the district has attained a high population of 13.4 lakhs (111 animals /km^2) which was almost equal to 1992 livestock population of Kachchh district. The population increased to 16.0 Lakhs (126 animals / km^2) in 1992. Similar to Kachchh district, a change in species composition was also recorded in Banaskantha district which is in favour of buffalo (109%) and goat (89%).

The total number of agricultural land holding in Kachchh district increased by 48% between 1971 and 1991. This increase was mainly due to the increase in marginal and small holdings. Similar trends were also observed in Banaskantha district. The total number of holdings increased by 60% of which the marginal and small holdings contributed

113% while the large holdings decreased by 49%. In both the districts the change in population density is the major factor which influence the land holding patterns.

The problems of salinity of soils in Kachchh is an important issue engaging the attention of all concerned in Rann area, the sea water enters from Kori creek and floods the Rann. The sea water advance eastward and normally passes between the Kuberbet and the Pachchham island. However, after the construction of Punjabi road the eastward flow of sea water has been restricted and is now flooding the Banni plains. Further, the western part of the Rann is also flooded by saline water from the adjoining salt affected areas of Pakistan.

Along the coastal area , salinity has increased tremendously due to over exploitation of groundwater resources which resulted in the ingress of sea water.

The ground water salinity is another serious hazard in irrigated areas. It has been estimated that a total of 4,77,200 ha of the cultivated area of the Kachchh district has been affected by salinity problem. In Banaskantha district the salinity was reported to be meximum in Santalpur and Radhanpur talukas, where more than 50% of the taluka area was affected.

In 1960, the total forest area in Kachchh district was 474.61 km^2 (1.3% of the district area). Due to implementation of silvipastoral schemes, the total forest area has increased to 2852km^2 (6.3% of the district area). The coastline of Kachchh district admeasures 338 km which consists of mud flats encompassing an area of 2500 km^2 of which , 709 km^2 is covered with mangroves (SAC, 1992). In 1962, the total forest area in Banaskantha district was 1597 km^2 (13% of the district area) which reduced to 12% in 1995 of which only 433 km^2 has dense forest cover (FSI, 1991). The per capita forest area in Kachchh (0.002 ha) and Banaskantha (0.0006 ha) is 30 fold and 217 fold less than that of the national average (0.13 ha)

In Kachchh district, there are 20 medium and 162 minor irrigation schemes with a total irrigation potential of 51821 ha (1994-95). However, only 28% of the potential created was annually (mean of last 10 years) irrigated by these schemes (1984 to 1994). In Banaskantha district, the total irrigation potential created by one major, three medium and 42 minor schemes was 69543 ha and the actual irrigation achieved in 1992-93 was around 12400 ha or 17.8% of the developed potential.

Groundwater constitutes the major source of irrigation in these two districts. Except in Abdasa and Lakhpat talukas of the Kachchh district, all other talukas in both the district mainly depend (>75%) on groundwater for irrigation. In Kachchh district, the groundwater potential estimated in 1991 was 517.1 MCM with an utilizable recharge of 439.50 MCM. The ground water balance after net draft (242.59 MCM) is 196.91 MCM. This indicates that about 45% of the utilizable recharge of water can still be used. However, the major part of the groundwater balance (120.5 MCM) is locked only in Bhuj taluka signifying therby that further development of the groundwater utilisation in other eight talukas is meager. Contary to this, the groundwater mining by way of dug wells has increased by 70.7% (1960-61 to 1993-94). and oil/ electrical motors by 240% (1969-70 to 1993-94). Due to over exploitation of groundwater, the levels of Total Dissolved Solids (TDS) have increased above 4000 ppm (TDS>2000 ppm is unsuitable for irrigation) and the area with good irrigable water has decreased by 6656.5 km^2 (34.3% of the district area). In Banaskantha district, the estimated groundwater recharge was 1027.9 MCM with an utilizable recharge of 873.7 MCM. The groundwater balance after a net draft of 784.1 MCM was 89.6 MCM indicating therby that about 10.3% of the total utilizable recharge can still be used. In contrast to this, the overdraft of ground water has continued at a faster rate. The number of wells have increased by 93% and oil engine/electric motors by 386% during the last three decades. As a result, the TDS have increased beyond 4000 ppm in the entire talukas of Wav, Santalpur, Radhanpur and major parts of Kankrej, Deodar and Tharad. Since these talukas are located adjacent to Rann areas they are highly sensitive to any unplanned activities.

In both the districts a change in the cropping patterns over a period of time was observed. The total cultivated area in Kachchh district increased by 15% between 1962 and 1993. Cotton, a highly salinity tolerant crop species, is mainly cultivated in the saline tracts of the district. However, cotton cultivation has decreased from 106684 ha in 1961 to 55288 ha in 1993. This significant decrease in

cotton area especially in the saline tracts may, therefore, suggest that even this tract is also slowly becoming unsuitable for the cultivation of cotton. In Banaskantha district more than 70% of its geographical area is under cultivation. An increase of 19% gross cropped area is recorded between 1961 and 1989. Wheat and rape-seed are the major rabi crops. A shift over from wheat to rape seed is quite evident. In 1961 nearly 80% of the rabi cropped area was under wheat, which is reduced to 15% in 1989. Cultivation of mustard and rape-seed, on the other hand, increased from 20% to 85%. Such shift might suggest that the cultivated areas in the district are slowly becoming unsuitable for wheat cultivation as wheat is relatively less drought and salinity resistant than the rape seed.

To overcome the above said issues, a set of management options are explained in this report. Further it is suggested that a holistic- integrated approach with people participation is very crucial for the complete success of any developmental project in these two districts.