



EXCELLENT RETURNS FROM IRRIGATION 333

the elaborate provisions made for navigation. In the drought of 1873-74, these canals were very incomplete, and water was rudely poured over the fields through cuts in the banks. The result was that 159,500 acres of rice were saved, worth not less than £600,000. Were a similar season of drought to occur again, 1,000,000 acres might be watered, the value of which would approach £4,000,000 sterling, or about double the cost of the works. It may

still be long before a return is obtained equal
In Orissa. to the interest at four and a half per cent. on the £3,110,000 spent, or remaining to be spent, in order to complete the canals of Orissa; but should another famine occur after they are completed, their value would be incalculable. In 1865-66, about a million and a half sterling was spent on famine relief in this province; yet about a million persons perished from starvation, and the province was enriched by no single public work to put against the money spent.

5. From the hilly character of the Deccan,
In the Deccan. the contracted form and broken surface of the valleys, and the absence of large works, irrigation has been more difficult and more costly in Bombay than in other parts of India; but tank irrigation is common, and some of the works by which the waters of the minor streams are utilized, though on a small scale, are extremely productive, and the value of watered crops is, in ordinary years, not less than four times that of others.

6. In Sindh we find a large province in which,
Sindh. without irrigation, agriculture and population would be alike impossible, but the province, which, with this protection has 1,800,000 acres of cultivated land, has reached a fair condition of prosperity, and gives complete evidence of far greater capacities for progress in the future.

7. The three great deltaic systems of irri-
In Madras. gation in Madras, the Godavari, the Kistna, and the Cauveri, yield direct returns of 8·7, 6·3, and 31·7 per cent. respectively on the capital spent on them. During 1876-77, a year when every unirrigated district



was importing the food of a large portion of its population, the value of rice produced in the deltas of the Godavari and Kistna is calculated, at the prices then prevailing, to have been not less than £5,000,000 sterling. The quantity exported by sea from Cocanada, the port of the Godavari delta, was valued at £870,000, while an equal quantity is believed to have been exported by land.

Effect of
irrigation
on crops

8. Over the greater part of India sugar-cane and rice can only be grown with the help of artificial irrigation, and even in Midnapur, in

Bengal, with an average rainfall of fifty-five inches, it has been found that the produce of irrigated rice is forty per cent. in excess of that grown on unirrigated lands.

And
on rental.

9. The ordinary rental of land in Northern India is doubled by irrigation, while in eleven districts of Madras the average rental rises from

Rs. 1.4.0 to Rs. 5.4.0 per acre when supplied with water. In Tinnevely the increase is nearly tenfold. In the eight years preceding 1875-76, the average selling price of irrigated lands in the Cauveri valley in Mysore was £35 per acre. The best dry land at the same time did not fetch above £2 to £2 10s.

The
grounds
which jus-
tify the ex-
tension of
irrigation.

10. It would indeed be a great error to rest the value of irrigation works on their direct revenue alone. It should be considered rather whether any particular tract is liable to frequent or serious drought, and whether, in the event of famine, the population is such that

large outlay would be necessary for its relief, and large loss of revenue would be incurred. If these questions are answered in the affirmative, and if, at the same time, it is possible to introduce irrigation from a source which can be relied on in years of drought, without any excessive cost, Government might usually embark on the enterprise without hesitation. The certain result will be an increase of the prosperity and of the general well-being and productive power of the population, and the development of every



"TERRIBLE MISERY" FROM FAMINE 335

indirect source from which the wealth of the country springs.

When dealing with Mysore, the Commissioners use almost minatory language with regard to the upkeep and extension of irrigation works in the Feudatory States. "With the evidence before us," they say, "of the terrible misery wrought by the recent famine, we would urge, in the strongest manner possible, that some practical system be devised to ensure the efficient maintenance of the works of irrigation, and that, if possible, it should be placed beyond the risk of being subverted, however weak might be the Government or capricious the ruler." Will the British public repeat this advice to the Indian authorities themselves, concerning the British Provinces? *And, having given the advice, WILL THEY SEE IT IS ACTED UPON?*

This, perhaps, is the best place in which to direct attention to a phase of the irrigation question which is seldom considered, and yet it is of vast importance. Under our rule great neglect has marked our action towards the ancient tanks which are to be found in almost every part of the Carnatic. *The Hindu* newspaper¹ of the 10th of May 1900, describes this neglect in the following striking terms: "The tanks and lakes to be found in the country are too few, and for want of occasional digging up and cleansing are often found silted up and too shallow to hold any large quantities of water. Nor is any attention paid to improving the facilities for gathering rain water falling over large areas of land into existing tanks and reservoirs. Owing to this state of things, the occurrence of famine in years when monsoons fail is almost inevitable, and this contingency is in no small measure accelerated by the tendency of avaricious and miscalculating landholders to convert every available piece of land into *nunja*. Small tanks and pools owned by private individuals have been allowed

¹ A daily newspaper, edited, owned, and published in Madras, wholly by Hindus—a strikingly moderate journal.



to be silted up that they might with small labour and outlay be converted into *nunja* lands. Within recent years, the tanks in many of the villages in several districts have become considerably narrowed in their dimensions by the aggression of owners of lands bordering on them, and the quantity of water they hold is too small to leave any surplus available for agricultural purposes after their use for purposes of drinking, bathing, or washing."

There can be no doubt that an immense accession to the present irrigable area in Madras could be obtained were adequate attention given to this matter. After more than a hundred years' administration, the authorities ought to be in a position to deal directly with every acre of water-catchment in the Presidency.

The Hindu, in another part of the same article, declares "the only well-calculated measure against the possibility of the occurrence of famines is the storing up of large quantities of water in spacious and deep reservoirs." How such a pronouncement, coming from an Indian source, would have rejoiced Sir Arthur Cotton!

Those who have studied irrigation and canal navigation under Sir Arthur's guidance, and who have as closely followed the arguments of opponents like Sir George Campbell and others, as they have Sir Arthur's printed works, have taken the line in conversation that, having received from the Commission of their own appointment so distinct and unmistakable a pronouncement as to irrigation being the FIRST, and (so far as any official recommendations have gone) the *only sure preventative of famine*, the authorities were not competent, were greatly failing in their duty, in not following out to the utmost a bold and far-reaching irrigation policy. On that point there was no mistaking the emphasis with which they argued. If the recommendations of a Commission of Enquiry are such as, if carried out, would serve the public good, the authorities may not disregard such recommendation. What was done in this particular instance?



IRRIGATION TO HAVE "FIRST PLACE" 337

The Famine Commissioners reported in 1880. They said then that, to the date of their enquiry, even on the bare commercial aspect of the undertaking, and leaving everything else out of consideration, irrigation had been fully justified. This was the case, though, as Sir Arthur never tired of pointing out, some most expensive works were never provided with transit outlets, and, for all practical purposes, were left in a desert. Unless navigation were provided as well as irrigation, there was often no temptation to the cultivator to provide capital and additional energy in preparing his land for the richly-nurturing river water. If the cultivator could not easily export the additional produce when he had raised it, where was the return—the hope of gain—to come from which he looked for, and which alone, in such circumstances, will stimulate enterprise?

Have irrigation works continued to deserve so good a word in their financial favour as was pronounced by the Famine Commissioners of 1880? The answer is that twenty years later, they more than justify all that was aforesaid concerning them. The witnesses cited in justification are the administration reports for the various presidencies, provinces, and chief commissionerships for the year 1898-99. They were available in London only in May of this year (1900) and, therefore, are as up-to-date as it is possible for Indian statistical statements to be. Madras, as the oldest presidency and the most important irrigationally, may lead the way in this array of evidence.



STATEMENT CONCERNING ALL IRRIGATION WORKS
IN THE MADRAS PRESIDENCY, 1898-99.¹

SURPLUS REVENUE.

	During 1898-99.	To end of 1898-99.
	Rs. ²	Rs. ²
1. GODAVARI DELTA SYSTEM . . . "The net revenue from the system during the year, after paying the interest charges, was 15.02 per cent. on the capital outlay 'Direct and Indirect,' against 15.75 per cent. on the previous year. The anticipated ultimate return was 9.4 per cent. per annum on the capital outlay. . . . The receipts from navigation rose from Rs. 76,581 to Rs. 89,663."	19,62,473	3,70,98,763
2. KISTNA DELTA SYSTEM . . . "The net return, after paying interest charges, was Rs. 11.32 per cent. on the total capital outlay against 9.49 per cent. in the previous year. The navigation receipts amounted to Rs. 50,857."	15,17,007	2,02,11,515
3. PENNERU ANICUT SYSTEM . . . "The net return, after paying interest charges, was 4.76 per cent. on the capital outlay against 4.12 per cent. in the previous year."	90,492	12,01,401

¹ *Madras Administration Report*, 1898-99, pp. 130-164.

² Although it was intended that all money figures should be stated in sterling rather than in rupees, it has been considered wiser, where the statements cover a long series of years, that the figures, exactly as they stand in the official records, should be reproduced here. For rough and ready purposes the reader has only to divide the amounts by 15 to arrive at the present value of the rupee to the £ sterling. In regard to many of the Madras works, and some of those in the North-West Provinces and the Punjab, profits were realized when ten rupees went to the £1.



GREAT PROFITS FROM IRRIGATION 339

	During 1898-99.	To end of 1898-99.
	Rs.	Rs.
4. SANGAM ANICUT SYSTEM . "The net return, after paying interest charges, was Rs. 29,900 against Rs. 16,234 in the previous year. The area irrigated during the year under first crop is the highest on record."	29,900	—5,61,993
5. CAUVERI DELTA SYSTEM . "The net return, after paying interest charges, was 37.91 per cent. on the capital outlay against 41.26 in the previous year."	8,00,867	2,35,38,320
6. SRIVAIKUNTAM ANICUT SYSTEM "The net return, after paying interest charges, was 1.82 per cent. on the capital outlay against 1.73 in the previous year. "The area irrigated under first crop is only 406 acres less than the highest on record, while that under second crop is the highest limit yet attained. Under this system the area of second crop irrigation bears a much higher proportion to the first crop irrigation than elsewhere."	26,981	77,711
7. GANJAM MINOR RIVERS SYSTEM "The actual return was 8.69 per cent. on the capital outlay."	7,290	4,44,455
8. CUMBUM TANK SYSTEM . "The actual return was 17.39 per cent. on the capital outlay."	11,204	1,18,838
9. THADAPALLI CHANNEL SYSTEM. "The actual return was 15.94 per cent. on the capital outlay."	20,030	5,20,859
10. ARKENKOTA CHANNEL SYSTEM . "The actual return was 3.78 per cent. on the capital outlay."	3,898	2,566



	During 1898-99.	To end of 1898-99.
	Rs.	Rs.
11. KALINGARAVAN CHANNEL SYSTEM. "The actual return was 12.72 per cent. on the capital outlay."	10,175	—55,673
12. PALAR ANICUT SYSTEM . . . "The actual return was 5.92 per cent. on the capital outlay."	1,23,049	16,37,386
13. POINAY ANICUT SYSTEM . . . "The actual return was 19.95 per cent. on the capital outlay"	46,204	7,24,044
14. CHEVARU ANICUT SYSTEM . . . "The actual return was 7.60 per cent. on the capital outlay."	30,831	3,59,208
15. CHEMBRAMBÁKAM TANK . . . "The actual return was 4.16 per cent. on the capital outlay."	31,086	6,63,703
16. MADRAS WATER SUPPLY AND IRRIGATION SYSTEM. "The actual return was 1.21 per cent. on the capital outlay."	21,121	—12,367
17. VALLURU ANICUT SYSTEM. . . "The actual return was 5.39 per cent. on the capital outlay."	3,533	39,090
18. TIRUKKOYILUR ANICUT SYSTEM "The actual return was 6.22 per cent. on the capital outlay."	15,826	3,82,514
19. MEHMATTUR ANICUT SYSTEM . "The actual return was 3.50 per cent. on the capital outlay."	2,489	72,183
20. VRIDDHACHALAM ANICUT SYSTEM. "The actual return was 25.46 per cent. on the capital outlay."	12,665	2,08,708



GREAT PROFITS FROM IRRIGATION 341

	During 1898-99.	To end of 1898-99.
	Rs.	Rs.
21. SHATIATOPE ANICUT SYSTEM . "The actual return was 40.73 per cent. on the capital outlay."	93,112	21,27,674
22. PELANDORAI ANICUT SYSTEM . "The actual return was 3.28 per cent. on the capital outlay."	19,224	—1,73,668
23. LOWER COLEROON ANICUT SYS- TEM. "The actual return was 27.26 per cent. on the capital outlay."	2,56,032	94,10,951
24. MARUDUR ANICUT SYSTEM . "The actual return was 114.32 per cent. on the capital outlay."	51,220	13,65,465
25. PROVINCIAL MINOR WORKS AND NAVIGATION. "Minor works for which neither capital nor revenue accounts are kept, but for which continuous records of expenditure and revenue are maintained individually, shew a nett revenue of Rs. 69,85,309."	69,85,309	
Totals Rs.	1,20,72,018	9,94,01,653

*Works showing DEFICIT Revenue.*

	During 1898-99.	To end of 1898-99.
	Rs.	Rs.
1. KURNOOL-CUDDAPAH CANAL .	8,24,352	1,49,49,034
2. BARUR TANK SYSTEM . . .	8,577	1,74,321
3. PERIYAR PROJECT "The project is only partly completed and at work."	1,92,396	Figures showing results to end of 1898-99, are not yet available.
4. MAJOR PROTECTIVE WORKS : RUSHIKULYA PROJECT. "The irrigated area both under first and second crops is steadily increasing."	1,27,522	12,18,198
5. NANDYAR CHANNEL "The working expenses exceeded the revenue by Rs. 775."	775	6,139
6. BUCKINGHAM CANAL (NAVIGATION). "The financial result of the year was a deficit of Rs. 8,736. There was a considerable diminution of traffic owing to a fall in the imports of salt, indigo, and coal, and to the Bezwada-Madras Railway having come into working."	8,736	80,949
Totals Rs.	11,62,358	1,64,28,641

Summary.

	No.	Surplus. Rs.
Works recording profit in 1898-99	25	1,20,72,018
Works recording deficit in 1898-99	6	11,62,358
Net surplus profit		Rs. 1,09,09,660

*Works under Construction.*

1. MUNÉRU PROJECT
2. DONDAPAD PROJECT
3. SAGILERU UPPER PROJECT
 "The results of the year show
 that the financial aspect of the
 project is fairly promising. . . .
 There should be a further increase
 of revenue."
4. CHOPAUD PROJECT

[No particu-
lars fur-
nished.]

The great Australian authority alludes to the Madras works in flattering terms.

The reports of the Madras Irrigation Department, he says, are in some respects the best in India, for though all the provinces publish admirable records of their work, these are exceptionally lucid and well-arranged. A glance at the map prefacing the annual report indicates at once the position and character of the great state undertakings for water supply. At the extreme north, where the east coast curves eastwards to Orissa, is the Ganjam and Gopalpur tidal canal, undertaken as a famine relief work, the estimate for which is £50,000. Southwards, two important rivers—the Godavari and Kistna—pour their streams over two large tracts, which unite to form a great irrigated area. A long, narrow strip in the mountains indicates the one private enterprise, the Madras Company's land, while the Pennar river, to which it leads, has at its mouth its own deltaic scheme. There are three smaller patches near Madras, and one in the interior at the Barur tank. Then come the great delta of Tanjore, watered by the Cauveri; at the extreme south, another delta below Tuticorin, and between the two, inland, the plain of Madura, to be commanded by the great Periyar project, now in course of construction. The five great schemes are deltaic, and similar in character, repeating here, as in Bengal, the likeness and lessons of the country below Cairo. If Egypt is the gift of



the Nile, certainly Bengal is the gift of the Ganges ; while the Godavari, Kistna, Pennar, Cauveri, and Tambragani have endowed the Coromandel coast with stretches of remarkable fertility, which have enabled its millions to be certain of their harvests year by year.

The water supply expenditure in Madras is dealt with under several heads, distinguishing works which were undertaken as reproductive investments of capital, from those which were executed to protect the country against famine, and from those which were expected to yield some return incidentally, but were not commenced solely with that end. Under the first head, "major productive works," the Presidency has invested £5,300,000 up to the end of 1889-90 ; upon "protective works," £160,000 ; and upon "minor works and navigation," £1,200,000. After allowing for interest upon capital, the first class show a profit to the State for the year of £275,000 on five schemes, and a loss of £102,000 on four, or a total net gain of £173,000. The net revenue, after deducting interest charges, is seven per cent., and would be twelve per cent. if the department were responsible only for the works designed and executed by its own officers. Nearly six million acres were watered during the year, of which two million three hundred thousand were under major works. The direct revenue derived from water rates was over £1,750,000, even after deducting remissions to the extent of £100,000. Many of the areas now commanded by State works were irrigated prior to their construction, and in each case the value of the work done in those days appears upon the accounts. Nor is the result in any sense unfavourable to the administration, for by means of the new works, areas in which there were but one million acres irrigated have now nearly two million two hundred and fifty thousand acres, while the revenue they yield has risen from £90,000 to over £500,000. The official estimate of the value of the crops in the one-third of the whole irrigated area, which is supplied by major works, is just short of £5,500,000, and if the remaining two-thirds be only taken at the same sum, this means security



PROFITS IN THE PUNJAB AND NORTH-WEST 345

for £11,000,000 a year. Such figures should convey to the mind of the Australian the magnitude of the system of irrigation executed in this one presidency—which is, after all, only half the size of New South Wales and not twice the size of Victoria.¹

None of the other Administration Reports give details in such fulness as does the Madras report. Hence, in those which follow only total results can be given.

THE PUNJAB.²

	Rs.
Receipts from all irrigation works . . .	1,27,36,719
Expenditure upon all irrigation works . . .	76,90,644
Profit	Rs. 50,46,075

NORTH-WESTERN PROVINCES AND OUDH,³

1898-99.

	PROTECTIVE WORKS.	PRODUCTIVE WORKS.	MINOR WORKS.	TOTAL.
	Rs.	Rs.	Rs.	Rs.
Receipts . . .	1,10,246	85,82,963	3,28,508	90,21,717
Charges . . .	1,09,769	28,54,713	1,82,828	31,47,310
Nett Revenue . .	477	57,28,250	1,45,680	58,74,407
Interest Charges .	1,63,324	30,37,403	—	32,00,727
Profit or Loss . .	-1,62,847	+26,90,847	+1,45,680	+26,73,680

"The Betwa canal is the only *protective* work in these provinces. The receipts have for a second time just exceeded the direct and indirect charges of the year, but by Rs. 477 only, and were Rs. 1,62,847 short of the interest charges. *Productive* works show a net revenue of Rs. 57,28,250, representing a return of 7.27 per cent. on the capital outlay

¹ *Irrigated India*, pp. 252-254. ² *Administration Report*, p. 202.

³ *Administration Report*, p. 118.



to the end of the year on works in operation, and of seven per cent. on the total expenditure on productive works.

"The net revenue, after deducting the interest charges of the year (Rs. 30,37,403, including interest on the expenditure on the Fatehpur division), shows a clear gain of Rs. 26,90,847.

"*Minor* works give a net revenue of Rs. 1,45,680, which is more than forty-five per cent. above the average, and gives a return of 5.17 per cent. on the capital invested in the canals in operation.

"After meeting the total interest charges, the receipts from all the works show a clear profit of Rs. 26,73,680."

	Rs.
Productive works, net revenue	26,90,847
Minor works, net revenue	1,45,680
	<hr/>
Profit (less Rs. 1,62,847 Protective)	Rs. 26,73,680

CENTRAL PROVINCES.¹

	Acres.
(a) Government canals	—
(b) Private canals	8,291
(c) Tanks	462,598
(d) Wells	75,959
(e) Other sources	15,780
	<hr/>
Total	562,628

No statistics in rupees available.

BENGAL.²

Major Irrigation Works.

	Rs.
Receipts	19,02,205
Expenditure	13,66,707
	<hr/>
Profit	Rs. 5,35,498

¹ *Central Provinces : Stat. Tables*, 1897-98.

² *Bengal Administration Report*, 1896-97, p. 214.



BOMBAY FIGURES MEAGRE

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Minor Irrigation Works.

	Rs.
Receipts	6,60,942
Expenditure	<u>5,76,226</u>
Profit	Rs. 84,716

BOMBAY.

The Bombay Administration Report for 1898-99 gives very meagre figures, and they are not lucid or easily to be understood.

RECEIPTS.

	Rs.
<i>Major Works :</i>	
Protective works	1,63,465
Productive works	4,96,985
<i>Minor Works :</i>	
Imperial	2,52,253
Provincial	<u>31,197</u>
Total	Rs. 9,43,500

EXPENDITURE.

	Rs.
Works	18,62,085
Repairs	14,11,304
Establishment	8,99,594
Tools and plant	<u>35,040</u>
Total	42,08,023
Less suspense account	<u>11,593</u>
	Rs. <u>41,96,430</u>



IRRIGATION WORKS THROUGHOUT INDIA.

GOVERNMENT OF INDIA: PUBLIC WORKS DEPARTMENT.

(Compiled from statements showing the financial results of irrigation operations throughout India, for, and to the end of, the year 1898-99)

No.	Mileage in Operation :		Area Irrigated :	
	Main Canals,	Distributaries.	Old Works.	New Works.
BALUCHISTAN :—				
2.	—	Miles. 4	Miles. 41½	Acres. 5,653
RAJPUTANA :—				
3.	—	—	—	25,560
BURMA :—				
1. Major Works	—	—	—	—
6. Minor Works	—	—	—	—
BENGAL :—				
4. Major Works (productive).	729	2,644	—	713,443
3. Minor Works	887,08	—	—	—
NORTH - WEST PROVINCES AND OUDH :—				
5. Major Works (productive).	1,439	9,965	—	2,112,778
1. Protective and Navigation Works	168	424	—	39,500
5. Minor Works	—	618	1,653	101,464
PUNJAB :—				
7. Major Works	1,598	7,596	—	3,320,000
1. Protective and Navigation Works	22	182	—	139,759
6. Minor Works	1,813	319	—	664,213
MADRAS :—				
9. Major Works	2,024½	5,708½	1,200,171	2,092,817
1. Protective Works	80	120	47,309	35,566
27. { Minor Works	1,365½	1,184½	315,487	248,110
Navigation Works	304½	—	—	—
BOMBAY :—				
15. Major Works	999	165½	21,910	694,130
6. Protective Works	156½	166½	—	40,461
34. Minor and Navigation Works	2,092	228½	295,848	512,374
	13,671½	29,574	2,085,351	10,650,175



SUMMARY.

Main Canals	13,671 $\frac{3}{4}$ miles
Distributaries	29,574 „
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Old Works	2,085,351 acres
New Works	10,650,175 „
<hr/>	
Total	12,725,526 „

CHARACTER OF WORKS.

	MAJOR WORKS.		MINOR WORKS AND NAVI- GATION.
	Productive.	Protective.	
Baluchistan	2	—	—
Rajputana	3	—	—
Burma	1	—	6
Bengal	4	—	3
North-West Provinces and Oudh	5	1	5
Punjab	7	1	6
Madras	9	1	27
Bombay	15	6	34
	46	9	81



DETAILS OF WORKING AND AREA IRRIGATED.

CSL

Irrigation Works.	Gross Receipts.	Working Expenses.	Surplus Revenue after charging interest.	Area Irrigated.	Percentage of working expenses in Rx.
<i>Major Works, Productive :—</i>	Rx.	Rx.	Rx.	Acres.	
Bengal	176,564	137,744	—200,756	713,442	78·01
N.-W. Provinces and Oudh	858,295	285,470	+269,084	2,112,778	33·26
Punjab	1,195,245	344,358	+525,718	3,320,000	28·81
Madras	777,992	189,042	+340,402	2,692,817	24·30
Bombay	167,942	51,877	+16,045	716,040	30·89
<i>Navigation :—</i>					
Bengal	7,431	5,003	—7,779	—	67·32
<i>Protective :—</i>					
N.-W. Provinces and Oudh	11,025	10,977	—16,284	39,560	99·56
Punjab	45,465	10,793	+19,194	139,759	23·74
Madras	8,782	4,407	—12,753	82,965	50·18
Bombay	16,359	7,732	—23,524	40,461	47·26
Total	3,265,100	1,047,403	+905,003	9,857,823	32·07
<i>Minor Works and Navigation.</i>					
<i>Irrigation :—</i>					
Baluchistan	5,407	2,084	—3,033	5,653	38·55
Rajputana	11,908	5,304	—2,901	25,560	44·54
Burma	88,529	23,473	+51,765	—	26·51
Bengal	499	60	—2,278	—	12·02
N.-W. Provinces and Oudh	32,851	18,283	+4,264	103,117	55·65
Punjab	133,122	79,854	+43,221	664,213	59·99
Madras	104,194	27,564	+43,109	563,597	26·45
Bombay	125,754	47,710	+36,740	806,222	37·93
Total	502,264	204,332	+170,887	2,168,362	40·68
<i>Navigation Works :—</i>					
Bengal	48,237	36,296	—31,079	—	75·24
Madras	10,550	11,787	—36,318	—	111·72
Total	58,757	48,083	—67,397	—	81·79
Total: M. W. and N.	561,051	252,415	+103,490	—	44·99
COMBINED TOTALS:—					
Major Works, all Kinds	3,265,100	1,047,403	+905,003	9,857,823	
Minor Works, all Kinds	561,051	252,415	+103,490	2,168,362	
	3,826,151	1,299,818	+1,008,490	12,026,185	



More striking confirmation of the financial success of great public works could not be desired.¹ That being so, it is desirable to observe to what extent the recommendations of the Famine Commissioners of 1880 have been acted upon in regard to occupying the "FIRST PLACE" with irrigation works as against railways, the only other public works of any magnitude carried out in India being buildings and roads, necessary at all times. Each year from 1882-83 to 1897-98 (the latest available) may be taken. I select 1882-83, and not an earlier year, so as to give the authorities two years in which to make the necessary arrangements for carrying out the policy which was described as of "first" importance. The figures are significant. They are more than significant. They suggest the very pointed enquiry as to how far the authorities may be held blameless for their neglect to carry out such plain and obvious reforms. If the responsible officials at the India Office—men of the past who are still living (Lord Salisbury not the least of a large number) as well as of the present—dare consider the preventible suffering now being endured in India, as the consequence of their want of foresight and effort, perhaps they will change their policy.

¹ Reviewing the foregoing works as a whole ten years previously, Mr. Deakin places this judgment on record: "The works as a whole are remunerative. In Madras, the North-West Provinces, the Punjab, and Sind, they yield handsome profits; in Bombay they are likely to pay for themselves, and in Bengal, they are, after all, the cheapest and best means of fighting famine, and saving the public treasury from ruinous drafts in bad seasons. On the merits of the investment, therefore, the stock would be entitled to rank high, apart from the guarantee."—*Irrigated India*, p. 233.



STATEMENT AS TO EXPENDITURE FROM REVENUE IN
INDIA AND ENGLAND ON RAILWAYS AND
IRRIGATION, 1882-83 TO 1897-98.

(Abstracted from Nos. 27 and 33 of the "Statistical Abstract
for British India.")

Year.	Expenditure in India.	Expenditure in England.	Grand Total.
	Rx.	Rx.	Rx.
1882-83	Railways . . 6,520,738	6,105,946	12,626,684
	Irrigation. . . 2,480,912	32,386	2,513,298
	<u>4,039,826</u>	<u>6,073,560</u>	<u>10,113,386</u>
			In favour of Rys.
			10,113,386
1883-84	Railways . . 6,808,186	5,929,836	12,738,022
	Irrigation. . . 2,440,963	2,039	2,443,002
	<u>4,367,223</u>	<u>5,927,797</u>	<u>10,295,020</u>
1884-85	Railways . . 8,158,667	6,000,597	14,159,264
	Irrigation. . . 2,501,949	81	2,502,030
	<u>5,656,718</u>	<u>6,000,516</u>	<u>11,657,234</u>
1885-86	Railways . . 8,975,159	6,661,693	15,636,852
	Irrigation. . . 2,489,964	590	2,490,554
	<u>6,485,195</u>	<u>6,661,103</u>	<u>13,146,298</u>
1886-87	Railways . . 8,777,884	7,271,620	16,049,504
	Irrigation. . . 2,416,712	1,921	2,418,633
	<u>6,361,172</u>	<u>7,269,699</u>	<u>13,630,871</u>
1887-88	Railways . . 9,068,422	7,668,269	16,736,691
	Irrigation. . . 2,552,619	33	2,552,652
	<u>6,515,803</u>	<u>7,668,236</u>	<u>14,184,039</u>
1888-89	Railways . . 9,494,359	8,282,130	17,776,489
	Irrigation. . . 2,692,950	551	2,693,501
	<u>6,801,409</u>	<u>8,281,579</u>	<u>15,082,988</u>
1889-90	Railways . . 10,336,538	8,126,638	18,463,176
	Irrigation. . . 2,723,146	1,018	2,724,164
	<u>7,613,392</u>	<u>8,125,620</u>	<u>15,739,012</u>



RAILWAYS AND IRRIGATION

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Year.	Expenditure in India.	Expenditure in England.	Grand Total.
	Rx.		
1890-91	Railways . . 10,353,049	7,565,408	17,918,457
	Irrigation . . 2,813,622	2,898	2,816,520
	8,539,427	7,562,510	15,101,937
1891-92	Railways . . 12,793,700	8,108,138	20,901,938
	Irrigation . . 3,020,347	2,603	3,022,950
	9,773,353	8,105,535	17,878,888
1892-93	Railways . . 13,081,225	9,166,886	22,248,111
	Irrigation . . 2,994,606	6,666	3,001,272
	10,086,619	9,160,220	19,246,839
1893-94	Railways . . 13,489,992	9,477,341	22,967,333
	Irrigation . . 2,917,024	1,894	2,918,918
	10,572,968	9,475,447	20,048,415
1894-95	Railways . . 13,655,371	10,483,754	24,169,125
	Irrigation . . 2,992,928	2,962	2,995,890
	10,662,443	10,480,792	21,173,235
1895-96	Railways . . 13,902,214	10,114,771	24,016,985
	Irrigation . . 3,013,153	1,475	3,014,628
	10,889,061	10,113,296	21,002,357
1896-97	Railways . . 13,353,383	9,617,168	22,970,551
	Irrigation . . 3,295,191	2,648	3,297,839
	10,058,192	9,614,520	19,672,712
1897-98	Railways . . 13,561,896	9,131,606	22,693,502
	Irrigation . . 3,142,339	1,746	3,144,085
	10,419,557	9,129,860	19,549,417
			Rx. 257,522,748

EXPENDITURE ON STATE RAILWAYS AND
IRRIGATION WORKS IN INDIA.

CHARGEABLE TO CAPITAL.

Year.	Object.	In favour of Irrigation.	In favour of Railways.
	Rx.	Rx.	Rx.
1882	Railways . . 3,931,543 Irrigation. . . 701,820 <hr/>		3,229,723
1883	Railways . . 2,710,894 Irrigation. . . 2,994,229 ¹ <hr/>	283,335	
1884	Railways . . 4,419,114 Irrigation. . . 1,010,797 ¹ <hr/>		3,408,317
1885	Railways . . 6,050,856 Irrigation. . . 953,507 <hr/>		5,097,349
1886	Railways . . 7,019,928 Irrigation. . . 760,810 <hr/>		6,259,118
1887	Railways . . 5,853,479 Irrigation. . . 664,835 <hr/>		5,188,644
1887-88	Railways . . 2,332,721 Irrigation. . . 626,849 <hr/>		1,705,872
1888-89	Railways . . 1,236,594 Irrigation. . . 539,418 <hr/>		697,176

¹ This large expenditure does not represent new works; during these years the authorities purchased the Madras Irrigation Company's works in Kurnool, around which, the reader will remember, so much sharp questioning occurred before the Select Committee of 1878.



CAPITAL EXPENDITURE

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CSL

Year.	Object.	In favour of Irrigation.	In favour of Railways.
	Rx.	Rx.	Rx
1889-90	Railways . . 2,799,432 Irrigation. . 498,802 <hr/>		2,300,630
1890-91	Railways . . 2,876,971 Irrigation. . 610,484 <hr/>		2,266,487
1891-92	Railways . . 3,418,364 Irrigation. . 808,108 <hr/>		2,610,256
1892-93	Railways . . 4,779,049 Irrigation. . 602,394 <hr/>		4,176,655
1893-94	Railways . . 4,086,848 Irrigation. . 761,389 <hr/>		3,325,459
1894-95	Railways . . 4,487,551 Irrigation. . 658,918 <hr/>		3,828,633
1895-96	Railways . . 3,945,011 Irrigation. . 757,918 <hr/>		3,187,093
1896-97	Railways . . 4,257,017 Irrigation. . 795,818 <hr/>		3,461,199
1897-98	Railways . . 3,635,797 Irrigation. . 742,663 <hr/>		2,893,134

Total expenditure on Irrigation . Rx. 14,488,759

Total expenditure on Railways . Rx. 67,841,169

The tables relating to revenue and capital, have been compiled from the *Statistical Abstract*:—No. 27, pp. 107-109; No. 33, pp. 114-116; No. 21, pp. 118, 119; No. 22, p. 119; No. 27, pp. 128, 129; No. 33, pp. 132, 133.



Summarized, the position, as shown in the foregoing tables, stands thus (Rs. 15 to the £1) :—

Expenditure from REVENUE :	£
Railways	201,381,789
Irrigation	29,699,872
Balance <i>against</i> IRRIGATION .	£171,681,917

Expenditure from CAPITAL :	£
Railways	45,227,446
Irrigation	9,659,173
Balance <i>against</i> IRRIGATION .	£35,568,273

The combined Totals show :—

Expenditure from REVENUE and CAPITAL :

	£
Railways	246,609,235
Irrigation	39,359,045
Balance <i>against</i> IRRIGATION .	£207,250,190

Thus was the emphatic recommendation of the Famine Commission, in 1880, to put irrigation "first" carried out by the authorities! Of what use is an enquiry by Royal Commission, when its most important recommendation concerning protection against famine is thus treated?

However, taking the figures given into consideration, what is there to be said for the irrigation that was undertaken? Fortunately, there is official testimony to fall back upon. The "Report of the Famine Commission, 1898," deals exhaustively with the subject, and does so in terms that would have rejoiced the heart of Sir Arthur Cotton could he have seen them. First, this comparison, based on "Productive" irrigation works, is given :

Area protected in 1878-79 :	Area protected in 1896-97 :
5,171,497 acres.	9,448,692 acres.
Increase : 4,277,195 acres.	

"Although the capital outlay on productive irrigation works has been increased by over fifty per cent. since the



report of the Famine Commissioners [in 1880], an average return of about six per cent. is still realised; the new projects and extensions undertaken since 1879-80 have been financially as profitable as the works constructed before that date, in spite of the fact that the outlay subsequent to 1879-80 includes the purchase from the Madras Irrigation Company of the Kurnool Cuddapah canal, which, with a capital account of Rx. 2,171,349, barely pays its working expenses."

Sir James Lyall, the President of the Commission of 1898, and his colleagues proceed to remark: "The remunerativeness of these works may be shown in another way. Taking them as a whole, including the works which are never likely to be remunerative and those not yet opened or in full operation, the surplus revenue realised to the end of 1896-97, after paying all interest charges and working expenses, amounted to Rx. 4,829,917, the surplus for the year 1896-97 itself being Rx. 809,173. The interest charges are calculated throughout at four per cent."¹

This pæan of success is not enough. A few pages farther on in their report, the Commissioners remark that "the result has been

A GREAT ADVANTAGE TO THE STATE, regarded merely from the direct financial return on the money invested, and apart from their value in increasing the wealth of the country in ordinary years, and in preventing or mitigating famine in years of drought."²

What is the position in India which makes a discussion of this nature necessary at the present moment?

It is this: Famine has now become chronic. There are few safe spots outside the irrigation-protected districts.

To what extent has India become chronically subject to famine?

Take the last half of this century, and note the following record of famines compiled from Part III., *Famine Histories*, published in 1881, and the Report of the Indian

¹ *Famine Commission's Report*, p. 334.

² *Ibid.*, p. 338.



Famine Commission, 1898 ("Narratives of Famines which have occurred since the Famine Commission's Report, 1880").

YEAR.	REGION AFFECTED.
1853	Bombay.
1857-58	Upper India.
1854	Madras.
1860-61	North-West Provinces and Punjab.
1865-66	Orissa. Behar and North Bengal. Madras.
1868-69	Rajputana. North-West Provinces. Punjab. Central Provinces. Bombay.
1873-74	Bengal and Behar. North-West Provinces and Oudh.
1876-77	Bombay. Hyderabad.
1877-78	North-West Provinces and Oudh.
1876-78	Madras. Mysore.
1884	Punjab.
1884-85	Lower Bengal. Madras.
1886-87	Central Provinces.
1888-89	Behar.
1889	Orissa (Tributary States).
1888-89	Madras (Ganjam).
1890	Kumaun and Garwhal.
1892	Kumaun and Dehra Doon.
1891-92	Madras. Bombay (Deccan). Bengal and Behar. Upper Burma.
1890-92	Ajmere Merwara.
1897-98	Madras and Bombay. Central Provinces. North-West Provinces. Central India.
1899-1900	Bombay. Punjab. Central Provinces. Rajputana. Central India. Hyderabad, Deccan. Berar.



Was ever before such a terrible record presented to an over-ruling Power? Forty-six regions affected in forty-seven years!

Yet, to combat the latest famines, and to PREVENT them, as was promised, there have been constructed 12,652 miles of railways, all of which are now working. In 1880, when the Famine Commission reported, the mileage was 9,308; in 1898, it was 21,960. It was indubitably stated that railways were to prevent famines. The advocates never wearied of asserting this. If Sir Arthur Cotton's works, and irrigation works generally, had presented even one-hundredth part of such ignominy and failure, after like confident, almost boastful, prophecy, could words scornful enough have been found for his proposals? "Scornful enough," I ask, because in the draft report of the Select Committee, before which he attended in 1878, there are expressions used concerning his suggestions which were scornful and ill-timed; in the light of the facts of to-day, they stamp their authors as deficient in insight and almost in common sense, altogether lacking in farsightedness and statesmanship.

When, in 1884, a Select Committee of the House of Commons inquired into the desirability of largely extending railways, there was no plea so frequently urged as that the railways would protect the people from famine, and greatly advance the prosperity of the country. For example, on the latter point the late Sir William Hunter, one of the witnesses, had the hardihood to remark¹:—

"I think that the increase of the prosperity of the country from the railway system which the Government proposes, will be so great that the Government is not only justified, but is bound to face the contingency of a large fall in exchange with reference to the interest payable on these railways. I believe that any probable fall in exchange will be more than counterbalanced by the increase in prosperity which railways produce."

Mr. Dalrymple asked: "I am right in thinking, then,

¹ Q. 7,184, *Minutes of Evidence*, p. 462.



that a greater extension of railways is asked for, especially as a protection against famine?"

"*That*," the same witness answered, "*is the basis of our proposals* ; but it is only the basis. The Government fully recognises the commercial aspects of the line, as well as their famine and protective aspects."¹

In reply to the next question asked of him, the witness added: "The Government of India would have been glad to recommend more railways as a protection at present."

The fundamental error in regard to railways is the assumption by the authorities that if "the problem of *famine relief*" be "nearly solved," that is enough. A confusion of ideas in regard to "relief" and "prevention" vitiates nearly all that even so clever a man as was the late Sir William Hunter wrote or said on this subject. As he, so all the others. But even he more than once got near the truth, as, for example, when it was asked²:—

"You made use of a very strong remark when you said that in time of famine the narrow gauge leads to delay and death. Could you give us an instance where the narrow gauge has led to death?"

"No," was the reply; "I am not prepared to give instances, because I do not know of instances in which this has occurred. I was referring to the proposal to make the Jhansi-Manikpur line on the narrow gauge."

Six years before Sir William thus expressed himself, the actual facts in India had proved themselves to be:—

RAILWAY-SERVED DISTRICTS.

A much higher mortality; money loss and human suffering more than in (not irrigated districts, but) non-railway traversed districts in which there are no irrigation

IRRIGATED DISTRICTS.

"During this most awful season of famine, the worst probably ever known in India, when the districts of this Presidency, through which the railways run, lost over eighty-five per cent. of

¹ Q. 7,222, *Minutes of Evidence*, p. 466.

² Q. 7,409, *Minutes of Evidence*, p. 477.



works, or, as in Kurnool, where success is denied to them through the system to which they belong being left unfinished, as a railway would never be similarly left.

their revenues, two-thirds of the population, and the whole of their products, for not an acre of land can be made to yield any products by a railway when the rains fail; the Godavari district, by means of its canals, paid double the revenues it had ever yielded in the most prosperous years before these works were constructed, carried on a trade nearly forty-fold in value to what it was when these works were undertaken, and came out of the trial strengthened in all its resources; whilst India has been brought to bankruptcy in spite of all endeavours to bolster up the railway system. If the condition of industry in India had been at all considered and compared with that existing at home, this waste of money, and time, and life would never have been allowed, but now I fear it will be long before India recovers, if she ever does at all, for it is appalling to see the state of these districts."¹

No argument could be more unsound, more out of accord with facts, than that which contends that railways prevent famines.

¹ Letter to Select Committee, 1878, from Colonel Fischer, R.E.



During the 1876-78 famine in Madras, nine districts were directly affected. Seven of these had a first-class railway, on either the broad or the narrow gauge, running through them; some were served by two such railways. It has been thought well to compare the decrease of the population, through famine, in certain Bombay and Madras districts served by railways and other districts not served by railways. This is how the comparison works out :—

DISTRICTS TRAVERSED BY RAILWAYS.

DISTRICT.	DECREASE. (1881 compared with 1872, and allowing for in- crease of one per cent. per annum.) ¹	PERCENTAGE OF DECREASE.
Bellary	481,430	26½
Coimbatore	364,275	19
Cuddapah	351,764	24
North Arcot	378,839	17
Sholapore	201,632	27
	Average	22½

DISTRICTS NOT TRAVERSED BY RAILWAYS.

DISTRICT.	DECREASE. (1881 compared with 1872, and allowing for in- crease of one per cent. per annum.) ¹	PERCENTAGE OF DECREASE.
Kurnool	336,800	32
Kaladgi	251,245	29½
Belgaum	166,020	16½
Dharwar	195,835	18
Sattara	95,392	8½
	Average	20½

¹ The Government of India (p. 367, *Report of Select Committee on*



WHY ARE FAMINES NOW FREQUENT? 363

On the ten districts selected the average indicates a difference of two per cent. against railways, *i.e.* the population decreased more rapidly where the districts were served by railways than where there were no railways. This is a protection against famine entirely in the wrong direction. The particular gain from railways is, however, seen by comparing Kurnool with Bellary; but if Kaladgi be put by the side of Sholapore, the gain to the latter, through the railway, is only two and a half per cent. The Bombay districts mentioned are those selected by the Government of Bombay for a test census, while the Madras district (Kurnool) cited in the first-quoted table was by far the worse affected of the districts not served by railways. It will, therefore, be seen that the facts, as the India Office Blue Books furnish them, have been fairly dealt with. North Arcot is a Madras district traversed by *two broad gauge railways*, yet, according to the late Sir William Hunter, in the *Gazetteer of India*, the utmost efforts of Government had to be put forth to prevent the district being depopulated in 1877-78.

The pointed query follows naturally: "Railways having, by official statement, failed to protect the country against famine in the past, what reason is there to suppose that there would be a different result in the future?" The efficacy of railways *during famine* all must admit. As the result of observations in Southern India and Mysore in 1877-79, the present writer is of the opinion that while, with railways, we lost five millions of lives, without them we should have lost ten millions.

At first sight it may appear a hard saying to remark that it is owing to *our* mode of administration in India that famines are now so frequent and so deadly. The Govern-

East India Railway Communication) puts the normal increase at one and a half per cent. per annum. Had the same figures been used, the case against railways, as protectors from famine, would have been of a stronger character than has been stated. The one and a half per cent., as a standard of increase, could not, however, be used; the Indian census returns do not justify it.

ment of India, with Lord Lytton as viceroy, announced this fact, in effect, though it was not put in that way, by introducing a new feature in Indian finance—a Famine Insurance Fund—because, as was stated, famines must henceforth be looked upon as a regular feature in Indian affairs. The effect of our system is to bring sixty millions of people at a time within the scope of death by famine and by our railways to save five or ten. The mischief lies in the circumstance that the sixty millions need not be famine-stricken at all.

Again, consider what all this would have meant had Sir Arthur Cotton's enterprises shown such deplorable results. He, and all who advocated the views he enunciated, would have been hounded out of argumentative existence; their proposals would have been ridiculed; no place would have been found for them even in our varied public life. But, railways being concerned, railway construction being a matter which interested all the steel and iron works, the locomotive builders, and the carriage and truck makers, as well as the very large proportion of the English public who had invested in Indian railways, I verily believe, without conscious knowledge on the part of any one that not good but harm was all the time resulting to the whole interests of India—every official's eyes became blinded, and each one saw not the condition of things as it actually existed, but as he supposed it must necessarily be. All this was good for the trade of England; it has helped to spell ruin to millions of Indian homes, and has done its part in causing more acute physical suffering and mental pain among British subjects than have all the wars waged throughout the world since the nineteenth century dawned.¹ Had half the money thus spent on railways been expended in the construction of navigation and irrigation works, there would have been great prosperity

¹ "The wars of ninety years, down to 1880, involved . . . the loss of 4,470,000 lives."—MULHALL, *Dictionary of Statistics*, p. 586, ed. 1892.



and the avoidance of much, if not of all, of the famine suffering.

What could irrigation engineers do in the face of such determination that their enterprises should not receive fair consideration, as is shown in a statement, gleefully made by Sir George Campbell, as to what he had done to check-mate those too-enthusiastic Water Apostles?

"We calculated in Midnapur,"¹ he says, "that supposing the whole of the water to be taken up which the canal supplies, and a reasonable rate to be paid for it, still the canal would not pay. That calculation was made by Colonel Haig, a man who is honourable and impartial, but who is certainly not prejudiced against canals, and therefore the conclusion we came to was that the Midnapur canal could never pay, although it was so far successful that the people were quite willing to take the water."

Was ever a worse instance known of the civilian blinded by prejudice? The only thing in connection with irrigation which this exceptionally clever civilian could see was the interest on capital expenditure. He did not feel *quite sure* that four or five per cent. would be realised. No calculation was made for navigation returns, no account was taken of the enormous increase in produce, which would give the cultivator more to eat, more clothing to wear, more money (no, not *more* money, but some money perhaps for the first time in his life), to spend on taxable articles which would benefit the Government revenue; above all, a certain insurance against famine. "The people were *quite willing* to take the water." But, Sir George Campbell was not willing they should.

Some day, in the Providence of God, by rebuke and suffering to us here in England, if we will not move of our own motion, adequate attention will be drawn to the famine suffering, and what is, perhaps, worse, the ordinary suffering caused in India by the adoption of the wrong methods of dealing with the condition of things existing

¹ Q. 1721, Select Committee, 1878, p. 123.



there.¹ India is not in its present deplorable condition because of any lack of the essentials to reasonable and fairly happy life. The land is not cursed of God ; it is, however, neglected of man, and that man is the representative of a nation favoured above all other nations of the earth.

That nation has sons possessing insight and energy which enable them, the world over, and nowhere more conspicuously than in India, to subdue kingdoms, work righteousness, overcome natural difficulties, wrest from the hard rock-ribs of the world the treasures lying hidden in subterraneous depths, abolish cruel and ghastly ceremonies and punishments, instil into alien or vacant minds a reverence for law and right-dealing, cherish a high ideal for individuals and communities, and laugh at the huge army of obstacles which bar the way to the attainment of desired ends. More than that; by dint of much self-denial the sons and daughters of that nation are to be found in

¹ For example, the increase of deaths from "Fever" (one of the official Indian medical reports speaks of fever as a euphemism for innutrition and insufficient clothing) is terribly alarming :—

<i>Administration.</i>	1888.	1897.	+
Bengal	1,095,300	1,679,132	583,832
N.-W. Provinces and Oudh	1,053,753	1,463,716	409,963
Punjab	379,893	422,826	42,933
Lower Burma	36,391	51,752	15,361
Central Provinces	158,195	389,335	231,140
Assam	71,825	144,307	72,482
Coorg	2,730	7,182	4,452
Madras	204,561	292,292	87,731
Bombay	304,449	452,596	148,147
Berar	29,979	65,611	35,632
Mysore	37,609	47,093	9,484
	<hr/> 3,374,685	<hr/> 5,015,842	<hr/> +1,641,157

That is to say, from "Fevers" only there were, in 1897, more than one and a half million more deaths than ten years previously. It is within the mark to say 1,500,000 died, practically, from starvation. The ratio per 1,000 population of total Fever deaths is from 9·0 in Madras to 23·62 in Bengal, 31·21 in North-West Provinces, Central Provinces 40·98, Coorg 41·50, 24·59 in Bombay, and 23 in Berar. (Pp. 298-301, *Statistical Abstract of British India*, 1888-89 to 1897-98.)



all parts of the world devotedly labouring for wholly intangible results, for consequences which cannot be put into any currency, even the spiritual welfare and eternal salvation of the souls of mankind. It is before such a nation the stupendous task lies of obliterating even the footprints of famine in a land where there need no more be famine than there is famine in our own country. Is that nation equal to the performance of its duty?

The means required for the transformation of India are at hand. Amongst the more important of them is a sufficiency of water to furnish liquid and manurial nourishment to the crops which, with the assistance of soil and sun, will always grow; this sufficiency is to be found every year in India. What is needed is the knowledge to use it rightly.

There is no mineral of which we know anything—neither gold nor copper—which, in value, can be compared with water. Twenty-six years have passed since the following comparison was made between the respective values of gold and water; he who made the comparison was the hero of these pages, Sir Arthur Cotton.

"The importance of any subject of investigation," he said, "is measured by the difference between the cost of obtaining it and its value when obtained, that is, in the case of material things. The question is not what is the value of a pound or a ton of anything. If a pound of gold costs more to obtain than its value, we must leave it alone; and if a pound of iron, when obtained, is worth double the cost of mining and smelting it, it is a highly profitable operation. If a thousand cubic yards of water can be made use of at a cost of sixpence, and if its value, so applied, is ten shillings, there is no gold mine in the world that can be compared to an irrigation work. At present it is stated that the average result of gold mining in Victoria is that it merely affords rather high wages to the men actually employed upon it. If so, it is nothing to the results of conducting water to the land in India. If a million a year



is spent in gold-mining, and it gives six shillings a day to the miners, who could otherwise be only gaining four shillings, there is a net profit of £330,000 a year; and if a million a year is spent, as the interest at seven per cent. on a capital of £14,000,000, in irrigating ten million acres, yielding in increase of produce and in other things twenty millions a year, it is sixty times as profitable as gold-mining in Victoria."

Allowing for the difference in the cost of labour since 1874, the argument is as good now as then. As are Tanjore, Godavari, and Kistna districts in the Madras Presidency, so, with modifications, might become the greater part of India, and, if such a change be not made, the responsibility rests upon the British people.

Adequate storage of water is the greatest need of India. Immense quantities may be stored at a "cost of £200 per million cubic yards of contents, or £140 per million supplied, and at a cost in interest and repairs at six per cent. of eighty thousand cubic yards per £1, besides the cost of distribution. Some vast sites have been examined and estimated, one to contain two thousand million cubic yards, five hundred times the capacity of the Sheffield reservoir that burst some years ago."¹

Again, as to the amount of water available in India.

"What quantity of water have we in India," asks Sir Arthur in one of his lectures, "that is at present totally lost, or worse than lost, and, from want of controlling and directing works, is allowed to destroy instead of refresh and fertilize? When the Godavari is full, for instance, it contains about one hundred and eighty millions of cubic yards per hour, or more than four thousand millions a day. This, at two thousand cubic yards per £1, is worth £2,000,000 a day. It is, however, seldom full—perhaps only once in four or five years, and then from one to ten days; but the

¹ "Three Lectures on Irrigation Works in India before the School of Military Engineers," delivered at Chatham in 1875 by Sir Arthur Cotton, p. 22.



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total volume flowing into the sea in the year from this one river is enormous. The average fall of rain in its basin is about forty inches, so far as I can judge, and of this, perhaps, one half flows by the river, which would be two hundred thousand million cubic yards, worth, if it could be all used, £100,000,000 sterling a year. This river drains one-tenth of the area of India.

“Leaving out the rainless tract, if an average of one yard of rain falls throughout India it would supply seven thousand five hundred cubic yards, sufficient for one crop of rice and one of other grain on an acre for two-thirds of the whole area, perhaps nearly all that is fit for cultivation. Land so irrigated would produce not much under a ton of food grains per acre, or sufficient for a population of one thousand five hundred per square mile, or six times the present population, and allowing one-third of the area for other things, there would be food for four times the present population. This is sufficient to show the main point, viz., that we have an unlimited supply of this material as far as any present prospects are concerned. We have, therefore, not only a mine of incalculably more value than any gold mine to work upon, but one of unlimited extent. We have in the case of the Godavari added to the income of the people by this means £1 per head or £5 per family, and when the works are completed there will be half as much more, making £7 10s. The average income of a family throughout India is, I believe, about £5 a year,¹ at which rate the income in Godavari has been already doubled, and will be eventually increased still more. There are in India fifty million families, so that if the same blessing were extended to the whole of the country it would add £375,000,000 a year to its income, or nine times the amount of the taxes now paid, besides all the incalculable benefits of health, comfort,

¹ This is an under-estimate; the average annual income in India is under £2 per head. When Sir Arthur made his statement the Cromer-Barbour inquiry of 1882 had not been made; this inquiry put the average annual income at Rs. 27, or, at Rs. 15 to the £, 33s. 9d. per head.



security, freedom from famine, satisfaction of the people under our rule, free intercourse of goods, passengers, etc., and this would be only with the present population, which is rapidly increasing."¹

Once more the profitableness of water use in India may be mentioned. Iteration and reiteration will be useful in impressing it on the mind. In the third of his Chatham series of lectures, Sir Arthur asked, "If a gold mine could be found in which it would cost £2 to obtain a pound weight of gold, what would be thought of it? Or, a silver mine that would cost three-halfpence to produce an ounce of silver worth four shillings?" How every newspaper would be full of it, but, because these very results are obtained by water, they are not thought worthy of a moment's notice. "That the Godavari works are, at this moment, costing £42,000 a year, producing £1,500,000 from six hundred thousand acres of irrigation, and about five hundred miles of navigation, is as simple and as palpable a fact as could possibly be brought before us. And so with the Sone works this year; before any part of them is finished they have watered one hundred and sixty thousand acres, producing £500,000 worth of grain, in the midst of a famine—about the whole cost of the works up to that time."

The vast storage tanks needed can be economically constructed. Not the least amazing of the great engineer's efforts was the cheapness with which he could make his enormous bunds. That point need not be laboured here, as it has been already dealt with in the description (chap. vii.) of the construction of the Dowlaisweram anicut. But, it must never be lost sight of in the discussion of estimates prepared by hydraulic engineers, who know naught of other than the accepted heavy stone masonry which is in favour generally.

One important feature in regard to irrigation must not

¹ "Three Lectures on Irrigation Works," pp. 29-30.



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be overlooked, and that is, even without large rivers, or even any rivers, much may be done to protect crops. "Here in Jaipur State the famine is less severe than it is in Marwar, and in many districts there has been a fair supply of fodder. Moreover, there are appreciable stretches of country where irrigation works have enabled the people to hold out longer than they would otherwise have done. True, the water this year has been scanty, and now, at the end of April, the canals and tanks are giving out ; but there is no doubt that the jealous care with which the scanty rainfall has been husbanded and utilised has done much to add to the staying power of Jaipur. The good work done in this direction is due to the man who, for thirty-three years, has given the whole of his energies to the advancement of Jaipur. Under Colonel Jacob's direction more than a hundred and fifty irrigation works have been carried through, and this in

A COUNTRY WITHOUT RIVERS,

and presenting as hostile a face to schemes of watering as, I suppose, any district in India. The usual plan adopted has been to select the best spots for catching and storing the floods which come with the rains, and then, by means of canals, to lead the water to as many village tanks or reservoirs as possible. Besides replenishing the tanks, the wells for a long way round have the leakage from the tanks to draw upon, so that the water is thoroughly well spread. Irrigation direct from canal to field—the common fashion in India—is also used. The accounts of the Public Works Department show what a splendid investment irrigation has been for Jaipur. On an outlay of five and a quarter millions of rupees there is an annual return of more than three hundred thousand rupees, and although the chief expenditure on capital account took place in the Eighties, the whole outlay since the beginning in 1868, will be recovered in another three years. The benefit to the people themselves may be imagined by those who know what the value of water means in India. I am told that



when Colonel Jacob goes about the country, the people of the unirrigated districts surround him as if he were the god of water, and beseech him to give them canals."¹

RIVER *VERSUS* RAILWAY—TO TAP CENTRAL INDIA.

When the Central Provinces and the Deccan were yet undeveloped by railway communication, Sir Arthur Cotton made most earnest efforts to turn the Godavari to account. Unfortunately, he laboured in India at the most crucial moment, and it is not in India that a decision is taken on such momentous matters. If only he had been in England, and had been able to secure the active (he had the passive) support of the late Earl of Derby (then Lord Stanley, M.P.), it is quite possible he would have succeeded in tapping the cotton country and in opening up the Central Provinces, by way of an Eastern India port. Had only Sir Arthur Cotton's counsel been followed, the Central Provinces would have been saved from four most terrible famines,² each succeeding one being more destructive than its predecessor, while the prosperity of the whole of Southern India would have been enhanced.

What Sir Arthur Cotton wrote on this point must be reproduced. Even though the extracts will fill several pages, it is due to his farsightedness, nearly half a century ago, that they should be put upon record, and note taken by all concerned what India would have become by way of credit and legitimate profit to Britain could he have prevailed. There is no sadder "might-have-been" in recent English history than the retrospect of what India, Britain, and humanity have lost because the forces against which Sir Arthur Cotton had to contend were too strong for him.

¹ The *Manchester Guardian* Famine Correspondent, May 25, 1900.

² The famines of 1868-69, 1886-87, 1897-98, and 1899-1900.



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Here is his own story (written before 1860) of what would have been could he have prevailed :—

What we have now to do is to discover means whereby the cost of transit may be reduced materially, so as to give a real relief to the country, and enable it to compete with other countries. Till this is accomplished nothing is done. All our immense advantages of soil, and climate, and cheapness, and abundance of labour, are lost, or at least the greater part of them. This is well shown in the case of the Berar cotton trade. It is stated by those who have the best means of knowing, that cotton is actually grown and sold at one penny farthing the pound ; to this about three farthings is added in bringing it into the great cotton marts of the district where it is cultivated. Fully one penny is added in conveying it to Bombay, and more in taking it to Calcutta ; another penny is added to it in bringing it into the English markets, and thus it arrives at Manchester at a cost which only puts it on a par with American cotton grown by slave labour at an enormous expense. At least three-halfpence per lb. could be taken off this cost by improved communications, and by throwing open the country, where so favourable a climate and soil are found for its growth. It is not merely for want of cheap transit a direct charge of one penny or more is added to the cost of the cotton, but for the same reason food, salt, etc., are three or four times the price they need to be. This is only one of many ways that the price of the cotton is indirectly augmented. At present the purchasing of the cotton from the cultivators is entirely in the hands of the ignorant, short-sighted, oppressive, native merchants. The natives begin to be very sensible of the advantage that it would be to deal with the European ; but nothing can deliver them from the present system without an open communication with the ports, giving Europeans free access to the districts, and gradually removing the absurd fancies that mercantile men have about living in the interior of the peninsula, as if they could not do it without great risk to their lives.

In the present great question of the cotton supply, there seems to be scarcely any point more worth investigation than this opening of the fine cotton countries of Nagpur to the coast. No doubt the cultivation would extend rapidly along the whole line of the Godavari. It seems now to be generally acknowledged that



Berar is naturally the most suitable climate for cotton for the English market, and that, therefore, we should make it our grand effort to open a cheap line of communication with it, and it is certain that no other line can possibly compare with that of the Godavari for bringing this cotton to the coast. Captain Fenwick tells me that during the three years Palmer's house¹ brought their capital to bear on this tract, the cultivation of cotton and the general welfare of the people increased surprisingly. There is thus a line of five hundred miles of the cheapest communication, leading into the very heart of the country, to be had almost for nothing; even if fifty thousand pounds were spent in improving it, it would still only cost a hundred pounds a mile.

In the paper on the Berar cotton, by Mr. Ashburner, read before the Asiatic Society, in 1837, the importance of the subject is shown on the very best authority. He states that cotton can be cultivated at three pounds for a Bombay candy (less than one penny a pound), and that the only obstacle to its unlimited production is the cost of transport: that it is sent to Bombay on bullocks at two pounds eight shillings a candy (less than three farthings a pound), taking seventy days on the journey; that large quantities cannot reach Bombay before the monsoon, which is consequently liable to be damaged or destroyed; that there was at that time a traffic of twenty thousand tons a year in salt and Berar cotton; that a good carriage road there would be a saving of one hundred and sixty thousand pounds a year. He then goes on to say: "It may be as well, however, to show the productive powers of the country more clearly, to instance the increase which has lately taken place in the amount of cotton exported from Bombay. From 1828 to 1835 the exports averaged one hundred and seventy-eight thousand bales a year, and remained nearly stationary. But the high prices of the latter year lead to more extensive cultivation, and, notwithstanding numerous obstacles to production, the Presidency of Bombay last year produced and exported no less than two hundred and ninety thousand bales of cotton, being an increase of one hundred and twelve thousand

¹ A well-known, and at one time extremely influential, family, the members of which, at Hyderabad, Deccan, transacted the business affairs alike of the Nizam and of the Europeans in the Nizam's Dominions.



bales within the year. Some portion of this increase, no doubt, is attributable to an unusually good season, but by far the largest share arose, as the reports of the revenue collectors show, from extension of cultivation alone." Here, then, is a specimen of what India is capable of doing under favourable circumstances, and there can be no question whatever, that the production of the cotton would, with good roads to the interior, go on increasing as rapidly as it increased during the last twelve months; for the stimulus to cultivation would be as great from decreased expenses as it has lately been from increased prices.

Thus with proper management we might reasonably expect to see the exports of the country in this staple alone swelling at the rate of one hundred thousand bales per annum, and amounting probably, at no distant period, to a million of bales. And what would be the consequences in other respects? Besides benefiting the revenue, and improving the condition of the people of India, such a trade would give employment to a vast amount of British shipping (four hundred thousand tons) at the same time that it created a greater demand for the manufactures of the mother country.

Now if this cotton, instead of being carried, as Mr. Ashburner proposed, by a carriage road, were conveyed down the Godavari at the rate at which goods are carried on the Mississippi, *i.e.* the sixteenth part of a penny per ton per mile, or about five shillings per ton for the whole distance, there would be a saving of £7 a ton, or of £210,000 on the traffic of two hundred thousand tons, besides saving the interest, insurance, waste, etc.

Think of a great portion of this cotton being carried from the banks of the Godavari, five hundred miles from the sea, by a land carriage of five hundred miles to Mirzapur, to be embarked on the Ganges, a point five hundred and fifty miles from Calcutta. But the important point in Mr. Ashburner's paper is his testimony to the astonishing increase of production consequent on an increase of price, showing clearly the grand fact that everything within that tract of country is in a complete state of preparation, and that nothing is wanting, but a relief in the cost of transit to England, to make the cultivation spring up to almost any extent. There are the climate and soil required for a good marketable cotton for England, and there are the people, the cattle, the enterprise, and all other requisites. This line of transit would probably



cause a saving of full three half-pence a pound, five times as much as would be sufficient to give a material stimulus to the trade.

There seems, thus, to be no reason why the Godavari may not become the line of a trade for a million tons a year, when once the pent-up treasures of its basin effect a breach in the barriers, which have hitherto shut it up.

India can supply Manchester fully, abundantly, cheaply, with its two essentials, flour and cotton, and nothing whatever prevents its doing so but the public works. If only the country is, by means of irrigation, supplied abundantly and cheaply with food, and, by means of communications, its produce can be cheaply conveyed to the coast, Manchester is safe: its supply with the two things upon which its very existence depends cannot fail. But while three-fourths of the people of India are raising food, and an eighth carrying their produce over the unimproved face of the country, at a cost that would instantly paralyse England if it were subjected to such an incubus, this magnificent appendage to England must be comparatively thrown away on her, and the prodigious, the incalculable, stimulus that it might give to her manufacturing and general prosperity must be, in a great measure, lost.

* * * * *

I have before reckoned that a stream of a million cubic yards an hour would secure a depth of three or four feet everywhere in the Godavari, and that tanks containing three thousand millions of cubic yards would be ample for this purpose, and would cost about £150,000. If treble this quantity were stored, so as to give a depth of full six feet, and the bed were perfectly clear of rocks so as to allow of the freest passage for steamers, then vessels of any power might be used, and I have little doubt that if kept at this regulated depth, excepting during the freshes, it could be worked at night as well as by day; and if very high speed were required, a mean current of, suppose, two miles an hour would be no obstacle to such vessels as would be worked. A vessel with the speed of twenty miles an hour, for instance, would go up at eighteen, and come down at twenty-two miles. The cost of storing nine thousand millions of cubic yards might be £450,000, and, allowing £50,000 to be spent on the bed of the river, etc., we should have half a million sterling as the cost of at least seven hundred miles of such navigation (besides making the same rivers available for small vessels to a much higher point), which would



be at the rate of only £700 a mile, against £2,000 for a steam canal, or £7,000 for a railway. And it would have this vast advantage, that in the very first year the river would be available throughout, and each year the whole navigation would be improved to the full extent of the amount expended. This is precisely what India wants, viz., to have whole lines of transit at once improved to a certain extent. If a high speed railway were laid on this line, it would be many years before the cotton country would be really accessible, and in the meantime, at least ten times the whole cost of the work would be lost for the want of the means of transit. £50,000 laid out in the river would, in the first year, provide a thoroughly good and exceedingly cheap communication from the heart of Berar to the coast, while £50,000 laid out on even a single high-speed railway, would provide for only perhaps seven miles out of the four hundred and fifty; if only a hundred thousand tons were carried per annum there would be a loss of £500,000 for every year that the opening of the communication was delayed.

This shows the real state of the case between the Bombay railway and the Godavari. To reach the centre of the cotton country would require four hundred miles of railway. What has already been done has been at the rate of ten miles a year and £7,000 a mile; and continuing at the same rate they would, if it were not for those plaguey ghâts, reach the Wurda in forty years, after spending about £2,800,000 on the road, and allowing only a traffic of a hundred thousand tons a year for half the time, or twenty years at £6 per ton, there would be an outlay of £12,000,000 on transit alone. And the account would stand thus at the end of forty years, even supposing the trade did not increase in the Godavari, and that goods were carried for nothing by the railroad:

RAILWAY.

400 miles at £7,000 per mile	£2,800,000
100,000 tons per annum for twenty years at £6 a ton	£12,000,000
Total expenditure	£14,800,000

GODAVARI RIVER.

Improving river to give a constant depth of six feet	£500,000
One hundred thousand tons for forty years at 6s. per ton	£1,200,000
Total expenditure	£1,700,000