CHAPTER II

PERSONALITY OF THE AREA

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2.1 PHYSICAL SETTING:

2.1.1 Location and Extent:

The study area lies between 21°54' and 22°13' N latitudes, and 62°30' and 72°50' E longitudes. It is a segment of Jambusar Taluka, District Bharuch in Central Gujarat (Fig. 2.1). It constitutes more than half (52.64% of the total area of Jambusar Taluka occupying 57759.30 ha(577.59 km^2)of the total area (109733.03 ha. = 1097.33 km^2) of the Taluka on its western margin. The maximum distance from the Jambusarr town to the extreme northern village is 35 km and southern village is 32 km.

The northern limit is formed by the estuary of river Mahisagar and the southern by the estuarine bank of river Dhadhar. The Gulf of Khambhat laps its western boundary and the eastern boundary is roughly formed by the Bharuch-Kavi narrow-guage railway line. Incidentally, the railway line furnishes a dividing line between the two segments of Jambusar Taluka (Sinha 1984). (1) The eastern prosperous one, called Haveli Tappa; (2) The western "problem area" (N.P.G. Gandhinagar) called Bara Tappa. Again the latter is divided into two sections (a) Tankari Bara, the area nearer the coastal margin and within the influence of tidal ingress, and (b) Kanam Bara near the railway line and away from the coastal margin and also from the tidal influence.

The meaning of the name "Bara" has not been found out to general satisfaction. There are various opinions:

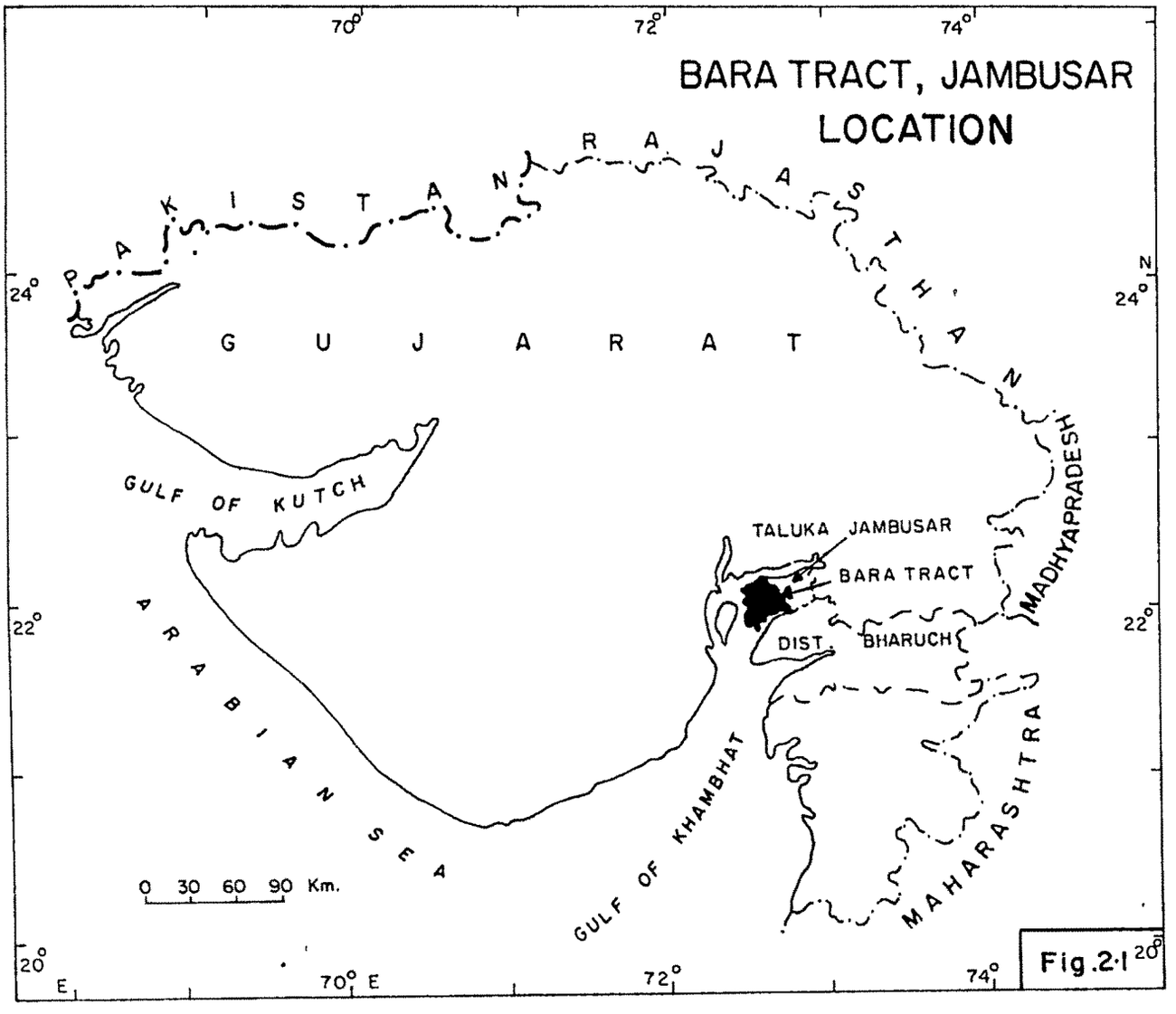

BARA TRACT, JAMBUSAR
LOCATION
70°
72°
74°
24° N
22°
20°
PAKISTAN
RAJASTHAN
GUJARAT
MADHYAPRADESH
MAHARASHTRA
GULF OF KUTCH
GULF OF KHAMBHAT
ARABIAN SEA
TALUKA JAMBUSAR
BARA TRACT
DIST. BHARUCH
0 30 60 90 Km.
70° E
72°
74°

Fig.2·1

(a) It characterises a saline, treeless tract directly under the influence of marine conditions.

(b) It signifies the land opening to the gulf; which makes an entrance to inland areas possible.

(c) It suggests exposure to tidal ingress, and the gusty landward winds from the sea.

(d) Lastly, one interpretation, which appeals most, is that literally the word "Bara" means door in Gujarati language. The mouth of rivers are also called "Bara" or "Baroon". The gulf of Khambhat on its eastern flank from north to south has the mouths of many rivers viz., Sabarmati, Mahisagar, Dhadhar and Narmada and other rivers. The The patches between the mouths of these rivers are known by different names, viz. (1) Bhal Bara - the area between Sabarmatiand Mahisagar and their environs, (2) Tankari Bara - the area under study between the estuaries of Mahisagar and Dhadhar; and (3) Dahej Bara - between the estuaries of Dhadhar and Narmada etc. Therefore, it may be accepted that the name "bara" may have been given to these areas due to the prevalence of the estuaries (baroon) of the rivers. Further, it also appeals for its geographical basis as the area bears certain special characteristics of salinity, treelessness and exposure to marine conditions.

There had been forty-seven villages in this area during 1959-60. Later, one village Isanpur near Zamdi, owing to drinking water problem, was depopulated. In 1969-70, for administrative and revenue purposes, this village was merged with the village Zamdi. Thereafter, only 46 villages remained in this area (Fig.2.2).

The area is roughly triangular in shape with its apex at village Degam overlooking the Mahi estuary and the base along the northern bank of River Dhadhar extending from village Nada in the west to Mahapara in the east. The north-south vertical extent from Degam to Tankari is 36 km. and west-east horizontal extent from Nada to Mahapara is 32 km.

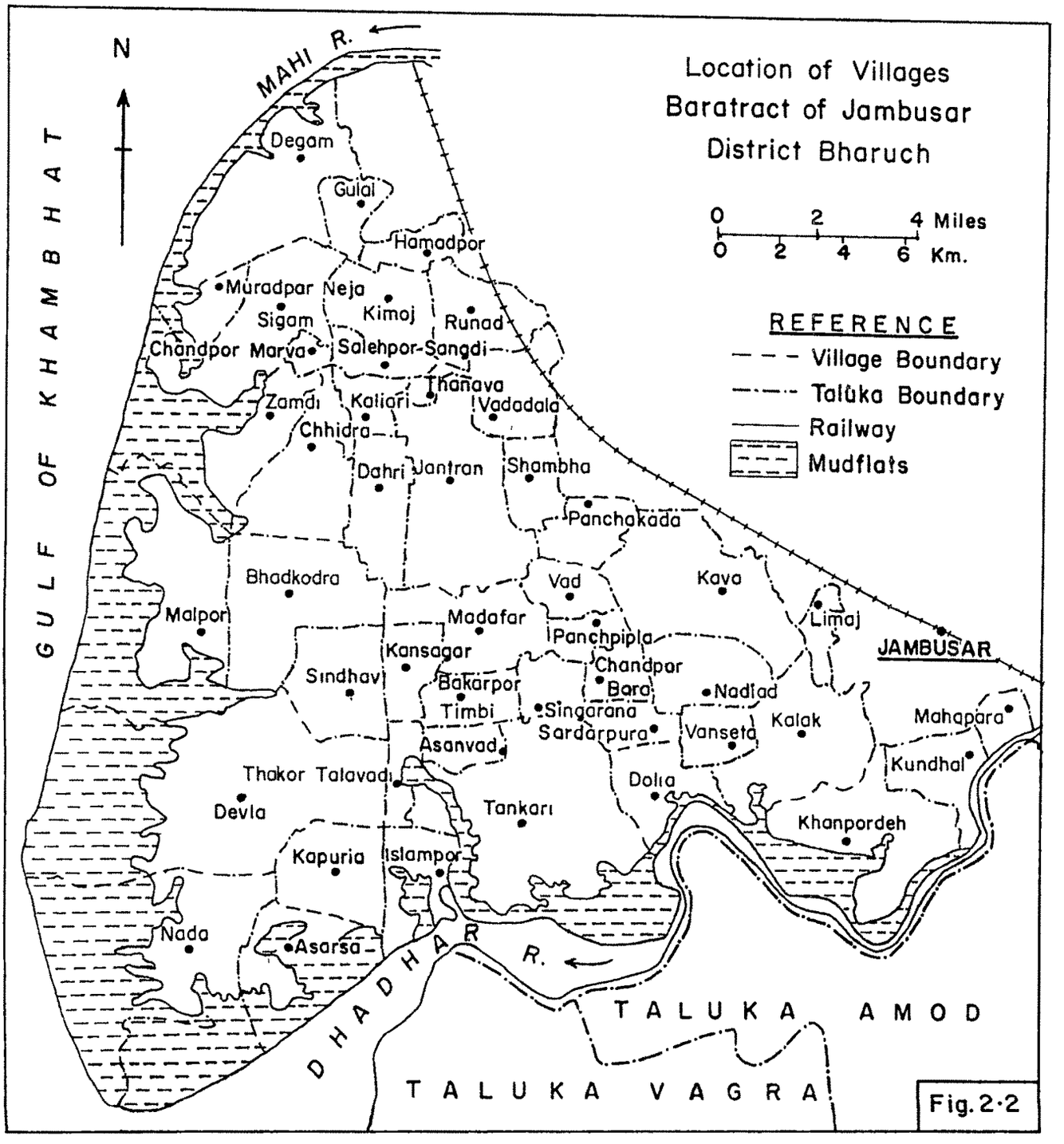

Location of Villages
Baratract of Jambusar
District Bharuch
N
MAHI R.
GULF OF KHAMBHAT
0 2 4 Miles
0 2 4 6 Km.
REFERENCE
Village Boundary
Taluka Boundary
Railway
Mudflats
Degam
Gulai
Hamadpor
Muradpar Neja
Sigam
Kimoj
Runad
Chandpor Marva
Salehpor-Sangdi
Thanava
Zamdi
Katiari
Vadadala
Chhidra
Dahri
Jantran
Shambha
Panchakada
Bhadkodra
Vad
Kava
Limaj
Malpor
Madafar
Panchpipla
JAMBUSAR
Kansagar
Chandpor
Sindhav
Bakarpor
Bara
Nadiad
Timbi
Singarana
Kalak
Mahapara
Sardarpura
Vanseta
Asanvad
Kundhal
Thakor Talavadi
Dolia
Devla
Tankari
Khanpordeh
Kapuria
Islampor
Nada
Asarsa
DHADHAR R.
TALUKA AMOD
TALUKA VAGRA

Fig. 2·2

2.2 GEOLOGY AND PHYSIOGRAPHY:

2.2.1 Geology:

The geological frame of the eastern coastal flank of the Gulf of Khambhat is very distinctly divided into two major segments:

(1) Mahi-Narmada Segment, and

(2) Tapi Segment.

The study area is the upper most part of the first segment bounded by the River Mahi in the north and River Dhadhar in the south. This segment is composed of the fluvial, estuarine, and at places, marine materials (marine blue clay) of the Quaternary era. Geologic-ally, it is recognised as "Jambusar Formation". Its thickness is estimated to be about 900 metres. Clay stone, sandy clay stone and sandstone are frequently found in it. Its underlain strata is called Broach Formation, and the topmost layer is known as "Gujarat Alluvium". The thickness of this segment has not yet been known. Its component materials are yellow and grey clays, coarse sand and kankar. Its estimated age is Pliestocene to sub-recent. The Gujarat alluvium has completely concealed this formaton and the sub-surface geology in the Jambusar-Bharuch block (Patel & Merh 1983 P.51).Its top layer (i.e. Gujarat Alluvium) is composed of the eroded cretaceous lava (Gazetteer Bharuch p.11)of recent to sub-recent times.

A fault line has been detected running from the mouth of Mahi River to river Narmada off Jmbusar and Bharuch. This fault line is supposed to have led to upraising of the land on its west and marks the limit of the alluvium. There is evidence also of another fault running approximately along the boundary between Zones 3 and which has caused an upward displacement of the marine blue clay and in consequence shallower alluvial deposits in Zone 4.

It has lately been known that this segment has rich reserves of petroleum and natural gas. The O.N.G.C. has recently started extracting oil and natural gas from Degam , Nada, Vanseta and

other villages. Explorations are in progress in other coastal and esturine villages of this area. Clay suitable for bricks and pottery is found at Dolia, Jantran, Kalak and a few other villages.

2.2.2 Physiography:

The entire area is a gently rolling featureless alluvial flat plain of eroded lava with no exposed geomorphic features or out-crops. It slopes from 32 ft. contour in the north-east and east to 8 ft.. or less along the coastline to the west. The slope is retarted due to the greater degree of flatness in the central part extending towards west upto Devla. The gradient of the area as a whole is 0.003% which is quite negligible. It makes the plain ill drained, causing innundation during the heavy showers of monsoon rains (Fig. 2.3). The presence of the faultline also contributes to the poorness of drainage (Fig. 2.4). Some flat surfaces are, at places, carved out of minor short-run drainage channels, and backwater creeks. These creeks or backwater channels run west to east on the west coast, and south to north from the northern bank of the Dhadhar river (Fig. 2.5, 2 & 6). These channels, however, play a double role - they spread the tidal water inland at the time of tides, and drain off the rain water during the inter tidal period. Sometimes, great problems arise when the high tide coincides with heavy rains. The two rivers of the area are Mahi in the north and Dhadhar in the south. They do not form any system of tributaries in the environs of the area.

Lack of adequate surface slope and drainage channels lead to sluggish flow of rain water especially from the central and southern parts of the area. However, the perennial water-logging is seen only in the mud-flats which are closer to the coast and frequently face the tidal ingress.

2.2.3 Fluvial Activity:

Some Recent Developments: - Since the two rivers, Mahi and Dhadhar are the main architects of this plain, it would be worthwhile to view in some detail the changes brought about by them in the fluvial geomorphology of the area.

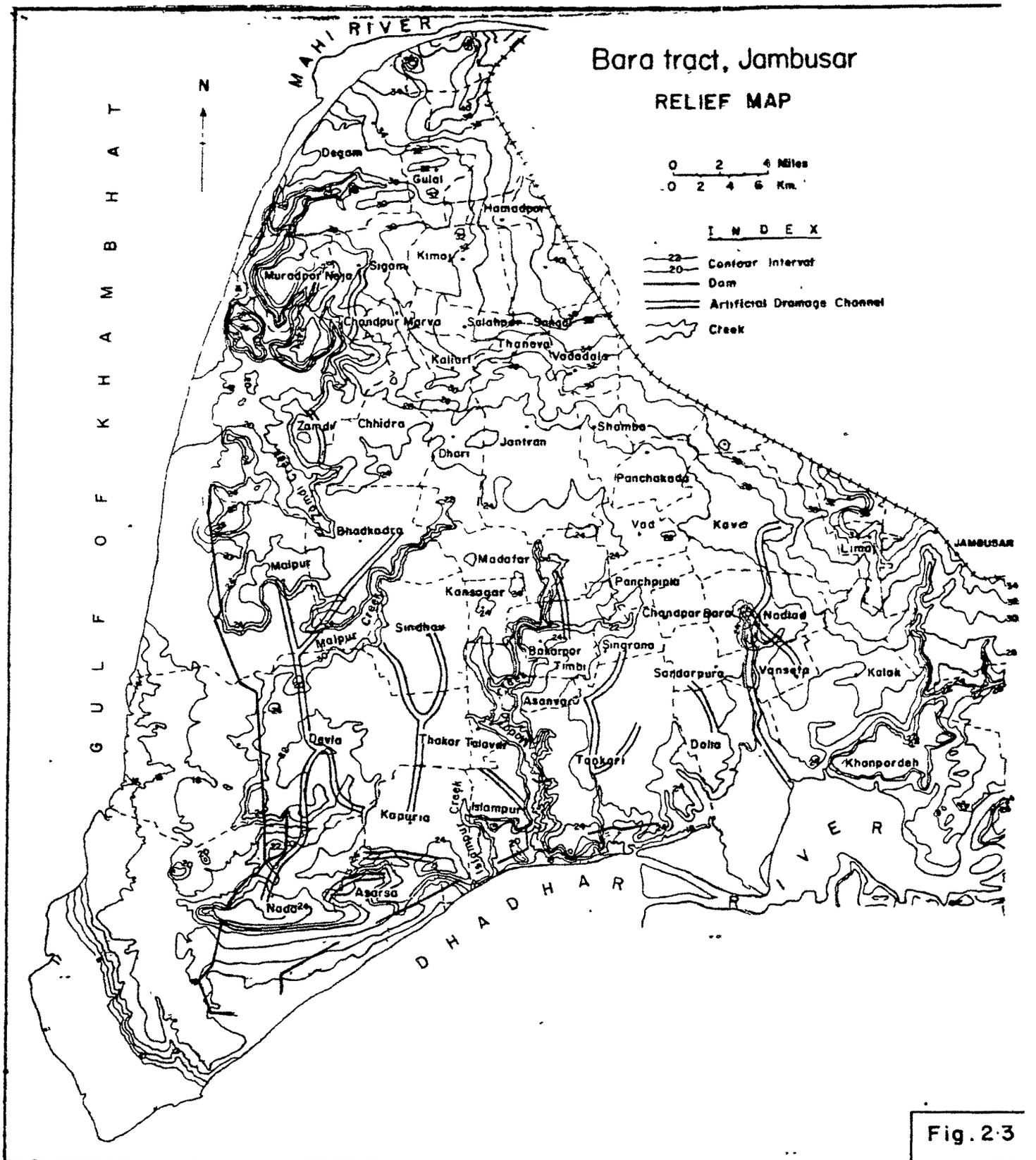

Bara tract, Jambusar
RELIEF MAP
0 2 4 Miles
0 2 4 6 Km.
INDEX
22 Contour Interval
20
Dam
Artificial Drainage Channel
Creek
N
MAHI RIVER
GULF OF KHAMBHAT
DHADHAR RIVER
Degam
Gulai
Hamadpor
Kimoj
Sigam
Muradpor Naja
Chandpur Marva
Salahpur
Sakad
Thaneva
Kaliari
Vadadala
Zamdi
Chhidra
Shamba
Jantran
Dhari
Panchakada
Bhadkodra
Vad
Kava
Limad
JAMBUSAR
Madafar
Malpur
Kansagar
Panchpipla
Chandpar Bara
Nadiad
Sindhav
Malpur Creek
Bakarpor Timbi
Singrana
Sandarpura
Vanseta
Kalak
Asanvad
Dhadhar
Thakor Talavdi
Taskari
Dolia
Khanpordeh
Kapuria
Islampur
Creek
Asarsa
Nada

Fig. 2·3

A comparative study of one-inch topographic map (approx. a century old)) and the recent 1:50,000 map show interesting features. The earlier sheet shows smooth courses of Mahi and Dhadhar, and a sharp bluff-like coastline making the conjunction of land and the Gulf. The shoreline marks the end of the land, and beginning of the water (Fig. 2.4 a). But the recent sheet (Fig. 2.4 b) as well as the LAND SAT imagery indicate the following changes (Nayak and Sahay 1983, pp. 89-91):

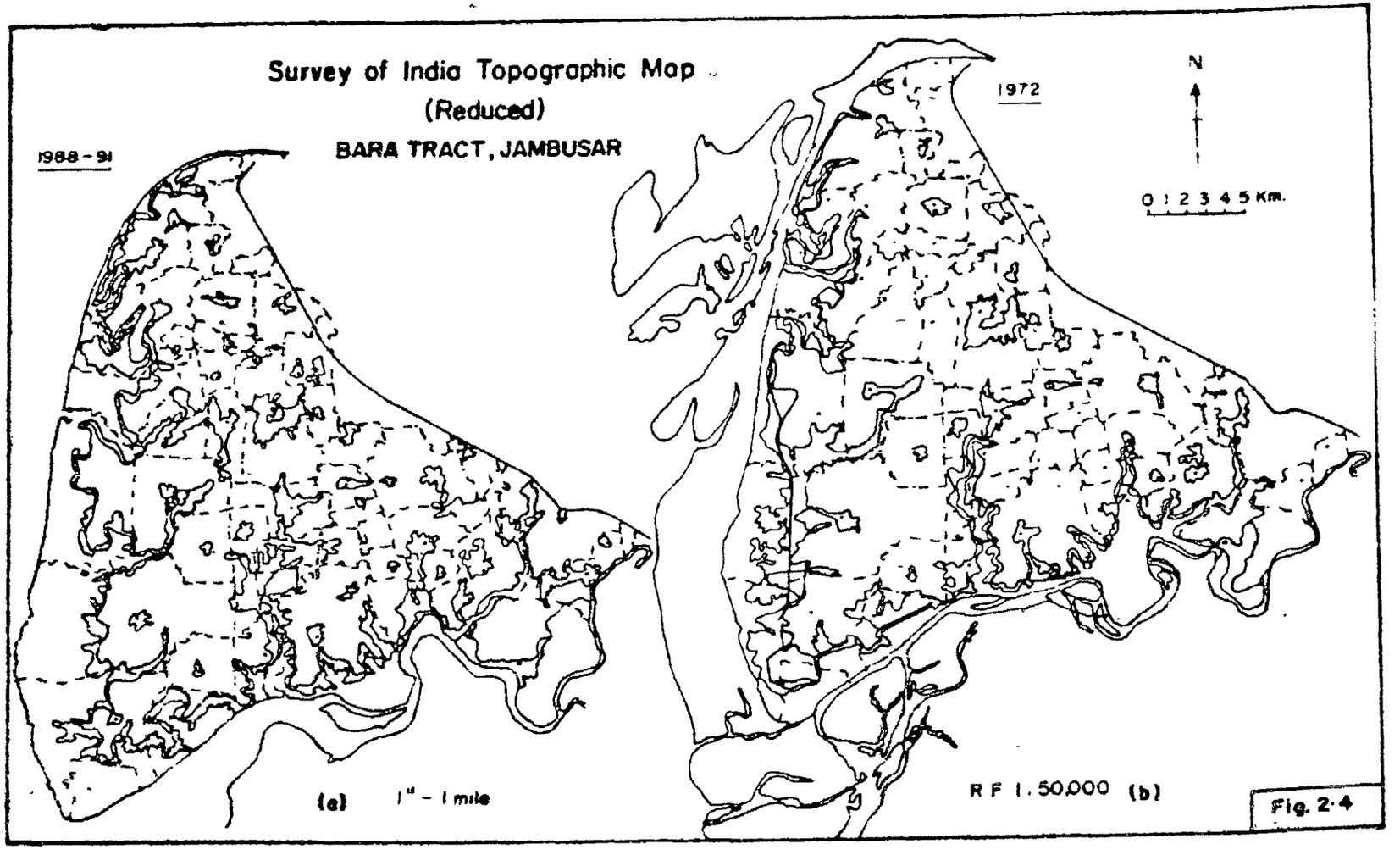
1. River Mahi has changed its course southwards after 1972.

2. Two shoals have developed in its mouth as a result of the weakening of its erosional force due to the Kadana dam constructed on the upper reaches of the river. The dam restrains the flood force which was flushing out the deposited sediments earlier.

3. The gulf water has receded, and discreet deposited features have emerged all along the coast from the estuary of River Mahi to that of River Dhadhar (S.O.I. Topographic sheet 1:50,000). But in the LAND SAT imagery of this area these features are not quite distinct.

4. The course of Dhadhar is slightly straightened. The outer part of the loop of its meander is eroded away. Prior to this change the meander was the natural line of demarcation between village Dolia of Jambusar (north) and village Denva of Amod (south). Now the eroded loop made a new boundary adding part of Denva land to that of Dolia. It caused oligarchical problems between the two villages.

The mudflats, as seen in the old toposheet (Fig. 2.5a), are wide in the lower (southern) part and narrow in the north. A very narrow strip is seen near the Mahi estuary. But the new toposheet (Fig. 2.5 b) shows the broad mudflats even near the Mahi estuary and all along the old shoreline. The river island near Tankari has increased in number from one in the old sheet to three in the new one. Two more small islands have come up near Dolia.


Survey of India Topographic Map
(Reduced)
BARA TRACT, JAMBUSAR
1988-91
1972
N
0 1 2 3 4 5 Km.
(a) 1" - 1 mile
R F 1.50,000 (b)
Fig. 2·4

The mudflats; as classified by Davis (1972) are of three types (1) High tide flats at the outer fringe; (2) inter tidal flats in the intermediate part and (3) low tidal or sub-tidal mudflats at the lower parts. The paleo-mud flats lie beyond the high tidal mudflats. They are quite different from the new one in their tone, texture and particle arrangements (Nayak and Sahay 1983 p.89-91).

The coastal morphology is marked by the two estuaries of River Mahi and Dhadhar, the mudflats and the inter-woven short streams in them. Another conspicuous feature is the back water creeks which are sweeping over a wide area along the coast; the Nada, the Devla, the Bhadkodara, Zamdi, etc. are the creeks carving their way out from the Gulf, whereas those of the Dolia, Tankari, Madafar, Asarsa, Khanpur-Deh and Kalak have intruded inland from the northern bank of River Dhadhar. In the north the Dehgam creek has come out of the estuary of River Mahi. These creeks together changed 26 and 25 percent of the total geographical area of Bara tract into kharland in 1959-60 and 1979-80 respectively. Based on the fluvial activities and the features resulting therefrom, the area may be divided into a number of geomorphic units.

2.3 GEOMORPHIC UNITS:

The Reconnaisance Soil Survey of the Government of Gujarat (1974-75) has divided the whole Jambusar Taluka into the following units:

(1) Mahi and Dhadhar Flood Plain;

(2) Midland Alluvial Plain;

(3) Coastal Lowland.

A close up view of the geomorphology of the area may lead to further micro divisions of these broadbased divisions. It is attempted to split them on the basis of their location, slope and terrain situations. They are:

1. a. Mahi estuarine basin
   b. Dhadhar estuarine basin.

2. a. Upper midland alluvial plain;
   b. Middle midland alluvial plain;
   c. Lower midland alluvial plain;
   d. Eastern Margins.

3. Coastal low lands.

2.3.1 The Mahi and Dhadhar Flood Plain:

The Mahi and Dhadhar flood plain is bifurcated into two micro divisions (a) the Mahi estuarine basin; and (b) the Dhadhar estuarine basin. These basins form the northern and southern sub-divisions of the fluvial plain. Since both of the estuarine basins frequently come into contact with the tides of the Gulf of Khambhat, a condition similar to that of the coastal low lands prevail for the most of their extent. However, their basic constituent material is fine silt as both of the rivers, in this area., are in their old age. The overlain material on these basins at the lower sides is belonging to marine silt and other materials. Through the creeks intruding inland much of the marine sand and silt as well as the riverine materials are deposited owing to the frequent tidal action along the creeks.

(a) The Mahi Estuarine Basin:

Since the study area is narrow in the north (its apex being at Dehgam), the Mahi estuarine basin area is quite narrow. It is composed of loamy soils. Floods in Mahi were spreading new silt, but that is more or less checked by the Mahi Dam at Kadana in Panchmahals and Vanakbori in Kheda District. Part of the basin near the Mahi estuary, and at the mouth of the creeks, have fine fluviomarine silt with higher percentage of salinity. This basin occupies approximately 7.61 per cent of the total area of the Bara tract. Its gradient ranges between 1 and 3 per cent towards the Mahi estuary and the north-eastern coast of the Gulf of Khambhat.

(b) The Dhadhar Estuarine Basin:

It is diametrically on the opposite to that of Mahi at the southern end of the area. This basin is larger in extent than the former. It covers approximately 9.59 per cent of the total area of the tract. It encompasses as many as fourteen villages in its east-west extent. No marked difference is observed in the constituent materials of this basin. However, it is seen that in Mahi basin there are a few patches of loam and clayey loam along with the trappean debris, whereas in this basin they are rare. The colour of soil varies from light to dark black. They are sticky, less permeable, and well drained. Their gradient ranges between 1 and 3 per cent tilted towards the Dhadhar river. The level of salinity varies from low to high from the upper to lower parts of the basin.

2.3.2 (c) The Midland-Alluvial Plain:

Bounded by the Mahi and Dhadhar estuarine basins in the north and south respectively and the coastal lowlands from the west, there is an expanse of flat or extremely gently sloping plain composed of fine silt and clay. Though the area lies near the coast in the old age state of the rivers, the soils are composed of the finest particles of silt and clay. There are three prominent types of soils in this sub-division of the area, (i) black cotton soil, locally known as 'kali', (ii) loamy soil - ('goradu'), less fertile and light black soils - (besar) soils of the low lying areas - ('kyari') and soils near the creeks and coastal low beds 'Bhata'. This plain, on the basis of its physiographic setting, is divided into three sub-divisions; upper, middle and lower.

a. Upper Midland Plain:

The upper midland plain is a narrow strip of land down to the Mahi estuarine basin. It is composed of the fine admixture of loamy and trappean soils. The contours in this part are ranging between the lowest 26' (8 meters) in the west to highest 38' (approx. 12 meters) in the east. The inclination of this sub-division is towards west with comparatively steep slope, posing no problem of innundation. The sub-soil salinity in this sub-

division starts at a depth of about 5 to 7 feet below the surface. Most of this sub-division is composed of the Ankhi-Haldar Series of the soils mixed with Dehgam Series. It covers approx-imately 10.09 per cent of the total area of the tract. Having the attributes of being well drained due to its proper gradient, this sub-division has the opportunity of growing all the kharif crops and a few rabi crops.

b. The Middle Midland Plain:

The middle midland plain has its composition of soils similar to that of the upper midland plain. It has poor gradient, and in the middle part it has concavity which had been causing innundation during the summer monsoons. Now, with the help of the artificial drainage system, this problem is partly overcome. However, it was once a significant rice growing area due to its 'kyari' (low lying area) soils. It covers almost 8.49 per cent of the total area.

c. The Lower Midland Plain:

The lower midland alluvial plain marks the northward limit of the Dhadhar estuarine basin. It is mostly composed of the Degam Series of soils. Being in the range of 22' to 24' contour-lines the area is very gently sloping towards the west. However, the intermittent low contour values (such as 22' at Singarna) develop a concave topography. It is at places swept over by the back water channels. The concavity causing innundation is, however, overcome by the construction of 'Kans'. This sub-division also, like its upper counter-part, has nucleated settlements. It covers approximately 10.85 per cent of the total area of the tract. Earlier, rice was cultivated in the kyari soils, but now due to the kans, it has become quite insignificant; now cotton, wheat and jowar are the major crops.

d. The Eastern Margins:

The eastern margins comprise a long narrow strip of land extending north to south. It falls mainly in the zone of Ankhi-Haldar series of soils. The contours range between 24' and 34' from west to east, giving sufficient slope as compared to other sub-divisions. Being well drained upland there is no

problem of innundation. It covers approximately 10.32 per cent of the total area. It has suitable conditions for all types of crops. However, cotton is the principal crop of this area also. The sub-soil salinity, in this sub-division, starts at a depth of 8 to 9 ft. According to Narmada Planning Group's irrigability classes, this sub-division falls under classes I, II and III, which shows that these soils can sustain the irrigation water without any damage (Gujarat Narmada Plan 1980-2001 , Vol. II, Chapter 9 - Irrigation Strategy for Special Areas, plate 9).

2.3.3 The Coastal Lowlands:

The coastal littoral extends in the north-south direction from the estuarine basin of Mahisagar to that of Dhadhar. This is the area coming under the influence of marine conditions. The topography is flat at the upper part, and tilted towards the Gulf at the lower parts. There are many creeks, marshland streams, kharlands and saltpans in this area. The contours rise up from 8' at the lower parts of the coast to 24' upland. The artificial check dam has been built in this sub-divisions to restrain the tidal ingress. This area covers approximately 28.58 per cent of the total area.

2.4 ARTIFICIAL FEATURES:

2.4.1 The Check Dam:

The tidal ingress through the creeks all along the coast and also along the banks of the two rivers had for long kept a large piece of land amounting to about 26% (in 1959-60) and 25 per cent (in 1979-80) of the total geographical area of the tract unavailable for agricultural purposes. Many of the villages along the coast and along the Dhadhar and Mahi banks are usually of bigger size in both area and population. But invariably greater half of their total geographical area has been comprising the kharland (saline land).

To check the menace of the tidal ingress, a series of earthen bundhs has been constructed along the coast (Fig. 2.7). They are now distinct features on the local landscape, and a conspicuous example of the change in the existing land use of the area.

The need for their construction was felt due to the growing population on one hand and the effective need for protecting and developing the endangered land on the other. The Government under the land development scheme got the bunds constructed longitudinally from Degam to Nada, and latitudinally from Nada to Khanpur-Deh and Kalak. They are constructed, to the possible extent, at the margins of the high water line along the coastal swamps and mudflats. These bunds are discrete even then the tidal force has developed breaches at many places. On the head of the creeks sluices (sliding gates) have been installed for the sake of adjusting the in and out flow of the tidal and also the rain water. Such sluices are installed at Devla, Nada, Islampur (one each) and Asarsa (two).

These bunds are like the dams and poldars of Netherlands, constructed for restricting the tidal ingress and reclaiming the tidal ingressed areas for human use. These dams now mark the last limit of the highest tide. A substantial portion of land area has thus been reclaimed from the kharland areas. However, inspite of the restricted area of influence of the natural force (tide) there are yet a few inlets allowing the Gulf waters to enter inland. These dams have enabled the inhabitants to extend the horizons of their agricultural farmlands, after the due improvement of the reclaimed kharland, to the areas nearer the gulf.

2.4.2 Artificial Drainage (Kans):

Another built up physiographic feature of the area is the artificial drainage system constructed in the middle, lower and the western part of the area. They have been constructed to meet the problem of innundation during rains.

There are as many as 18 such drains. Some of them are small and some are big. Some are joined with the village tanks, some with the creeks. Two major channels enter this area from Sarod village of the Haveli Tappa. In all, these channels take 131.38 ha. (0.23%) of the total area. (Fig. 2.5).

BARA TRACT, JAMBUSAR
Artificial Drains & Embankments

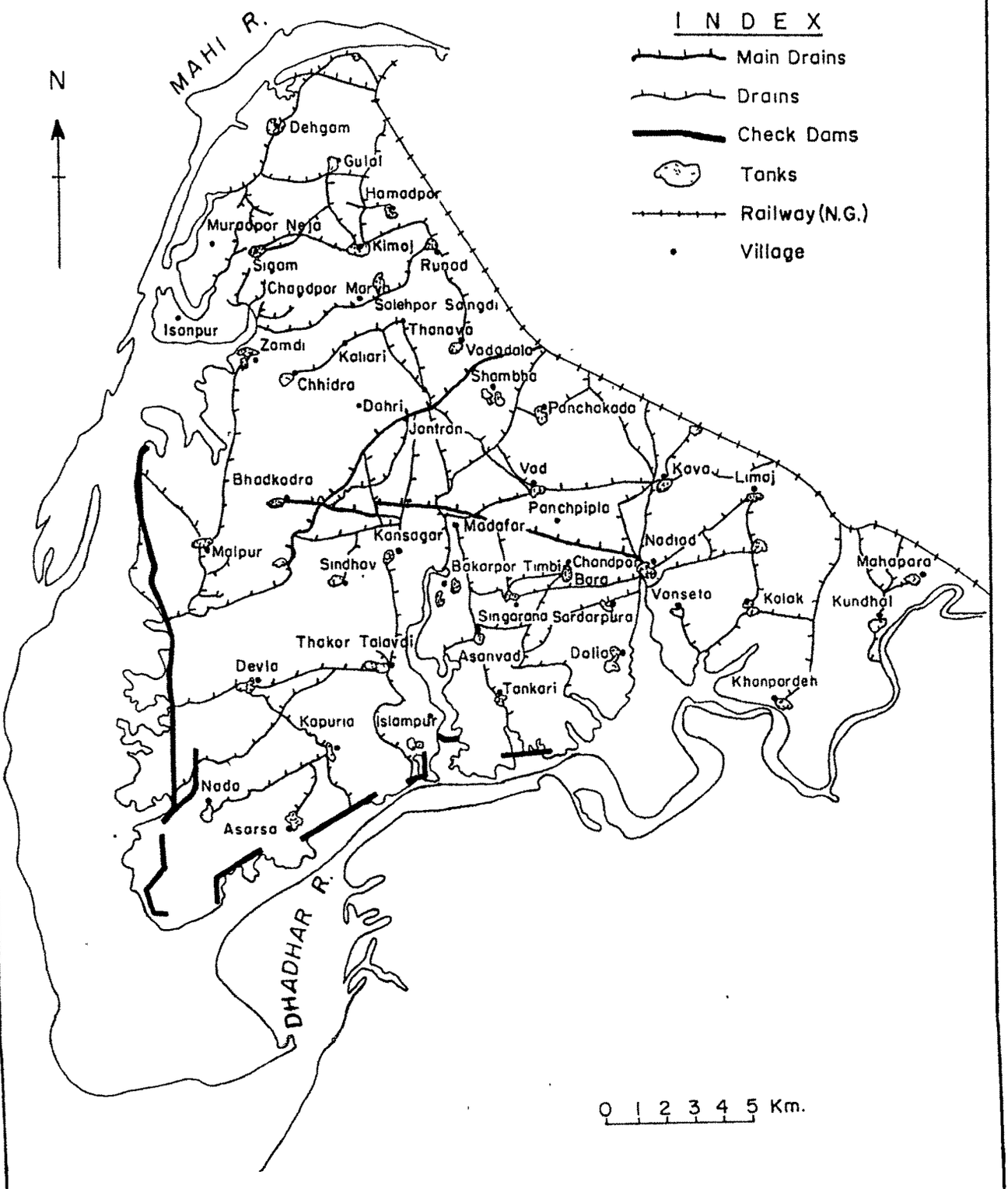


Fig.2·5

These channels have brought about a major change in the cropping pattern of the area, by making the land, formerly innundated during rains, available for cultivation during kharif season. However, they have also brought with them the menace of soil erosion.

2.5 CLIMATE:

More than any other factor, the climate plays a dominent role in the development of the pattern and character of land use. The type of bio-mass, the human settlements, the types and patterns ofgeneral and cropland use etc. in one or the other way reflect "a major exploitation of the climatic resources" (Peacock and Shelly 1974, p. 87)

Bara tract of Jambusar is a micro climatic zone in the vast monsoonal realm of the Indian Sub-continent. The climate in this area represents the salient characteristics of the south-west monsoon, partly modified by the marine influences. Being situated between the estuaries of Mahi in the north, Dhadhar in the south and the Gulf of Khambhat in the west its climate is moderated by the presence of these waterbodies. There are seasonal rhythms but rarely reaching the extremes as experienced in the interior parts of the country.

On account of the seasonal rhythms, the year has broadly been divided into three seasons - the winter, the summer and the rainy season. A period of transition intervenes between each outgoing and incoming seasons.

2.5.1 The Winter Season:

The winter season in the Indian sub-continent starts from the end of the rainy season. But at different places, due to the spatial influence, the onset period is varying. In Bara tract the winters do not start just after the end of the rainy season but sometimes after mid-October when the evenings and nights give a feeling of somewhat winterlike conditions. This period is the transitional period between the rainy and the winter seasons and characterised by the hot and moist days and moderately cool moist nights. This is the most disease-prone period of the year in which

the malarial paracites are activated, and cold cough and seasonal fever grip the people. This season lasts till mid-November. Thereafter , the winter starts, the mercury dips from 28°C down to 24°C or below. Usually the winters are mild, but sometimes, due to the cold waves brought by the northerly winds, become quite severe with mercury dipping down to 15 or 16°C during the day time and 8 to 10°C or below during the nights. However, during the two points of time under study this condition has not been observed. The winters normally last upto mid-February. The actual winter months, are mid-December to mid-February.

During the winters the maximum temperatures range between 22° and 24°C and the minimum temperatures between 13°C and 15°C. In the events of winter rains, locally known as 'Mavathoon' the diurnal temperatures dip down to 17 or 18°C or even lower. On the whole, the winters may be characterised as the season of warm days with bright sunshine and cool nights.

The winter conditions are normally very suitable for cotton and also for wheat and rabi oilseeds. Frosts are almost unknown. The rains from the retreating monsoon, or by the cyclones (Vavazoda), brighten the prospects of the rabi crops and if they arrive in the earlier parts of the winter, are very beneficial for the tur and cotton crops.

Table 2.1 gives the maxima and minima of the temperatures of the winter months of 1959-60 and 1979-80:

Table 2.1

Temperatures in Degree C

		1959-60			1979-80		
		Max.	Min	Range	Max.	Min.	Range
Temp. °C	Nov.	25 .2	22.6	2.6	24.60	20.50	4.10
	Dec.	23.6	17.9	5.7	23.80	18.50	5.30
	Jan.	24.8	14.6	10.2	13.60		11.00
	Feb.	24.7	14.8	9.91	23.50	14.60	8.90

Contd.....

R.H. (%)	Nov.	N.A.	N.A.	-
	Dec.	66	29	37
	Jan.	63	29	34
	Feb.	56	22	34

In fact the nights in this area remind the winter, the days are quite warm but not scorching as those of summer.

There have been no significant difference between the monthly maximum and minimum temperatures. However, between the two points of time, when compared, the November 1959-60 had 0.60°C more than that of the same month of 1979-80. December had less by 0.20°C, January had 0.20°C more and February also had 1.21°C more. The minimum temperatures also followed the same pattern. In November it was more by 1.10°C, in December less by 0.60°C and January and February had more by 1.00°C and 0.20°C respectively. This shows less fluctuation, rather more stability in the winter temperaturtes. This is highly beneficial, especially to cotton, the principal crop of this area.

The average higher percentage of humidity for the three months, December, January and February, (for November not available) ranges between 66 and 56 per cent, and the lower ranges between 29 and 22 per cent which also provides ideal condition for cotton crop in particular and other crops in general. The marine condition prevailing in this area moderates the temperatures and increases the humidity and provides the most suitable conditions, especially for cotton.

During winter, gentle continental winds blow from north-east to south-west with an average speed of 2.3 km per hour. However, the velocity varies, sometimes from 4.6 km p/h in November to 5.9 km p/h in February. The north-easterly direction of the wind continues throughout the winter season because of the presence of high pressure over a vast continental area from around Himalayas and the corresponding low pressure over the Indo-Gengetic Plain particularly during the months of November and December. The increase in November and February velocity of the wind may be

due to the drift of cyclones from the Mediterranean towards the tongue of low pressure over the Indo-Gengetic Plain(Kurien 1969). Since it has to cross a long distance the speed decreases and most of the moisture is shed on the way, keeping often a little or nil for this area. That is why the winter rain is not a regular phenomenon, but it is always longed for as it brightens the prospects of the winter crops; however, its late arrival is dangerous for tur and cotton crops.

These winds bring the cold wave and cause a dip in the winter temperature, but seldom to freezing point, as the marine conditions moderate and stabilize the temperatures and hold them around 25°C (max) and 15°C (min) during the peak of the winter season. Thus, the winters are normally pleasant with bright sunshine and gentle breeze sometimes associated with a little rain.

2.5.2 Summer Season:

The summer season is fairly long starting from mid-February and staying till the setting in of monsoon by mid-June. In reality the rainy season is a moderated summer. This season is characterised by the warm to hot and scorching conditions during April, May and part of June., The early part of the dry summer is the harvesting period of the 'rabi' crops, and the final plucking of cotton (cotton plucking starts from late December). The sky is cloudless. The bright sunshine and warm winds assist in the ripening of the crops. Cloudiness and rains during this season may spoil the crops and prove disastrous for cotton.

The summer heat is also moderated by the marine conditions. It hardly rises above 35°C. The maximum temperature ranges between 25°C in early summers and 31°C in its later days, and the minimum temperatures range between 18°C and 28°C. During the early summers the difference between maximum and minimum remains around 7°C whereas during the later part, it is reduced to around 2 to 2.5°C only, making the nights warm, sultry and uncomfortable. Table 2.2 gives the summer teperatures for 1959-60 and 1979-80.

Table-2. 2

Summer Temperatures (°C)

	1959-60				1979-80			
	March	April	May	June	March	April	May	June
Maximum	24.50	26.60	27.80	30.40	24.50	26.60	27.80	30.05
Minimum	17.60	19.80	23.80	28.00	17.60	19.80	23.80	28.00
Range	6.90	6.80	4.00	2.40	6.90	6.80	4.00	2.05

The temperatures in Bara tract at both points of time have remained almost uniform, with a negligible difference of June temperature. The difference between maximum and minimum is gradually decreasing from 6.90°C in March to 2.50°C in June. This reveals the moderating effect of the marine conditions. June is the hottest and most sultry month provided rains do not come early. The late rains make the conditions very much uncomfortable.

The winds blow from south-west to north-east. A vast high pressure belt develops over the Arabian Sea and its tongue - the Gulf of Khambhat, which lies to the south-west and west of the study area; and the low pressure belt encompasses the continental part and particularly over Indo-Gengetic Plain during the same period. Thus, the onshore winds blow with a velocity of 8 km to 12 km per hour from April to June. The same winds accumulating more moisture become rain-bearing in June. An unusual and infrequent phenomenon of thunder storms and light showers occurs in April and May.

The summer is the most difficult season for this area. The water problem arises due to the dried-up tanks and ponds. Agricultural work remains suspended after the summer harvest. The fields are criss-crossed with wide cracks breaking the top layer of the soil into innumerable blocks-square, rectangular and rectilinear. The cracks often go as deep as 5 to 6 meters. These make way for the fast evaporation of moisture from the

lower horizone of the soils reducing the sub-soil moisture to a minimum. The little amount of water remaining in the percolation wells (made over the tanks) becomes brackish.

2.5.3 The Rainy Season:

15th June is considered to be the date of the "break" of monsoon rains, but it rarely comes on this date. It comes either earlier or later than this date. Similarly, the departure date is 15th October, but it hardly stays upto that date. The words that can explain the nature of this season's rains are : precarious, unreliable, irregular, scanty, excessive, etc. The late arrival and early departure proves disastrous and equally disastrous is unabated spells for long durations.

The actual rainy months are the later half of June, July and the first half of August. July is the rainiest month. The force of monsoon starts dwindling from mid-August and practically disappears by mid-September. Occasional showers are received during October only in the event of good season.

A study of the pattern of rainfall for 81 years (1901-1981) shows that there have been 41 years of below average rains and only 40 years of average and above average. 1948 was the driest year which received only 173 mm rainfall. This year is remembered as the year of famine. 1918 was another year of deficient rains which got only 222 mm. 1974 received 257 mm and 1972 received 287 mm. These were the years of scarcity of rainfall. The year 1958 received the unusually high rainfall of 3066 mm which is all-=time high of this long span of 80 years.

During the bi-decadal period of 1961-80, there were 10 years of below average rainfall (average 729 mm) and 10 years of above average. However, it is not the average that matters much, it is the coming of rains at regular intervals that bears great significance. If the rains come in light to moderately heavy showers at regular intervals of 15 to 20 days, they are more beneficial even if it is 450 to 500 mm in the entire season. This may bring prosperity in agriculture.

The wet spell increases the humidity and decreases the temperatures, but this statement would be true only when a prolonged wet spell is experienced. Table 2.3 gives the temperature and rainfall of the rainy season to substantiate the fact:

Table 2.3

Month	1959				1979			
	Max. °C	Min. °C	Rain-fall (in mm)	No. of days.	Max. °C	Min. °C	Rain-fall (in mm)	No. of days.
June	30.40	28.0	53.75	7	30.5	28.0	132.25	5
July	29.9	26.7	399.75	10	30.5	27.0	47.75	3
August	28.9	26.3	279.75	15	29.5	27.0	277.75	10
September	28.5	26.7	377.25	10	29.5	27.5	53.75	3
October	28.7	25.8	58.75	4	28.5	26.5	-	-
November	-	-	-	-	-	-	121.00	3
Total	146.7	133.5	1129.25	46	148.5	136.0	632.50	24
Average	29.25	26.7	225.85		29.7	27.2	126.50	

Table 2.3 shows that the longer spell had brought down the August temperature in 1959 as compared to its corresponding period of 1979. However, the rain fall situation of 1979 as compared to 1959 was better as the required amount of showers came at proper intervals upto November which was useful for the crops of both sseasons. But in 1959 there were heavy showers during the months of July, August and even September and for longer durations, and also there was no rain after October. Given the nature and types of soils of this area, this hampered the agricultural operations because such heavy rains caused the problems of innundation keeping the agricultural work suspended till the drying up of the fields.

2.5.4 Winds:

The south-west winds blow with an average speed of 10-12 km per hour. The velocity of winds is experienced highest

during June which is taken to be an indicator of onset of monsoon. These winds are usually moisture laden, and even if they do not shed the moisture, they increase the atmospheric humidity. The increasing humidity, pressure, and the sultry atmosphere indicate the nearness of the setting-in of monsoon. Sometimes heavy showers associated with gusty winds cause great havoc for the life and property of the rural folk. During monsoon the humidity rises to more than 90 per cent.

2.5.5 Dynamics of Temperature and Rainfall:

The temperature conditions are found almost constant. Frost is rare. However, a slight increase in diurnal range of temperature was observed in 1979 over 1959, during the months of July, August, September and also December and January. No specific reason except the natural variation may be cited for this change. But possibly the larger amount of rainfall of 1959 and less of 1979 may also be considered responsible for this change. Inspite of the variation in temperatures at the two points of time, they are, on the whole, ideal for all crops of this area and particularly for cotton - the principal crop.

Rains are more dynamic than the temperatures. The degree of inconsistency, which is the nature of the monsoon rains has been found varying at wide margins.

To measure the inconsistency of the rainfall of this area, the method of coefficient of variance has been used $(\frac{O}{M} \times 100)$. The period from 1901-1980 has been divided into four parts of twenty years each, and then their coefficient of variance (C.V.) is calculated. Table 2.4 shows the result:

Table - 2.4

Bidecadal values of S.D and C.V.

Sr.No.	Years	O	C.V.
a.	1901-1920	25.35	3.75
b.	1921-1940	27.03	3.51
c.	1941-1960	29.59	3.04
d.	1961-1980	25.51	3.72
e.	1959-1979	25.97	3.66

It is found that (a) and (d) are most inconsistent and (b) and (c) are less inconsistent. The most consistent period of rainfall is (c), and most inconsistent is (a). The study period 1959-79 (21 years) is also a period of inconsistent rainfall. These results are also proved by the actual data. The percentage deviation of the mean of this period (708 mm) against the long term mean (764 mm) is - 7.32. Since the rainfall has been irregular and uncertain throughout, but more so during the study period, the cropping pattern has been found highly affected with it; that a trend of change is noted from diversification of 1959-60, to specialization of 1979-80. Irrigation is, therefore, a must to utilize the given potentiality of the soil.

A glance over the long-term statistics of rainfall from 1901 to 1981 reveals the following interesting facts:

(1) The rains were never consistent.

(2) The period 1901-1920 received the lowest amount of rainfall.

(3) The increase after 1921 continued till 1960. This period of 4 decades has received the maximum amount ofrains and specially the period between 1941 and 1960 has received the highest amount (18430 mm). The same period has the speciality of having the lowest rains (173 mm) in 1948, and the highest ever (3066 mm) in 1958.

(4) The cycle takes a turn towards inconsistency and lower amount of rains after 1960, and the period between 1961-80 received relatively lower amount of rains with the total of 13696 mm than the preceding period.

(5) However, there have been 40 incidences of below average rains and forty of above average, (the data for one year 1957 is not availablke), from 1901-1981 i.e. 81 years. Between 1959 and 1980 (21 years), there have been nine incidences of below average rains, including the two years 1972 and 1974 of very low amount of rains (287 mm and 257 mm respectively). However, it is observed that every third year is found to be the year of below average and every fifth year of above average rains.

2.6 SOILS:

"Soil is the most valuable natural resource we have in the country and is the basis of all agricultural production". (Rajan and Rao 1978 p.i). Though modern technology is developing the scientific measures to grow crops without soil, it seems an illusion in the wider spectrum of the significance of soils, for large crop raising.

The soils of the study area are the part of the broadly classified soils of the 'Kanam' region - the region characterised for its black soils and cotton crop. However, the sub-regional classification of soils (at district level) shows that there are five types of soils within this broad region. Out of these, four types (1) Black cotton soil; (2) Gorat soil; (3) Bhatha soils and (4) Kyari soils, are found in the plain areas and fifth (5) stony soils are found in the hilly and forested areas of the district. (District Gazetteer Broach 1961 p.209).

The first four soils are found in the study area also. However, the soil survey party constituted by the Government of Gujarat in 1974-75, conducted a soil survey of Jambusar Taluka of which the study area is a part and named it "The Reconnaisance Soil Survey of Jambusar Taluka". The survey party basically used the old method of classification of the soils in Gujarat and the soils classified by the national soil survey. By sampling and analysing the soils of the various places in the Taluka, they identified and named the soil series. They are -

(1)	Ankhi Series	)	These names are given after the places the first sample was taken from.
(2)	Haldar Series	)	
(3)	Dehgam Series	)	
(4)	Balota Series	)	
(5)	Onjal Series	)	

The Reconnainance Soil Survey Report (1974-75), Department of Agriculture, Government of Gujarat, p.32.

2.6.1 Ankhi Series:

A strip of recent alluvium has been deposited along the lower reaches of the Mahi and Dhadhar flood plains. These soils have been formed by the flood action in the two rivers over the recent geological past. These soils are often found in association with Haldar Series. These are calcarious fine loamy to clayey loam in nature. They are sticky when wet and hard when dry. They are deep to very deep brown to dark yellowish brown in colour. These soils are comparatively better drained than the soils of the interior parts. These soils bear weak structure. When dried they develop wide cracks often going several meters deep. These cracks divide the soils into blocks of different sizes and angles. They have the capacity to retain moisture for long time. Their pH value is 7.1 which suggests that they are near neutrality slightly leaning towards alkanity, which is not detrimental to plant growth. These soils are, therefore, ranked best, and have the potential for intensive use, if necessary infrastructure, especially the facilities of irrigation, were provided. These soils are best suited to cereals and cotton .

Distribution:

In association with Haldar Series, these soils are found in the eastern segment of the area. But in patches these soils are found all over the study area. Their villagewise distribution is given alongwith their associate, the Haldar Series (Fig. 2.5).

2.6.2 Haldar Series:

They are slightly different from the Ankhi Series. They are deep to very deep fine clayey soils overlain on the besalltic alluvium. They, like Ankhi, have high shrink and swell nature. When dried, they develop deep vertical cracks about 6 to 8 cm wide and sometime 100 or more cm deep. They are sticky and less permeable when wet. Their pH value lies around 7.9 which makes them comparatively more alkaline than the Ankhi soils. They belong to the family of "White Alkali Soil". Their high salt concentration prevents dispersion of soil granules "giving a physical

condition that is not unfavourable for agriculture" (Buckman & Brady 1969 p.p. 341-342). The crops can be raised on such soils by improving the drainage facilities and lowering their salt content.

The Haldar Series of soils are most suitable for the crops of high tolerance (Reco.Survey '75) such as cotton, wheat etc. However, these soils are taken to be good for paddy, kharif and Rabi Jowar, Bajri, etc.

Distribution:

The distinct line of demarcation is difficult to draw between the distribution of Ankhi and Haldar Series. Both of them are overlain side by side. Both have practically the similar gradient ranging between one and three per cent.

The chief concentration of these soils is found in Degam, Kimoj, Sigam, Shamba Salehpor Sangdi, Chhidra, Bakarpor-Timbi, Limaj Kava, Kalak, Vadadla, Runad and other villages lying on the eastern margins of the area. Thus, the belt in which these soils, Ankhi and Haldar Series, are found may be called the Ankhi-Haldar belt (Fig. 2.5).

2.6.3 Degam Series:

These are the clayey soils, mixed with silt and loam. Lime, gravel and ferro-mangenese are their other components.

These soils also bear the characteristics of shrink-and-swell without an in take of moisture. When dried, wide cracks develop and go as deep as 60-70 cm or more. Their lower horizon bears incrustation of salt, which may come to surface due to capillary action. They are poorly drained and their gradient lies between one and two per cent only. The National Soil Survey has classified them as "Deep Black Soils".

Degam series have closer affinity with Haldar Series. But differ only in the level of concentration of salt, which is normally found at a depth of 60-70 cm in the latter (Reco. Soil Survey 1975 p.34).

The pH value of these soils is found around 9.3 which makes their reaction strongly to very strongly alkaline and found decreasing with depth (Reco. Survey p. 35). They are more used during kharif season . Because of the paucity of artificial supplies of water, they can hardly be used during the Rabi season if there is no rain. The principal crops of these soils are Jowar, Legumes and cotton, wheat is cultivated when rains occur in October end or when the soil moisture balance is sufficiently retained.

Distribution:

Like other series, they are also wide spread in patches. But they are mainly concentrated in Khanpur-Deh, Kava, Nadiad, Dolia, Tankari, Panchpipla, Singarna, Islampur, Asanvad, Devla, Degam, Hamadpur-Kantharia, Pachakda, Dahri Bhadkodara, Kapuria, Sindhav and the other villages of the mid-land alluvial plain (Fig. 2.6).

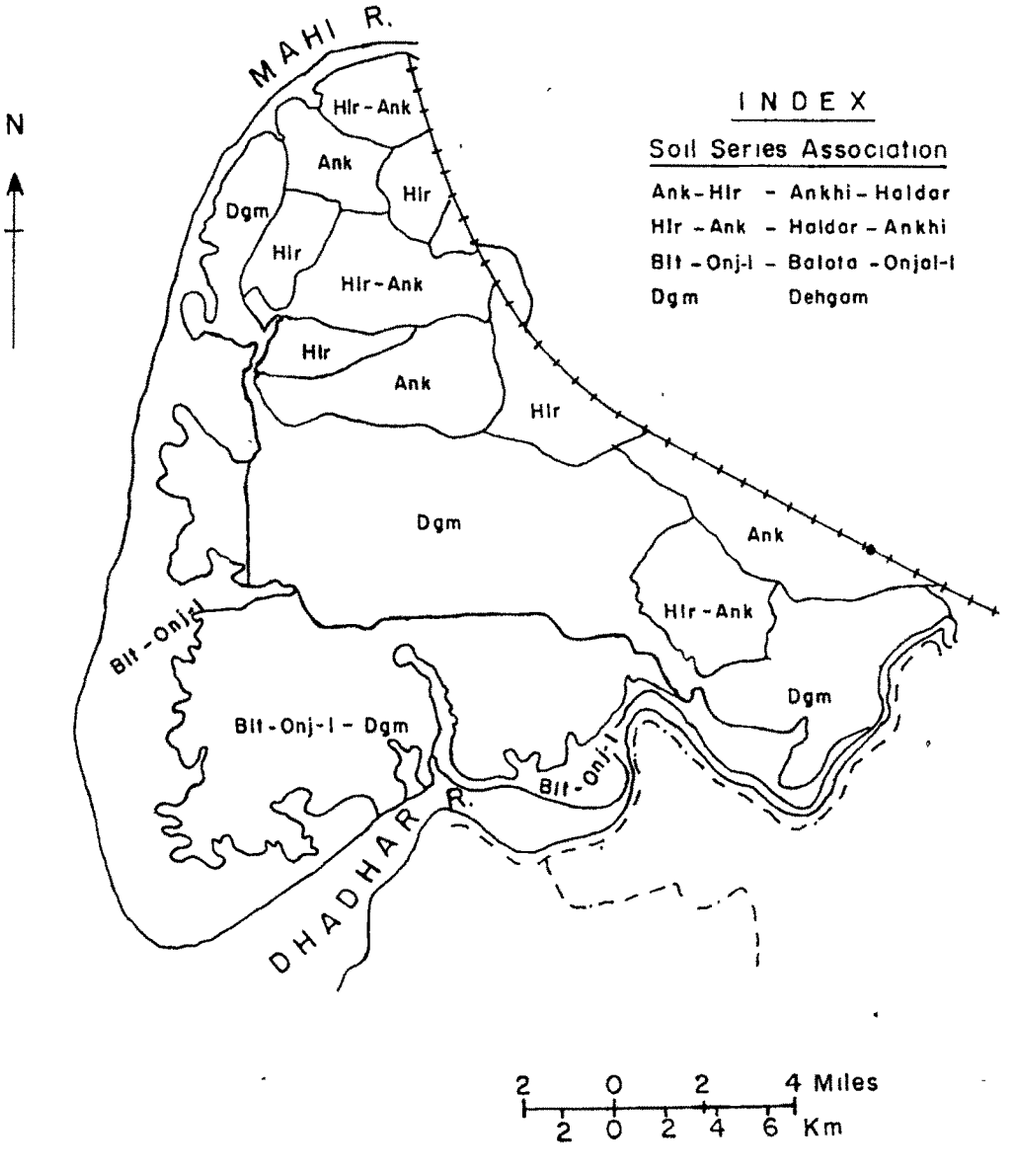
2.6.4 Balota Series:

These are the soils of the coastal littoral and the tide ingressed estuarine basins of Mahi and Dhadhar rivers. They are shallow to moderately deep, poorly drained, very dark greyish brown to dark greyish brown soils. They are medium textured composed of silty loams and clays mixed with marine silt. The frequent ingression of tidal water was keeping it innundated throughout the year. But the check dam has assisted in part reclamation of these soils for different uses. The National Soil Survey has classified it as the highly saline and alkaline soil as its pH value is above 9.00. However, the upper parts of the same soil series have lower pH value of 8.2 or so. Thus, the entire tract of these soils with varying pH value may be called medium to strongly alkaline.

These are ill-drained soils with gradient ranging between one and three per cent.

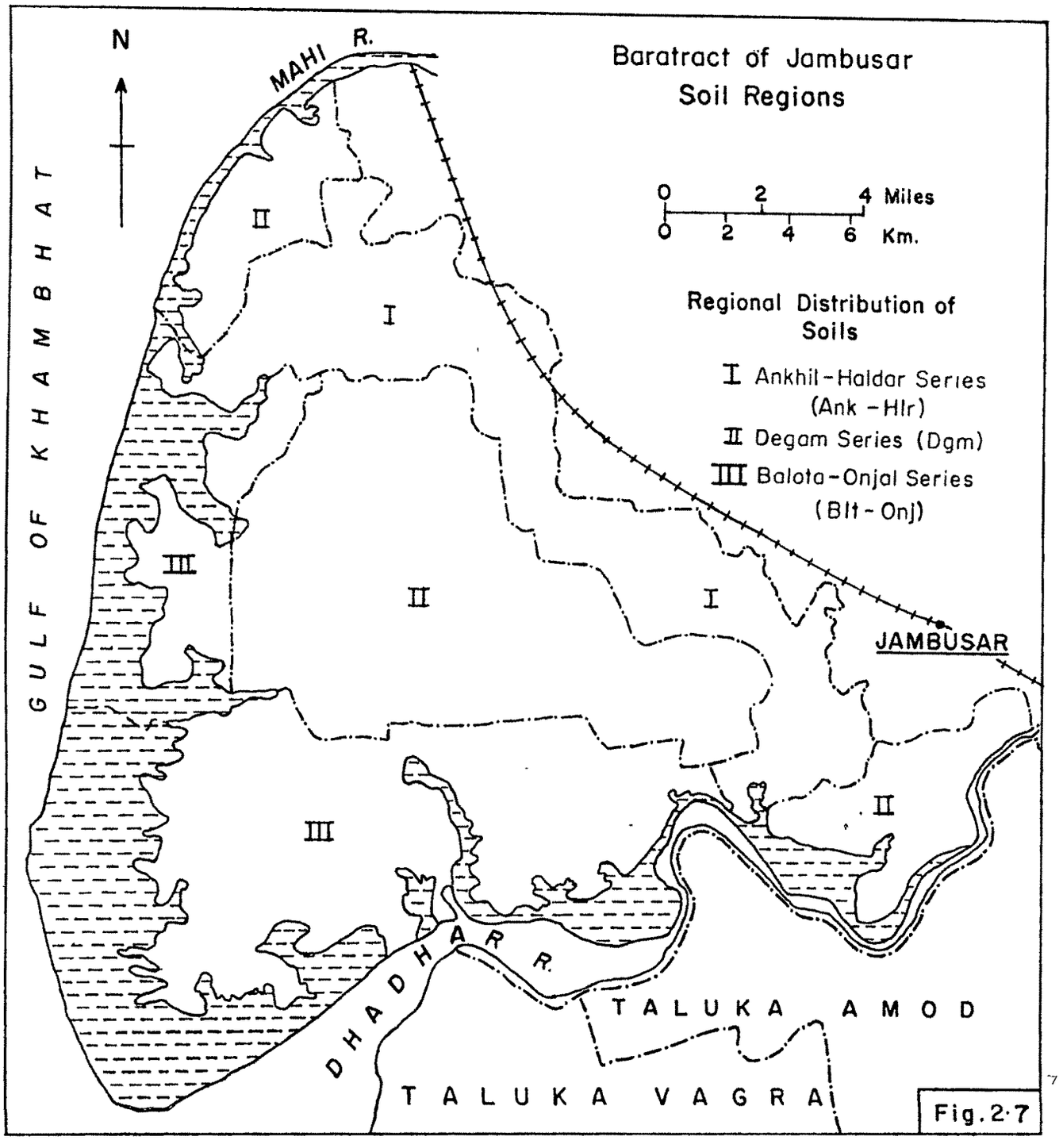
These soils are poor in quality as compared to other series, but with proper management they can be useful soils. The unreclaimed portion of these soils is yet of no use, but the reclaimed parts are being gradually brought to some agricultural and salt extraction uses. Some salt loving plants of acacia family and salt tolerating weeds and grasses grow on these soils.

SOILS OF BARA TRACT, JAMBUSAR



Source : Reconnaisance Soil Survey Report
Govt. of Gujarat, 1974-75.

Fig.2·6


N
MAHI R.
Baratract of Jambusar
Soil Regions
0 2 4 Miles
0 2 4 6 Km.
Regional Distribution of
Soils
I Ankhil-Haldar Series
(Ank -Hlr)
II Degam Series (Dgm)
III Balota-Onjal Series
(Blt-Onj)
GULF OF KHAMBHAT
JAMBUSAR
DHADHAR R.
TALUKA AMOD
TALUKA VAGRA
Fig.2·7

Distribution:

These soils are confined to the coastal and estuarine margins of the area, they are found in Dolia, Tankari, Devla, Islampur, Nada, Malpur, Asarsa, Asanvad, Kapuria, Degam, Moradpor Neja,, Zamdi and a few other coastal and estuarine villages. They are mostly found in association of Onjal-1 Series of soils (Fig. 2.6)

2.6.5 Onjal-1 Series:

These are poorly drained, deep to very deep greyish and yellowish brown soils. Their composition is more or less like that of the Balota Series. The principal component is clay mixed with estuarine and marine silt, with high salt content. They are saline soils.

When dried these soils crack and develop angular and sub-angular blocks. When wet they swell like other series. The upper part of their lower horizon is almost 5 cm. The salt content in this horizon varies from 0.2 to 2.2 per cent or more. They have less permeability mainly because their moisture balance is high and the water table stands barely at a depth of one meter or so from the surface. They are useless for cultivation. In association with Balota Series the Onjal-1 is distributed on the coastal areas and lower estuarine margins. Devla, Malpur, Dolia, Nada, Tankari, Islampur, Khanpur Deh, Asarsa Asanvad, Kapuria, Degam, have these soils (Fig. 2.6).

2.6.6 Soil-Moisture Balance:

The soil moisture study is very essential for the cropland use and cropping pattern studies specially for those areas which fall under semi-arid and erratic rainfall conditions.

The chief characteristics of the soils discussed above, are their moisture retentive capacity, and the moisture is retained by them when there is sufficient rainfall.

A study on these lines done by the Core Consultants, Baroda for the Narmada Planning Group has proved that the soils inspite of their moisture retentive nature loose all their moisture even before the peak of the wilting season. They took the mean rainfall

of Vagra (710 mm), calculated the rate of run-off as 35 per cent of the total rain received. Since the soils develop wide cracks, the initial percolation is very high, therefore, it is very slow which increases the rate of evaporation. We take the case of only cotton which alone has the rate of evapotranspiration to the tune of 246 mm. The soil evaporation counted is 448 mm only. The calculated recharge is 22 mm. Thus, the total loss of moisturte reaches to the tune of 721 mm.

Evapotranspiration of cotton	-	246 mm
Surface Evaporation	-	448 mm
Surface Recharge	-	05 mm
Calculated recharge	-	22 mm
		721 mm

The total rain received	710 mm
Total loss	721 mm
Balance	-11 mm

This shows that the area has the deficiency of soil moisturte by -11 mm. Under these conditions, the cropping pattern can be oriented according to the available supply of moisture, but the dry seasons will not allow any use of agricultural land without the artificial means of supply of water.

2.7 VEGETATION:

The area lacks in vegetation. There are no forests. The Xerophytic type of trees of short stature grow sporadically over the area. However, nearer the railway line i.e. the eastern margins, comparatively more greenary is seen. Towards the coast appearance of barrenness gradually increases.

The official records show an area of 23.71 hectares under the mangrove forests at Malpore. It has remained unchanged over a period of two decades.

It is assumed that the sub-soil salinity does not allow the trees to send their roots deep to extract more nutrition and water for their growth, they keep them upto a shallow depth and suck the available moisture which keeps them almost in a semi-dry state making them Xerophytic in their genus. These trees do not contribute significantly to the economy of the area.

2.8 SOCIO CULTURAL ASPECTS:

Population is the central point in the concept of land utilization. Be it static or dynamic land use is designed by man. "Population furnishes the focus for all observation of geographic elements" (Trewartha 1953 p.2).

2.8.1 Population Distribution:

Among the various physical and cultural factors influencing the distribution of population in the area, it is seen that the drinking water and the quality of soil have overwhelming influence. The soils deteriorate in quality from the eastern margins to the western littorals, whereas the drinking water is a problem all over. The population distribution pattern clearly reflects the impact of these two factors (Fig.2.8). It is evidenced by the clustering of settlements in northern and southern parts of the central plain, and their dispersal in the rest of the area. Characteristically, the sparsely distributed settlements are larger in size (both in area and population) than their counterparts.

Table 2.5 gives the spatial pattern of population distribution in the area. In 1961, two villages Chandpur Marva and Salehpur Sangdi, both of Region-I had less than 100 people, thirteen villages (of the three regions) had from 100 to 400, eight villages ranged between 401 and 800, three had 801 to 1200, five villages were in the range of 1201-1600, two in 1601-2000, and the same number in the next range. Three villages, Degam, Devla and Tankari, were the biggest villages in the range of 2400 to 2800. None in that year had more than 2800 persons (Fig. 2.8 a).

In 1981, a general trend of positive growth (except in the village Panchpipla) is observed. However, Chandpur Marva's insignificant increase by only four persons kept it in the former range. S. Sangdi went upto the next range. Though a marked overall increase is seen the thirteen villages maintained their former range. The five villages, Muradpur Neja, Kapuria, Nada, Thanava and Vad, however, entered the next higher range of 401 to 800; but the eight villages formerly in this range did not change. Three villages, Islampur, Kimoj and Zamdi entered the next range.

Table -- 2.5

Population distribution (villagewise)

	0-100	101 - 400	401 - 800	801 - 1200	1201 - 1600	1601 - 2000	2001 - 2400	2400 - 2800	Above 2800	Total
	1	2	3	4	5	6	7	8	9	10
0-100	Chandpur Marva (01)									01
101-400	Salehpur Sangdi(01)	Asanvad Bakarpura Timbi, Chandpura-Bara Gulal, H.Kantharoia Kansagar,Kundhal Mahapura,Panchpipla Sardarpura,Singarna Thakor Talavdi, Vanseta (13)								14
401-800		Muradpur-Neja Kapuria,Nadiad Thanava, Vad (05)	Asarsa,Dahri Dolia,Kaliari Limaj,Pachakda Shambha, Sindhav (08)							13
801-1200			Islampur Kinor,Zamdi(03)							03
1201-1600				Madafar Kava(01) Runad Vadadla(03)						04

Table 2.5 contd...

	1	2	3	4	5	6	7	8	9	10
1601-2000					Chhidra Kalak(02)					02
2001-2400					Nada(01)	Khanpur Deh Malpur(02)				03
2401-2800					Jantran (01)		Bhadkodara Sigam(02)			03
Above 2800								Dehgam Devla Tankari(03.		03
Total	02	18	11	03	05	02	02	03		46

Madafar, Runad and Vadadla went upto the next range, but Kava already in the same range did not go up. But Chhidra Kalak, Nada and Jantran in the same range made varying increase. The first two went upto 1601-2000, Nada to 2001-2400 and Jantran to 2400-2800. Degam, Devla and Tankari went up to the highest range of above 2800. However, formerly Devla was the largest village in population and Degam in area, in 1981 Degam surpassed Devla in population also and became the largest village of the study area. (Fig. 2.8 b).

2.8.2 Density:

The physical determinants efffectively determine the distribution and density of population in any area. If the rural density of the year 1961 is compared, the study area had 63, the Taluka had 143, the Bharuch District had 159, and Gujarat State had 136 per sq. km. In 1981, the densities in the same order were 87, 123, 143 and 184. It is notable that the density figures of the study area and the state have increased, but that ot the Taluka and District have decreased over a period of two decades. The individual villages hardly exceeded two person per ha^2. at both points of time.

The agricultural densities of both years were 39 and 40 only which reveal the capacity of this profession to sustain more people.

2.8.3 Growth of Population:

Growth is the most dynamic aspect of the population of any area. At the time of census 1961, the study area had a total population of 36,250 persons. In 1981 an addition of 13952 persons raised it to 50202 persons, which roughly added 698 persons per annum. Table 2.6 shows the percentage rate of the annual growth of population in the 46 villages of the area over two decades.

Table - 2.6

percentage Rate of Annual Growth of Pupulation 1961-1981 (Villagewise)

Range %	+ Ve	Total Number	- Ve	Total No.
Upto 1.50	Chandpur Marva, Chhidra, Kaliari, Kava, Runad. Th.Talaodi Vadadla.	07	Panchpipla	01
1.51 - 2.50	Asanvad, Asarsa, Bhadkodra, Dahri, Kapuria, Khanpur Deh, Madafar, Malpur, Muradpur Neja Shambha, Sigam, Sindhav, Tankari, Vanseta, Zamdi.	15		
2.01 - 2.50	Dehgam, Devla, Hamadpur-Kantharia, Islampur, Kalak, Kansagar, Kimoj, Nada, Nadiad, Pachakda, Sardarpura, Singarna.	13		
2.51 - 3.00	Chandpur Bara, Dolia, Jantran Kundhal, Mahapura, Salehpur, Sangdi, Thanava.	07		
3.091 - 3.50	— — —	—		
Above 3.50	Bakarpur Timbi, Gulal, Limaj	03		
Total:		45 + 1	=	46

The area has shown an upward growth trend in as many as fortyfive villages. Only Panchpipla went down due to the increased rate of out migration. The annual growth rate varies between 1.50, and more than 3.50 per cent. However, seven villages with 84, people in Chandpur Marva and 1557 in Chhidra in 1961 show the lowest and sluggish rate of growth of 1.50 per cent per annum. Fifteen villages with 269 people in Vanseta and 1969 in Bhadkodara went up at the rate of 1.51 and 2.00 per cent. Another big lot of thirteen villages with 214 and 2730 people in Singarna and Devla respectively had registered their annual growth rate between 2.01 and 2.50 per cent. Seven villages in the range of 82 persons in Salehpur Sangdi and1576 in Jantran showed the growth rate of 2.51 and 3.00 per cent. Three small villages Bakarpur Timbi, (153) Gulal (174) and Limaj (403) seem to have been more prolific

Bara tract, Jambusar

POPULATION DISTRIBUTION & GROWTH

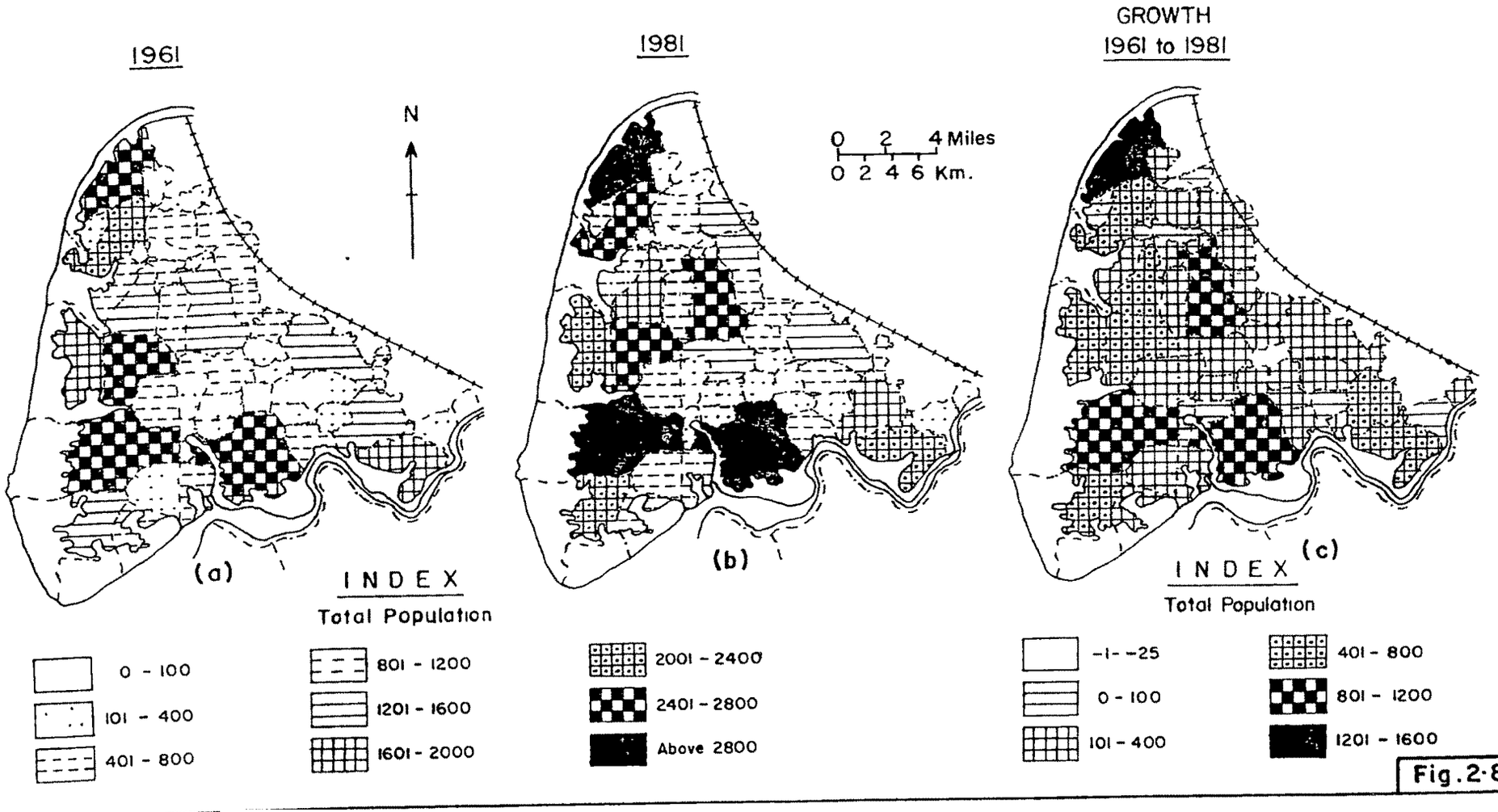


Fig. 2-8

than the other villages of the area. They had the highest rate of growth of more than 3.50 per cent (Fig. 2.8 c). Invariably, the trend of growth speaks that most of the villages of lesser population registered greater percentage rate of growth. And most of such villages are economically very weak. It, therefore, proves the general assumption of the demographers that the economically weaker section of the society is relatively more prolific than economically stronger section.

The overall growth rate of the area was 38.36 per cent over two decades (1961-1981). If compared with the All India rate and also of the State's rate, it is seen that it was much less than India's 55.63 per cent, State's 65.20 per cent and the district's 45.34 per cent for the same period. It may thus be assumed that in the absence of any pronounced incidence of accelerated mortality rate over this period, it is the accelerated rate of migration (mobility) which has neutralized the growth rate over time. This is in consonance with the economic vulnerability of the area, that it cannot sustain increased pressure of population.

In the regional milieu, the growth rate varied in each of the three regions, Region-I with its thirteen villages ranged between four and 78 per cent, but its cumulative rate of growth was 41 per cent. Region-II with its 22 villages ranged between 15 per cent and 72 per cents. Its cumulative growth rate was 42 per cent i.e. one per cent more than Region - I. Region-III with its 11 villages ranged between 11 and 59 per cent. It showed the cumulative rate of growth of 38 per cent, which is lowest of the other two regions.

2.8.4 Population-Growth and-Regional Economy:

Growth of population not only increases the total number of people inhabiting any area, but also changes its structure of economy, in the wake of which the phenomenon of land use is probably the most highly affected. A host of consequences of growth of population come out, of which a few are, expansion of settlement area resulting into loss of agricultural fields, increase in number of land holders, resulting into the fragmentation of land holdings, increased rate of migration etc.

This being a universal phenomenon the study area is not an exception. An attempt is made to illustrate it in the three micro regions of the area.

Of the total population of the area in 1961, region-I had 9207, region-II 15386, and region-III, 11657. In 1981, it increased to 12432, 21569 and 16201 respectively. With this increase in population, the number of agricultural workers increased, which urged to increase the net sown area to meet the increased pressure. The agricultural workers icreased by 24 per cent in region-I, decreased by 9.95 per cent in region-II and increased by 2.57 per cent in region-III. The net sown area went up by 2.71, 2,23 and 3.71 per cents in the three regions, respectively.

It is seen that both N.S.A. and agricultural workers increased in Regions I and II, whereas the former increased, and the later decreased in Region II. However, the percentage increase in N.S.A.in all the three regions is not in accordance with the increase in agricultural workers. Region-III marked the largest increase followed by Region-I and II. Similarly, the percentage increase in agricultural workers was highest in Region-I followed by Region-III. In Region -II, it substantially decreased. It shows that larger attraction for agricultural work is yet existing in region-I and substantially less in other two regions. It leads us, therefore, to infer that the increased percentage of N.S.A.does not indicate that the percentage of agricultural work force should also increase. The rural occupational structure is invariably dominated by agriculture, and its ancillaries. Table 2.7 gives the regional break-up of the occupational structure of the study area for the census years 1961 and 1981.:

Table - 2.7

Regional Break-up of occupational structure - 1961 & 1981

Region	Year	Cultivators and Agri.	Workers in H.and.	Other workers	Marginal workers	Non-workers
I	1961	35.03	0.93	1.57	-	62.46
	1981	32.17	0.23	3.63	5.72	56.40
II	1961	38.80	0.98	3.03	-	56.68
	1981	24.92	1.11	4.03	8.15	61.38
III	1961	34.73	1.47	6.19	-	56.95
	1981	25.63	0.53	4.97	13.58	52.54

Source: Census of India, Gujarat, Bharuch District: 1961-1981.

Taking into account the percentage of workers engaged in the different functional categories, it is seen that agriculture alone holds the largest percentage of workers which is the salient characteristic of the rural functional structure. Since the prospect of other functions in rural areas are usually not bright the negligible percentage of population are found engaged in them. The percentage of workers engaged in household industries has gone down by 0.70 and 0.95 per cents in Regions I and III and negligibly increased by 0.13% in Region II. However, the percentage of other workers increased by 2.06 and 1.00 per cent in Regions I and II and decreased by 1.22 per cent in Region III. A new category of marginal workers was added in 1981 in which 5.72, 8.15 and 13.58 per cent workers were accounted in Regions I, II and III respectively. This shows the deviation from the traditional rural occupational structure.

2.8.5 Literacy:

Appreciable efforts weremade in the field of literacy between the two points of time. The literates have marked an increase upto 40 per cent over the former census year; simultaneously a decrease of 3-5 per cent is also seen in a few villages of Region II and III.Literacy defined as ability to read and write shows an upward trend, as many primary and a few secondary schools have come up for the purpose. Table 2.8 gives the villagewise percentage of literates (of both sexes) for 1961 and 1981.

Table 2.8 shows the lowest percentage (10.20%) of literates in Salehpur Sangdi in 1961 and Kansagar in 1981. Kundhal made progress from the lowest 0.10 per cent to 20.1 - 30 per cent. But Degam and Gulal maintained their former level. Vad and Panchpipla went up from 10.1-20 to 30.1-40 per cent. Asarsa, Kalak, Kapuria, Nadiad and Zamdi went upto next higher percentage. Nine villages, Dolia, H.Kanthara, Kimoj, Limaj, Madafar, Malpur, Nada, Pachakda and Sardarpura stuck to their former percentage. Thakor Talavdi made a significant progress from 10.1-20 to 40.1-50 per cent. Bakarpur Timbi, Dahri, Kaliari, Kava and Tankari stepped up from 20.1 -30 to 40.1 -50; Bhadkodara, Chhidra,

Table - 2.8

Percentage of Literates (villagewise) 1959-60 - 1979-80

1959-60 / 1979-80	0-10	10.1-20	20.1-30	30.1-40	40.1-50	50.1-60	Above-60	Total
0-10	-	-	-	-	-	-	-	-
10.1-20	S.Sangdi(01)	Kansagar(01)						02
20.1-30	Kundhal(01)		Degam,Gulal (02)					03
30.1-40		Vad,Panchpipla (02)	Asarsa,Kapuria Nadiad,Zamdi Kalak (02)	Dolia,H.Kanth-aria,Kimoj, Limaj,Madafar Malpur, Nada Pachakda, Sardarpura(09)				16
40.1-50		Thakore Talavdi(01)	B.Timbi,Dahri Kaliari, Kava, Tankari (05)	Bhadkodara Chhidra Islampur Shambha, Sindhav(05)	Devla,M.Neja (02)			13
50.1-60			Mahapura(01)	Asanvad,Jantran Vadadla, (04)	Ch.Marva,Ch.Bara Sigam,Singarna (04)			09
Above 60			Runad (01)	Thanava (01)	Khanpur Deh(01)			03
Total	(02)	(04)	(14)	(19)	(07)			46

Table - 2.9

Ratio of Literates and Agricultural Workers to total Population

Year	Total No. of Literates	Percentage to total population	Ratio to total population	Total No. of agri. workers	Percentage to total population	Ratio to total popula-tion	Percentage increase/ decrease literates over 1961	Percentage increase/ decrease in agri. workers over 1961
1961	12307	33.94	1:3	13358	36.85	1:2.71	-	-
1981	21581	42.99	1:2	13654	27.20	1:3.68	+75.36	-2.21

———x———

Islampur Shambha and Sindhav rose to next higher, but Devla and Muradpur Neja maintained their former level. The village Mahapura progressed from 20.1-30 to 50.60 per cent. Asanvad, Jantran Vadadla and Vanseta went from 30.1-40 per cent to 50.1-60 per cent and Chandpur Marva, Chandpur Bara, Sigam and Singarna from 40.1-50 per cent to 50.1-60 per cent. In the highest range of above 60 per cent were three villages, of them Runad progressed from 20.1-30 per cent, Thanava from 30.1-40 per cent and Khanpur Deh from 40.1-50 per cent. It, therefore, establishes that the percentage of literates has increased in almost all the villages, and the range of percentages has shifted from 0 to 10 to 40.1 to 50 in 1961 to 10.1 to 20 to above 60 per cent in 1981.

2.8.6 Impact of literacy on Land Use:

As such no marked effect of literacy is seen on the general land use, but the agricultural land use definitely bears the testimony of its impact. It is a proven fact that literacy and agricultural work are inversely related. It is seen from the population and agricultural land use data, that the increasing literacy had the effecct of decreasing agricultural work force. This statement may be tested both mathematically and quantitively. Table 2.9 gives the number of literates acnd agricultural work force at both points of time.

It is obvious from table 2.9 that with the increase in percentage of literacy the percentage of agricultural workers has declined in 1981 over 1961.

And if seen quantitatively the Spearman Rank Correlation method also establishes the above fact:

1961 - r = - 0.23

1981 - r = - 0.003

It proves a negative relation between the literacy and the agriculture workers at both points of time, but the relation has very much declined at the second points of time in comparison to first point of time.

2.8.7 . Man-Land Ratio:

Tables 2.10 and 2.11 give the land-man ratio for the total land, and also for the cultivated land of each village. It is a known fact that the land is either directly or indirectly used by the people inhabiting any unit area.

Table 2.10 shows the natural result of the growth of population. The per capita share of the total geographical area has decreased in 40 villages, increased in one village Panchpipla due to its negative growth, and maintained the constancy of level in five villages.

Table 2.11 gives per capita share of G.C.A.in each village over the two points of time.

The growth factor is conspicuous. Most of the villages show a decreased per capita share of their N.S.A. Panchpipla shows increase. Thanava shows constancy, and so do the five villages - Bakarpur Timbi, Kapuria, Kundhal, Salehpur Sangdi and Thakor Talavdi.

An interesting change in the per capita share of the N.S.A.to the total agricultural population of each village took place in 1981. The agricultural population shows a marked percentage decrease in some villages as against the general increase in the population. Table 2.12 shows the per capita increase of N.S.A. to total agricultural population instead of decrease - that should have been the natural result of the increase in the population.

Table 2.12 reveals that, as against the decrease in per capita share of geographical land for the total population, the per capita share of G.C.A. for agricultural population has increased in quite a number of villlages. However, Thanava, Chhidra, Degam, Kaliari, Malpur and Sigam retained their former share whereas Asarsa, Muradpor, Neja, Nada, Pachakda, Runad, Vadadla, Kalak, Hamadpur Kantharia and Tankari, show a marked decrease from their former respective shares of G.C.A. Kimoj, Madafar, Mahapara, and Vanseta made one step descent, Chandpur Bara, Dolia and Khanpur Deh show no change, but Islampur, Shambha and Zamdi went one step up. Dahri, Devla and Bhadkodara went two and

Table - 2.10

Per Capita Share of Total Geographical Area (in Ha.) of each village (villagewise)

1959-60 / 1979-80 Y	0 - 0.50 V.L	0.51 - 1.00 L	1.01 - 1.50 M	1.51 - 2.00 High	Above 2.00 V.High	Total
0-0.50 V.Low	Thanava(01)	-	-	-	-	01
0.51-1.00 Low	—	Limaj,Runad, Sigam, Vadala Bhadkodara,Chhidra Chhidra, Kaliari (07)	Chandpur Bara, Hamadpur Kantharia Kalak,Madafar, Shambha, Islampur Jantran,Mahapura, M.Neja, P achakda (10)			17
1.01-1.50 Medium	—	—	Asanvad,Dahri,Kava Khanpur Deh, Sardar-pura, Kimoj, Vad Vanseta (08)	Dolia, Malpur Tankari(03)	Dehga, Devla, Gulal Singarna (04)	15
1.51-2.00 High	—	—	—	Chandpur Marva (01)	Asarsa,Kansagar, Nadiad Nada,Sindhav,Zamdi(06)	07
Above 2.00 V.High	—	—	—	Panchpipla (01)	Bakarpur Timbi, Kapuria, Kundhal,S.Sangdi,Thakor Talavdi (05)	06
Total:	01	07	18	05	15	46

Table-2.11

Per Capita Share of G.C.A.(Villagewise) Area in Ha.

	0-0.50	0.5-1.00	1.01-1.50	1.51-2.00	Above 2.00	Total
0-0.5	Thanava(01)	--	--	--	--	01
0.51-1.00		Limaj, Runad Sigam, Vadadla Bhadkodara Chhidra Kaliari(07)	Chandpur Bara Hamadpur Kantharia Islampur, Jantran, Madapur, Kalak Mahapura,M.Neja Pachakda,Shambha(10)			17
1.01-1.50			Asanvad,Dahri,Kava Khanpur Deh, Sardar-pura, Kimoj, Vad Vanseta (08)	Dolia, Malpur Tankari (03)	Dehgam, Devla,Gulal Si-ngarna (04)	15
1.51-2.00	--	--	--	Chandpur Marva (01)	Asarsa, Kansagar,Nada Nadiad,Sindhav,Zamdi (06)	07
Above 2.00	--	--	--	Panchpipla (01)	B.Timbi, Kapuria, Kundhal, S.Sangdi, Thakore Talavdi(05)	06
Total:	01	07	18	05	15	46

Table - 2.12

Per Capita Share of G.C.A. to Ag. population 1959-60 (Area in Ha.)

	0-1	1.01-2	2.01-3	3.01-4	4.01-5	5.01-6	6.01-7	Above 7	Total
0-1	Thanava(01)	—	—	—	—	—	—	—	01
1.01-2	Limaj(01)	Chhidra, Dehgam Kaliari, Malpur Sigam(05)	Asarsa, M.Neja Nada, Pachakda Runad, Vadadla Kalak(07)	H.Kantharia (01)	Tankari(01)				15
2.01-3		Islampur, Shambha, Zamdi(03)	Ch.Bara, Dotia, Khanpur Deh (03)	Kimoj, Madafar Mahapura, Vanseta(04)				Gulal(01)	11
3.01-4		Bhadkodara (01)	Dahri, Devla(02)	—	Asanvad, Jantran(02)		Singarna (01)	Nadiad (01)	07
4.01-5			Vad (01)	Kava (01)	Sardarpura Sindhav(02)		Ch.Marva Thakor Talavdi(02)		06
5.01-6	—	—	Panchpuipla(01)		—	—	B.Tombi, S.Sangeta(02)		03
6.01-7	—	—	—	—	—	Kundhal, Kapuria(02)	Kapuria (01)		03
Above 7.00	—	—	—	—	—	—	—	—	-
Total:	02	09	14	06	05	02	06	02	46

one steps up respectively, while Asanvad, Jantran, Singarna and Nadiad show decrease from their former levels to 3.01-4 ha, Vad and Kava went up by two and one steps, Sardarpura and Sindhav retained their level, but Chandpur Marva and Thakor Talavdi made a descent by two steps. Panchpipla went up to 5.01 to 6 ha., from 2.01 to 3 ha. But Bakarpur Timbi and Salehpur Sangdi went down by one step. Kundhal went up by one step but Kapuria retained its former level.

12 villages (26%) have shown increase, 22 villages (48%) have shown decrease in per capita share of the N.S.A. to agricultural population; and 12 villages show no change. It explains that 22 villages have stuck to their traditional primary occupation even with the increase in their population, but twelve villages inspite of the increase in their population have shown no increase in their agricultural population, as their share has not increased, while other twelve villages show decrease in the agricultural population as a result of which the per capita share of the N .S.A. increased. This, however, shows that gradually the attraction towards cultivation is diminishing.

Apart from the villagewise variation in the per capita share of the N.S.A, the average per head shares of the N.S.A. for the whole area were 2.59 ha. and 2.60 ha. in 1961 and 1981 respectively, which is much higher than Ward's (1969) scale of 1.200 ha. per head. The per capita land to the agricultural population seems to be more than sufficient in the light of the Ward's scale. But owing to low productivity, not only the hectareage according to Ward's scale, but also the actual per capita share of N.S.A. in the area at the two points of time would be quite inadequate.

Table 2.13 reveals that over the two decades, the N.S.A. total population, agricultural population and arithmatic density of population in the area have increased while the percentage of agricultural population to the total population and the agricultural population density have decreased. But when we observe the regions separately, this overall picture is somewhat disturbed. Region I, which enjoys better edaphic conditions show rise in

Table – 2.13

General and Agricultural Density of Population (Regionwise)

Region/Year		Geog.Area	N.S.A.	Total Pop.	Agri. Pop	% of Agri. pop. to total pop.	Densities	
							General	Agriculture
I	1959-60	10402.05	8326.74	9207	3225	35.03	89	39
	1979-80	10402.05	8552.78	12432	3999	32.17	120	47
II	1959-60	23563.53	15158.26	15386	5970	38.80	65	39
	1979-80	23563.53	15495.91	21569	5376	24.92	92	35
III	1959-60	23793.72	10995.91	11657	4049	34.37	48	37
	1979-80	23793.72	11409.10	16201	4153	25.63	68	36
Total:		57759.30	34480.91	36250	13244	36.54	62.76	38.41
			35457.79	50202	13528	26.95	86.92	38.15

agricultural population and also in its agricultural density. This is a clear indication that in the area as a whole, though the population is increasing, most of the additional hands are opting out of agriculture. This may be a consequence of various factors. One may be the increase in literacy and education which makes the younger generation of the villages unwilling to opt for agricultural work and pushes them to the urban areas, the other may be increasing uncertainty of rain leading to greater risk in agriculture thus making it less profitable, and a third factor may be the pull of higher wages in non-agricultural sectors.

The people's tendency of turning away from agriculture is having two contradictory consequences (1) it is causing a shortage of agricultural labour force which has to be met with the help of emigrant casual labour coming mostly from the hill areas of Chhotaudepur, and (2) it is relieving the pressure on land; people's turning to secondary and tertiary economic activities is universally recognised sign of development provided it is not at the cost of agricultural development. Looking into the general level of agricultural development in the area it may not be looked as a healthy sign. If agriculture is made efficient and adequately profitable and modern techniques of management are introduced, along with provision of modern amenities of life, the push factor can be successfully concentered.

The increasing agricultural density in Region I is a clear indication of the capacity of the land to accommodate still more people if the physical and human conditions are improved.