CHAPTER IV.

STATISTICAL AND PHYSICAL DESCRIPTION OF THE SADAR SUBDIVISION OF THE PURI DISTRICT.

(This chapter was entirely written by Mr. H. McPherson in 1898-99. Only the figures have been revised.)

Situation and boundaries.

71. Puri, the southernly district of the Orissa Division, is also the most southernly district of the Bengal Presidency, It lies between 19°28′ and 20°26′ north latitude and between 85° 00′ and 80° 30′ east longitude. The District is divided by physical feature, historical tradition, and administrative arrangement into two distinct portions. The hill country to the north-west included in the Government estate of Khurda occupies two-fifths of the total area of the district and is known as the Khurda Subdivision. The remaining three-fifths of the district known as the Sadar subdivision consists of a deltaic alluvial plain stretching from the base of the Khurda hills to the Bay of Bengal.

The Sadar subdivision is situated between 19° 28′ and 20° 22′ north lalitude and between 85°12′ and 86° 30′ east longitude.

Its general shape is triangular. If we take the point where the Bengal and Bombay Presidencies meet on the coast line of the Bay to be the apex of the triangle then the base is the Cuttack boundary, a line 40 miles in length. The shore of the Bay forms the south-eastern and longer side about 90 miles in length, and the north-western and shorter side about 80 miles in length is the Khurda boundary.

Puri town, the head-quarters of the district, stands on the sea-shore about half way down the south-western side of the triangle, at 19° 48′ 14″ north latitude and 85° 51′ 39″ east longitude.

Area.

72. The total area of the Puri district is 2,499 sqare miles. The area of Khurda subdivision is 971 square miles and of the Sadar subdivision 1,528 square miles. The present report is concerned only with the temporarily-settled parganas of the sadar subdivision. To ascertain the area of this portion it is necessary to exclude from the total the following items :—

		Square miles.
I.— Permanently-settled parganas —		
(i) Marichpur	....	53·29
(ii) Andhari	....	16·10
(iii) Malud	....	15·35
(iv) Parikud	....	67·52
(v) Bajrakote	....	17·08
(vi) Manikpatna	....	24.14
		193.48
II.— Chilka Lake, so far as included in the Sadar Subdivision	....	310.35
III.— Lands of Khurda *Killa*	....	42
	Total	546

There remains a balance of 982 square miles. This is not entirely temporarily settled. A large number of villages, portions of villages, and parcels of land are held revenue-free and are altogether excluded from the areas of temporarily-settled estates. The area of these revenue-free lands amounts to 145 square miles.

There are also 10 square miles of permanently-settled tenures within the Kodhar Khas mahals.

Lands occupied by various departments of Government and excluded from revenue-paying estates cover an area of 6 square miles.

If these items be excluded, the area of revenue-paying estates falls to 821 square miles* though the revenue returns show only 818 square miles temporarily settled.

* For explanation, See Chap. XXI.

Puri estates have land in Cuttack district and some Cuttack estates h lands in the Puri district. For the former an addition of 5 square miles, and for the latter a deduction of 5 square miles, has to be made, so that no change is made in the temporarily-settled area.

Administrative Divisions of the Sadar Subdivision.

73. There are two recognised divisions of the Sadar Subdivision the first Magisterial by Thanas, and the second collectorate by Parganas. The former was originally made for purposes of Police administration, whereas the Pargana was the old fiscal division obtaining from the days of the Hindu Rajas. It is now proposed in Orissa, as in Bihar, to extend the application of the Thana and to make it the general unit for all administrative work. The Pargana Division will subsist only in certain estate registers and records for which an arrangement by Parganas appears to be indispensable. Puri is divided into three Thanas, viz, Gope, Pipli, and Puri, and into 24 Parganas. The areas of the Thanas are respectively :—

		Sq. miles.
Gope	....	339
Pipli	....	331
Puri	....	858
	Total	1,528

This total includes 42 square miles of the Khurda Subdivision, which for Police purposes, is included in Thanas of the Sadar Subdivision.

The following is a statement of the areas of Parganas arranged alphabetically :—

Name of Pargana		Area in Sq. miles.	Name of Pargana		Area in Sq. miles.
Andhari	....	16·10	Total brought forward	....	579·22
Antrodh	....	53·20	Kurelo	....	20·18
Astrang	....	8·97	Lembai	....	89·86
Athaisi	....	52·13	Malud	....	15·35
Bajrakot	....	17·08	Manikpatna	....	24·14
Banchas	....	30·33	Matkatpatna	....	10·48
Chaubiskud	....	100·32	Marichpur	....	53·29
Dumarkhand	....	29·49	Oldhar	....	41·12
Kanman (Tappa)	....	6·50	Parikud	....	67·52
Khodar	....	27·46	Paschimduai	....	26·01
Kotdes	....	182·08	Purbaduai	....	32·63
Kotrahang	....	55·56	Rahang	....	150·34
Total carried forward		579·22	Serai	....	67·32
			Total	....	1,177.46

The Pargana and Thana totals do not tally, because Thanas Pipli and Puri both include detached portions of Khurda Subdivision and Thana Puri in addition comprises a large expanse of the Chilka lake, which is not included in any Pargana.

It will be seen from the above figures that Thanas Gope and Pipli are of nearly equal size and are much smaller than Thana Puri, but the latter includes, besides the Chilka Lake, Puri town, for which there are separate Police arrangements. Puri town is comprised in 16 survey villages, and has an area of 2·92 square miles. If the town and the Chilka be excluded from the Sadar Thana, then we have for its true dimensions an area of 545 square miles with 786 villages. Even so reduced, it is much larger than either of the other two Thanas.

Of the Parganas, Kotdes is the largest, with an area of 182 square miles, and Tappa Kanman, the smallest, with an area of 6·50 square miles. The average size of the Pargana is 49 square miles.

Division into villages.

74. There are 2,145 villages in the sadar subdivision, grouped as follows under their respective Parganas and Thanas.

The area of the Parganas in acre and the average size of a village in each Pargana have been added :—

Name of Pargana.	Area in sq. miles.	No. of Villages.	Average area of Village in acres.
P. Andhari	16·10	18	572
Antrodh	53·20	127	268
Astrang	8·97	16	359
Athaisi	52·13	70	477
P. Bajrakot	17·08	21	521
Banchas	30·33	58	335
Chaubiskud	100·32	180	357
Damarkhand	29·49	74	255
Kanman (Tappa)	6·50	18	231
Khodar	27·46	45	391
Kotdes	182·08	355	326
Kotrahang	55·56	190	187
Kurelo	20·18	52	248
Lembai	89.86	234	246
P. Malud	15.35	10	982
P. Manikpatna	24·14	12	1,288
Matkatpatna....	10·48	8	839
P. Marichpur	53.29	56	609
Oldhar	41·12	49	537
P. Parikud	67·52	61	720
Paschimduai....	25·01	62	269
Purbaduai { Puri Town	2·92	16	....
Purbaduai { Rest of Pargana	32·63	73	286
Rahang	147·42	236	400
Serai	67·32	104	414
Total	1,177·46	2,145	351

The Parganas marked P (p) are the permanently-settled Parganas. A similar statement to the above is given *Thanawar* (including detached villages of Khurda, excluding Chilka Lake)—

Name of Thana.	Area in sq. miles.	No. of Villages.	Average area of Village in acres.
Gope	339	614	353
Pipli	331	794	264
Puri { Town	2·90	16	118
Puri { Rest of Thana	545	786	443
Total	1,218	2,210	351

These figures show that in the District as a whole there are nearly two Villages to every square mile of country. Kotraheang is more thickly studded with villages than any other Pargana. The permanently-settled Parganas are the most sparsely populated, as they all comprise large unculturable areas of river, marsh, and shore sand.

75. At the beginning of last Settlement there were 263 temporarily-settled estates in the Sub-division. Their number has been increased by partition in the

Division of Estates.

course of the Settlement to 475. The distribution of estates by Parganas according to the Collectorate registers is as follows :—

Name of Pargana	Number of estates at ast settlement	No. of estate at present.
Antrodh	3	5
Astrang	1	1
Athaisi	7	14
Banchas	18	41
Cahubiskud	13	16
Damarkhand	13	16
Kanman (Tappa)	2	2
Khodar	2	3
Kotdes	16	35
Kotrahang	50	78
Kurelo	8	8
Lembai	7	7
Masrud	3	3
Oldhar	16	21
Paschimduai	36	109
Purbaduai	31	64
Rahang	21	22
Serai	8	8
Sultan-nager	1	3
Saidabad	7	19
Total	263	474

Partitions have been most numerious in Paschimduai, Purbaduai and Kotrahang. In these Parganas the process of subdivision has ben carried to such a ridiculous extent that prior to re-settlement they contained 57 estates paying less than Rs. 10 of revenue and three paying less than Re. 1.

A limit to the partition of temporarily-settled estates of the nature of that provided in Section II of the old Partition Act VIII (B.C) of 1876 for permanently-settled estates has been provided for all revenue-paying estates in Section II of the new Act V (B.C) of 1897.

Allowances were originally granted to zamindars on the theory that they relieved the State of the trouble, expense, and risk of collecting the small sums payable by individual raiyats. When by excessive partition the amount payable by the zamindar becomes less than the amount realisable from the average raiyat, the State gets no *quid pro quo* for the allowance it makes to the zamindar. This has been recognised in the new Act, and the line has been drawn at Rs. 10.

Revenue of Estates.

76. The extent to which estates differ in size may be judged from the fact that the largest estate in the District, viz., Kotdes, tauzi No. 44, paid before re-settlement a revenue of Rs. 81,082 and the smallest, viz., Salpuradang, tauzi No. 479, a revenue of Rs.14.

A classification of estates by former revenue yields the following results :-

Rs.	Rs.	No. of estates.	Rs.	Rs.	No. of estates.
1 to	10	64	1,000 to	5,000	31
11 to	50	131	5,000 to	10,000	1
50 to	100	75	10,000 and	over	5
100 to	1000	177			

The average amount of revenue was Rs. 604 per estate, the estates which paid a revenue exceeding Rs. 2,500 may be especially mentioned; they are given in order of magnitude :—

Kotdes, tauzi No. 44 .... 81,288 Kotdes and Antrodh Pargans
Delang, tauzi No. 257 .... 33,754 Lembai Pargana
* Rahang tauzi No. 268 .... 25,895 Rahang „
* Krishnagar tauzi No. 270 .... 19,583 Serai „
* Krishnachander, tauzi No. 270....12,661 Chaubiskud Pargana

Kotsahi, tauzi No. 61	5,392	Kotrahang Pargana
Pipli, tauzi No. 62	4,523	
Khodar, tauzi No. 251	4,189	Khodar Pargana (a Government estate)
Killa Kokal, tauzi No. *421*	*4,163*	Chaubiskud -do-
Killa Rovang, tauzi No. *130*	*3,383*	do -do-
Killa Gobra, tauzi No. *189*	*2,514*	*Athaisi* -*do*-

The three estates marked with an asterisk were, during the late Settlement, held ***Kha's*** on account of the recusancy of the proprietors. The amount shown against them represents the average net income derived from them by Government over a series of eleven years.

Regrouping of Estates in blocks.

77. The information that has been given above has reference to the old *jamas* payable by estates previous to the present revision of Settlement.

In writing the assessment reports of the new Settlement it has been found convenient to adopt an arrangement which differs slightly from the ***Parganawar*** arrangement obtaining in the last Settlement.

In the first place what may be called the obsolete or paper Parganas—

Mahal Musrud, Saidabad, and Sultan nagar—have been discarded. These were not territorial divisions of the District, but merely names given to small detached areas scattered over numerous Parganas and included within the bounds of certain estates. In some cases they extent to the adjoining district of Cuttack. They have never been recognised as territorial units by the Survey Department either at last or the present Settlement, and their areas have alwaye been included within the Parganas to which they geographically belong.

In the next place it has been found convenient in a few cases to group together and re-arrange Parganas because they have possessed some important feature in common. The new division have been styled "Blocks", and are as follows :—

Name of Block.	Parganas included.	Reason for arrangement.
Kotdes	Kotdes Antrodh	Because more or less conterminous with Kotdes estate, tauzi No. 44.
Khodar	Khodar Kurelo Kanman (Tappa) Astrung	Because alike liable to inundation from the Debi and Prachi rivers.
East Athisi & Damarkhand.	East Athaisi & Damarkhand.	Because more or less conterminous with *Killa* Gobra, and alike liable to inundation from the Prachi and Kadua rivers.
West Athaisi and Matkatpatna	West Athaisi Matkatpatna	Because alike liable to inundation from the Kushbhadra rivers.
Lembai	Lembai	Single Pargana
Kotrahang	Kotrahang	-do-
Paschimduai	Paschimduai	-do-
Purbaduai Oldhar	Purbaduai (include Oldhar, portion of Matkatpatna and Athaisi.)	Because alike liable to inundation from the Bhargabi (Adlabad breach), the Dhauna and Kushbhadra rivers.
Rahang	Rahang	Single Pargana.
Serai	Serai	-do-
Chaubiskud	Chaubiskud	-do-
Banchas	Banchas	-do-

To these have been added the miscellaneous items—Scattered estates.
The distribution of estates over blocks is as follows :—

No.	Block.	No. of estates.	Area in acres (fractions omitted).
1.	Kotdes	39	1,23,300
2.	Kodhar	14	25,900
3.	East Athaisi and Damarkhand	26	39,000
4.	West Athaisi and Matkatpatna	10	16,800
5.	Lembai	7	53,100
6.	Kotrahang	78	28,000
7.	Paschimduai	109	12,500
8.	Purbaduai Oldhar	87	31,700
9.	Rahang	22	68,800
10.	Serai	9	40,300
11.	Chaubiskud	16	56,600
12.	Banchas	41	12,700
13.	Scattered estates	27	14,600
	Total	485	5,23,300

The average size of an estate is 1,079 acres. But the largest, Kotdes, has an area of 1,10,562 acres; and the smallest, Kharidagi Mahura, tauzi No. 487, an area of ·43 acres. Under the new settlement the classification of estates by revenue will be :—

Rs.	Rs.	No. of estates.
1 to	10	46
10 to	50	106
51 to	100	78
100 to	1,000	211
1,000 to	5,000	37
5,000 to	10,000	2
10,000 to	1,00,000	4
Over Rs.	1,00,000	1

The variations in revenue will be from Rs. 1,04,324 (Kotdes) to Re. 1-2 a nd the average amount of revenue per estate Rs. 777.

Division into Holdings and Plots.

78. To ascertain the average sizes of a holding and of a plot two different sets of figures must be considered.

As the number of revenue-free holdings and plots cannot be separated out from the number of revenue-paying without an amount of trouble incommensurate with the object, the average size of a holding may be ascertained by dividing the total assessed area by the total number of holdings according to the Settlement reports, while the average size of a plot may be ascertained by dividing the total area of the temporarily-settled Parganas by the total area of plots according to Survey records. The figures so ascertained are—

Total assessed area	....	3,73,300
Total number of holdings	....	2,04,400
Average size of holdings	....	1·8 acre

Name of pargana.	Total area in acres	Total cultivated area in acres.	Total number of plots.	Average size of plot 3÷5.	Average size of plot 4÷5.
1 Antrodh	34,054	26,909	98,084	0·34	0·27
2.. Astrang	5,743	2,839	7,625	0·75	0·37
3. Athaisi	33,363	12,893	42,116	0.79	0·30
4. Banchas	19,413	14,804	50,051	0·38	0·29
5. Chaubiskud	64,207	37,471	90,236	0·71	0·41
6. Damarkhand	18,876	13,012	38,450	0·49	0·33
7. Kanman Tappa	4,163	2,335	7,354	0·56	0·31
8. Kodhar	17,579	12,215	50,759	0·34	0·21
9. Kotdes	116,325	92,504	404,724	0·29	0·22
10. Kotrahang	35,460	29,246	120,601	0·29	0·24
11. Kurelo	12,916	8,081	26,309	0·49	0·30
12. Lembai	57,597	45,184	162,766	0.35	0·27
13. Matkatpatna	6,709	2,382	7,453	0.90	0·31
14. Oldhar	26,319	12,195	28,117	0·93	0·43
15. Paschimduai	16,650	13,642	55,134	0·30	0·24
16. Purpaduai	20,888	16,559	45,959	0.45	0.36
17. Rahang	96,097	73,992	210,840	0·45	0·35
18. Serai	43,091	32,526	75,313	0·57	0·43
Total—	6,29,550	4,48,789	15,21,891	0.41	0·29

An alternative figure for size of plot has been given, the first inclusive and the second exclusive of the uncultivated area. The number of unclutivated plots is comparatively small, though the area is considerable. It would be difficult to separate out the number without elaborate examination of the records, and as it bears only a very small portion to the total number, its inclusion does much affect the value of the average.

It would appear from the above figures that the average holding comprises seven plots. The average being 351 scres in extent, will comprise on the average 92 holdings and 689 plots.

General description of Physical Features.

79. The sadar Subdivision of the Puri District is the south-western section of the Mahanadi delta. It is flanked on the west by the hill country of Khurda, a continuation of the low ranges which separate the Native States of Nayagarh, Khandpara, and Rampur from the valley of the Mahanadi. The boundary between the Sadar and Khurda Sub-division is a well-defned line running close to the foot of the hills and occupied by the Kawakhai and Daya channels. The valley of the Daya is crossed by the hills at two points only—at Dhaulagiri, an isolated peak standing in a detached village of Khurda in North Kotrahang below the bifurcation of the Daya and Bhargabi; and at Jagdalpur, where there is a line of low hills intersected by the new Puri Branch Railway. The highest peak in this range, rising behind the Jagdalpur bungalow and crowned by an ancient Hindu Tample, is about 500 feet above sea level. Dhaulagiri, famous for the *Asoka* inscription carved on a great slab of living rock near its base, is about the same height.

The Sadar Subdivision crosses the Daya at two places only—in North-west Lembai, where it encroaches on the Khurda uplands and encloses the small hills of Kanbagpara Anragarh; and again in West Serai, where it diverges from the river for a distance of 2 to 5 miles and encloses some high land and rocky mounds in Garh Sanput.

With these trifling exceptions, the Sadar Subdivision is alluvial deltaic country, stretching without break from the Eastern Ghâts to the Bay of Bengal.

The main portion of the delta is contained between the channels of the Daya on the west and of the Kushbhadra on the east. Beyond the Kushbhadra valley is a tract of high inferior land where cultivation is varied by stretches of moorland intersperesed with patches of forest and scrub jungle. This higher belt forms the watershed between the southern Cuttack and Puri section of the Mahanadi delta. It stretches from the head of the Sadar Subdivision in North Kotdes through parganas Antrodh, Damarkhand, Banchas, and the Kodhar block to the marshes of *Killa* Marichpur. The Katjuri through its chief offshoot the Devi finds an outlet to the sea in *killa* Marichpur through a network of creeks.

In the delta proper lying between the Daya and the Kushbhadra three more or less distinct areas may be distinguished. The Parganas at its hed—Kotdes, Kotrahang, and Lembai—are marked by considerable diversity of level. The higher lands are occupied by small patches of forest, by extensive mango, jack, and *palang* groves, and by village sites concealed from view in the foliage of *banyan*, tamarind, and other umbrageous trees. Rice lands of varied levels fill up the intervals. The whole combines to form a pleasing picture, and the eye is nowhere wearied by dull flat expanses of plain country stretching unbroken to the borizon.

As we proceed further south we come to the second zone of the delta. There is here less diversity of level. Woodland scenery is rarer. The village sites are more exposed, and clusters of cocoanut, palmyra, and date palms take the place of the more leafy groves of the north. The only breaks in the monotony of the landscape are caused by the large rivers whose banks are fringed with trees and undergrowth. Parganas Athaisi, Purbaduai, Oldhar, Paschimduai, Rahang, Chaubiskud and Serai lie within this second zone. In the southern extremities of these Parganas where we approach the third zone the aspect of the country is dreary beyond description. The land is flat as the surface of a table ; it is only a few feet above sea level, and is mostly subject to river flood which converts whole tracts by turn into inland seas or marshy swamps. The village sites are huddled on the top of isolated mounds, some provided by nature, others constructed or developed by art. The trees, if any, round the homesteads, are seldom more than a group of palms, so few that they can be counted on one's fingers.

The last zone is the area lying beyond the line of cultivation. On the south-east it is a belt of sand along the sea-coast varying from 1 to 4 miles in breadth; on the south-west it is the great expanse of water called the Chilka Lake. Along the coast is a line of sand hills which the rivers of the delta find it difficult to pierce. The Kushbhadra on the east finds an obstructed outlet to the sea; but the Bhargabi, after flowing due south for nearly 50 miles, finds it can make no headway through the shore sand, throwing off some of its volume into the Sar Lake and the Samang Pat, two shallow lagoons to the east and north of Puri town, then turns abruptly to the west and makes its way to the Chilka.

The Chilka Lake.

80. The Chilka Lake occupies about one-fifth of the total area of the Sadar Subdivison. It is the great basin into which the rivers of the southern delta empty themselves. On the west it is flanked by the Khurda hills. On the east it is divided from the sea by a belt of sand and a group of low islands formed by silt deposit. A small opening of two or three hundred yards connects its waters with the sea and admits the tide. The lake is fresh in the rains and salt in the hot weather. The depth varies from a few inches to a few feet, and its area fluctuates with the season, with the intensity and duration of the annual river floods, and with the ebb and flow of the tide. The normal area of the portion included in the Puri District may be taken to be 310 square miles and the average depth about 4 feet. An ornate description of the lake and its scenery may be found on pages 22 to 25 of Sir W. W. Hunter's "statistical Account of Puri" and in volume I of the same author's "Orissa."

The Soil.

81. Save in the west, where the Sub-division encroaches on the laterite uplands of Khurda and on the south and east, where the shore sand forms a belt of varying width, the soil of the Subdivision is of the normal alluvial type found in deltaic country. There is every variety of admixture from almost pure sand to almost pure mud. Generally speaking, the lighter soils, the sandy loams, are most abundant in the north of the district, where there is much diversity of level. The black soils are found more widely in the lower levels of the southern Parganas.

There are several native classifications of soils, as viewed from different points of view. Perhaps the most general is the division into.—

Pal land, the riverside silt-enriched soils on which miscellaneous crops of tobacco, sugarcane, *arhar, kulthi,* etc., are grown, and

Jal land, the ordinary rice lands within the embankments.

In the *ruidad* of Pargana Rahang soils are divided into the following classes, which may be taken as typical :—

(1) ***Diha,*** homestead land (including the garden as well as the house site).

(2) ***Kala*** (black land) lying below the village site ; the land over which the washing water of the village is poured and all village refuse is thrown.

(3) ***Gora*** (light-coloured land), the ordinary crop land.

(4) ***Nadipatu*** (river clay), the land on the river bank enriched by alluvial deposit. (*cf.* ***Pal*** land above).

(5) ***Sarpatu*** (watery land), as for example in the ***dalua*** tracts of the Sar Lake and the Samang Pat.

There are numerous names again for the different varieties of ordinary crop land according to composition, colour and other peculiarities. I have found the following names in use :—

Balichar.—	Pure sand out of cultivation.
Balia or *Baliara.*—	Sandy soil just fit for cultivation.
Balia matal.—	Sandy loam, the most common of all soils and varying much in composition and fertility.
Goria matal.—	Soil mixed with pebbles and small stones, usually high land recently reclaimed.
Dudhia matal.—	(milk coloured.—White soil, very friable and fairly fertile ; grows fine paddy.
Telia matal.—	A damp clay soil with an oily appearance ; fairly common and not unfertile.
Sudh matal.—	Purely muddy soil.
Chaulia matal.—	Brownish soil, very friable ; common and fairly fertile.

Pansia matal.—	Ash-coloured soil, not uncommon and also fertile ; very friable.
Kimbhiria matal.—	Slate (crocodile) coloured soil ; something like the preceding.
Telia balia —	Intermediate between ***balia matal*** and ***telia matal***.
Dhaulia matal.—	Greyish-white soil.
Nalia matal. -	Red soil.
Haldia matal.—	Yellow soil.
	Called from their colours, which are due to peculiarities of local origin; usually fertile.
Janha matal.—	An inferior variety of ***chaulia matal***
Hadua matal.—	Coloured like bone, and of hard consistency.
Khulthi matal or *Khari matal.*—	A chalky soil ; fairly fertile.
Chikta matal.—	Sticky, muddy soil ; often found in the bottom of tanks.
Kala matal.—	Black soil, usually of low levels ; the most fertile of all (to be distinguished from ***kala mati***—the land round the village site).
Nunia matal.—	A soil which from some peculiarity of composition becomes saltish in the hot weather. It abounds near the Chilka. The subsoil I suppose gets affected and the saline impregnation gradually pervades the upper soil and gives it a bluish-white apperance.
Nunia.—	(called ***nuni char*** while out of cultivation), soil which has been inundated with salt water and has not recovered; may or may not be in cultivation. This is also common in the Chilka side villages.

Fertility of soils.

82. When village notes were compiled in camp, raiyats used to be asked to give estimates of the produce of different soils. These estimates were anything but correct, and always fell much short of the truth. They varied considerably from village to village. I give, for what it is worth, a table which shows for each class the number of times it is mentioned in the village notes and the average produce assigned by the raiyats.

Class of soils.			Number of times mentioned.	Average produce in *gownies*=4·6 seer of 80 tolahs.
Balia or Baliara		....	4	57
Balia	Matal	....	74	95
Goria	Do.	....	1	30
Dudhia	Do.	....	7	83
Telia	Do.	....	11	85
Sudh	Do.	....	25	106
Chaulia	Do.	....	53	95
Pansia	Do.	....	12	100
Kimbhiria	Do.	....	5	88
Telia	Do.	....	5	70
Dhaulia	Do.	....	5	110
Nalia	Do.	....	9	132
Haldia	Do.	....	4	115
Janha	Do.	....	3	90
Hadua	Do.	....	1	120
Khalli	Do.	....	1	80
Chikta	Do.	....	3	90
Kala	Do.	....	19	161
Nunia	Do.	....	15	66
Nunia	Do.	....	5	80

The average for 262 entries comes to 98·7 *gownies*—454 standard seers. This is of course an understatement; an addition of 50 per cent. at least would be required to make the estimates an approach to truth.

River System.

83. The range of hills which separate the Native States and the District from the southern valley of the Mahanadi is pierced by that river at Naraj, a village 7 miles above Cuttack town and about 10 miles from the northern angle of the Sadar

Subdivision of Puri. The Mahanadi, after emerging from the Naraj gorge, throws off to the south one of its chief affluents, the Katjuri, which in its main steam is the principal drainage channel of southern Cuttack. The Katjuri, opposite the town of Cuttack and only a mile or two below the point where it leaves the Mahanadi, is tapped by the Kawakhai which is the head stream of the Puri section of the delta. It has three main distributaries; at Balianta, about 12 miles from its head; it sends off the Kushbhadra to the left, and at Sadaipur 7 miles lower down, it divides into the Bhargabi continuing south, and the Daya inclining to the south-west. The most easterly of the three rivers, the Kushbhadra, makes its way by a more or less direct line to the sea and forces a sluggish passage through the shore sand about half way between Puri town and the mouth of the Debi river, under which name the parent stream the Katjuri finds an outlet into the Bay. The most westerly of the three distributaries, the Daya, follows more or less closely the base of the Khurda hills and enters the Chilka Lake at its north-east end. The Bhargabi, the central stream of the Puri delta, flows almost due south in the direction of Puri town, and finding itself checked by the shore sand, curves rapidly to the west and seeks the Chilka, into which it discharges itself by a network of channels, some of them linked with the Daya.

84. The remaining rivers of the District are either tributaries and affluents of the three main streams, or local drainage channels. Beginning from the east corner of the District the following names may be noted. *Killa* Marichpur is drained by the Debi and its offshoots the Gadokont, the Magranal and Kotai rivers. The Prachi carries down to the sea the drainage of the border country between the two districts. It is joined at its mouth by the Kadua, another local stream which flows midway between the Prachi and Kushbhadra basins. The Kadua and the Prachi enter the sea between the two Parganas Athaisi and Kurlo. The Kushbhadra receives no important contributions from the east; but, on the west at a point 6 miles from the sea, it receives the whole of the drainage to the Parganas lying between its own and the Bhargabi channels. The Dhanua, with its sub-tributary the Mugai, conveys this large addition of volume to the Kushbhadra, and the point of junction is said to be the lowest point in the delta. The distance of this point from the sea by a direct line is only 6 miles, but as the fall is very gradual, the river adopts a winding course and does not reach its destination till it has carried twice that distance. There is a constant struggle at the Kushbhadra mouth between the river current and the tide. The struggle has resulted in the formation of a sandy bar which effectively checks the river discharge in time of heavy flood.

North-eastern Rivers.

85. The Bhargabi, which is heavily embanked throughout, receives no tributaries of any note from the point of bifurcation at Sadaipur to its turning point north of Puri town. On the other hand it gives off some of its volume to the Sar Lake by the Bengai and Kanchi ***nalas***, and to the Samang ***Pat*** north of Puri by the Dhauria, East Kania, and Athara ***nalas***. The excess spill water of these escape basins is carried by the Harichandan of Suna Mahi river through the sand in a line parallel to the sea front for a distance of nearly 20 miles, when it enters the Chilka near the Chilka mouth. About 10 miles from Puri this channel was joined by a small stream from the north called the "Naya nadi" or "Mew". This small stream was, some forty years ago, artificially connected with the main stream of the Bhargabi, and now as the "Naya nadi" is one of the escape channels of the great river. The Bhargabi after turning to the west thus gives off two affluents to the south-east, viz., the East Kania and the "Naya nadi". The rest of its progress is westward and north-westward towards the Chilka. It sends one offshoot, the South Kania, due west to the Chilka. The main stream then turns north and receives the Rathanchira, a tributary which conveys to it the drainage of the south-eastern half of the country between the Bhargabi and the Daya. Its course is again deflected west, and a network of channels carry its waters to the Chilka at the very point where the Daya enters the lake. The country between the two rivers Bhargabi and Daya has two chief drainage channels, the Rathanchira on the south and east, and the Nun on the north and west. The Rathanchira as remarked above joins the Bhargabi. The main stream of the Nun enters the Daya a few miles above its mouth, but it has

Southern Rivers.

numerous independent creeks connecting it direct with the Chilka. On its left bank the Daya receives several hill streams running down from the uplands of Khurda. The chief of these is the Gangua on the north and the Madagui on the south. The Gungua enters about the 10th mile, and the Madagui about the 28th.

Distribution of Puri rivers.

86. All the rivers of the Distsict have one characteristic in common. In the hot weather they are beds of sand with tiny streams or none at all, while in the rains they receive more water than they can carry. This is only the common experience of an Indian river. The particular evils that result in the Puri District will be discussed in a subsequent section of the report.

In Mr. Taylor's report of 1871 on the Orissa Embankments are two statements that show at a glance the distribution of the deltaic rivers, and of the local drainages in the District; and though prepared nearly thirty years ago they give an accurate description of the present order of things.

Embankments.

87. The rivers of the District have from time immemorial been restrained within embankments, and the cultivated lands have been in a more or less efficient degree protected from the disastrous effects of inundation. Before attempting to draw parallels with former times, I will endeavour to give a brief description of the embankments as they exist at present. They are shown on map No. V to understand which it is necessary to know the recognised distribution under the following four classes :—

Class I.— Canal embankments which are intended to be above high flood level marked 0000. (There are none of these in the Puri District).

Class II.— Agricultural embankments mostly above present high flood level which will probably be permanently maintained at their present height; marked -o-o-o-o.

Class III.—Embankments which eventually it will probably be desirable to abandon, but which it is proposed to retain for the present; marked □—□—□—□

Class IV.— Embankments which it is undersirable to retain, as in some cases they are actually harmful and the reminder are of doubtful utility; marked * * * *

Zamindari and abandoned Government embankments used to be shown in the maps by a zig-zag line thus ⩘⩘⩘ and classed V, but they have, by recent orders, been expunged from our records and need not be referred to.

It will be seen from the map that only the three principal rivers into which the Kawakhai breaks up, viz., the Daya, the Bhargabi, and the Kushbhadra, are embanked. The Kawakhai has on its right bank a Class IV embankment which is continued for a few miles along the Daya. The embankment is not in good repair and no serious attempt is made to maintain it. For the rest of its course on the right bank the Daya is devoid of embankments. The Kawakhai on its left bank is defended by a Class II embankment up to Balianta, where the Kushbhadra takes off, and by the Pilgrim road which acts as a Class II embankment from Balianta to Sadaipur where the second bifurcation occurs. The Daya left has a Class II embankment from the point of bifurcation to within a few miles of the Chilka. The Bhargabi is defended on its right bank by a Class II embankment continuous from its parting with the Daya to a point a few miles from the Chilka. On the left the embankment is of Class III. Its line is first broken by the unrepaired Adlalad breech in the 6th miles. From Gabkand to the opening of the Kanchi river the embankment is of Class IV. Then follows a series of escape channels and openings near the westward curve of the Bhargabi. Three tracts of country enclosed by these escapes are protected by ring embankments of Class III. The largest is surrounded by the Bhargabi, the East Kania, the "Naya nadi" and the Harchandi river, forming an oblong about 15 square miles in extent. The rest of the left bank of the Bhargabi and its affluent the South Kania is embanked by Class III *bunds* to within a few miles of the Chilka. The last few miles both on the Daya and the Bhargabi are left open because in flood time there is always a heavy backwater from the Chilka, and embankments are useless.

Class IV, and a small stretch of Class III, embankments are shown along the north shore of the Sar Lake and the coure of the Bengai river, but they have not been repaired for several years, and under present conditions are useless for the protection of the country lying to the north and east.

The Kushbhadra has a Class II embankment for 6 miles down the right bank, and Class IV embankment not repaired and not continuous for 12 miles down the left bank.

It has been stated in a previous paragraph of the report that the Debi river, an affluent of the Katjuri, enters the District in the extreme north-west corner. There is a short length of combined Class IV and Class III embankment along the right bank at the place where it skirts Kodhar Pargana. This is breached in many places, and it has been proposed, if not already decided, to leave it in disrepair.

From the above it will be seen that the present policy of Government is to effectively protect the large central tract lying between the Daya and Kushbhadra channels, and to leave the rest of the District to take its chance. The tract to the west of the Daya and to the east the Kushbhadra are practically unprotected. The mid tract between the Kushbhadra and the Bhargabi is one only partially protected in the northern half. In the southern half it is exposed to the mercy of the annual floods.

A list of the existing Class II, III, IV and of the abandoned Class V, embankments taken from the records of the Public Works Department forms Appendix G to this report. From this it will be seen that the distribution by classes is as follows :—

Class		Miles.	Feet.	
II	....	97	1,336	To be retained permanently.
III	....	113	3,494	To be retained temporarily.
IV	....	46	1,790	Probably to be abandoned.
V	....	62	1,405	Already abandoned.

The total length of the existing embankments (Class V exclused) is 257 miles 1,250 feet.

As it was only a few years ago that the present policy of abandoning embankments supposed to be useless or injurious was inaugurated, it would have been interesting to contrast the average cost of maintenance before and after, but I have not been able to get the figures necessary for comparision.

In 1896-97 it appears that 257 miles 1,340 feet of Puri embankments were maintained at a cost of Rs. 35,792 or Rs. 139 per square mile as against an average cost of Rs. 247 per mile in Cuttack and Rs. 182 per mile at Balasore. (See Government Resolution No. 209 I. D., dated the 18th February, 1898).

With this we may compare the statements found in the statistical account of Puri that the total length of embankments in 1866 was 316¾ miles with 43 sluices, maintained at an annual cost of £7 16, or Rs. 156 per mile; that is, at a total cost of Rs. 49,413.

The figures of a single year taken at random do not however convey much information. In 1896 there were heavy breaches, which swelled the bill of costs.

It has not yet been decided definitely what will be the ultimate fate of the embankments of Class IV. From the revenue point of view, I do not think that it would be judicious to abandon those on the Kushbhadra left, on the Bhargabi left, on the Bengai and on the Sar Lake. But the embankments on the Bengai, the Bhargabi left, and the Sar are more or less useless if the Adlabad Gap remains open. If then it is decided to leave the Adlabad Gap in *statu quo*, there is not much to be gained by maintaining the others.

Effects of Floods on Embankments.

88. The volume of water poured into the Puri District by the Kawakhai Channel varies enormously from year to year. The carrying capacity of the embanked channels that conduct this water to the Chilka and the sea varies also with the distance from the head of the delta. To properly appreciate the condition of the problem we want to know first what is the estimated discharge from the Katjuri into the Kawakhai in years of high flood. We then want to know the carrying capacity of the distributaries of the Kawakhai at various distance from the head of

the system. Distances of 25 and 40 or 50 miles would supply data from which could be estimated the effect of floods on the upper and lower sections of the District, respectively. The Superintending Engineer of the Orissa Circle has kindly given me some notes from which it appears that the estimated discharge of the Kawakhai at head in the exceptionally high flood of 1842 was computed to be 334,483 cubic feet per second, and that the high flood discharge may in future be estimated at 277,180 cubic feet per second.

In a report made by Major Harris in 1858 the discharge capacities of the Kawakhai distributaries at a point 25 miles from Cuttack were estimated as follows :—

		Cubic feet per second.
Daya	....	33,100
Bhargabi	....	59,220
Kushbhadra	....	9,853
Total	....	102,173

After the flood of 1872 it was estimated that in their lower reaches these rivers could only discharge 45,000 cubic feet per second. It is evident, then that even in a year of very ordinary flood when the discharge is, let us say, only half of the high flood discharge, the Puri rivers are unable to contain within their banks the volume of water passed into the District through the Kawakhai even within the first 25 miles; there must be a discharge of the excess. Under present conditions the spill in ordinary years occurs over the right bank of the Daya, through the Adlabad breach in the Bhargabi left, and over both banks of the Kushbhadra about 20 miles below Cuttack. The relief thus afforded prevents breaching of the embankments lower down.

As regards the phenomena to be witnessed in exceptional years we have ample evidence in the flood reports of 1892 and 1896.

The flood of 1892 was remarkable for its intensity, and that of 1896 for its duration. In 1892 the most serious breaches that occurred in the important embankments of the Daya, Bhargabi, and Kushbhadra were the following :—

On the daya Left (Class II) at Madhepur in the 8th mile.

On the Bhargabi Right (Class II) none serious. *Left* (Class III)., at Adlabad in the 6th mile; Gabkand in the 23rd mile.

On the Kushbhadra Left (Class II) at Jogisahi in the 1st mile.

These breaches occurred at places that are always weak points in the embankments. The breaches in the Daya left are caused by the return to that river of the great volume of water escaping across the Class IV embankments of the Kawakhai and Daya right bank. The flood water takes the direction of the Gangua ***Nala*** and returning to the river at a point where the channel is contracted, impinges on the left embankment almost at right angles. After breaching the embankment and the Puri-Khurda Road, the water makes its way across Lembai Pargana. Some of its volume returns to the Daya south of the Jagdalpur hills and again imperils the embankment. The rest seeks the Chilka through the channel of Nu'n river. The left embankment of the Daya has not only to withstand the volume of this returning flood water; it is also endangered by the flood poured against it by the Mandagine, a tributary which in addition to its own volume receives by a sub-tributary called the Rajna much of the flood that has spread over the west Daya tract. Breaches in the lower left embankment of the Daya are thus inevitable in years of heavy floods.

The Bhargabi right (Class II) is the most efficient of the district embankments, probably because on account of the breaching of the opposite bank and the relief so afforded to the river it gets less work to do than any other. It rarely gives way, save in the lowest reaches of the river near the Chilka, where breaches have no serious results and flooding is inevitble.

The Bhargabi left (Class III) is the most troublesome of the embankments. Breaches have occurred so frequently at Adlabad in the 6th mile that since 1895 it has been decided to leave the gap open. The serious results that flow from this policy have been described in detail in the special report on Purbaduai, Oldhar Parganas, and it is hoped that the question will receive reconsideration in the right of its relation to land revenue. The next weakest point is at Gabkand. No breach

occurred here in 1896 because of the relief afforded by the Adlabad gap. The embankment from Gabkand to the head of the Kanchi outlet is shown in the maps as Class IV. I have not seen this portion of the embankment, but hope that it is not proposed to abandon it and intensify the misfortunes of the flood-afflicted Parganas to the east. The relief afforded to the river by the Adladad breach and the escape channels near Puri is such that no breaches occurred in the lower embankment during floods of 1896.

The Kushbhadra left embankment (Class II) is so aligned that breaches are inevitable in years of high flood. The embankments are funnel-shaped from the head of the stream downwards, and the contraction of the flood water volume can have no result but one. It is suggested by the Superintending Engineer in the report of 1896 that a gap be left at the point of breach. This, in my opinion, would be fatal to the prosperity of Kotdes, one of the richest Parganas of the District, accounting for over one-fourth of its total revenue. It cannot be argued that because an embankment is bound to give way in exceptional years, it should not be maintained in ordinary years when its beneficial effects are inestimable. Raiyats will cultivate their lands and pay their rents if they know that they will be protected in ordinary years. They are resigned to the misfortunes of exceptional years, but they cannot be expected to face cheerfully a certainty of calamity.

State of Embankments in 1896.

89. To complete the account of the effects of floods on embankments I make no apology for quoting Mr. Inglis' (Superintending Engineer's note of January 27th, 1897, which sums up the existing situation and is to some extent a declaration of policy:—

"8. ***Kawakhai Branch.***— The Kawakhai banch leaves the Katjuri on the right bank just below the Ganjam road, and flows though the Puri district. The chief peculiarity of this branch is that it has no large channel leading directly to the sea. The greater part of the water carried by it has to pass to the sea through the Chilka Lake. The channels by which the water is conveyed to the Chilka can in their lower portions carry only about 45,000 cubic feet per second, as compared with 324,483, the estimated discharge of the Kawakhai near its head in the flood of 1872. It is, therefore, obvious that whenever there is a high flood, a considerable part of the Puri district must become a lake for time being".

"The flood entering the Kawakhai is first guaged at Kajipatna. The reading here on 25th July was 81·68 as compared wiht 82.63 of 1892. Roughly, about three-fifths of the total discharge of the Kawakhai flows into it directly from the Katjuri main stream, and about two-fifths come into it a little lower down across the Ganjam road from the spill over the right bank of the Katjuri. The next guage is at Balianta, 14 miles below. At this place, the Kushbhadra branch leaves on the left bank. The highest reading of the year here was 71·35, that of 1892 having been 73·05. The Kawakhai in this length is embanked throughout on the left bank. There was a small breach in the 10th mile which caused no damage and which was soon closed. On the right bank the Kawakhai is not embked for some distance from its head; lower down there is a more or less continuous marginal embankment, but it is not of much importance, and it is among those which have been scheduled in Class IV. This was overtopped and breached in several places. The Kawakhai continues beyond Balianta for 7 miles as one stream. It then, in Sadaipur, splits up into the Daya, which is the larger stream on the right, and the Bhargabi on the left. This was not breached or overtopped, but some injury was caused by erosion. The highest reading of the gauge at Sadaipur was 53·67 as compared with 55·67 in 1892".

"9. ***Daya Branch***:—The Daya branch, commencing at Sadaipur, continues as one stream until it reaches the Chilka Lake. It has a continuous embankment on the left bank which is able to stand a moderate flood such as that of 1895, but is bound to be overtopped and breached in a high flood such as that of the present year".

"10. ***Kanti Breach***:—The first breach occurred in the 11th mile. It is 960 feet in length and the scour at the deepest part went down to 34 feet below the crest of the embankment. The gap will be closed either in the former line of bank, or by a ring bund, as may be found more economical. Breaches occurred here in 1872 and 1892 and as the flood way of the river narrows owing to high ground on the right bank just below this place, a breach here is inevitable in very high floods. It does not appear to be within the bounds of practicability, nor, if it were, would it,

in my opinion, be desirable to raise the left embankment to such a height that it may pass all floods without breaching. This being so, there would appear to be only two alternatives-the one to leave things as they are, making good breaches when they occur; the other to construct at suitable sites on the left bank, escapes or overflow weirs, which would give the required relief to the river. The water from this breach passed off along the course of the Nuna river. It is reported to have caused damage to the Khurda-Pipli road, to have breached the newly-constructed railway embankment close to the bridge over the Nuna river, and to have brought down many huts in the villages.

"11. The next breach occurred in the 18th mile. It is 340 feet long and 16 feet deep from crest of embankment. This is said not to have caused much damage. The water passed off down the Nuna river.

"The third breach took place some days after the first two in the 28th mile, and did not cause much damage as the country had already been flooded by the water from the first breach. It was 300 feet long and 16 feet deep".

"In addition to the above breaches, some damage was caused at several places by erosion, which will have to be made good either by slope cutting with stone pitching or by retired lines of embankment.

"12. At the Kanti gauge, which is 11 miles below Sadaipur and just below the first breach described above, the highest reading of the flood of this year was 37·95 as compared with 37·35 in 1892. In the latter year there were, however, in addition to a breach of 930 feet at the same place as the breach of this year, two other breaches above in the left banks aggregating 700 feet in length.

In this case, as in all others where the gauges are situated below the points at which the embankments breach, the readings are in themselves no criterion of the magnitude of the flood. They are useful as indicating the volume of water passing at a particular point in a particular flood. The right bank of the Daya is now, except for a few miles near the head, open to flood throughout.

"13. ***Bhargabi Breach.***—We may now return to Sadaipur and consider the Bhargabi branch. This runs as one stream for 29 miles when, near the point where it is crossed by the Puri road, it throws off on the left bank the Kanchi branch. Further on it throws off also on the left bank the East Kania, the Naya nadi and the South Kania branches, and what is left of the Bhargabi finds its may to the Chilka lake in conjunction with the Daya.

"When I say that the Bhargabi flows as one stream up to the point where the Kanchi takes, I refer rather to past than to present condition. For several years in succession, a breach occurred at Adlabad in the 7th mile of the Bhargabi on the left bank; it was decided last year to leave the breach open. About half the discharge of the Bhargabi passes out through this gap, and will take the course of the Dhanua river, which lower down joins the Kushbhadra. Part of the combined discharge passes directly into the sea through a channel much obstructed by sand, and the reminder has to pass through the Sar Lake and on past Puri parallel with the coast, till it finds an exit through the sand ridges to the sea. With the exception of this gap the water in the Bhargabi was within its banks (natural and artificial) till near its end, where, owing to the water escaping from the breaches in the left bank of the Daya river overtopping the banks, it joined in the general inundation.

"***14. Kushbhadra Breach.***—As has been mentioned above, the Kushbhadra branch takes off from the Kawakhai at Balianta. This channel is now embanked for a few miles at its head, only the embankments lower down having been abandoned as useless.

"The present declared policy is to maintain the embankment on the right bank for a little over 6 miles, and on the left bank only for about half a mile, where it protects a village. As was mentioned in the report on the flood of 1895, there is a weak place in the right embankment closed to the head, where a breach has occurred for several years in succession. This breach was closed by a strong bank in the early part of this year and would probably have stood an ordinary flood. The unusually high flood of this year rose to the crest of the old embankment and broke through a short distance above the new bank. This breach quickly spread and the whole of the old gap was opened out again. It seems a little doubtful whether we should not accept the situation and allow for an escape here. The water escaping

at this place joins that from the Adlabad breach on the Bhargabi and takes the course of the Dhanua river to the Sar Lake. In the meantime the gap will be closed by a strong bank, which is likely to be effective for some years at all events".

State of the District during flood.

90. The notes that have been given in the preceding section refer chiefly to the effects of flood on embankments and take little note of the effects on the country at large. To Mr. Inglis' report is attached a map which shows roughly the area affected by floods and the areas free from flood and is reproduced as map No. I appended to this report. The area which is coloured blue represents the area which was submerged in 1896. The portion of the blue which is shaded with lines represents the area which under present conditions is liable to inundation in years of ordinary flood. The facts may be put briefly thus. In ordinary years the tracts liable to inundation are—

(1) The West Daya tract, including West Lembai, West Serai and Balbhadrapur (of Khurda Subdivision); results serious.

(2) The Dhanua basin, including the greater portion of Parganas Purbaduai, Oldhar, Matkatpatna and a small portion of Kotdes and Rahang Parganas; results serious.

(3) The Samang ***Pat***, north of Puri, suited for ***dalua*** cultivation. The inundation is a necessity, not an evil.

(4) The lower reaches of the Kadua and Prachi rivers; damage slight.

(5) Portions of Parganas, Kodhar, Kurelo, Tapa Kanman. This is due to the inefficient state of the Khas Mahal and Public Works Department embankments on the south bank of the Debi.

The effects of inundation are most disastrous in tract (2), where the water lodges for a longer period than elsewhere on an account of the inability of the Kushbhadra to discharge its volume quickly. It is also by far the largest of the tracts, and the annual loss of Government revenue, if the existing policy, is continued, cannot be estimated at less than Rs. 4,000. The loss of zamindars and raiyats is many times that amount, but cannot be gauged and reduced to figures.

In years of extraordinary flood the only portions of the District not liable to inundation are—

(1) Kotrahang.
(2) Paschimduai
(3) East Rahang.
(4) South-East Chaubiskud.

The whole of the rest of the District is converted into a lake for the time being. The effects are least disastrous in the northern Parganas where the ground fall is sufficient to carry off flood water before irremediable damage has been done. Kotdes, Lembai, Antrodh, Damarkhand and Banchas may be placed in this category. The Parganas further south are liable to suffer very heavy loss of crops. The loss in bad years is unusually total in those Parganas which even in ordinary years are subject to flood.

The problem of protecting the District from river inundation is a difficult one. It cannot, I think, be said that the present situation is very satisfactory, and it will not I believe be accepted as final. The problem is to conduct a given amount of water from the head of the district to the Chilka and the sea by channels that reduce to a minimum the chance of danger to the cultivated area.

In ordinary years the embanked channels of the Kawakhai distributaries are equal to the task. In extraordinary years they are unequal to it. The object to be aimed at is to conduct the excess water in directions by which it will do least harm. At present it is allowed to spill into low-lying areas, where the results are most harmful, while on the other hand complaints are made that where flood water is wanted on the shores of the Chilka to neutralise the salt impregnations of the hot-weather tides, a sufficient supply of river water is not now obtainable.

I make the above remarks with all due deference to the opinion of experts, as the problem is surrounded with professional difficulties which I have not the technical knowledge to estimate. It is further complicated by the claims of other tracts and by the want of funds. My chief object is to draw attention to the extent of the damage that is caused in certain areas by the present arrangement.

A careful perusal of the Departmental Reports of recent years leads me to think that the damage in these areas has not been fully realised and considered.

Salt floods.

91. A word should be added about the liability of certain tracts to salt inundation. All the rivers of the District, whether they enter the Chilka or the sea, run dry in the hot weather and are then liable to have salt water forced up their channels by the action of the tides and the strong breeze which blows from the south for several months of the year. When the rivers are embanked and the tides high and the breeze strong, the salt water overflows and does much damage to the cultivated fields. The tracts specially liable to this misfortune are a belt of about 5 miles round the shore of the Chilka in Parganas Chaubiskud and Serai and the lands situated on the lower reaches of the Kushbhadra, the Prachi, the Kadua and the tidal creeks of the Kodhar block.

Fields deeply submerged do not recover fertility for a period of three or four years. The crops are therefore precarious in tracts liable to this visitation. For such areas river inundation is highly beneficial. The saline impregnations get washed out of the soil by river flood, and the effects of tidal flood are counteracted. But for this happy contingency many large stretches of country would doubtless lie west along the Chilka shore. There have always existed salt embankments in a more or less fragmentary condition. An attempt was made in 1896 to improve these *bunds*, but the work was not completed. The subject has been fully discussed in the Khas Mahal reports of Serai and Chaubiskud Parganas, and I understand that an effort will be made in the cold weather of 1898-99 to complete the line of empankments. (Written in July, 1898).

Embankments and liability to inundation at last Settlement.

92. Mr. Taylor's embankment report of 1871 supplies a mass of interesting information regarding embankments as they existed then and as they were shortly after the last Settlement. His report embodies the results of enquiries made at the suggestion of the Embankment Committee which sat after the great famine of 1866-67. The object of the enquiry was to ascertain what obligations had been imposed on Government by the Settlement of 1837 as regards the up-keep of embankments, and to report how these obligations were being fulfilled. Mr. Taylor found as regards Puri that Government had now here covenanted to either construct embankments or to maintain them in repair, but he states that as a matter of fact "it has always been the custom for the Government to construct and keep up any embankment that might be required."

All the existing embankments were elaborately measured, described and detailed and suggestions were made for their improvement. It does not appear that save in the matter of the Adlabad breach, the embankments of 1870-71 were in a better or worse condition that at present. The Daya right had practically been abandoned; the Daya left, the Bhargabi right and left were maintained in good repair. The Kushbhadra right for about 13 miles was in good condition and the left was in great disrepair. The embankments on the smaller streams, some described as Government and some as zamindari embankments, were all in a state of great neglect; the Chilka embankments were in a condition almost exactly analogous to that of the present year.

Mr. Taylor gives some interesting extracts from a report made on the Puri embankments in 1858 by Captain Short, Superintendent of Bengal Embankments (pages 73-76). The Parganawar statements prepared by Captain Short show that the condition of the District in his times was worse than it is at the present day. It is curious to note that in discussing the case of Pargana Kotdes he uses the words—

"Before such large volumes of water found their way down the Kawakhai (*via* the Katjuri river), this Pargana could be irrigated and drained at pleasure, but of late years it has suffered in the extreme from the floods breaking the embankments and topping the Puri road, but when the equilibrium is restored at the head of the delta and a supply of water given commensurate with the channel the prosperity of this tract will be restored."

This indicates that a few years before the words were written (probably before the great flood of 1855) the volume of water carried through the Puri District was much less than it was in 1858 and than it is now. Both in 1858 and later in 1871 there was under consideration a plan of erecting a weir across the the head of the Kawakhai to regulate the Puri water-supply.

The cost was estimated in 1871 at one lakh of rupees, equal to two years' cost of the annual repairs which then amounted to Rs. 50,000. The project has long ago been abandoned.

From Captain Short's statement it may be gathered that the Kodhar embankments were much neglected, and the country seriously liable to inundation.

Kotdes suffered from breaches in the Kawakhai and Kushbhadra embankments.

Paschimudai was suffering from breaches in the Bhargabi embankments.

Purbaduai was two-thirds lying waste, and of *Oldhar* only one-seventh was cultivated on account of the disrepair of the Bhargabi, Sar Lake, Bengai and Dhanua embankments. (The condition of these two Parganas was worse if possible than at present).

Rahang was liable to serious inundation, and the only remedy suggested was the regulation of the Kawakhai discharge.

Kotrahang had suffered serious damage of late years and there could be no remedy save that suggested in Rahang.

Lembai was in the like condition to Kotrahang and Rahang.

Serai and Chaubiskud were very unfavourably placed on account of the absence of salt embankments.

Astrang .... }
Kanman .... | Were beyond the influence of the embanked rivers but not protected from the local streams, and various improvements were suggested. Compared with the above, present conditions show considerable advance and improvement. From the hopeless way in which Captain Short speaks of any policy other than that of regulating the supply at the head of the delta, it would appear either that the volume of water passed by the Kawakhai is now less than it was in 1858 or that the plan suggested was of his own devising and was commended to the exclusion of others. Whether it is a solution applicable to the present situation, it is for others to say; my intention in examining these old records was merely to ascertain whether zamindars and raiyats have any grounds for making the suggestion that in the earlier years of Settlement revenue and rents pressed less heavily than now, because of the greater efficiency of the embankments. Whatever may have been the position prior to 1855 it would seem that at least since that year the reverse has been the case, and that with the exception of the single tract affected by the Adlabad breach, zamindars and raiyats are much better off now than they were thirty or forty years ago.
Damarkhand .... |
Banchas .... |
Matkatpatna .... |
Antrodh .... }

93. There are three stations for the registration of rainfall in the Sadar Sub-division, viz, Pipli, Puri, and Gope.

Rainfall and Temperature.

The following table shows the distribution of the rainfall month by month at the three registering stations, (1) normal, (2) for 1897:—

Name of Mont	Puri.		Pipli.		Gope.		Average.	
	Normal.	1897.	Normal.	1897.	Normal.	1897.	Normal.	1897
January	·28	....	0·33	Nil	0·25	Nil	0·28	Nil
February	0·78	4·25	0·38	·30	0·51	1·07	0·55	1·87
March	0·61	2·55	0·82	4·78	0·62	3·43	0·68	3·58
April	0·45	0·08	0·20	Nil	0·11	0·22	0·25	0·10
May	3·02	1·40	3·56	0·96	4·40	Nil	3·66	0·78
June	8·06	5·12	8·17	4·35	7·81	4·05	79·6	4·50
July	9·80	19·91	10·92	14·06	10·53	18·35	10·41	17·44
August	10·38	9·57	13·58	8.61	12·06	6·83	12·20	8·33
September	10·36	6·59	10·59	4·54	11·65	4·62	10·86	5·25
October	8·90	8·17	5·60	8·38	6·92	9·94	7·14	8·83
November	3.48	7·58	2·05	2·03	5.08	4·11	5·53	4·57
December	0·80	0·14	0·22	0·29	0·24	0·08	0·32	·17
Total	56·92	65·36	56·42	48·30	60·18	52·70	57·84	55·42

It will be seen that in normal years the variations are very slight between one station and another. This is as one would expect in a flat country where the interval from one station to another does not exceed 25 miles. In 1897 there

was excess rain at Puri and a slight defect at Pipli and Gope, but the rain was well distributed and a bumper harvest all over the District was the result, In 1896 the rainfall was heavier than normal, but there was practically nothing after August. The heavy rains of June and August caused floods which injured the crops, and the subsequent drought completed their ruin.

Temperature.

Puri Town is situated on the shore of the Bay of Bengal and its temperature is equable all the year round. It rarely falls below 70° or rises above 90°. In the hot weather a strong fresh sea breeze blows up from the south and renders a temporary stay there an agreeable change from the accustomed heat of the plains. Puri cannot yet be styled a hot-weather resort or a favourite watering-place of Bengal. It has been, till lately, too much out off from the world to be of much importance, but it is now connected with the East Coast Railway by a branch line, and already there are indications that Puri will be sought after in the hot weather. When railway communication with Calcutta has been established we may xpect it to become a place of pilgrimage to seekers after health as well as to devuote Hindus.

Puri Town is situated in the South of the district, while Cuttack is only 7 miles from the northern extremity. The temperature of the district generally may be supposed to lie between that recorded at Cuttack and that recorded at Puri. I give in tabular form a note about the temperature of 1897 for which I am indebted to Meteorological Reporter of Bengal:—

MONTH.	PURI.			Variation between Puri and Cuttack.		
	Maximum.	Mean.	Minimum.	Maximum.	Mean.	Minimum.
January	82·3	73·8	65·1	- 4·7	-1·3	+1·9
February	85·7	79·8	73·8	- 6·5	-1·5	+3·5
March	87·2	81·9	76·6	- 8·9	-3·0	+3·0
April	90·7	85·1	79·5	- 9·2	-3·6	+2·1
May	91·0	86·0	81·0	-10·8	-6·2	+1·5
June	89·9	85·6	81·0	- 8·1	-4·1	- 0·3
July	88·5	83·9	79·4	- 3·1	-1·6	+0·1
August	87·6	83·4	79·2	- 0·3	+0·4	+1·0
September	89·5	84·8	80·1	+ 1·6	+1·8	+1·9
October	88·8	82·8	76·7	+ 0·7	+1·3	+1·9
November	83·5	76·1	68·7	+ 0·2	+1·1	+2·0
December	79·6	69·9	60·2	+ 0·5	+1·7	+2·9
Average	87·0	81·1	75·1	- 4	-1·2	+1·5

It will be seen that it is only in the daytime and for six months of the year that Puri has an advantage over Cuttack. During the months of August to October residence in Puri is very trying. The temperature is high, the atmosphere laden with moisture and the breeze which blows strong in the hot wheather, is absent. It is curious that, taking the whole year round, Puri should have a maximum average 4 degrees below Cuttack, and a minimum average 1½ degrees above Cuttack. This alone shows within how narrow limits the Puri temperature ranges.

Climate.

94. The climate of the sadar subdivision is generally salubrious; save in certain swampy tracts of the Chilka, it is free from malaria.

Perhaps the Subdivision can be divided climatically into four tracts—the northern Parganas, free from water-logging in the rains, are the healthiest; the flooded Parganas of the south are often submerged for over a month, and cannot but be unhealthy when the water is draining off and drying up; the coast belt, though always cool is often unpleasantly moist and is apt to be enervating after long residence; the Chilka belt is damp in the rains and the atmosphere is disagreeably saline in the hot weather. On the whole there is not much to complain of; I may add the testimony of personal experience by saying that I have been in the District

for the better part of the last six years and have been to every nook and corner of it without contracting illness of any form.

Extent of cultivation.

95. The total area of the temporarily-settled Parganas, exoluding detached lands of *killa* khurda, is 651,300 acres. Of this 463,800 acres are cultivated, 33,600 acres are culturable, and 153,900 acres are unculturable. A copy of the *milan khasra* statements by Thanas is given in Appendix E. As, from a Collector's point of view, the Pargana statements have most interest, I extract from them the following statements which show for each Pargana in Puri the proportional percentage of cultivated, culturable and unculturable land :—

Name of Pagrgana.	Percentage of cultivated to total area.	Percentage of culturable but not cultivated.	Percentage of unculturable.
1. Antrodh	79·	7·7	13·2
2. Astrang	49·4	23·8	26·8
3. Banchas	76·2	6·8	17·
4. Chaubiskud	58·24	5·57	36·29
5. Damarkhand	68·9	14·9	16·2
6. Kodhar	69·4	8·8	21·8
7. Kotdes	79·4	2·1	18·5
8. Kotrahang	82·3	2·5	15·5
9. Kurelo	62·5	15·5	22·
10. Lembai	78·3	4·1	17·6
11. Matkatpatna	35·5	6·3	58·2
12. Oldhar	46·3	3·7	50·
13. Paschimduai	82·5	2·	15·5
14. Purbaduai	79·2	5·4	15·4
15. Rahang	75·5	1·8	22·7
16. Serai	75·5	5·3	19·2
17. Tappa Kanman	56·	13·4	30·6
18. Athaisi	38·6	8·3	53·1
Total*	71·	5·1	23·9

The Parganas in which the percentage of cultivation most exceeds the average are Paschimduai and Kotrahang, which are both well protected by embankments from river flood. Kotdes, which is partially protected, comes next, and Purbaduai follows Kotdes. It must be said that the figures do not truly represent the present situation, and that, since the first Survey was made, much land has been thrown out of cultivation on account of the calamitous floods of recent years. Parganas Antrodh, Banchas, Lembai, Rahang and Serai are partly protected by embankments and partly exposed to flood. In Pargana Serai some of the land shown as cultivated has gone out of cultivation.

Of the Parganas in which the percentage falls below the average, Damarkhand, Kodhar and Kurelo run the average close. For the low percentages obtaining in other Parganas there are special reasons. Thus in Matkatpatna which has the lowest figure of all, and in Athaisi which is not much better, about half of the entire area consists of a belt of shores, and varying from 2 to 4 miles in width in which cultivation is a physical impossibility. The same reason applies to Oldhar, and in a lesser degree to Tappa Kanman, Astrang and Chaubiskud. In all these four last Parganas there is also considerable liability to inundation either from river or salt floods.

Of the Thanas, Pipli, which includes Kotrahang, Lembai, Paschimduai and Kotdes, is most highly cultivated. The percentage is 76. Thana Gope, which includes Athaisi, Astrang, Oldhar and Matkatpatna, as well as Antrodh and Banchas, is the least highly cultivated. The percentage is 62 as against 70 in Thana Puri, which contains Rahang, Chaubiskud and Serai.

* For all the cadastrally surveyed portions of the subdivision as in Appendix E.

The percentage of land that has been shown in the *milan khasra* statements as culturable is exceedingly small, only 5·1 per cent. for the Subdivision. This is probably an understatement. It may be expected that a large slice of the 23·9 per cent. entered as unculturable will gradually be reclaimed as the increase of population presses harder on the resources of the soil. It is noticeable that in the five Parganas situate in the north-east corner of the district, viz., Astrang, Damarkhand, Kurelo, Tappa Kanman and Kodhar, the highest percentages of culturable lands are shown. There is a considerable amount of low scrub jungle in these Parganas, and much of this has probably been entered as culturable. The differentiation between culturable and unculturable obviously depends much on the individual opinion of the officer in charge of the survey party. The amins working in the five Parganas were probably working under the supervision of one and the same Officer.

Extension of cultivation since last Settlement.

96. There are two sources from which the extension of cultivation since last settlement can be estimated. The first and less reliable guide is a comparison of the Survey records of 1837-41 with the present *milan khasra*. More reliable information is to be obtained by comparing the assessed areas of estates according to the records of the last and of the present Settlements. The Survey record of course refers to alarger area, to the whole of the temporarily-settled Parganas. The Settlement records refer exclusively to temporarily-settled estates situated within the temporarily-settled Parganas. I make the former comparison by Parganas and the latter by completion blocks.

The Survey comparison gives the following results :—

NAME OF PARGANA.	ACCORDING TO SURVEY OF 1837-41.		ACCORDING TO PRESENT SURVEY.		Percentage of increased cultivation.	Proportion of present cultivated to total area.
	Tiotal area in acres.	Cultivated area in acre.	Total area in acres.	Cultivated area in acres.		
1	2	3	4	5	6	7
1. Antrodh	33,926	26,352	34,054	26,909	2·1	79
2. Astrang	5,594	2,728	5,743	2,839	3	49·4
3. Banchas	12,329	14,294	19,413	14,804	3.5	76·2
4. Chaubiskud	67,498	20,341	64,220	37,484	84·2	58·24
5. Damarkhand	18,767	12,356	18,876	13,012	5·3	68·9
6. Kodhar	17,406	11,664	17,574	12,210	4.7	69·4
7. Kotdes	1,16,194	86,020	1,16,296	92,455	7·4	79·4
8. Kotrahang	35,728	17,913	35,666	29,346	63·8	82·3
9. Kurelo	12,806	7,033	12,916	8,081	14.9	62·5
10. Lembai	57,580	30,807	57,575	45,161	46.6	78·3
11. Matkatpatna	6,915	2,203	6,709	2,383	8 1	35·5
12. Oldhar	26,331	1,875	26,319	12,195	550·4	46·3
13. Paschimduai	16,589	5,613	16,650	13,642	143.	82·5
14. Purbaduai	20,802	4,283	20,888	16,559	286·6	79·2
15. Rahang	95,679	67,480	96,150	72,503	6.9	75 5
16. Serai	43,308	23,356	43,091	32,526	39·3	75·5
17. Tappa Kanman	4,208	2,024	4,163	2,335	15·8	56
18. Athaisi	33,289	11,975	33,363	12,893	7.7	38·6
Total	6,24,949	3,48,317	6,29,666	4,47,337	28.4	71·6

A comparison, however, of Survey figures with Settlement figures renders the distribution of areas in the former exceedingly doubtful. The Settlements were made within a year or two of the Survey. They were made by responsible officers working on the spot, and the mistakes of the Survey amins were cleared up before assessment was made. The Settlement records show a very different state of things from that shown by the Survey. I give below, by completion blocks,

a comparison with last Settlement, and add a column to show how widely the results differ from the figures of the previous statement :—

Name Block	Completion	AT LAST SETTLEMENT. Total area in acres.	AT LAST SETTLEMENT. Assessed area in acres.	AT PRESENT SETTLMENT. Total area in acres.	AT PRESENT SETTLMENT. Assessed area in acres.	Present age of increase in assessed area.	Percentage of present assessed area to total area.
1		2	3	4	5	6	7
1. West Athaisiand.... Matkatpatna	....	10,612	3,405	10,660	3,883	14·0	6·4
2. East Athaisi and Damarkhand	....	32,507	15,397	36,453	18,027	34·5	49·4
3. Banchas	....	12,577	3,818	12,742	9,194	17·6	72·2
4. Kodhar	....	25,896	11,574	25,951	15,934	37·7	61·4
5. Lembai	....	54,926	35,131	53,123	44,327	26·2	83·4
6. Rahang	....	62,215	58,100	68,764	54,540	13·4	79·3
7. Kotdes, including Antrodh	....	1,21,006	78,020	1,22,981	97,552	25·0	79·4
8. Kotrahang	....	27,632	20,005	28,041	23,305	16·5	83·1
9. Paschimduai	....	11,093	7,704	11,578	9,431	27·3	81·4
10. Chaubiskud	....	43,345	23,990	56,570	30,873	28·7	54·6
11. Serai	....	41,653	25,398	40,310	31,384	23·6	77·8
12. Purbaduai, Oldhar		37,754	14,415	37,787	18,340	27·2	48·5
13. Scattered estates		14,916	11,247	15,217	13,780	22·5	75·0
14. Estates with lands in Cuttack.	....	3,024	2,237	3,086	2,751	23·0	74·0
Total	....	4,99,155	3,02,441	5,23,263	3,73,321	23·4	71·3

The Settlement figures are much more reasonable and much more intelligible than the Survey figures. While they show a total increase of 23·4 per cent., not differing widely from the total according to Survey records, they distribute the extension much more evenly over the whole district. The increase does not fall below 13 per cent. nor rise above 38, whereas according to Survey records, it ranges from 2 per cent. to 550 per cent. The Parganas in which there has been least increase have been west Athaisi, Matkatpatna, Banchas, Rahang and Kotrahang. These, except Kotrahang, are Parganas in which Survey records also showed little advance. It is worthy of notice that in Kotrahang, one of the first Parganas to be assessed, a considerable area lying fallow but culturable, was assessed to rent by the Settlement Officers of 1837. The Parganas in which the extension is notably above the average are Kodhar, Kurelo, Tappa Kanman, Astrang and Damarkhand. The area available for reclamation in all these Parganas was extensive.

At the last Settlement three-fifths of the total area of the temporarily-settled estates was brought under assessment. The proportion has now risen to over seven-tenths, and, as has been stated in paragraph 95 of the report, of the remaining three-tenths, only about one-sixth is capable of reclamation. The reclamation of new land during the sixty years of the last Settlement was a prolific source of advantage to zamindars and proprietary tenure-holders. In this district it was almost the sole cause of the increase of assets which has rendered the present enhancement of Government revenue possible. This source of increase has now almost been exhausted, and for at least fifteen years of the new Settlement proprietary income and estate assets must remain practically stationary.

Composition of the unassessed area at last and present Settlement.

97. The composition of the unassessed areas at the last and the present Settlement is shown in the following statement :—

LAST SETTLEMENT.	Area in Acres.	percentage.	PRESENT SETTLEMENT.	Area in Acres.	Percentage.
Unculturable waste. (*nalaik padia*).	 1,76,000	31·2	Unculturible lands	84,800	16·2
			Jungle	13,800	2·6
			Old fallow	20,100	3·8
Culturable waste (*laikpadia*)	 4,600	·9	Grazing reserve	19,800	2·3
			Cremation reserve	1,500	·3
Jungle	 25,600	5·1	Current fallow	4,400	·8
Minha	 3,400	·7	Tanks and		
Jagir	 7,100	1·4	miscellaneous	500	·1
			Orchards	1,400	·2
			Minha	1,900	·4
			Jagir	1,800	·3
Total unassessed	1,96,700	39·3	Total unassassed.	1,50,000	27·0
Total assessed	3,02,400	60.6	Total assessed.	3,73,300	73·0
Total	 4,99,100	100	Total	5,23,300	100

Nalaik padia appears to have been a description that was not applied with any pretence to accuracy. Nearly one-half of the area must have come under cultivation during the sixty years of Settlement. It is probable that in the same way, though to much more limited extent, the present term "unculturable" will be found to be a misnomer. The small areas under jungle and orchard will be noted.

Distribution of the principal Crops.

98. Appendices E and F give, Thana by Thana, the crop statement of the Sadar Subdivision (the permanently-settled Parganas excluded). From this has been extracted the following statement, which shows for each Pargana the proportionate distribution of the principal crops :—

NAME OF PARGANA	Percentage of early rice.	Percentage of winter rice.	Percentage of spring rice.	Percentage of *mandia*	Percentage of *kulthi* & other pulses.	Percentage of *bari*.	Percentage of orchards.	Miscellaneous.	Percentage of double-cropped area to net cropped area.
1	2	3	4	5	6	7	8	9	10
1. Antrodh	7.4	70.8	0.3	3.7	11.8	3.3	1.8	0.8	9.7
2. Astrang	3.1	82.2	0.3	4.4	4.1	4.3	1.3	0.6	3.5
3. Banchas	2.6	78.8	1.4	3.8	6.5	3.6	2.3	1.0	5.7
4. Chaubiskud	0.7	88.0	2.6	0.8	1.9	1.7	4.0	0.3	1.4
5. Damarkhand	5.8	74.4	1.7	3.0	8.4	3.7	2.0	1.0	6.2
6. Kodhar	5.5	75.8	0.2	4.5	6.6	3.4	2.1	1.9	5.2
7. Kotdes	8.4	66.3	0.1	0.4	16.7	4.2	3.4	0.7	18.7
8. Kotrahang	10.1	61.7	0.3	3.5	14.9	3.6	4.7	1.2	15.9
9. Kurelo	8.2	61.4	1.5	7.9	10.2	5.9	2.7	2.2	7.0
10. Lembai	6.2	74.4	0.2	0.3	12.3	3.5	2.5	0.6	10.8
11. Matkatpatna	4.0	72.4	9.1	2.0	4.6	3.1	2.2	2.5	2.7
12. Oldhar	2.4	48.1	31.7	1.6	2.9	2.2	1.9	1.2	2.3
13. Paschimduai	19.1	44.7	1.2	0.9	24.2	3.5	4.7	1.7	30.9
14. Purbaduai	4.2	78.5	1.5	3.1	7.8	3.1	1.3	0.5	6.6
15. Rahang	1.7	72.7	8.8	1.1	4.4	2 3	8.1	0.9	3.1
16. Serai	1 5	89.5	4.2	0.4	1.8	1.5	0.8	0.3	1.6
17. Tappa-Kanman	7.9	68.0	0.3	6.1	6.7	5.1	1.8	4.1	9.2
18. Athaisi	6.1	69.6	4.8	4.7	7.2	3.4	2.4	1.8	6.9
Total	6.3	78.4	3.5	1.9	10.9	3.3	4.1	0.4	9.3

From the Subdivisional total it will appear that winter rice (***sarad***) is grown on 78·4 per cent. of the total cropped area. The proportions of early (***biali***) and spring (***dalua***) rice are very small. The pulses occupy 10·1 per cent. of the total area. The two chief pulse crops are ***kulthi*** and ***mung***. It is unfortunate that separate figures have not been prepared for each of these crops. My impression gathered from touring about in the district, was that the larger area is occupied by ***kulthi***, but some Assistant Settlement Officers were of opinion that there is a preponderance of ***mung***. In estimating below the food-supply of the district, I have

assumed that the two occupy equal areas. The area grown with *mandia* is very small. *Bari* lands and orchards cover 3·1 and 3·4 per cent. respectively of the cropped area. The area that is double cropped is 9·3 per cent. of the whole. There is, however, considerable reason to believe that the area shown as double-cropped and consequently also the areas shown as grown with *mandia* and pulse crops are under-estimates. It has always struck me while on tour that a very much larger proportion than 10 per cent. of the cropped area was cultivated in the cold weather with *mardia, kulthi, mung* and *biri* crops, and this impression has been corroborated by statements of Assistant Settlement Officers and Kanungos, who say that when Survey operation was first commenced—that is, in 1889-90—raiyats and zamindars combined together wholesale to conceal the double-cropped area, and for two or three years refrained from growing winter crops. It was fancied that the new assessments would be a *fasal-bandhi* assessment, and much was to be gained by concealing the *dofasali* land. As the assessment has been made on the basis of existing *pahi* rents, raiyats and zamindars have gained nothing by the fraud, but we have been deprived of data from which the true food-supply of the District can be estimated. Varying estimates of the true *dofasal* area have been given to me by different officers. Some have placed the proportion as high as 33 per cent. I do not think that it can be much less tnan 20 per cent.

Keeping these general remarks in mind, we may now look at the distribution of crops by Parganas. The figures which disclose most striking divergence from the normal have been in the statement put in bold figures and may be briefly noticed as follows:—

Early rice.

Early rice is grown in largest quantities in Parganas Kotrahang and Paschimduai. These are both protected Parganas of very varied level with a considerable proportion of high land. The Parganas in which least *biali* is grown are Rahang, Serai and Chaubiskud, which are all situated round the lower reaches of the great rivers at the point where they enter the sea and the Chilka. The lands of these Parganas are low-lying and flat and consequently not suited to early crops.

Winter rice.

Winter rice is the principal crop in all Parganas, but the most striking preponderance is in the two Parganas Serai and Chaubiskud which grow least *biali*.

The proportion is lowest in Oldhar, which contains extensive *dalua* lands, and in Paschimduai with its larger *biali* and pulse-cropped areas.

Spring rice.

Spring rice is grown in very small areas except in Parganas Oldhar, Matkatpatna and Rahang, Oldhar Pargana includes the Sar Lake, a fresh water lagoon into which the Bhargabi discharges through its escape channels, the Bengai and Kanchi *rivers*. The lake is about 6 square miles in extent and very shallow, and a large portion is cultivated with *dalua* in winter months. In Matkatpatna the presence of the Kushabhadra river which runs through the Pargana enables some *dalua* lands to be irrigated up to February or March, after which date the river becomes tidal. In Rahang *dalua* is grown chiefly on the Samang-*pat*, a large expanse of low lying country north of Puri town which gets flooded annually from the Bhargabi through the Dhanua, East Kania and Athar-nala escape channels.

Mandia.

Mandia is grown in comparatively small areas chiefly as a second crop. It will be noticed that it favours most the north-east Parganas, Kodhar, Kurelo, Tappa Kanman and Astrang (included in the Kodhar block), and Athaisi, which adjoin Cuttack.

Kulthi, Mung and Biri.

Kulthi, mung and *biri*, the principal crops of the Pulse group, are grown chiefly on double-cropped land, and therefore most extensively in Parganas Kotdesh, Kotrahang and Paschimduai, which alone have exceptionally large double-cropped areas. The very small areas covered by pulse crops in Parganas Chaubiskud, Oldhar, Rahang and Serai are, as I have said above, probably less than actual.

Homestead lands and gardens.

Homestead lands and gardens are diffused more or less evenly over the Subdivision. The area is conspicuously small only in Chaubiskud and Serai. These two Parganas are situated close to the Chilka. I have noted in the general description how the village sites in this tract consist of bare isolated mounds rising only a little above the general level.

Orchards, like homestead, are more or less evenly distributed. The area is noticeably small in Serai Pargana. It is large in Chaubiskud, because there is a large tract lying between the cultivated land in the heart of the Pargana and the belt of sand to the south-east which is covered with scrub jungles and fruit trees.

Orchards.

Miscellaneous includes a multitude of crops which are all grown on areas so small that percentages if calculated would not be of any particular interest.

Miscellaneous.

The chief miscellaneous crops are castor oil, sugarcane, cotton, indigo, *pan*, tobacco and vegetables.

(i) Castor-oil.

The castor plant is grown in small quantities in all Parganas. Its cultivation is most extended in Athaisi and least in Serai.

(ii) Sugarcane.

Sugarcane is, according to Survey records, grown in all parganas except Chaubiskud, Serai and Matkatpatna. It is pobably cultivated in portions of these three Parganas, but has escaped the notice of the Survey amins. The sugarcane areas in Parganas Athaisi, Kurelo and Tappa Kanman are relatively greater than else where.

(iii) Cotton.

Cotton is grown in small quantities in all Parganas except Oldhar. There is very little in Matkatpatna, Serai, Chaubiskud and Paschimduai. The area is relatively greatest in Kodhar Pargana.

(iv) Indigo.

Indigo (included under "Dyes—other") is grown in very small quantities in 13 out of the 18 Parganas of the Sub-division. It is found chiefly in Kotdes Antrodh, Kotrahang and Damarkhand.

(v) *Pân* (Betel)

Pan (Betel) is grown in small quantities in ten Parganas—chiefly in Damarkhand, Rahang, Lembai and Kotrahang. In north-west Damarkhand there is a *pan*-growing centre at a place called Narsingpur. Cultivation has extended much of recent years and the particular variety grown there has established for itself popularity in the Cuttack and Calcutta markets, and is known by its local name as "Narsingpur *pan*". The *pân*-gardens of Kotrahang, Lembai and Rahang are to be found chiefly close to the Jagannath Road. The *pân* grown in these gardens is sold to pilgrims and exported to Puri town.

(vi) Tobacco.

Tabacco is grown in 11 Parganas. The largest areas are in Kotdes, Rahang and Paschimduai. The tabacco grown is for the most part consumed locally.

(vii) Vegetables.

Vegetables (included under "Miscellaneous crops—Food—others") are grown everywhere on riverside lands and lands adjoining the village sites. The areas are relatively large in Rahang, Kotdes, Kotrahang, Lembai and Paschimduai which are traversed by the principal rivers of the district and have extensive village sites. They are infinitesimal in Damarkhand, Astrang, Kurelo, Tappa Kanman, four of the north-eastern Parganas. The chief varieties are mentioned in Mr. Nathan's note quoted above.

Outturn of crops.

99. Mr. Nathan gives the following estimate of outturn per acre of the different classes of paddy :—

		Gauni.		Standard seers
Biali	....	20 to 120	average	322
Chota laghu	....	50 to 60	,,	253
Medium *laghu*	....	100 to 120	,,	506
Bara laghu	....	140 to 160	,,	690
Sarad	....	200 to 220	,,	966
Bara dhan	....	200 to 240	,,	1012

Very few crop experiments have yet been made in Puri District, and it is therefore impossible to say how far these estimates which are based on enquiries made from cultivators can be accepted.

The only Puri experiments of which I could find records are the following:—

	Average outturn in seers.
Four made by Assistant Settlement Officer Babu Jatindra Mohan Sinha.	669
Five made by Assistant Settlement Officer Babu Sudarsan Das	882

The general average of these experiments is nearly 800 seers.

As the Puri lands are none of them irrigated by canals, we may compare the averages found on irrigated lands of Cuttack and Balasore in the field season of 1895-96. In Cuttack the average of 28 cuttings was found to be 961 seers per acre, and in Balasore the average of 21 cuttings was found to be 936 seers.

In view of these estimates and experiments I think the produce of average *sarad* land may safely be taken at 900 seers per acre *.

The produce of *biali* lands varies within very wide limits. Some *biali* land is as good or better than first class *sarad* land, while on the other hand some is very poor. For want of exact information I think we may take the average of Mr. Nathan's estimates for *biali* and the three *laghus* as an approximation. The average is 443 seers, we may say 450 seers. For estimating the produce of *dalua* lands there are no Puri experiments to assist, but I take the following from the statement published with the Director of the Department of Land Records and Agriculture's No. 356A., dated 3rd March 1898. The average of experiments in the Cuttack and Balasore Districts was 1, 226 lbs or 613 seers; 600 seers may be taken for simplicity.

About the outturn of crops other than rice there is at present absolute uncertainty, as will appear from a comparison of Mr. Nathan's estimates with averages entered in the above statements. I give them side by side :—

Outturn per acre in seers.

Name of Crops.	Mr. Nathan's estimates	Director of the Land Records and Agriculture's statement of 3rd March 1898 (lbs. converted into seers.)		
			Approximately	
Mandia	92	616	600	Mr. Nathan's average for *mandia*, *mung* and *kulthi* appear to be inexplicably low; estimates based on experiments are more reliable.
Mung	92	376	400	
Kulthi	184	545	550	
Arhar	....	510	500	
Biri	....	375	400	
Chana (grain)	....	467	450	
Gabo (Caster oil)	92	....	....	
Rasi (Til)	69	....	....	
Mustard	....	215	200	
Sugarcane	....	1,735	1,700	
Wheat	....	355	360	

Of Cotton or Jute I can find no estimate. An acre *pân* garden yields about 7,200,000 leaves a year, according to an estimate made by Mr.D.H. Kingsford, Assistant Settlement Officer in charge, Balasore.

An acre of tobacco land yields about 12,500 leaves (Mr. Nathan says five *joris* per *gunt*, each *jori* consisting of two strings with 50 leaves on each).

Food-Supply of district.

100. In the last section I have endeavoured to throw together some information on the subject of average outturns. It will be seen how imperfect and incomplete are the data available, but they are the best we have and I propose to use them in order to prepare a rough estimate of the food supply of the Subdivision. The crop statement of the Sub-division is confined to the temporarily-settled Parganas, that is to about 1,000 square miles out of total of nearly 1,200 (excluding the Chilka Lake).

The food-supply in this area may be estimated thus :—

Crop.	Area in acres.	Averge outturn per acre in seers.	Total in maunds.
Rice—			
Biali	28,000	450	3,15,000
Sarad	3,56,000	900	79,65,000
Dalua	16,000	600	2,40,000
Total—Rice	4,00,000	....	85,20,000
Pulses—			
Mandia	9,000	600	1,35,000
Kulthi†	24,700	550	3,40,000
Mung†	24,700	4 0	2,47,000
Sugarcane	560	1,700	24,000
Total-Pulse, &c.	58,960	....	7,46,000
Grand Total	4,58,960	....	92,66,000

* This is Mr. Mcpherson's estimate. It is higher than that adopted by me in chapter VI of this report.

† There are not separate figures for *kulthi* and *mung* but as noted above, I have assumed that they are grown over a more or less equal extent of country.

The areas under wheat, maize, *chana* and other miscellaneous food crops are inappreciably small, and it is unnecessary to include them in the estimate. The total area under oil-seeds is only 1,000 acres, and the outturn varies so much according to the situation of the land and the variety of crop that an estimate of the total yield is impossible. It is unnecessary to allude here to the non-food crops, which also occupy an infinitesimally small proportion of the cultivated area of the District.

Note about population.

101. The information that is procurable regarding the earlier fluctuations in the district population is very meagre and unreliable. The first regular census was made in 1872. Piror to that we have only rough estimates made by the Police and Survey Departments and based on the numbering of houses. At page 232 of the Famine Commissioner's Report of 1866 there is a statement of the population of the District by Parganas compiled by the Police in October 1866. It shows the number of inhabitants before the famine and the number that died during the famine. From the Survey offiice, I have obtained a statement of the number of houses and number of inhabitants cmpiled in the Survey operations of 1837-42 for all Parganas of the District except Malud, Bajrakote, Parikud, Manikpatna, Chaubiskud and Serai. I find that for the Parganas for which the figures of both periods are available, the increase of population for 1837 to 1865 amounted to 16 per cent.

Assuming that the same increase occurred in the six Parganas mentioned we are able to construct the following comparative table for the three periods 1837-41-1865 (before the famine) and 1866 (after the famine):—

Name of Parganas.	Population in 1837-41.	Population in 1865.	Population after famine.
Malud	(2,870)	3,329	1,812
Bajrakote	(3,312)	3,842	1,947
Parikud	(8,823)	10,238	4,433
Manikpatna	(5,262)	6,104	1,679
Chaubiskud	(24,701)	28,654	9,727
Serai	(9,813)	11,384	3,966
Rahang	88,228	80,375	43,229
Lembai	29,979	41,896	37,896
Kotrahang	72,556	39,889	27,889
Paschimduai	14,636	18,326	16,828
Purbaduai	11,083	13,829	8,395
Kotdes	86,951	93,424	53,603
Banchas	10,280	10,067	5,781
Athaisi	6,926	13,447	7,561
Antrodh	15,900	20,683	10,663
Astrang	1,274	2,293	745
Kurelo	5,433	10,920	5,233
Kodhar	7,807	14,102	6,622
Marichpur	6,421	7,449	3,222
Damarkhand	7,930	12,445	5,532
Oldhar	6,318	8,400	4,296
Matkatpatna	1,062	1,039	603
Total	3,77,559	4,52,133	2,61,610

The increase of population in the first thirty years of the Settlement averaged as before mentioned 16 per cent. Then came the terrible calamity of the great famine, which according to the Police numbering reduced the population of the Sadar Subdivision by over 40 per cent. The population in 1866 remained about 30 per cent. below what it had been thirty years before.

The first regular census was made in 1872. In this, as in the Census Reports of 1881 and 1891, the statistics that were compiled are ***Thanawar*** and it is impossible to extract figures for each Pargana without an amount of expenditure and trouble incommensurate with the object. Looking however, for the present, to the Subdivision as a whole, we find that in 1872 the population had gone up to

488, 751. In 1881 it rose to 564, 759 and in 1891 to 613, 575. The fluctuation may be shown briefly thus :—

Period of numbering of census.	Population.	Percentage of variation on previous period.	Percentage of variation on last settlement Survey numbering.
1837-41 (Survey)	377,559	....	....
1865 (before Famine)	443,133	+16	+16
1866 (after Famine)	261,610	-40	-30
1872	488,751	+87	+30
1881	564,759	+15	+50
1891	613,575	+ 8	+62

The most remarkable fact in the history of the district population is the celerity with which it recovered after the violent interruption of the Famine year. In six years the population nearly doubled itself, but this can scarcely be regarded as within the bounds of possibility and the true explanation seems to be either that the population before the famine was very much under estimated or that the number of deaths was very much over-estimated. Both causes were probably at work. It is exceedingly likely that as the number of deaths was estimated from the number of empty and deserted houses. a great many people who had temporarily removed to Khurda and the *Garhjats* were counted amongst the dead. Leaving out of account the extraordinary disturbance of the Famine year, and comparing the population of 1872 with the previous population of 1837 and 1865 and with the subsequent censuses of 1881 and 1891, it will appear that there has been a steady advance in the population. The growth from 1872 to 1891 has been 25 per cent. It is not improbable, then, that the advance from 1837 to 1872 amounted to 30 per cent., and I am therefore inclined to place considerable reliance on the result of the Survey count of last Settlement.

The statistical records of the censuses of 1872, 1881 and 1891 being *Thanawar,* I have endeavoured for the sake of comparison to build up Thana totals from the Pargana figures of 1837 and 1865. For Parganas not contained entirely within one Thana a division has been made according to the existing number of houses as counted in the present Survey and Settlement Operations. An attempt has also been made to estimate the present population of the District. The number of houses in each thana being known, it has been multiplied by the *Thanawar* average number of persons to each house according to the 1891 census. In this way the following comparative table has been prepared :—

Name of Thana.	Population in 1837-41.	Population in 1865.	Population in 1872.	Population in 1881	Population in 1891.	Present number of houses.	Multiplicand per house according to census of 1891.	Estimated Present Population	Variation of present estimated population and Population at last Settlement.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
Gope ..	74,796	106,844	96,096	116,167	134,038	23,868	6·0	143,208	91	Thana Puri includes the town of Puri and Nabba thana of the 1872 census.
Pipli ..	144,495	171,642	204,375	226,782	241,470	45,655	5·3	241,971	73	
puri ..	158,270	164,647	188,280	221,810	238,067	38,302	5·6	214,491	55	
						6,927 (Town)	4·4	30,479		
								244,970		
Total ..	377,559	443,133	488,751	564,759	613,575	114,752	....	630,149	66	

The present estimated population is only 2·7 per cent. in advance of that ascertained in 1891. The advance of 1881 on 1872 was 15 per cent., and of 1891 on 1881 8 per cent. It may be that the pressure of population on the resources of the soil has gone almost as far as it can go and that this is the cause of the slightness of the advance made during the last decade. On the other hand the Survey count of houses may be incorrect and this method of estimating the population does not in any case pretend to be very exact. The table shows that the growth of population has been greatest in Thana Gope. This is not unnatural, as that Thana was at Last Settlement and still is the least developed of the three. It is still much more cut off from the rest of the world by absence of communication than Thanas Pipli and Puri, which have in addition to the Trunk road, recently acquired the convenience of Railway communication. Looking to the general result of the above enquiries it may I think be safely assumed that the increase in the population of the Sadar subdivision during the term of the last Settlement has been not less than 60 per cent. The importance of this conclusion from the revenue and rent point of view will be discussed below.

Division by sex.

The number of males as shown in the census returns is slightly in excess of the number of females, especially in Puri Town. The proportions are-For the Subdivision, males, 50·6; females, 49·4. For Puri Twon-males, 55·3; females, 44·7.

Division of religion.

Puri being one of the chief strongholds of Hinduism it is not surprising to find that Hindus compose 98·6 per cent.of the total population. Musalmans represent 1·3 per cent. The proportion of Hindus is highest near the precincts of the sacred city, viz., in Puri Thana and Puri Town. There are a large number of Musalmans in village Gope, accounting for the high proportion in that Thana.

The general proportion of Hindus to Musalmans throughout Bengal in 1891 was 64·07 and 31·70 per cent., respectively; in Cuttack 97·00 and 2·73; in Balasore, 97·90 and 2·10. Puri is thus pre-eminently a home of the Hindus.

Immigration.

It will be seen from the census statements that nearly 7 per cent. of the resident population in 1891 consisted of immigrants. By far the largest number came from Cuttack District, and of these most settled in Thanas Gope and Pipli; where it may be presumed they engaged in cultivation and its accessory occupations. The settlers in the southern portion of the District came chiefly from Madras. The recorded immigrants of Puri Town were probably for the most part pilgrims. There is no emigration from the District in the more special sense of the term. There is a constant influx and efflux of pilgrims and labour between Puri and the neighbouring districts of Ganjam and Cuttack, but there is no cooly emigration. The difficulty of communication with Calcutta has been hitherto a well-nigh insuperable obstacle. Now that it is shortly to be removed we may expect to find the cooly recuiter in the District. The year 1896 was a year in which there was more movement of population than usual. The scarcity prevailing in the flooded Parganas Purbaduai, Oldhar, Serai and Chaubiskud drove many of the poorer agricultural labourers to seek work on the East Coast and Bengal Nagpur Railways. Many of these labourers have not yet returned to their homes as the prospect of cultivation in Purbaduai and Oldhar is still by no means bright.