CHAPTER 2

PROBLEM OF THE RUNN OF KUTCH
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The existence of the Rann of Kutch is an important factor in shaping the soil characteristics of the regions round it. Its breadth is 80 to 100 miles and length is about 200 miles from Gujarat towards Sind. It is divided into three parts: the Little Rann, the Banni area and the Great Rann.

GEOLOGY AND ORIGIN OF THE RUNN

An account of the geology of Kutch is given by Wynne. According to Wadia, "Jurassic rocks occupy a large area of the Kutch State. It is the most important formation of Kutch both in respect of the lateral extent it covers and in thickness. With the exception of a few small patches of ancient crystalline rocks, no older system of deposits is met with in this area. It is quite probable, however, that large parts of the country which at the present day are long, dreary wastes of black saline mud and silt, the Rann, are underlain by a substratum of the Peninsular gneisses together with the Puranas. The Rann of Kutch, another tract of the Indo-Gangetic depression, owes its present
condition to the geological processes of the pleistocene age."

The Runn of Kutch once formed a part of the sea, and during recent geological epoch two arms of the latter entered the mainland at the Khori Creek and the Hansthal Creek. The Runn was subsequently raised to its present level by later earth movements and thus cut off from the sea. The Runn experienced earth movements even in recent times from the frequent earthquake shocks of 1819, 1844, 1845, 1864 and later years, attended by a fall or rise of the Runn at several places. In course of time the shallow bed was gradually lifted with the silts and clays discharged from the rivers draining into the Runn.

HISTORICAL EVIDENCE

According to T.H. Holdich: "Over a vast space of the now desert country, east of the Indus, traces of ancient river beds testify to the gradual desiccation of a once fertile region; and throughout the deltaic flats of the Indus may still be seen old channels which once conducted its waters to the Runn of Kutch, giving life and prosperity to the past cities of the delta, which have left no living records of the countless generations that once inhabited them."

"The Runn is almost certainly the raised bed of an arm of the sea, the result of the forces that
raised the vast plains of Western India and Sind. Alexander the Great (325 B.C.) found the Rumm a great lake. At the time of Periplus (80 A.D.), the Rumm seems to have been fit for navigation; and it seems probable that for nearly a thousand years after, a great part of the waters of the Indus crossed the Rumm on their way to the sea. At that time 'Charzi' and 'Nirona' on the edge of the Rumm between 'Lakhpat' and 'Banni'; 'Bhita'ro' on the west of the Banni and 'Dor'at', Dobi' and 'Phangwado' in the island of Pachham were harbours. The date when the Rumm was last navigable cannot be fixed.

It was about 1360 that Pirom Shah's army all but perished in the salt waste of the Kunchi Ran or Ran of Kutch. The fact is patent, Colonel Barton wrote in 1875, that year by year the sea reaches further eastward, and places a few years ago inland villages are open to water traffic.  

Thus, "There is considerable evidence to show that an eastern branch of the Indus, namely the Nara or the Koree flowed in historic times through the present Great Rumm of Kutch into the Arabic sea and that portions of the Rumm were highways of commerce from Kutch to Sind and from Kutch to Rajasthan. There is also evidence to show that parts of the Rumm had much more water than they now have and that both the Great Rumm and the Little Rumm are now drying up. The Rumm
has been raised above the bed of the sea by the long continued debris from highlands of Kathiawar and Kutch and the silts and sands from Rajasthan and Sind. In 1024 A.D. Mahamud of Ghasni destroyed Somnath and later stayed a year in Gujarat. He decided to return to Ghasni by way of Sind across the Rann of Kutch. Here, he encountered deserts, his cavalry was destitute of forage and many of his men died of heat and thirst. A meteor is said to have guided him towards north and finally he found himself on the border of a fresh water lake all full of water. In Nizam-ud-Din's "Akbar" we read that the author who was one of Akbar's generals "crossed over the Rann into Kutch where the Rann was not more than 3 Kos (Kos = three miles) wide and set to work plundering and destroying. We burnt and destroyed 'Kari' and 'Kataria'.

After destroying nearly 300 villages in 3 days we recrossed the Rann opposite Maliya and Morvi. Here the Rann was 12 kos wide and we were engaged from dawn to even in the passage. The water was up to a man's navel." This was in 1584. The first crossing was apparently between Piprala and Lakhapur where the Rann is now 1½ miles wide, and the second between Kutch and Maliya where the present width of the Rann is about 6 miles. It will be useful to ascertain the exact months in which these crossings were made.
The Sara now stops short at the north-western corner of the Great Rann. In olden days, however, the river ran down the western Rann to sea and its inundations watered the low ground north of Lakhpat, forming a fertile rice land known as 'Saira' between Lakhpat and Sindri.

There were frequent wars between the Amirs of Sind and Maharao of Kutch and about 1764, after the battle of Jarru, a bund was built across the Koree in Sind by Ghulam Shah to divert its water into other channels. In 1802, another effective bund was constructed at Ali Bandar and the waters of the Indus were prevented from entering the Rann. The fertile rice fields of 'Saira' gradually changed into Rann.

The Indus delta is subject to earthquakes. According to Burnes, an earthquake in May 1668 destroyed the town of Samawani in the Indus delta. In June 1819, the great Kutch Earthquake occurred. This was accompanied by a sudden depression of a large part of the Rann north of Lakhpat including the fort of Sindri which was a customs outpost on the banks of the Koree, and a raising of the land further to the north, forming a long elevated mound popularly called 'Allah Band' about 50 miles long crossing the Koree channel transversely. The sinking of the Koree bed round Sindri caused an inflow of sea-water and the formation of a salt lake extending for 16 miles on each side of Sindri.
Sir A. Burnes\(^9\) says that "this embankment was elevated about 10 ft. from the level of the river and is composed of soft clay, mixed with shells, having the appearance of being cut through at some late period, the side being quite perpendicular."

Although occasionally, exceptional floods of the Indus burst into banks and caused the flood waters to cross the Allah Bund, the Sindhis soon repaired the bund and prevented supply of water to Lakhpat.

In 1844, the Sindri lake and surroundings were surveyed by captain Baker. The lake was then 34 miles long and 150 sq. miles in area. In 1907, according to Mr. Sivewright, the lake had completely dried up. Now, of course, with the Sukkar Barrage and the full utilization of the Indus waters in Sind, no water enters the Rumm of Kutch.

"Tradition has it that there were many ports both in the Greater Rumm and in the Lesser Rumm." Examples of such ports are Vavania and Khor on the Kathiawar coast. At Vavania, north-east of Navlakhi, an ancient boat without any iron in it, but with cordage of coir, is reported to have been found at a depth of 15 ft. in the mud in the Rumm. Harbours are said to have existed on the Patcham Island in the Greater Rumm and at a place called Nerona 20 miles N.N.W. of Bhuj. Sir A. Burnes says that "numerous pieces of iron and ships" nails were thrown up at
Phangwaro (west of Patcham Island) at the time of the great Earthquake.

Wynne\textsuperscript{10} states that at one spot on the northern shore of the Patcham, some traces of this old sea have been found in a small patch of sub-recent littoral concrete full of marine-shells. This was clearly in situ resting upon local Jurassic rocks to a height of nearly 20 ft. above the level of the Rann, but sloping towards it.

There is no doubt then, that the Rann of Kutch has been formed by fluvial deposition of sand, silt and salt and that the Hills of Kutch and Kathiawar have contributed to them and protected the sediments from sea action. The main sources of sediments have been:

(1) The Indus, and perhaps also other rivers between the Indus and the Loonse, now lost in the desert,

(11) The Loonse,

(111) The Banas, Saraswati and Rupen falling into the Little Rann, and

(iv) The northward flowing monsoon streams of Kutch and Kathiawar.

\textbf{GENERAL DESCRIPTION OF THE AREA}

Encircling the main land of Kutch to the north,
east and south is the Runn of Kutch situated between 20°47' to 24°N and 68°26' to 71°10' E, a great salt waste, which covers an area of about 8,000 sq. miles. It consists of two parts called the Great Runn in the north and the Little Runn in the south which are joined by a narrow four mile wide strip between Adesar, location 23°34'N and 70°58'E and Piprala location 23°40'N and 71°5'E. Commencing from the mouth of Khori Creek (Arabian Sea), the Great Runn forms a west to east strip of country of about 180 miles long and varying from 30 to 60 miles in width and comprises a total area of 6,500 sq. miles, including 1,000 sq. miles under Banni. The Little Runn takes its origin from the Hansital Creek opening into the Gulf of Kutch and runs W.S.W. to E.N.W. It is about 60 miles long, and 5 to 30 miles broad enclosing an area of about 1,500 sq. miles.

Map 1 shows the sites visited. Map 2 locates the area under study in a map of India. Map 3 locates the sites wherefrom the samples of water were collected. Map 4 shows the boundaries of the area, the two Runns and the Banni area. (See p.49 a, 34 a, 108 a, and 35 a).

PHYSIOGRAPHY OF THE AREA

The mainland of Kutch is an elevated plateau with scattered low bare hills and hillocks, seldom rising above 1,000 ft; while the Runn of Kutch is not
very much above the mean sea level and is almost flat excepting localised minor depressions and elevations. Three types of features are recognised in the Runn. The first is known as Runn, salt soaked plain, which gives its name to the whole tract. The second known as Dhoi or Bet, a sandy soil free from salt, with a cover of grass and occasionally stunted trees and bushes, is found round the margins of the Runn and islands of various size and the third is known as Kalar or Kala and Lana, a transition between the first and second, with comparatively less content of salt and bears some scattered vegetation. On the higher grounds which have been raised above the flood level by the accumulation of wind borne material, the salt has been washed out by rain and in the larger patches fresh water may be found in shallow wells, though deeper excavations would find only the same salt subsoil water that underlies the Runn. One such large area of grass land, Danni, probably a bank or bar of soil brought down by the north flowing Kutch streams lies south of Patcham island extending westwards along the north of Kutch mainland for a length of about 50 miles and a breadth of about 20 miles. Of the islands in the Runn, the important are Patcham, Khadir and Bela in the Great Runn and Pung in the Little Runn.

An idea of the relief of the Runn may be gauged from the following levels along particular
alignments, referred to G.T.S. datum line.

GREAT RUNN

1. Lakhpat to Moghalbin... The level is 7 ft. for a distance of 20 miles.
2. Lakhpat to Badin ...... The level varies from R.L.3 to R.L.5.
3. Najipir to Allahbund... The levels in the Runn crossing are likely to be about 8 to 10 ft.
4. Dhori to Kavada ........ The levels in the Runn crossing about 3 miles wide are likely to be 10 to 12 ft.

LITTLE RUNN

1. At Malia Crossing ..... R.L. about 7 ft.
2. Between Manaba and vensar................. R.L. is approx. 8 ft.
3. Between GonthAna and Tikar............... The levels are likely to be 8 to 9 ft.
4. Between Adesar and Piprala.............. The level at the junction of Great Runn and Little Runn are 12 ft.
5. Across Adesar and Piprala crossing....... 4 to 6 ft.

From the above data it is evident that there is an imperceptible east to west slope in the two Runns. In the Banni area, which is slightly higher in level than the Runn the slope differences are not conspicuous.
APPENDIX OF SEA WATER, FLOODS AND DRAINAGE

"The maximum distance of the penetration of sea water in the pre-monsoon period particularly from April to early July is roughly the line Nada bet, Pung island and Khuda in the Little Runn, while in the Great Runn it is to a point approximately 6 miles east of Patcham island. During the monsoon period, a number of rivers, Luni, Banas, Saraswati, Rupen, Phulka and Bhoman from the adjoining territories of Rajasthan and Saurashtra and the streams from the mainland of Kutch discharge their waters into the Runn, the flood water depth varying between one to seven feet in different parts. The strong winds from S.W. and S.S.W. force the sea water into the Runn and due to an admixture with sea water flood water is rendered saline. During the monsoon period the water in the Little Runn at the Kalia crossing which is nearer to the Gulf of Kutch, "remains sweet and drinkable for the first fifteen days of the floods but later slowly turns saline." Near the Bela island of the Great Runn "the water remains sweet only for the first three or four days of the flood." It is said that part of the Banas river water moves slowly north and flows into the Great Runn but Luni water, which is supposed to be partially saline, does not enter the Little Runn. The Banni area is apt to be under water in times of high flood upto a depth of one foot."
The flood water stands on the ground from early July to end of September. By October the ground is clear of water but the surface remains soft to a varying degree at different crossings till about December. The area remains dry from December to early June. Thus the distribution of the total area of the Bunn may be computed as follows:

<table>
<thead>
<tr>
<th>Area</th>
<th>Sq. miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banni</td>
<td>1,000</td>
</tr>
<tr>
<td>Area flooded by river waters (Great and Little Bunn)</td>
<td>1,900</td>
</tr>
<tr>
<td>Area carrying surface deposit of salt</td>
<td>1,700</td>
</tr>
<tr>
<td>Area under sea-water in Great Bunn</td>
<td>1,600</td>
</tr>
<tr>
<td>Area under sea-water in Little Bunn</td>
<td>500</td>
</tr>
<tr>
<td>Area now under Pakistan</td>
<td>1,300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,000</strong></td>
</tr>
</tbody>
</table>

The data on the total volume of water estimated to flow into the two Runns from the catchment areas during the monsoon period is summarised in Table A.
<table>
<thead>
<tr>
<th>Source of catchment</th>
<th>Drainage area (sq. miles)</th>
<th>Average rainfall (inches)</th>
<th>Run-off (percent)</th>
<th>Volume of Run-off (sq. mile ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Great Runn Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Great Runn</td>
<td>5,372</td>
<td>6</td>
<td>80</td>
<td>3,149</td>
</tr>
<tr>
<td>2 Luni Basin</td>
<td>14,788</td>
<td>16</td>
<td>15</td>
<td>2,957</td>
</tr>
<tr>
<td>3 Banni</td>
<td>1,081</td>
<td>6</td>
<td>18</td>
<td>43</td>
</tr>
<tr>
<td>4 Kutch</td>
<td>2,819</td>
<td>14</td>
<td>12</td>
<td>395</td>
</tr>
<tr>
<td>5 Allabund</td>
<td>788</td>
<td>6</td>
<td>80</td>
<td>178</td>
</tr>
<tr>
<td><strong>Total...</strong></td>
<td></td>
<td></td>
<td></td>
<td>6,722</td>
</tr>
<tr>
<td><strong>Little Runn Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Little Runn</td>
<td>1,474</td>
<td>15</td>
<td>80</td>
<td>1,474</td>
</tr>
<tr>
<td>2 North flowing rivers...</td>
<td>1,635</td>
<td>30</td>
<td>30</td>
<td>1,226</td>
</tr>
<tr>
<td>3 West flowing rivers...</td>
<td>5,880</td>
<td>40</td>
<td>30</td>
<td>5,880</td>
</tr>
<tr>
<td>4 South and East flowing rivers</td>
<td>652</td>
<td>15</td>
<td>20</td>
<td>163</td>
</tr>
<tr>
<td><strong>Total...</strong></td>
<td></td>
<td></td>
<td></td>
<td>8,743</td>
</tr>
</tbody>
</table>
From the figures given in the last column of Table A, it is evident that a large volume of run off water (6,722 sq.mile ft. in the Great Bunn and 8,743 sq.mile ft. in the Little Bunn) which is now running waste will be available for washing out the salt from soil under controlled and regulated conditions, particularly in the Little Bunn.

CLIMATE AND WEATHER OF THE BUNN AND ITS SURROUNDINGS

The Bunn lies between 23° and 24°S in the subtropical zone of the northern hemisphere and the skies are unclouded except for two months in the year. The maximum temperatures in May go up to 115°F and more. The atmosphere is very dry; even during the monsoon, when there are strong west-south-westerly winds from the Arabian sea at the surface, the air above 1½ km. is generally dry and of continental origin.

The average annual rainfall in the Little Bunn is about 15" and in the Greater Bunn 10". 92 to 95% of the rainfall occurs in the monsoon months, June to September. The rainfall decreases towards the north-west. Apart from the scantiness of the rainfall, its year to year variability and the variability of its distribution during the season is great. The further west we go, the greater is the variability of the rainfall. Defining the
variability of rainfall as \( V = \frac{d}{R} \times 100 \),

where \( R \) is the mean rainfall and \( d \) its standard deviation, Dr. Ramdas\(^1\) gives the following values of the percentage year to year variabilities of rain in the different monsoon months in Sind, W. Rajasthan and Gujarat.

**TABLE B**

<table>
<thead>
<tr>
<th>Region</th>
<th>June R</th>
<th>July R</th>
<th>August R</th>
<th>September R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sind</td>
<td>0.4</td>
<td>2.4</td>
<td>1.7</td>
<td>0.5</td>
</tr>
<tr>
<td>W. Rajasthan</td>
<td>1.1</td>
<td>3.4</td>
<td>3.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Gujarat</td>
<td>5.3</td>
<td>13.1</td>
<td>7.9</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Most of the rainfall in the Rann and its surroundings is associated with the passage of monsoon depressions or storms across Gujarat. When the depressions are few, or pass too far away from Gujarat, the rain fails.

The suggestion has often been made that the climate of W. Gujarat and Sind has been changing and is even now changing for the worse. It may be worthwhile to summarise the evidence. There is little doubt that 4,000 to 5,000 years ago when the early Indus civilization...
was still active, there was greater rainfall in Baluchistan and Sind and presumably also in Gujarat. "The reasons for this view have been given by the archaeologists of Mohenjo-daro and Harappa. The Indus valley to the south of Mohenjo-daro which is now a sandy desert except in artificially irrigated areas, once supported great cities which used millions of baked bricks in their construction. Fuel and hence forests should have been plentiful. There were rain water drains in the ruined cities. Among the seals are vivid representations of marshland and jungle animals like tiger, elephant, rhinoceros and buffalo, the pictures of the desert animal camel, are scarce. In the Baluchistan hills, there are many ruined irrigation dams near chalcolithic sites implying greater rainfall and sustained effort at controlling irrigation. While it is conceded that part of the deterioration in plant life might be due to human intervention such as the wholesale cutting down of the forests, the desertion of cities and towns due to invasions etc., still the existence of large and civilised settlements for over a thousand years must certainly have meant a more congenial climate than prevails to-day either near Mohenjo-daro or Harappa." At the time of Alexander's invasion, Sind was well populated and he had to fight many stiff campaigns on his way from the Punjab to the sea. From the difficulties he had to experience in his further passage across Baluchistan, it is clear, however, that Baluchistan
had even then been arid. More abundant rainfall in Sind and Baluchistan implies either a westward extension of the monsoon or a southward extension of the winter rains.

Coming to the recent past, we have rainfall data extending for a number of stations in Gujarat to over 70 years and for a few stations to 100 years. The rainfall data of the whole of north-west India have been examined by Dr. S.K. Banerji and Dr. S.K. Fremanik and for Gujarat by Dr. B.N. Desai. Dr. Desai concludes that "there is no persistent tendency to decrease over Maha Gujarat during the period under consideration."

Considering the rainfall averages for all the years for which data are available up to 1886, 1920 and 1940, Dr. Banerji found that there was a significant progressive decrease of rainfall in N.W. India and an increase in E. Rajasthan, Madhya Pradesh and Uttar Pradesh. Examination of the 10 years running means of rainfall for stations in Saurashtra and Kutch however shows that while there was a slow decrease in rainfall from 1850's to 1900-05, there was again an increase in the period 1915-30. From the evidence at present available, we can only say that there are certain long-period fluctuations in the general circulation of the atmosphere which leads to oscillations of the Indian monsoon, but cannot say either that there is a progressive decrease in the monsoon rainfall or assign a definite period for the oscillation.

From the middle of April the temperature rises...
and the maximum temperature is recorded in May and June.
The highest and the lowest temperatures recorded at
Bhuj are 111°F and 40°F respectively. The rain-factor
and N.S. Quotient for the Great Rann region (Bhuj to
Budin area) are low and characteristic of a semi-desert
and semi-arid climate, while the climatic conditions
in the Little Rann (Bhuj to Jamnagar) are nearer to
arid or semi-arid conditions.

VEGETATION OF THE AREA

Vegetation of Kutch is described as desert
vegetation by Hardy (1913); semi-desert by
Unstead; poor steppe land by Johnstone and tropical
thorn forest by Champion (1936). There are scattered
thorn forests in Kutch. In the Rann proper there is
no vegetation but in the Banni tract, camel bush, a
small Euphorbeaceous shrub or coarse grasses and groves
of babul (Acacia species) are the characteristic
vegetation.

Only extremely xerophytic vegetation can
survive in this area. Two major ecological divisions
are, arid region where vegetation is very poor with
vast barren areas and semi-arid region where plants of
the most xerophytic typo are found. De Martonne (1926)
has employed index of aridity to delimit the different
vegetational zones on the earth. According to him,
indices below 5 characterize the true desert from botanical point of view, indices about 10 correspond to the dry steppe, those of 20 more or less to prairies and above 30 to forest vegetation. The index of aridity for Bhuj is 9.3. The most important crops of Kutch are bajra (pennisetum typhoides) and cotton. Cultivation terminates a few miles from the edge of the Runn.

It has been a belief with many people that the Runn of Kutch is extending its territories. An attempt is made in the thesis to examine how far this belief is justified.
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