CHAPTER II

AGRICULTURAL GEOGRAPHY OF BROACH

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I. CLIMATE AND SEASONS

A survey of the conditions of agricultural production in Broach during the early decades of the nineteenth century is a testimony to the extent to which agriculture was exposed to the vagaries of nature. The average rainfall in Broach for a series of years ending in 1849 was recorded at about 33 inches - barring the coastal zone to the south which had a higher average.[1] Spread between mid-June and mid-October, and supplemented by heavy dew from October to December, the rains were deemed not insufficient for the needs of the flat, absorbent and imperfectly drained surface of black soil comprising the greater part of the plain of Broach.[2] In reality, however, the rainfall regime was characterised by great instability and contemporary accounts abound in references to "great fluctuations of seasons".[3] If at one time it was the failure of rains that caused a serious setback to cultivation, at other times it was heavy rains. Sometimes it was excessive heat while on other occasions frost that inflicted serious injury to the crops. Insects and pests also took their toll. The seasons fluctuated greatly and even within the district weather variations were substantial. C.W.Martin, the superintendent of the Experimental Cotton Farm at Broach complained in 1832: "the climate and weather differ so much at villages situated only at very short distance from each other that the crops are as various in quality as possible at different places".[4] He illustrated the point with an instance of that

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1. Bombay Presidency Gazetteer, Vol II, Surat and Broach (Henceforward Broach Gazetteer), 1877, p. 353.
2. Ibid, p.353.
3. Broach Collector's letter, 1.2.1818; Revenue Department (Henceforth R.D.), 127,1818.
4. R.D., 6/413,1832.

year : "at the farm this year we have had no rain since the 20th August, whereas in many parts of the Pargana the heaviest fall of the rain has been since that period".[5]

During our period of study the incidence of 'bad years' due to either inadequate or inordinate rains, is conspicuously high. There was a partial failure of crops in 1805-06 due to delayed monsoon.[6] In 1808-09 heavy floods destroyed the first crops sown.[7] It was again heavy rains in July and August of 1813 that damaged the crops. The damage to crops was further aggravated by want of a seasonable after fall of rain. Cotton had to be resown twice, and in some villages thrice during that season.[8] The "extreme drought" of 1815/16 "caused the rice crops to be particularly unproductive in every village" and "cotton also suffered considerably" in Ankleshwar and Hansot parganas. The collector had to plead to the Bombay Government for a reduction of the demand.[9]

In 1816-17 the rains "discontinued after the 5th August, (and) the Crops Consisting of Wheat and Jowaree entirely failed", reported the collector while on his tour through the villages. He further observed that "from a Cloudy sky accompanied with great heat for this time of the year, the Lang and Till in these Tuppahs are nearly destroyed by a worm that has gone into the shell of the seed".[10] The year 1818/19 was "very bad and less land had been cultivated".[11] The next year was also of extreme hardships for the peasants. The district collector reported in his dispatch to the government that "incessant Rain for these two last monsoons had nearly destroyed all the Chomassee crops

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5. Ibid.
6. Collector's letter, 16.1.1806, R.D., 48-A, 1806.
7. Revenue Commission's letter to Bombay 20.12.1808, R.D., 64, 1808.
8. Coll. to Bombay, 13.12.1813, R.D., 90, 1813.
9. letter, 10.4.1816, R.D., 112, 1817.
10. letter, 10.4.1816, R.D., 112, 1817.
11. Collector's letter, 9.7.1819, R.D., 144, 1819.

Kharif and when the period arrived for sowing the Sealoo Irabi, the lands that would have been with a favourable season covered with cultivation exhibited the same appearance as those that had not received any seed".[12]

In 1823-24 the partial failure of rains affected the crops and consequently the land revenue. The fall in the revenue of Jambusar pargana, according to the first Assistant to the Broach Collector, "proceeds from the almost total failure of the Dangur crops owing to the want of a seasonable supply of rain at the latter part of the monsoon".[13]

Of all the crops in this district the cultivation of wheat was most vulnerable to nature's uncertainties. Too low or too heavy a rain could harm it considerably. It was also more prone to attack by insects and diseases. In 1827-28, the wheat crop "suffered considerable injury from blight which the native call Gerwa". In local reckoning the gerwa was "a wind that passes over the crop in the night or early in the morning leaving behind it a red powder which has the effect of drying the stem and shriveling the grain".[14] For the rain failure in 1833 we have the collector's report: "the Dangur and Kodra plants in the Oklesur Pargana has been burnt up .... and should we not have a considerable raintall in the course of 3 or 4 days the Kuppas and Jowaree will be much injured. In Jamboosar also the Dangur crop entirely burnt up. The plants of Kuppas, Kodra and Bajree are also looking very unhealthy. In some of the villages a kind of Black insect are(sic) destroying the plants. The cattle are miserably off for want of forage. Amod, Wagra, Hansot talukas (are) experiencing the same".[15]

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12. 1.6.1820, R.D., 156, 1820.
13. R.D., 12/96, 1824.
14. 18.3.1828, R.D., 3/208, 1828.
15. letter No. 24, 12.8.1833, R.D., 34/5/8, 1834.

However,it was in 1834-35 that the district was worst hit. Very heavy rains totally destroyed all the cotton and jowaree crops grown on low land. In the month of August "the Inundation was so excessive that the Southern part of the Town of Broach was completely flooded, so much so as to drive the Inhabitants from their Houses". Many of the cattle were carried off by the floods, almost all the huts were washed away and number of houses collapsed.[16] After the flood, crops were attacked by locusts. The collector's annual report carries a vivid account of the calamity. A few glimpses from it: "About the latter end of October and the beginning of November the leer or locusts made their appearance in swarms in the Eastern direction of the Broach Pargana. They are said to have originated from the Beer or Grass lands. The ravage which these insects made was very extensive towards the Chomasoo Jowaree, Bajree, Tuver, Tullee,... The destructive progress of the Locusts was put a stop to by the Swarms of Birds which soon after made their appearance and devoured as many of them as they could get hold of in their flight which they took in the direction of the sea ".[17] There were other predators too "Previous to the flight of the Locusts from this Zillah the Khuperee and kumsaree both of which may be said to belong to the Grass hopper tribe had made their appearance ... The kumsaree destroyed the Badgeree in large quantities after it was cut down and destroyed stocked in the fields,consumed the mutt,mung,urud,and such other crops as do not grow high... The Khuperee caused destruction by sucking the milk from the venomous effects of its bite which is said to contaminate the Plant and to prevent its vegetation".[18] The effect was compounded when "the sudden Frosts and intense cold,which prevailed successively on the 19th,20th and 21st January totally changed the appearance of the

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16. Collector's letter No. 519, R.D., 34/578, 1834.
17. letter No.245, 1.8.1835, R.D., 8/695, 1836, paras 9-11.
18. Ibid, paras, 12-14.

country". It was "truly lamentable ....Everything wore a withered and shrivelled appearance".[19] With many villages abandoned by their inhabitants, there was sharp fall in the land revenue of the year.[20]

Following a period of three comparatively good years, the year 1838-39 once again saw a "failure of the rains which completely destroyed the Rice & early Jowaree crops, prevented cultivation of wheat, Gram, Laung &ca and dried up the late Jowaree and Cotton Crops so that they did not yield a third of their usual produce".[21] The extent of this failure is indicated by the revenue which fell by Rs.10,73,000 over the collections of the previous year.[22]

2. Soils

The whole of the Broach district is one huge plain of alluvium and its soil is free from rocks or stones: "the soil may be said, indeed, to be even without a pebble" observed the Revenue Surveyor in 1819.[23] The soil is classified into two grand divisions, viz. marwa or gorat and Kalibhoi or black soil. The Marwa or gorat is a sandy soil, of a light brown colour. It absorbs the rain rapidly, and never presents a broken surface in the dry season, or a muddy one in the monsoons. Fine water is found in almost every part of it at a comparatively short depth from the surface (i.e. at thirty to thirty five feet). The fields of marwa were everywhere enclosed with tall, thick, live hedges,[24] probably the only example we have of enclosed fields in India.[25] The soil abounded too with fine umbrageous trees, not only in the

19. Ibid, paras 18-19.

20. Ibid, paras 2 & 16.

21. Collector's letter No.221, 28.9.1839, R.D., 17/1101, 1840.

22. Ibid

23. Monier Williams, Memoir of Broach, Bombay 1855, p.41

24. Ibid, p.17.

25. Irfan Habib, Agrarian System of Mughal India, Bombay 1963, p.28.

hedge, but in the fields. The most commonly found trees being the mango, but the tamarind, mowhra,[26] bur, the peepul etc. are not rare and grow luxuriantly.[27] The largest tracts of marwa are to be found chiefly in the Jambusar pargana. In 1820 it amounted nearly 30% of the total arable land of the pargana.[28] The breakdown for the other parganas of the district is as follows : Dahej 8% ; Amod 6.5% ; Hansot 3% ; Broach 8% ; and Ankleshwar 1%.[29] The marwa soil of the last three parganas included a distinct sub-category called bhatha. This is of an extremely rich quality and is found chiefly on the bank of the Narmada. In contemporary assessment "the very nature of this kind of soil, composed of the finest reduction of organic and inorganic particles of a rich mineral and wooded valley, gives it a decided superiority over other soil of the district".[30]

However, the marwa soil is not peculiar to Broach. It comprises a considerable portion of the lands of central Gujarat, commencing with the southern boundaries of the Jambusar and Baroda parganas, and extending to the northern extremity of the province. It is bounded to the west and south by a line running about north-west from Cambay.[31]

The agricultural produce of the marwa of Broach was wide-ranging including (as it did) bajri, baoto, Kodra, Jowar, cotton, dangar or dry rice, math, tuver, tal, divelt or erandi, val, mug, urad, chora, gawar, banti, chana, lang, ambadi, bhendi and pan or indigo.

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26. Mowhra tree was valued for its flowers, fruits, seed and timber and was of considerable economic importance to a large proportion of the poorer classes. The fruit was sometimes eaten but the principle edible product was the succulently developed flowers which were very largely used both as an article of food and for the manufacture of a spirituous liquor. Ct. G.R. Ambekar, Crops of the Bombay Presidency, Bombay 1927, p.146.

27. Memoir of Broach, p. 17.

28. Ibid, p.7.

29. Ibid, pp.10, 13, & 17.

30. Selections from the Records of Bombay Government (Henceforth SRBG), No.CCCCVII, New Series, Bombay, 1902, p.41.

31. Memoir, p. 17.

The Kalibhoi is the soil of by far the greatest part of this district. But it is also found in the adjoining parganas of Surat, in Saurashtra, in a great part of Malwa, and in the valley of the Deccan.[32]

The Kalibhoi has the appearance of a very rich mould. It is entirely free of stones and looks superior in fertility to the marwa[33] though in reality the marwa is a superior soil. The black soil is eminently suited to the cultivation of cotton, although the quality of its produce differed from place to place according to the depth of the soil. As N.B.Beyts, the acting superintendent of revenue and assessment had observed :

> In some parts the stratum of pure soil is above 4 feet, and in other barely covers the underlying calcareous earth mixed with nodules of kanker. In as much the tap root of the cotton plant for full development needs a depth of at least three or more feet of soil, it is not surprising that as soon as it reaches kanker, or the dry and hard stratum which the clayey surface has deprived of the benefits of rain penetration, the plant should immediately become stunted, and give rise to the supposition that the soil must be of a different texture. The grayish appearance it sometimes assumes is owing to the subsoil becoming mixed up with it - 34

Broach soils were considered a debris of ancient forests, a true alluvium, and the depositions of still water. Beyts speculated that the "idea of Broach once having been the bed of the ocean may not appear extravagant, when geologists recognise several parts of the high land of India to have been under the same element".[35]

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32. Ibid, p. 20.

33. loc.cit.

34. SRBG, CCCCVII, N.S., p. 40.

35. He substantiates this with an observation: "An instance of this formation is now occurring in Alibet, an island at the mouth of the river, proving in a great measure... This island which has attained within a comparatively short time an area of 22,000 acres is covered by a dense forest of marine trees growing upon black clayey soil in every respect very different from the siliceous accretions caused by annual floods higher up in the channel of the river; but is still incapable of culture, owing to the tide covering most parts of it, and the total absence of sweet water". Ibid, p.40.

Expansion and contraction are the peculiar features of black soil. In the hot weather the land is covered with cracks, deep and wide, which disappear on the first advent of monsoon showers. The periodical expansions and contractions being injurious to the growth of trees, the black soil areas were devoid of trees and hedges, - in sharp contrast to marwa or gorat lands. This also necessitated ploughing the land soon after the rains to preclude the formation of cracks.[36]

In the opinion of British surveyors the kalibhoi of the twenty one bara villages of the Jambusar pargana and of some of the western villages of the Broach and Amod parganas, was of an inferior kind. In these areas the black soil deposit is thin and consequently the land not very much higher than the level of the sea. Furthermore these villages are separated from the sea by a perfectly flat tract whose surface is impregnated with salt, and which produces no vegetation. The dust blown from this salt tract called the khar, damages the fields of the adjoining villages.[37] Distinct from this inferior, salinated type of black soil is the kanam or pure black soil.[38]

The major agricultural produce of black soil is cotton, but jowar, wheat, dangur, gram, divel, tal, mug, and tuver are also raised. Wheat formed almost the only produce of the lands of the bara villages. In the better kind of black soil its cultivation is minimal.[39]

An estimate of the productivity of the marwa and black soil in respect of the principal crops was made in 1818 in forty villages of Jambusar pargana. The results are set out below in Tables I and II.

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36. P.R.Mehta, The Elements of the Agriculture of the Bombay Presidency, Bombay 1905, p. 27.
37. Memoir of Broach, p. 20.
38. W.E.F.Robertson, Glossary of Gujaratee Revenue and Official Terms, Bombay 1865, p. 41.
39. Memoir of Broach, p. 21.

TABLE I

PRODUCTIVITY OF MARWA SOIL IN SERS PER ACRE

Crops	Minimum	Maximum
1. Bajri with Rathor	250	670
2. Kodra	350	1340
3. Baota	350	1680
4. Jowar	250	670
5. Kapas (Cotton)	170	590
6. Dangur (Rice)	350	670
7. Muth with Bajri	-	170
8. Tal with Tuver	80	250
9. Tuver with Tal	60	170

Source : Monier Williams, Memoir of Broach, p.19

TABLE II

PRODUCTIVITY OF BLACK SOIL IN SERS PER ACRE

Crops	Minimum	Maximum
1. Jowar	170	670
2. Kapas	110	500
3. Wheat	90	380
4. Gram	100	250
5. Divel (Castor Oil Plant)	60	340
6. Tuver with Tal	80	170
7. Tal With Tuver	80	250
8. Dangur with Kapas	130	670

Source : Monier William's Report dated 15.10.1821, R.B., 23/23, 1821, folio 31.

While the above tables exhibit the two extremes of productivity we have data (1833) on the average yield per acre separately for each pargana. They, however, do not relate to soil differences and have been set out (See Table III) to illustrate the substantial differences in crop-yields within the district.

TABLE III

AVERAGE PRODUCE PER ACRE IN SERS, 1833

	Broach	Wagra	Ankleshwar	Hansot	Jambusar	Amod	Dahej
1. Cotton	192	216	235	240	192	240	300
2. Jowar	560	800	364	320	480	480	360
3. Bajri	240	312	542	-	320	480	240
4. Wheat	560	320	254	240	480	480	240
5. Kodra	320	640	580	160	480	960	-
6. Lang	640	320	-	480	640	960	240
7. Tuver	480	240	-	240	640	480	240
8. Divel	480	240	360	320	320	320	-
9. Tal	200	180	428	240	480	160	120
10. Tobacco	1100	800	-	800	-	480	-
11. Dangur	640	960	800	240	-	240	320
12. Gram	560	240	330	-	480	320	240

Source: Broach Collector's letter No.473, dated, 2nd February 1833, R.D., 16/484, 1833.

Over and above these basic categories of land, namely marwa and kalibhoi, 19th century Broach had a few celebrated tracts of land recognised for the exceptional quality of their soil. One such tract, in the words of Monier Williams, was the ridge running along the northern side of pargana Ankleshwar "parallel with the south bank of the Narmada distant from it from two to four miles, and said once to have been its bank. The soil of the tract between this ridge and the present bank of the river is of the richest description of gorat or marwa, or, as it is called at some villages, "eetana". Some parts of this tract are laid out in plantain, guava, lime, and other gardens, and in sugarcane

plantations. There are fifteen villages, the lands of which are situated, entirely or partly, on this rich flat, which is also designated by the general term 'bhata'".[40]

Another exception to the general description of soil was a strip in Hansot pargana called morkanta, so designated from the number of peacocks found on it. It commenced near the mouth of the Kim river, and running northerly, comprised part of the lands of villages of Kantijal, Samli, Wamlesar and Katpur. "Its breadth varies from two to four furlongs, rising in the middle, and sloping gradually to the east and west. It is a very remarkable tract of pure marwa or gorat, being enclosed with hedges and bearing trees, although an arid salt bounds it on the west, and the open, bare, level kali bhoi on the east".[41]

A third category of exceptionally productive lands were those devoted to rice cultivation. Here ground was cut into beds or kiaris and watered from adjoining tanks. In favourable seasons these could produce from thirty to forty maunds of rice of fine quality per bigha.[42] In case of black soil kiaris, which retained

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40. Memoir, p. 3.

41. Ibid, p. 5.

42. Ibid, p. 3.

moisture, for a longer period, a crop of val or divela was sown after rice in the cold weather.[43] However, during our period of study, the kharis did not exist in abundance and were found in small number in Ankleshwar, Hansot and Jambusar parganas.[44]

3. Cropping Pattern

Cotton was the major crop grown in Broach. It occupied an average of one-third of the total cultivable land of the district throughout our period.[45] An idea of the proportion in which the different crops were raised in Broach district may be formed from the following table relating to the year 1850 - 51.

TABLE IV

CENTESIMAL PROPORTION OF EACH PRODUCT IN BROACH DISTRICT : 1850 - 51

Cotton	39.39	Divel	0.51
Jowar	28.41	Tobacco	0.35
Wheat	7.63	Some grain	0.13
Bajri	2.61	Kasumba	0.12
Tuver	1.38	Sugarcane	0.06
Rice	1.27	Indigo	0.02
Lang	1.01	Miscellaneous	1.18
Kodra	0.78	Fallow, Grass Land & Temporary Waste	14.43
Til	0.71	Total	100.00

Source : Revenue Commissioner, N.D. to Bombay, 25.1.1853, R.D., 11 of 1853, folio 179.

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43. P.K.Mehta; op.cit, p. 30.

44. Memoir, pp. 3, 5 & 7.

45. Percentage of cotton cultivation to total cultivation for a series of years 1834/35 to 1845/46 was 33, 42, 40, 46, 54, 49, 47, 40, 40, 34, 44, 45. vide: J.M.Davies, Broach Collector to D.A.Blane Revenue Commissioner N.D., No.141, 5.7.1847, R.D., 57, 1848.

Cotton cultivation remained at the heart of the agricultural economy of Broach. It served as a major source for the peasants to meet the state demand even for other crops.[46] It had also been of prime interest to the British as an important article of trade.

The marwa produced two kinds of crops viz. kathor or pulse crops and dhan, the grain crop. The varieties of kathor cultivated were math, val, gavar, mug, and chora. These were consumed as green vegetables as well as in the form of pulses. Gavar, however, was eaten only as a vegetable while it was green; once dry it was used as fodder.[47] The dhan crop included bajri, kodra, dangur, baoto, banti, etc. Both kathor and dhan were kharif crops, that is, they were sown at the commencement of the rains, and were reaped in the months of October and November.[48] In very small quantities either cotton or jowar was produced in the best marwa lands. Hence the rabi cropping was comparatively insignificant in the case of marwa lands.

Bajri was entirely a kharif crop. It ripened in October. As a rule it was always sown together with some crops of kathor. Two or more crops from amongst math, mug, chora, urad, gavar, and tal were sown subordinate to bajri.[49]

Jowar was the major grain crop of the black soil. It was never sown for two successive seasons on the same ground. In most parts it was sown alone but tuver and mug were sometimes sown with it in the best lands. The main crop of jowar in Broach was known as sialu, which was sown in August, and

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46. Collector's letter, 20.8.1842, R.D., 14/1456, 1843.
47. Memoir, p.18.
48. Ibid, p.18.
49. Mehta, op.cit. p. 151.

harvested in February. Though the late rains were deficient in Broach its deep black soil and the level nature of the ground preserved the moisture to such an extent that, normally, no crop except rice ripened in it during kharif.[50] For this purpose the cultivation of jowar in black soil required special preparatory methods : After one or two ploughing, the soil was put to repeated harrowing during the rainy season. Thereby the weeds were destroyed and the soil turned loose and open, allowing the rain water to seep into the lower levels. The need for hand-weeding was eliminated because the field was thoroughly ploughed before being sown.[51] A minor crop of jowar called chomasio jowar was sown in June ; ripening about the end of October.[52]

In the succession of crops, jowar commonly succeeded cotton with a period of wasul (vashil) or fallow separating the two. Alternatively in the interval chana, til-tuver, or wheat was sown.[53] The jowari straw called kadbi in Gujarat, yielded good fodder. It found a ready market in the towns, and the produce from an acre of land generally fetched a value of Rs.1 1/2 to Rs.1 3/4 in 1820.[54]

Wheat formed almost the only produce of the lands of the bara villages. It was also cultivated, marginally though, in the better kind of black soil. Here again the soil had to be prepared in very much the same fashion as in the case of jowar. Following this the wheat fields rarely required either hand-weeding or intercultivating.[55] Sown in late September or early in October, the crop ripened in March, when it was pulled up by the roots. The wheat grown in Broach was of the "bearded kind", and was about 18 inches high when fully grown. Being easily affected by too much or too little rain (in addition to the common menace posed by deer, birds, and insects), wheat proved to be the most uncertain of the crops.[56] However, when the late rains were favourable, and

50. Ibid, p. 138.
51. Ibid, pp. 142-43
52. Memoir, p. 21.
53. Loc.cit.
54. Loc.cit.
55. G.K.Ambekar, op.cit. p. 157.
56. Memoir, p. 21.

the cold weather was clear and produced sufficient dew, there would be a bumper harvest.[57] The relatively large quantity of seed required in the cultivation of wheat was a serious drawback in the economics of wheat production. While the price of wheat and jowar was generally about the same in the market, the former took about 38 sers of seed per acre, the latter about five sers.[58] An experiment made at Dolia, one of the bara villages of the Jambusar pargana, in March 1819, to ascertain the production of wheat farming revealed that an acre produced about 336 sers. The field on which this experiment had been made was kept fallow in the preceding season without being manured.[59]

The cultivation of lang in Broach requires special note as it constituted, as late as 1915, 82% of the total produce of lang in the Bombay Presidency.[60] It was a coarse kind of pea, notorious for producing paralysis if eaten in excess. The pulse of the lang was inferior and was usually consumed by the poorer classes. Its fodder, however, was highly nutritious and was reserved as food for cattle employed in heavy work. Lang was invariably grown alone and it thrived best on deep, retentive, black soil. It was grown as winter crop on land which would raise no other kind of pulse. Fields, which became water logged and too wet for cotton in the kharif season, were occasionally sown with lang. The field was repeatedly ploughed and harrowed and all weeds destroyed. Generally no manure was applied. The crop was sown in September or in early October. The usual seed rate was thirty-five sers per acre. An average crop yielded about one thousand sers of pulse and thirteen hundred sers of fodder per acre.[61]

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57. Mehta, op.cit.p.157.

58. Memoir, p.21.

59. Ibid, p. 22.

60. Ambekar, op.cit.p. 40.

61. Ibid, pp. 44; see also George Watt, Commercial Products of India, 1908, pp. 704-45.

Tuver and mug (mung) were most commonly sown with jowar. Tuver was the vetch from which dal was chiefly made. Chana or gram and divel or castor seed were usually sown together either in new lands or those in which another crop might have failed. Both were sown immediately after the rains. They did not impoverish the land. Their cultivation and a fallow were reckoned as nearly the same.[62]

The tal (til) and diveli were used for making oil. While the oil of the former was mainly used for cooking, that of the latter was used for burning. To a limited extent the tal oil was also used for burning but only in temples. While the tal cakes or khal were given to the cattle, the divel khal was used as manure for certain plants. One maund of tal seed produced about 18 sers of oil, the same amount of divel seed yielded 14 sers of oil.[63]

Tobacco was grown on bhata lands in the villages situated on the bank of Narmada. It was rarely rotated with other crops, because it was claimed that the longer the soil remained under tobacco, the better would be its produce. Tobacco required a great care in ploughing and hoeing. Being a remunerative crop the area under its cultivation gradually increased. From about 884 acres in 1832/33[64] it rose to 2035 acres in 1850/51.[65]

A mention may be made of two important dye crops which gradually disappeared from the agricultural map of Broach, but were still important during the period of our study. The first of these was indigo the cultivation of which was confined to Jambusar pargana and even there it was chiefly grown in Gajera village (a place known for its trade and culture from very early times)[66], and to some extent in the vicinity of Jambusar town.

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62. Monier Willam's letter, 15.10.1821, R.D., 23/23, 1821.
63. Ibid.
64. Broach Coll. letter, 2.9.1833, R.D., 16/484, 1833.
65. Revenue Commissioner N.D Report, 25.1.1853, R.D., 11, 1853.
66. Ms. Survey No. 14, 'Survey of Jambusar', folios 20 & 39.

Referring to its importance in Gujarat, E.C.Ozanne, Director of Agriculture, Bombay, wrote in his annual report of 188586 that "In the 16th and 17th centuries, indigo, partly of local growth and partly brought from upper India was one of the chief exports of Gujarat. Towards the close of the 18th century (c 1777) its cultivation, chiefly for local use, would seem to have been on a very considerable scale. But in the early part of the present century it declined and in 1827 had almost altogether ceased".[67]

Decline in the indigo trade of Gajera village was taken note of in 1818 by the revenue surveyor. At this point of time the village produced about 40 maunds of prepared indigo. As opposed to the patel's stated estimate of 15-16 maunds of pan (indigo plant) per kumbha the surveyor arrived at an estimate of "2 cart-loads or 30 to 32 maunds... per koombha".[68] The annual reports of Broach for the years 1832-33[69] and 1858-59[70] return figures of 589 kumbhas (about 564 acres) and 1127 bighas (about 563 acres) under indigo in the respective years. Thus Ozanne's pointed reference to 1827 as the year when indigo cultivation "almost altogether ceased" in Gujarat needs to be toned down in the case of Broach where the decline was less sudden in comparative terms - specially if we keep in mind the fact that indigo cultivation in district Broach was almost wholly confined to one pargana. By 1900-01 the overall acreage under the crop in the Bombay Presidency had slumped to a mere 656 acres. See Table V.

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67. Quoted in George Watt, op.cit., pp. 676-77.
68. 'Survey of Jamboosar',folio. 26.
69. Coll. letter, 2.9.1833, R.D. 16/484, 1833.
70. Birdwood, Catalogue of the Economic Products of Presidency of Bombay, Bombay 1862, p. 355.

TABLE V

AREA UNDER INDIGO CULTIVATION IN THE BOMBAY PRESIDENCY

YEAR	ACRES
1885-86	3,987
1895-96	3,987
1900-01	656
1905-06	257
1910-11	84
1915-16	141
1921-22	35
1926-27	22

SOURCE : G.R.Ambekar, Crops of the Bombay Presidency, Bombay 1927, p. 81.

The cause for the total decline of indigo cultivation was the availability of synthetic dyes. As Ambekar observed; "The increase in the range of dyes which can be manufactured from coal-tar has gradually driven almost all vegetable dyes out of the market".[71]

Another dye crop to meet the same fate was kusumba or safflower. Two varieties of safflower were grown in the Bombay Presidency - the oil seed variety and the dye plant.[72] In Broach, only the dye plant was grown. By one estimate dating to 1832-33 about 77 acres were cultivated with kusumba.[73] It's culti-

71. Ambekar, op.cit., p. 81.

72. George Watt, op.cit, p. 277

73. Coll. letter 2.9.1833, R.D., 16/484, 1833.

-vation in the district fell to 17 acres and by 1914-15 it ceased altogether.[74] Once again the decline was general and not confined to Broach (Table VI).

TABLE VI

KUSUMBA PRODUCTION IN BOMBAY PRESIDENCY

DISTRICT	1885-86 ACRES	1914-15 ACRES
Ahmedabad	602	292
Kaira	2965	1206
Broach	17	Nil
Surat	98	Nil
Khandesh	322	Nil
Nasik	725	Nil
Bijapur	Nil	1
Total Bombay Presidency	4729	1499

Source : Ambekar; Crops of the Bombay Presidency, 1927, p.82

4. Agricultural Techniques

The system of growing mixed crops was widely prevalent. The peasant knew that the cereal crops benefited when grown with pulse crops. The latter gathered nitrogen which acted as fertilizer for the cereals. Another substantive advantage of

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74. Ambekar, op.cit., p. 82.

mixed cropping was that it reduced the risk of total loss of produce in the event of a crop failure. Where, for instance, the cereals failed, the pulse crop would survive or vice versa.[75] Following this principle, the peasant over the ages had worked out the proportion in which the different crop-seeds were to be combined.

Bajri was always sown with some kathor and in an acre of marwa four sers of bajri was combined with one and a half of muth, or with four sers of val, gavar, muth and mung. The seeds were mixed prior to sowing; the whole mixture making about eight sers for an acre. Similarly three sers of kodra was mixed with dangar, the proportion being six sers of cotton seed to 18 to 20 sers of dangar. Jowar was generally sown alone, requiring five sers of seeds per acre. But in mixed cropping four and a half sers of jowar was mixed with a quarter ser of tal and diveli each. Sometimes jowar was also mixed with tuver and mug.[76]

Crop rotation was an important element in the agricultural technique of Broach. The rotation of crops meant the recurring succession of certain crops in definite order on the same soil.[77] In Broach the black soil was deep and stiff and the fields, therefore tended to retain moisture for a considerable period. They had to be kept very clean, otherwise the weeds choked the crop during the rains when the soil was too wet to permit field-operations. For these reasons the system of keeping fields bare-fallow or vashil had been in vogue for a considerable time. The efficiency of this system was greatly facilitated by the fact that the holdings in Broach were larger than in other districts. However, the intensity of the practice differed from pargana to pargana. According to a collector of Broach it formed an "essential part of the agricultural economy" of Broach, Amod

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75. Mehta, op.cit., p. 55.
76. Memoir, p. 54.
77. Mehta, op.cit., p. 54.

and Dahej pargana while it was scarcely followed in Jambusar, Ankleshwar and Hansot.[78]

Under vashilwada, or bare-fallowing system not only was no crop sown, the field was ploughed three or four times during the monsoon and constantly harrowed throughout the year. The land was thus thoroughly reinvigorated and prepared for producing a healthy crop. As a rule a mixed crop of cotton and rice (dangar) was sown in a field that had been kept fallow the previous year. The excess moisture of the vashil field was absorbed by the rice crop to the advantage of cotton. Although this system entailed a loss of a year, it brought dividends in the form of enhanced crop as well as saved time and labour spent in the process of weeding the fields under cultivation.[79]

Notwithstanding the fertility of the marwa, it should be remembered weeding was a troublesome and expensive operation, especially in conditions of the early nineteenth century. It was performed by hand and in seasons of high rainfall, the operation had to be repeated thrice. In circa 1820 the expenses if weeding per acre were computed as follows: indigo-plant field - two and a half rupees; kodra and dangur together 2 rupees; bajri,baota and cotton (sown singly) - one to one and a quarter rupee each; and tal and tuver together - one and a quarter rupee. The cost of cultivating the marwa was said to be nearly double that of cultivating the inferior kali bhoi.[80]

Generally a two or three year rotation was followed in Broach. In the former case jowar followed cotton. In three year rotation,cotton,jowar and wheat were sown successively followed by a year of fallow. The process was repeated thereafter. Sometimes

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78. Letter No.202, 30.9.1842, R.D., 16, 1849.

79. Mehta, op.cit.,pp. 58-59.

80. Memoir, p. 19

lang took the place of wheat in the third year.[81] Since cotton sown immediately after jowar ended in failure, wheat, tuver or chana were considered the most appropriate crops after jowar.[82] With this practical qualification, the cotton-jowar rotation worked well, since technically, cotton was a deep feeder and jowar a shallow-feeder.[83]

In marwa the rotation varied considerably owing to the number of grain crops it was capable of producing. The favourite system, however, was jowar mixed with tuver during the first year, bajri in the second, and kodra mixed with divali in the third.[84] In bhatta soils the common rotation was tobacco and divel alternately, but in some exceptional villages, rice, vegetables, plantains, and sugarcane followed in succession; cotton, jowar and wheat serving to ring the changes without disadvantage.[85]

Ploughing, manuring and weeding are the essential constituents of crop-production. Manure was hardly used in black soil. In marwa or gorat lands the plough had often to be resorted to in eradicating weeds, and once in three years manuring was necessary to restore the soil which was exhausted sooner than the black soil.[86] Manure came chiefly from the dung and litter of the cattle.[87] Occasionally mud from the bed of dry tanks, and cakes of castor oil (divel khal)[88] also served the needs of manuring the marwa soils. The average cultivators, however, could at the

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81. Mehta, op.cit., p. 60; SRBG. CCCCVII, N.S., p. 42.
82. SRBG, CCCCVII, NS. p. 42.
83. Mehta, op.cit., N.S. P.42.
84. SRBG, CCCCVII, N.S. P. 42.
85. loc.cit.
86. loc.cit.
87. R.D., 130, 1818, folio 2777.
88. R.D., 23/23, 1821.

most afford a maximum of about 22 cart-loads per acre once in three years. Annual manuring was rather exceptional.[89]

5. Irrigation

Agriculture in Broach was very largely rain fed, with artificial irrigation occupying a marginal position.[90] The black cotton soil was least suited to irrigation. Water stagnated in it exercising a deleterious effect on the crops by stopping the aeration of the soil.[91]

The marwa or gorat lands were irrigated by means of wells and tanks. Irrigation by rivers was impossible, the river bed being too deep for canal construction. As elsewhere in Gujarat, in Broach every village had a tank and the depth and size of the tank depended largely on the size of the village and its needs. The Broach collector informed the Bombay Government in 1813 that there were two methods of watering from the tanks. In Hansot and Ankleshwar, channels were dug for the water to run into adjacent fields of rice which were bent on the sides to retain the water. When one field was filled to a certain height the water was turned to the next. This mode employed two or three men at a time.[92] Where the fields were at a considerable distance, the water was conveyed to them in water courses by means of a scoop made of bamboo and covered with leather. The water was lifted out of the tank by the scoop and thrown into the course. This system employed four men at a time. The collector reported that only one and a half bighas of land was watered in a day by this method. It was a laborious process and used only in a few villages where the number of wells was insufficient.[93]

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89. Memoir, p.18, Monier Williams states the rate of manure from two to four anas per cart-load.

90. R.D., 130, 1818 folio 2766; and SRBG, op.cit., p. 39.

91. Mehta, op.cit., 116.

92. R.D., 86, 1813, folio 1464.

93. Loc.cit.

Irrigation by wells was more common than by tanks. In pargana Broach most villages had a well each, a few had more than two while very few had none. However, the extent of land irrigated by well was very trifling.[94] It is also clear from a later report that wells used for irrigation purposes were not large in number. N.B.Beyts recorded in 1871 that out of 391 wells available in the district, 8 were situated in the aliented villages, 169 wells were used exclusively for drinking purposes, but 28 of them were found in uttar ruin. The number of wells used for irrigation in gorat villages was 179 and 35 wells earlier in use had fallen into disuse since several years ago.[95]

In Ankleshwar pargana many villages had more than ten wells, because the watertable was quite high, enabling the peasants to dig a well without having to reinforce the wall with brick and mortar. The latter was necessary in the villages of pargana Broach.[96] The depth of wells in Broach varied from 35 to 85 feet while water was available at a distance of 8 to 25 feet. In Amod and Jambusar parganas, the water table was low and, hence, the wells deep.[97] It should be underlined though that Broach was scarcely irrigated either by wells or tanks. In the mid-19th century it was calculated that the cultivated area of the district under artificial irrigation was "less than one percent".[98] It was actually 0.32% in 1845-46 and 0.31 in 1846-47.[99] Alexander Mackay found it disgusting that the government should be so indifferent to such an important aspect of agriculture, despite the injunctions issued in the matter by the Court of Directors.[100]

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94. Ibid, folio 1466.

95. SRBG, op.cit., p. 39.

96. R.D. 86, 1813, folio 1466.

97. Ibid, folio 1465; SRBG, op.cit., p. 39; 'Survey of Jambusar'.

98. Alexander Mackay, Western India, London 1853, p. 179.

99. Out of 734324 bighas cultivated in 1845-46 only 2382 bighas were irrigated and in 1846-47 the proportion was 2360 to 752671 bighas. Broach Coll. letter 30.9.1847, R.D., 16, 1849.

100. Mackay, op.cit., p. 177.

6. Implements

The implements of agriculture were of a simple kind. They were generally constructed of wood with attachments made of iron. As such they could be produced and repaired locally, the expertise of the village carpenter being sufficient for the task. The hal or plough is an apt illustration. While the main body of the hal comprised of wood, the shares and coulters were made of iron. The depth at which the plough was required to work was easily arranged by lengthening or shortening the rope which secured the yoke to the beam and body of the implement.[101] The Gujarat or Broach hal was a light plough and worked well as the soil required repeated ploughings to bring it to a fine state of tilth.

Besides the plough,harrows and hoes of different sizes were in vogue governed by the nature of work. They were used in loosening the soil and eradicating weeds. An iron blade, slightly bent like a sword, 2 1/2 to 4 inches in length and breadth, was used in kadab or ramp. Each end of the blade was turned up two inches and hammered into square or round shapes. This adapted it to be fitted into two iron tubes or stout wooden stays. In the latter case, the blade was held in position by an iron ring on each stay. The stays were fixed on a horizontal beam which formed the head-piece of the harrow. To complete the harrow, a draft pole, a neck yoke, a draft rope and a still or handle were required.[102]

The Larbadi was a smaller instrument of the same kind used for clearing the grass and weeds out of the spaces between rows of corn or cotton and also for loosening the earth around the roots.[103]

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101. P.R.Mehta, op.cit., p. 124.
102. Ibid, pp. 128-29.
103. Memoir of Broach, p. 56.

Panjeti or dantal was a tined harrow. Instead of the blade, stout wooden tines or teeth shod with iron were fixed to the head-piece.[104] It was used for weeding and thinning the corn.

The samar was a plank roller or leveller. This comprised of a flat piece of wood, about 4 feet long, 8 inches wide, and 4 inches thick. This was attached to a yoke. A vertical bar of wood was fixed in the centre to which the driver would hold on to while standing on the samar. After the field had been ploughed the samar was drawn over the soil in order to break clods of earth, level the field and prepare it for sowing.[105] It was also drawn over rabi crop, while still young, to press down the soil and conserve its moisture.[106]

A 'narrow hoe' known locally as kodaloo was used for cutting out the dry cotton shrubs and the stumps of jowar by the roots.[107]

In Monier William's account we are furnished with a list of prices of various agricultural implements. (See Table VII.)

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104. Ibid, p.55; Mehta, op.cit., p.130.
105. E.P.Robertson, op.cit., p.55.
106. P.R.Mehta, op.cit., p.131.
107. Memoir of Broach, p.56.

TABLE VII

PRICES OF AGRICULTURAL IMPLEMENTS IN BROACH

1820 - 21

IMPLEMENT	PRICE Rs.	Qr.	Reas
1. Hal	2	2	0
2. Kadab	2	2	0
3. Kadabi	0	2	0
4. Dantal(Or Panjeti)	1	0	0
5. Tarphein (Drill Plough)	1	0	0
6. Kodaloo.	0	2	0
7. Dranti (Hand Weeder)	0	0	50

Source : Monier Williams, Memoir of Broach, p. 55 - 56.

7. Live-Stock

The live-stock in Broach district witnessed an enormous growth over the first fifty years of the 19th century. The number of oxen, the prime draught animal in the district, was 41632 in 1820.[108] By 1851 this number rose to 85976[109] an increase of 106.5%. The oxen were used in two major works: tilling the land and transporting goods. The inland trade was carried on by bullock - carts.[110] Monier Williams observed in 1820 that the "large two-wheeled carts, drawn by eight and ten

109. Broach Coll. 'Statistical Memorandum on Broach Zilla' No.517,15.5.1856,R.D.,19,1856, para 50.

110. The statistics on carts for the entire district are not available. However, we have comparative figures for three parganas viz. Jambusar, Amod and Dahej for 1820 and 1851. In the first period there were 3409 carts in these three parganas. The number rose to 7765 in 1851, giving an increase of 158% in thirty years. See Memoir, pp.6-15; 'Statistical Memorandum' of 1856,R.D.,19, 1856, para 55.

yoke of oxen come to Broach, Jambusar, for the purpose".[111] In 1849 this traffic was "so considerable that every year about 2000 carts left Broach for the inland parts of Gujarat and the west of Malwa".[112] The oxen census presumably reflects an augmentation in the volume of trade.

The same trend of growth is visible in the milch cattle (cows and buffaloes). Their total number was counted in 1820 at 50542.[113] The census of 1851 reported the number of cows and buffaloes to be 88234,[114] that is an increase of 74.5% in thirty years.

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111. Memoir of Broach, p.57.
112. Gazetteer of Broach, 1877, p. 425.
113. Memoir, pp. 1-15.
114. Broach Coll. No. 517, 15.5.1856, R.D., 19 1856, para 50.