

(1) Number of pages 16
 (2) Date of repair 17.6.86
 (3) Initials of the Referencer lcs

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Rev. DEPARTMENT

G.O. No.	509	Press.
B.P. No.		Mis.
Dated	6.2.1879	-197-

lcs

Not to be folded or roughly handled

Accompaniment to G.O., No. 17 I of 9th January 1879.

APPENDIX A.

STATEMENT showing the Balances of Estimates sanctioned for Godavari and Kistna Delta Systems.

	Number and Date of G.O. in which the Estimate was sanctioned.	Amount of Estimate.	Outlay up to end of 1875-76.	Balance.	Remarks.
1	2	3	4	5	6
<i>Godavari Delta.</i>					
Eastern Section ...	No. 3,215 of 12th Oct. 1868. No. 1,409 of 23rd May 1871. No. 1,523 of 6th June 1871. No. 1,217 of 7th May 1874.	13,14,000	7,80,977	5,33,023	
Western Section ...	No. 2,295 of 18th Nov. 1871.	13,04,640	8,26,374	4,78,266	
Constructing a shutter and gearing for Dowlaishevaram under sluices.	No. 2,692 of 20th Sept. 1875.	750	350	385	Rupees 15 not required.
Constructing an experimental set of gearing for working Vijeshweram under sluices.	No. 2,514 of 3rd Sept. 1875.	1,500	400	1,105	Rupees 5 excess over estimate.
Experimental gear, Vijeshweram under sluices.	No. 283 I of 1st Sept. 1877.	1,675	...	1,675	
Improving the under sluices of the Vijeshweram branch.	No. 73 I of 25th Jan. 1878.	8,700	...	8,700	
			Total ...	10,23,154	
Tools and Plant ...	No. 1,344 of 20th May 1874.	1,91,560	70,145	*1,21,415	*Amount required, G.O., No. 127 I of 2nd July 1877 ... 1,06,618
<i>Kistna Delta.</i>					
Widening Main Canal.	No. 130 of 24th April 1871.	1,13,530	1,02,923	10,607	Outlay in 1876-77 ... 14,797
Pulleru project ...	No. 2,308 of 1st October 1872.	1,87,990	1,76,519	11,471	1,21,475
Ryves' Canal project...	No. 2,543 of 10th Aug. 1867.	4,14,193	3,18,407	95,786	
Commamnore Canal ...	No. 545 of 19th Feb. 1877.	9,640	...	9,640	
Ferry boats ...	No. 78 I of 18th Jan. 1878.	2,104	...	2,104	

APPENDIX A.

STATEMENT showing the Balances of Estimates sanctioned for Godavari and Kistna Delta Systems—continued.

	Number and Date of G.O. in which the Estimate was sanctioned.	Amount of Estimate.	Outlay up to end of 1875-76.	Balance.	Remarks.
1	2	3	4	5	6
<i>Kistna Delta—contd.</i>					
Lock sheds ...	No. 132 I of 14th Feb. 1878.	Rs. 5,795	Rs. ...	Rs. 5,795	
Outlet, 52nd mile, Commammore Canal.	No. 133 I of 14th Feb. 1878.	830	...	830	
Rest-house at Gudivada.	No. 365 of 11th Feb. 1876.	2,875	2,810	65	
Extension of east side channel.	No. 3,408 of 30th Nov. 1875.	9,050	3,354	5,696	
Budam project ...	...	46,420	46,220	200	
Inampudi tunnel. under	No. 213 I of 2nd Aug. 1877.	22,100	19,750	2,350	
Lingala drain ...	No. 1,911 of 15th July 1874.	3,905	2,716	1,189	
				1,45,733	

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

APPENDIX B.

STATEMENT showing the Details of the Amount of "Further Outlay" required to complete Godavari and Kistna Delta Systems.

	Works.	Establishment.	Tools and Plant.	Total.
1	2	3	4	5
<i>Godavari Delta.</i>				
Central Section	Rs.	Rs.	Rs.	Rs.
Unforeseen works ...	10,00,000	3,00,000	80,000	13,80,000
Establishment to complete works in Eastern and Western Sections, G.O., No. 127 I, dated 2nd July 1877.	5,00,000	1,50,000	...	*6,50,000
Establishment charges on the estimates for Vijeshweram under sluices at 30 per cent.	...	2,49,368	...	2,49,368
Establishment charges during 1876-77	...	3,112	...	3,112
Total ...	15,00,000	76,315	...	76,315
	15,00,000	7,78,798	80,000	23,58,795
<i>Kistna Delta.</i>				
Amount required to complete works already sanctioned, G.O., No. 127 I, dated 2nd July 1877.	...	28,661	1,452	30,113
Outlay in 1876-77 ...	...	14,897	5,888	20,785

*For whole delta.

APPENDIX B.

STATEMENT showing the Details of the Amount of "Further Outlay" required to complete Godavari and Kistna Delta Systems—continued.

	Works.	Establishment.	Tools and Plant.	Total.
1	2	3	4	5
<i>Completion Estimates.</i>				
Anicut works ...	Rs. 1,30,000	Rs. 39,000	Rs. 10,400	Rs. 1,79,400
<i>Eastern Section.</i>				
Main canal ...	11,380	...	...	...
Masulipatam canal ...	4,42,152	...	...	...
Bank canal ...	10,39,867	...	...	...
Ellore canal ...	2,11,150	...	...	...
Ryves' canal ...	6,54,291	...	...	...
Polraz Codu ...	6,40,724	...	...	...
Bantumilli channel ...	5,59,775	...	...	...
Total, Eastern Section ...	35,59,339	10,67,802	2,84,747	49,11,888
<i>Western Section.</i>				
Main canal ...	5,47,860	...	...	...
Bank canal ...	4,09,510	...	...	...
Nizampatam canal ...	3,26,454	...	...	...
Commamur canal ...	17,22,671	...	...	...
Total, Western Section ...	30,06,495	9,01,948	2,40,520	41,48,963
Total, Completion Estimates ...	66,95,834	20,08,750	5,35,667	92,40,251
Total, Kistna Delta System ...	66,95,834	20,52,308	5,43,007	92,91,149

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

APPENDIX C.

STATEMENT showing the Working Expenses of the Godavari and Kistna Delta Systems for the Years 1873-74, 1874-75, and 1875-76.

	Works.	Repairs.	Establishment.	Tools and Plant.	Profit and Loss.	Suspense.	Total.
1	2	3	4	5	6	7	8
<i>1873-74.</i>							
Godavari Delta System	Rs. 890	Rs. 1,00,386	Rs. 67,778	Rs. 9,934	Rs. ..	Rs. ..	Rs. 1,87,988
Kistna do.	5,073	1,29,325	57,648	4,357	..	..	1,86,403
<i>1874-75.</i>							
Godavari Delta System	2,742	1,22,962	73,857	38,796	..	..	2,38,357
Kistna do.	8,211	1,48,711	64,353	3,729	..	..	2,25,004
<i>1875-76.</i>							
Godavari Delta System	2,607	1,61,336	90,480	46,981	..	..	3,01,404
Kistna do.	6,308	1,32,838	62,777	22,983	..	..	2,24,906
Godavari.	Rs. 1,87,988	Rs. 1,96,403					
Kistna.	2,38,357	2,25,004					
	3,01,404	2,24,906					
37,27,749 Total.	37,27,749	37,27,749	37,27,749	37,27,749			
2,42,583 Average.	2,42,583	2,42,583	2,42,583	2,42,583			

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

APPENDIX D.
STATEMENT of Past and Intended Expenditure on Kistna Delta System with Drainages Cost reduced comparatively to Irrigation Area drained for Sections not received.

Sections of Delta.	Names of Principal Works.	FURTHER INTENDED EXPENDITURE.				Total.	Total of Past and Intended Expenditure.	Navigation Works included in further Intended Expenditure.	Remarks.
		Head Works.	Main Canals and Branches.	Distribution.	Drainage and Protective Works.				
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
	Amount Works	Rs.							
	Tools and Plant	7,57,355							
	Establishment, 25 per cent. on I	69,232							
	Tools and plant, 8 per cent. on I	8,17,637				1,30,000	9,47,627		Estimate for raising aqueduct either permanently or temporarily.
	Amount Total	8,17,627				1,30,000			
1st Sub-Section.	Eastern Delta.								
	Main Canals, 900 yards..	1,07,903	5,620			17,000	1,24,906		
	Masulipatam canal	6,54,311	2,13,520	1,91,786	33,816	4,42,152	10,06,493	38,860	
	Bank canal	41,865	8,05,415	1,86,217	48,203	10,53,937	10,81,932	11,970	
2nd do.	River embankment	32,932					35,932		
	Ellore canal	2,16,313	1,37,500	46,916	26,675	2,11,159	4,27,463	27,755	
3rd do.	Ryves' canal	4,12,400	75,608	4,882		80,400	11,56,439	10,950	It is considered that Irrigation has already borne more than its full share of cost of embanking the river.
	Fulleru down to Polraz Coda		1,27,815			6,51,291			Details not in this office.
4th do.	Do. Polraz Coda			2,043		9198			
	Do. Lower	3,05,722	1,41,400	1,52,012	2,97,652	6,10,724	9,49,416		
5th do.	Do. East side channel			48,000					
	Do. Butler Coda								
	Do. Rantundilli channel		303	230		5,59,775	1,29,680		
	I. Total Works	17,77,539	26,01,281			36,54,647	54,32,286	2,10,213	
II. Establishment, 25 per cent. on I									
Do. Survey do. (Past)		2,845	6,50,315			9,18,661		64,801	
Do. Survey do. (Future)						22,000			

III. Tools and Plant, 8 per cent. on I		910	2,08,100		83,300	2,92,570		17,337	
Total, Eastern Delta						48,97,878		2,91,556	
Western Delta.									
Main Canal		9,610	5,38,250			6,47,860	8,57,296		Abandoned.
Southern II. L. channel							29,555		
Bank Canal			2,68,040	1,41,470		4,09,510	6,34,800	1,18,000	
River bank							1,398		
Nizamapatam canal			10,645	4,940		3,27,834	7,18,675	10,645	Estimates not in this office.
Commandur canal			234	1,146		6,15,191	21,62,276	2,73,510	
			7,51,870	1,71,010		1,85,100			
I. Total Works		9,610	15,68,539	3,18,766	11,11,100	30,07,875	44,04,330	4,02,155	
II. Establishment, 25 per cent. on I									
Do. Survey do. (Past)		2,402	5,92,135	79,641	2,77,700	7,51,968		1,00,539	
Do. Survey do. (Future)						23,000			
III. Tools and Plant, 8 per cent. on I		768	1,25,483	25,488	88,908	2,10,680		32,172	
Total, Western Delta						40,23,473		5,34,856	
Less Navigation Works								8,26,422	Includes navigation works hitherto constructed.
Grand Total		48,00,000				90,34,051			
						8,26,422			
						82,57,629			

N.B.—Figures in large type show balances of sanctioned estimates remaining unexpended on 31st March 1877 on works in progress.

MASULIPATAM,
10th December 1877.

(Signed) J. O. HASTED, Major, R.E.,
Superintending Engineer, Kistna.

(Signed) JOHN MULLINS, Lieut.-Colonel, R.E.,
Chief Engineer for Irrigation.

Summary.
Past outlay 48,00,000
Further outlay 90,34,051
Total to complete .. 1,38,34,051

1877-78
32,17,122
1,38,34,051

APPENDIX E.

STATEMENT showing the Amounts of Full and Reduced Estimates of the Drains of the Kistna Delta under Works.

Sub-Sections.		Full Estimates.	Reduced Estimates.	Remarks.
1	2	3	4	5
	<i>Eastern Section.</i>	RS.	RS.	
1	Bank Canal ...	1,45,960	48,653	G.O., No. 3,528, 22nd Dec. 1876, paragraph 6.
1	West side channel ...	2,10,260	...	Do. do. paragraph 9.
2	Ellore canal ...	36,795	36,795	Do. do. " 10.
3	Ryves' canal, &c. ...	(a) 6,22,980	(b) 3,78,096	(a) Note paragraph 90 in do.
4	Polrazkodu canal ...	3,655	3,655	(b) Appendix D.
4	Drainage works ...	4,89,643	3,06,027	G.O., No. 3,528, 22nd Dec. 1876, paragraph 11.
5	East side channel ...	(c) 3,42,060	(d) 2,56,545	Do. do. paragraph 13, being 2ths of full amount.
	Butler Codu ...			(c) Paragraph 90 of note in above Proceedings, Madras Government.
	Buntumilli canal, &c. ...			(d) From Appendix D.
	Total, Eastern Section ...	18,51,353	10,29,771	This (column 4) differs by Rupees 12,235 from Appendix D, and the cause of the difference is not known.
	<i>Western Section.</i>			
	Romperu drain ...	4,03,970	1,85,100	
	Tungabhadra main drain ...	18,57,365	6,15,191	Entries in column 4 from Appendix D.
	Repalli main drain ...	7,38,005	3,10,869	
	Total, Western Section ...	29,99,340	11,11,160	
	Grand Total ...	48,50,693	21,40,931	

The estimates of the 3rd and 5th sub-sections of the Eastern Section and those of the Tungabhadra and Repalli Main Drains, Western Section, have not yet been reviewed in detail.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

STATEMENT showing the Amount of Past and Future Outlay on the Godavari and Kistna Delta Systems.

System.	Outlay up to end of 1875-76.				Balance of Estimates sanctioned.				Further Sanction and Outlay required.				Grand Total.	Working Expense Average of 3 years ending 1875-76.	Area of Irrigation Average.	Working Expenses per Acre.	Remarks.
	Works.	Establishment.	Tools and Plant.	Total.	Works.	Establishment.	Tools and Plant.	Total.	Works.	Establishment.	Tools and Plant.	Total.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Godavari Delta.	RS. 60,32,812	RS. 9,79,046	RS. 1,89,714	RS. 72,01,572	RS. 16,23,164	RS. 1,21,415	RS. 11,44,609	RS. 15,00,000	RS. 7,76,708	RS. 80,000	RS. 23,38,795	RS. 1,07,04,936	RS. 2,42,583	RS. 515,832	RS. A. P. 7 6	6	Exclusive of the value of the tools and plant transferred from Upper Godavari.
Kistna Delta.	RS. 38,77,043	RS. 5,83,707	RS. 68,447	RS. 46,19,197	RS. 1,45,733	RS. 20,52,303	RS. 5,43,007	RS. 92,91,149	RS. 1,40,56,079	RS. 2,15,438	RS. 213,429	RS. 1 0 2	2				

Figures for columns 2, 3, 4, and 5 have been obtained from the Examiner's statements printed in Proceedings, Madras Government, No. 3,048, of 14th November 1876. Appendix A shows the particulars of columns 6 to 9, and Appendix B shows the particulars of columns 10 to 13; figures for column 15 have been obtained from a statement received from the Examiner with his office note of 25th February 1879—vide Appendix C.

Column 16 for Godavari is the average of three years ending 1876-76 obtained from statements printed in Proceedings, Madras Government, No. 514 I. of 22nd November 1877, and for Kistna it is the average of three years ending 1874-75 (those of 1875-76 not yet available) obtained from Mr. Wilson's statements printed in Proceedings, Madras Government, No. 1,268, of 20th May 1876.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

GOVERNMENT OF MADRAS.
PUBLIC WORKS DEPARTMENT.

9th January 1879, No. 17 I.

Irrigation.

Read the following papers:—

No. 17. Telegram from the Secretary to the Government of India, Public Works Department, Calcutta, to the Secretary to the Government of Madras, Public Works Department, dated 23rd January 1878.

It being understood that a report by Colonel Brownlow on the Kistna Works has been laid before the Madras Government, the Government of India would wish to be favored with the report and the views of the Madras Government thereon at earliest convenience.

APPENDIX F.

Kistna Irrigation Scheme.

The total area likely to be irrigated from the completed system of canals in the Kistna Delta may be fairly assumed as 470,000 acres.

Of this area, however, 255,000 acres have already been irrigated, and a total income of Rupees 7,91,000 has already been secured from this area. From this income, however, a deduction must be made on account of land assessment on "waste brought in," as Government of India objects to land revenue being credited as an irrigation asset. How much ought to be deducted, on this account, no one seems to know exactly; but, if we assume the land revenue at one-fourth of the total credit for land and water, we may, as a rough approximation, deduct Rupees 85,000, on account of land assessment, leaving a balance of Rupees 7,06,000 fairly due to the canal works.

From the area 215,000 acres which remains as possible increase of irrigation must be deducted 18,000 acres on account of existing tank irrigation, of which a large portion will probably come under the extended canal irrigation. This will leave a net balance of 197,000 acres on which water rate may be assessed.

Mr. Stokes (Secretary, Board of Revenue) tells me that $\frac{1}{2}$ or $\frac{1}{3}$ per acre would not be an unfair average to assume for water rate. My own assumption, stated below, would give an average rate of very nearly $\frac{1}{2}$. Thus—

		ACRES.
Total area of irrigation	255,000	
Deduct for "usual wet occupied" and land irrigated free of charge.	68,000	
Balance	187,000	
		RS.
Total revenue	7,91,000	
Deduct estimated amount land assessment	85,000	
Miscellaneous revenue	12,000	
Balance	6,94,000	

$\frac{6,94,000 \text{ Rupees}}{187,000 \text{ Acres}} = 3.70 \text{ Rupees per acre average water rate.}$ Assuming, however, for safety only 3.66 Rupees per acre as average water rate, we shall have the following statement of income from the completed works:—

Existing.	ACRES.	RS.
Irrigation and revenue	255,000	7,06,000
Estimated increase at $3\frac{1}{2}$ Rupees per acre	197,000	7,22,000
Free	18,000	...
Miscellaneous revenue increase say	...	22,000
Total ...		14,50,000
From this total must be deducted maintenance charges, which according to best information I have will amount to about one per acre irrigated or		4,70,000
Net balance to meet interest charges		9,80,000

As the Government of India requires a reasonable assurance of 7 per cent. return upon its outlay before classing works as "Extraordinary" and advancing money for their construction from Loan Fund we must not lay out more than $9,80,000 \times \frac{1}{7} = 140$ lakhs of Rupees on our complete works.

Major Hasted, the Superintending Engineer of the Kistna Works, has, after communication with Colonel Mullins, furnished me with a statement of past and probable future expenditure on these works, of which I give an abstract below:—

	RS.	RS.
* Including Establishment charges.		
Expenditure of all kinds to end of 1876-77*	48,00,000	48,00,000
Required to complete works on account of—		
Irrigation—		
Works	40,17,986	
Establishment	10,54,495	
Tools and Plant	3,21,438	
		53,93,919
Navigation—		
Works	6,21,370	
Establishment	1,55,343	
Tools and Plant	49,709	
		8,26,422
Drainage and Protective Embankments—		
Works	21,53,166	
Establishment	5,33,291	
Tools and Plant	1,72,253	
		28,63,710
Grand Total ...		1,38,84,051

If, therefore, the assumptions made in this note could be generally supported by Board of Revenue, and an assurance given by His Grace the Governor in Council that the amount debited to the irrigation scheme on account of drainage and protective works shall not exceed the total entered under that head in above abstract, a very fair case indeed would be made out for submission to the Government of India.

MADRAS,
15th December 1877.

(Signed) H. A. BROWNLOW, Colonel, R.E.,
Offg. Inspector-General of Irrigation.

No. 52 I.

MEMORANDUM.

No. 18.

Irrigation.

The information required by Government regarding the Godavari and Kistna Delta Systems is shown in the appended statement, and the general results arrived at are —

2. Godavari Delta System—

	RS.
(1) Expenditure to end of 1875-76	72,01,572
(2) Balance of estimates at that date	11,44,569
(3) Further sanction and outlay required	23,58,795
Total to complete ...	1,07,04,936

The particulars of the items making up the sums entered against (2) and (3) are given in Appendices A and B to the statement. It has been considered desirable to enter under further outlay required a sum of five lakhs of Rupees for unforeseen works. The sums entered for the Central Delta are only approximate, as the revision of the estimates has not yet been finished. It is believed that the amount named will suffice.

The provision for establishments has been made at the rate of 30 per cent. on works in the case of all works outlay not yet sanctioned. Such provision has been made until recently at 25 per cent., but this under present arrangements cannot suffice, as 25 per cent. is the charge on grants or outlay, whichever may be the greater, for which Provincial is allowed credit, and there are special items besides. What the actual cost for establishments will be depends in no way upon the cost of supervision during the execution of the works.

3. The total to complete should be understood to be the outlay required to do all that is necessary for the irrigation of the ultimate area contemplated by the estimates, viz.:—

	ACRES.
Proceedings, Madras Government, 28th September 1870, No. 2,335. Note, paragraph 5.	
Eastern Delta	188,170
Central do.	122,420
Western do.	296,000
Total ...	606,590

and for the subsidiary works contemplated. If a greater area be found to be irrigable, and this is by no means improbable, for the extension an additional outlay may be proposed. There is no finality in projects of this kind, but if they pay their way as they progress or expand they do more than all that was expected of them.

4. The average cost of maintenance including minor improvements of the system for the three years 1873-74 to 1875-76 was Rupees 2,42,583. The component items will be found in Appendix C, which was obtained from the Examiner's office. It will be seen on referring to the column Tools and Plant in the appendix mentioned that in the two later years the expenditure under this head was abnormally large, the explanation being that after the floating plant had deteriorated for many years its restoration to efficiency was vigorously undertaken. This plant is now in fair order, and abnormal expenditure under this head will cease; but it is not necessary to assume that maintenance charges will decrease materially, for in some other directions a somewhat more liberal outlay would be beneficial; 8 to 9 Annas an acre on the average will not be unreasonable, and the latter on the ultimate area will amount to Rupees 3,41,200. The outlay on works, maintenance, and minor improvements, averaged only 4-13 Annas an acre in the years referred to.

5. Kistna Delta System—

	RS.
(1) Expenditure to end of 1875-76	46,19,197
(2) Balance of estimates at that date	1,45,733
(3) Further sanction and outlay required	92,91,149
Total to complete ...	1,40,56,079

Particulars of (2) and (3) will be found in Appendices A and B.

The total differs slightly from that* compiled by Major Hasted in December last

* Rupees 1,38,84,051.

and to establishment charges having been increased on (3) to 30 per cent.

6. The point on which it is understood that a definite opinion is desired with

Proceedings, Madras Government, No. 3,528,
of 22nd December 1876. Note,

paragraph 5.

Proceedings, Madras Government, No. 3,572,
of 19th December 1874. Note,

paragraph 8.

should meet the cost of the drainage of the whole country, seeing that the whole country is not to be irrigated, but considerably less than half of it, and the drainage scheme provides not only for getting rid of surplus irrigation, a small quantity, but of rainfall water, a very large quantity. On the other hand the expenditure was to be limited to that found to be necessary, or directly advantageous. In reviewing the estimates the proportion of the total assumed cost of drainage, which appeared to be fairly chargeable to the Delta System with reference to the circumstances of the area interested, was suggested by the Chief Engineer for Irrigation, and this proportion has now been retained with regard to the estimates which have been reviewed, while

Vide Statement, Appendix D.

the Superintending Engineer has settled the proportion in a similar manner for the estimates not yet reviewed. The particulars of the full estimates for drains and the reduced amount for each drain will be found in Appendix E. There need be no hesitation, in giving any required assurance that the provision for drainage† included in the total to complete above shown will not be exceeded.

† Rupees 19,98,119.

It will be optional with Government to restrict expenditure on drains, and the essential portion of the expenditure on such improvements is believed to be but a small part of the whole. The greater part or the paying part of the benefits will be secured by a moderate outlay. Something more may be spent to improve the value or to add to security of crops on low-lying lands. Much information has been given in the notes on the estimates as to the circumstances, and if the tentative course therein noted as the proper system to follow be carefully adhered to the results will be sure to be satisfactory.

It is one of the evils of the system introduced of late years, of trying to completely estimate the ultimate cost of a great project, that much has to be estimated for on necessarily imperfect data, and a great deal of work is sanctioned which probably will never be found necessary.

7. The best evidence available of cost of drainage is that of the Godavari Delta. There the areas, sanctions, and expenditure have been as follow :—

					Area.	Amount sanctioned.	Spent to 31st March 1877.
					SQ. M.	RS.	RS.
Eastern Delta ...	...	...	...	...	445	5,06,566	2,40,129
Western do. ...	...	...	...	...	1,030	2,96,070	1,59,263
Total ...					1,475	8,02,636	3,99,392

Here expenditure on drains has been but small of late, because enough has been done for the present, and until a season of very heavy rainfall occurs it cannot be determined what more should be done. The

* For works.

outlay* above shown amounts to Rs. 271

per square mile, and the sanction to Rupees 544 per square mile. So far as a judgment can be formed at present the entire sanction will not be spent.

In the Kistna the areas and reduced estimates for drainage are :—

					Area.	Estimates.
					SQ. M.	RS.
Eastern Delta ...	...	...	...	...	1,160	10,29,771
Western " ...	...	...	...	...	950	11,11,160
Total ...					2,110	21,40,931

consequently the provision made is at the rate of Rupees 1,000 per square mile.

The undersigned considers that more will have to be done as regards drainage in the Kistna than in the Godavari, because in the former the outfalls (natural) are less free and open, but the figures above given show a margin more than sufficient to meet the less favorable circumstances.

8. As in the case of the Godavari the total to complete outlay for the Kistna is based upon an assumed ultimate area of irrigation in the—

					ACRES.
Eastern Delta ...	...	...	...	...	270,000
Western do. ...	...	...	...	...	200,000
Total ...					470,000

and if these areas be exceeded further outlay on account of the extension may be proposed.

9. The average cost of maintenance, including minor improvements, of this system for the three years 1873-74 to 1875-76 was Rupees 2,15,438. The items are given in Appendix C. This average is considered to be abnormal because the extension of irrigation has exceeded the capabilities of the canals and distributaries in their present incomplete state, and the quantities of water which have had to be carried in order to supply the more distant lands have been much in excess of what would have been necessary had the means of securing convenient water levels, and distributing water according to actual requirements, been in existence. Nevertheless the cost of maintenance in this delta will always be higher in proportion to the acreage than in the Godavari, because the Kistna water is more highly charged with silt. A sufficient maintenance allowance per acre will, it is considered, be 12 Annas, and the charge on the ultimate area of irrigation will then be Rupees 3,52,500.

10. It may be assumed that the navigation receipts will meet the navigation charges and interest on the expenditure on navigation works incurred from 1870-71 inclusive. Arrangements have been made for securing this correspondence in the Godavari, and similar arrangements are intended to be introduced in the Kistna as soon as the improved condition of the navigation may warrant the enhancement of the charges for the use of the canals. The matter is of some importance in considering returns in connection with expenditure.

The receipts realized in the Public Works Department from Navigation and Miscellaneous items for the three years ending 1875-76 have been—

		Navigation.	Miscellaneous.	Total.	Average.
		RS.	RS.	RS.	RS.
Godavari ...	...	1,03,805	17,311	1,21,116	40,372.
Kistna ...	...	25,620	3,492	29,112	9,704.

11. The memorandum on the Kistna Delta scheme drawn up by Colonel Brownlow, Officiating Inspector-General of Irrigation Works, will be found in Appendix F to this memorandum.

FORT ST. GEORGE,
2nd March 1878.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

To the Joint Secretary to Government, Public Works Department, Irrigation Branch.

6

PUBLIC WORKS DEPARTMENT, 9TH JANUARY 1879, No. 17 I.

No. 19. ORDER THEREON, 9th January 1879, No. 17 I.

RECORDED.

2. Ordered that a copy of the above be forwarded to the Government of India.

(True Extract.)

Lt. Col.

Lt.-Col., R.E.,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

N 509

Copied to the P.W.D.

To the Superintending Engineer First Circle.
" Chief Engineer for Irrigation.
" Revenue Department.

6 Feb 1879

Exd. C. Howarth.
Spare Copies.

Revenue 1879
No 1050.

Prop.

TRIMMINGS.

Boat of 1879

PUBLIC WORKS.

THE SUPERINTENDING ENGINEER.

FIRST CIRCUIT.

Sec. Gen. Ac.

Vide Ca 7440/80

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Mr C 6 February 79 No 509

1879

To the Board of Revenue

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With order