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MADRAS RECORD OFFICE

GOVERNMENT OF MADRAS

Revenue DEPARTMENT.

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G.O. No.
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DEPARTMENT

Read the following papers:—

No. 204 W.

No. 103. *Note by the Chief Engineer for Irrigation.*

In Proceedings, Madras Government, of the 26th July last, No. 1,901, certain papers showing the irrigation in the Godavery Delta in 1874-75 and also in 1873-74 were recorded pending the submission of explanations regarding decrease of area irrigated and of revenue which had been called for by this office from the District Engineer.

2. The Executive Engineer in charge of the district has transmitted, in reply to the reference from this office, a report on the subject, which conveys also his views as officer in charge of the Eastern Delta together with reports from the officers in charge of the Central and Western Deltas.

Printed in Procs. Madras Govt., No. 1,901.

3. In this office memorandum No. 64 G.D., certain discrepancies in the Western Delta under—

(1) areas of villages,

(2) ultimate area of irrigation were noticed.

The Range Officer explains that the village kurnums give annually the ayacuts of their villages, and the total of these very often differs from that of former years. The areas of villages have nothing to do with the ayacut, and are invariable unless the village boundaries are altered. Care should be taken to make these and all other standard entries accurately.

4. With regard to the marked decrease of area of irrigation and revenue in the Eastern Delta, Lieutenant McNeil Campbell has gone carefully into the subject and into the causes of the decrease, and though it would have been preferable had he retained the papers for review by Major Beatty, whose acquaintance with the delta is much more extended, his remarks deserve consideration. In paragraph 7 he mentions eight causes or reasons for a decline in the extent of irrigation in this delta.

5. 1*st Reason.*—Water being supplied late in the season. This he considers to be the chief cause. This late supply has been occasioned, at any rate principally, by the improvements in progress, but it is doubtful whether this reason should justify the postponement of the commencement of the season's cultivation. However that may be, the works have been so far completed as to render any inconvenience on this account unnecessary in the future, and the canals should all be open for irrigation by the 1st June at latest, and earlier should the freshes in the river render irrigation practicable. Statement A gives the date of opening of the several canals of this delta from 1871 to 1875 inclusive.

6. 2*nd Reason.*—Paragraph 1 of Rule II of Revenue Circular No. 5. Lieutenant Campbell notices that the effect of this rule is to give the ryots the advantage of well manured (by silt) lands for dry crops, while paying only for land the assessment (dry) on which was fixed without reference to this advantage. Also that dry paddy is successfully cultivated within a short distance of the canals when but for these it could not be cultivated. It is, however, doubtful whether this species of cultivation will be other than exceptional, for it would not in general pay a ryot to cultivate inferior paddy in order to avoid the water-tax. The point is however one which

should receive attention in order that the extent so cultivated from year to year may be ascertained.

7. *3rd Reason.*—Preference of ryots for dry crops. There is no doubt that much of the land, especially in the higher parts of the delta, is better fitted for dry than for wet cultivation, and it is certain that under the particular circumstances lands well adapted for either kind of cultivation are more remunerative when dry cropped than when irrigated, because the canals and the neighbouring wet cultivation produce sufficient moisture to make successful dry cultivation almost a certainty, and an acre of thoroughly well-grown cholum is more profitable than the same area of excellent paddy. It is certainly desirable that there should be a variety of crops in every considerable area or tract of country, and it is not therefore to be wished for that the delta should be entirely or nearly wholly irrigated, but at present the irrigated area is rather less than one-half of the total area, and it exceeded one-half only in one year, 1871-72, and then only very slightly, so that there is clearly room for more irrigation without unduly curtailing the extent of dry crops. Moreover, it is not probable that very much land hitherto successfully irrigated will be permanently used for dry crops. The ruling prices of any particular time for paddy and other grains or seeds respectively will exert an influence, and when dry grains and seeds are in demand such land as is well suited to their production will be so cultivated in preference to paddy. This need not be a matter of regret, though it may affect more or less the apparent benefit as exhibited in the revenue of accounts, resulting from outlay on irrigation works. With regard to the bank canal, it will be seen that Lieutenant Campbell is of opinion that the prospects of extended irrigation are not good. Similar views were held by the late Mr. Sage when in charge of this delta, and a consideration of the circumstances induced the undersigned to think that the canal should be designed for a considerably less acreage than had been intended, but the then District Engineer was strongly in favor* of providing water for the larger area, and the revised estimates which were approved in the order marginally noted† were prepared accordingly.

Paragraph 20 of Notes of Inspection in Proceedings, Madras Government, No. 1,077 of 18th April 1871.

* Paragraph 5 of letter No. 1,168, of 10th March 1873; paragraph 3 of letter No. 2,650, 2nd December 1873.

† Printed in Proceedings, Madras Government, No. 664, of 12th March 1874.

8. *4th Reason.*—Improved drainage. The extensive drainage works have very probably, as Lieutenant Campbell supposes, rendered lands fit for dry crops which before could be cultivated only with wet. It may be possible in due course to show how far this has been the case. With regard to this officer's remark on the dimensions of drains it is to be noticed that their present dimensions are tentative, and the rainfall has of late years been light. When the results of a really heavy rainfall have been ascertained, recorded and reviewed, it will be practicable to come to a settlement of their ultimate dimensions. The data available when some plan had to be adopted for the preparation of the estimates were extremely limited, and for reliable data the observations of many years are required. The question of the incidence of charge for drainage works is one out of many which has to be considered.

9. *5th Reason.*—The progress of the works provided for in the completion estimates. To this cause Lieutenant Campbell attributes a not inconsiderable effect.

DEPARTMENT

Proceedings of the Madras Government, Public Works Department,
6th October 1876. *No.* 2,697.

Some inconvenience must have been unavoidable but, unless the ryots of the Eastern Delta differ essentially from those of the Western Delta, only actual rather than possible inconvenience would have substituted a decrease for an increase of irrigated cultivation. Any doubt about water-supply must, moreover, long since have vanished.

10. *6th Reason.*—New side channels. Lieutenant Campbell attributes much influence upon the area of irrigation to the introduction or construction of side channels where they did not formerly exist. He has mixed up two entirely distinct subjects in this supposed cause of diminished extent of irrigation, viz.:—

1st.—The distribution of water by numerous or few offtakes from principal canals.

2nd. The relative efficiency of side channels or channels parallel to the canals on the one hand, and diverging channels on the other hand.

Lieutenant Campbell plainly and strongly advocates the adoption of a system of numerous distribution channels, and in fact the retention of the old system of allowing any number of offtakes from canals, the only change being the construction of masonry sluices or iron pipes for their regulation in supersession of the palmyra spouts or other temporary and dangerous means of drawing off water, which existed on the former unimproved canals.

(1.) The objections to numerous offtakes and to the provision of separate distributaries from canals for small areas are essential and radical.

1st.—They cause great waste of water, and complicate drainage arrangements. Were the head of water available for the supply of distributaries constant, and were the quantity of water required for a given small area of irrigation invariable or very slightly variable, the objection to numerous offtakes on the ground of waste would be obviated, but small areas require at times a quantity of water greatly in excess of the average supply necessary and the sluices supplying distributaries must be arranged to afford the maximum. It is impracticable to arrange for the regulation at short intervals of the supply from hundreds of sluices by means of canal establishments, and ryots find it easier to let water run on to and off their fields when there is surplus than to go to the head sluice and regulate the water according to their requirements. There is abundant experience to show that, with multiplied offtakes from principal canals, the total water-supply has to be far in excess of the quantity otherwise necessary and the consensus of opinion and the uniformity of practice not only in this Presidency but under the great irrigation works of the North-Western Provinces is remarkable. Engineers, if not everywhere, at any rate in widely separated provinces, have arrived at the conclusion that economy of water-distribution is unattainable with numerous offtakes from principal canals.

2ndly.—Numerous offtakes are costly. A sluice in the bank of a canal costs very nearly as much if it be to supply one hundred as for three or four thousand acres, and similarly the cost of channels is far from being in proportion to the acreage for which water may be carried.

(2.) Lieutenant Campbell's experience has, until within the last few months, been confined to the Kistna Delta where, from the many imperfections of the canals and distributaries, the waste of water is very great, and were such waste not to be, as it will be in due course, obviated, it would be impossible to irrigate anything approaching to the ultimate area intended to be supplied.

(3.) Side or parallel channels may or may not be in particular cases the proper alignment of distributaries. This must depend upon the circumstances. The most economical arrangement as regards cost of construction is to carry a distributary by the most direct route to the point at which it will be in cutting equal to from one-third to two-thirds the depth of water to be carried, and thence along a line which will keep it in such cutting as nearly as may be conveniently practicable. On the other hand, questions of land compensation, of avoidance of cultivation, of separation of irrigated land from existing sources of supply, and many other matters affect the determination of the best line for a distributary.

(4.) Lieutenant Campbell's remarks on the irregular practices in the way of placing bunds or dams across them and cutting their banks, which practices he avers cannot be stopped owing to the difficulty of detecting their perpetrators, point to the absence of a proper system of minor distribution, which defect should be attended to at once. Such practices will be rare if not unknown when all excuse for them is removed. What is necessary is to determine the proper place for the head of each minor distributary whether such channel has to be constructed and maintained by Government or by the ryot. This is a matter of levels and with them is of easy determination. With minor channel heads in their proper places, all necessity for dams across the channel of supply at once is obviated, and the regulation of the heads of minor channels should be effected by appropriate sluices which, at least for field channels, may be of the simplest construction, viz., a floor and side walls with grooves in the latter for a plank. Ryots if left to themselves naturally endeavour to obtain a supply for their fields from the point on a channel nearest to their lands, and frequently the levels will not admit of a supply being thence obtained without a dam. A very remarkable instance of inefficient secondary distribution was exhibited in the case of the side channels or, as they are really, canals of irrigation of the Nizampatam canal, Western Delta, Kistna, and there the want of a proper knowledge of what was necessary led to the construction of dams across these canals to supply improperly located offtakes, instead of placing the heads of the latter in their proper positions, thus undoing much of the benefit intended to be secured by the construction of these canals at a very considerable cost.

Vide paragraph 52 of Notes of Inspection in Proceedings, Madras Government, 29th September 1874, No. 2,732.

(5.) Lieutenant Campbell's ideas as to the superior efficiency of distributaries having their heads immediately above locks are based upon a misapprehension. The head of an irrigation channel should be placed where the levels afford a sufficient command, and as near to the land to be irrigated as may be, consistently with securing this command. So also the remarks about loss of head in distributaries are, at any rate as stated, erroneous. Irrigation water should be carried at a level which will conveniently command all the land to be irrigated. If it do this it is immaterial at

DEPARTMENT

3/256

Proceedings of the Madras Government, Public Works Department,
6th October 1876. *No.* 2,697.

how much below the level of the water of the canal of supply the distribution water is conveyed.

(6.) Were the general system of distribution in the Eastern Delta at fault, the similar system in the Western Delta would necessarily produce like results. There however instead of decrease of area of irrigation there has been a steady and marked increase of area irrigated. What is in fault is no doubt a defective system of minor distribution, and to this the Range Officer should give early and careful attention. The ryots want only efficient arrangements which must be laid out for them in detail. They may have suffered inconvenience from the new arrangements, and, if so, it is because these have stopped short of what is essentially necessary to their efficiency.

(7.) Every area of land, whether great or small for which it may be determined to afford means of irrigation must be effectively supplied. There are some small areas near canals which have been irrigated, but which it may not be desirable to continue to irrigate, because they can be supplied only at the expense of the efficiency of supply of much larger areas. The new channels under the Samulcotta canal are not intended for the supply of the strip of land close and parallel thereto, but for the considerable areas to the south which they will effectively command. The intention is on record. The land close to the canal may be separately provided for by direct irrigation from the canal whenever its extent is sufficient to justify the expense of putting sluices into the canal bank; otherwise it should not, or should cease to, be irrigated. There are several cases in which lands are too high to be effectively and economically irrigated from canals from which they have been in the past supplied; they were so irrigated formerly because the demand for water was less and the arrangements which were then not injurious to the bulk of the irrigation are now no longer permissible. With care and proper investigation all the land which is at a suitable level can and should be effectively supplied under arrangements which will reduce waste to a minimum, allow of adequate supervision and regulation, and obviate recourse on the part of the ryots to irregular practices of whatsoever kind. There is plenty of land so situated to absorb all the water provided by the canals, and in the Eastern Delta the results may be made as satisfactory as they are in the Western Delta. The management of a delta range is no light task, but there is much help to be obtained from past experience, and had the District Engineer been at hand to correct Lieutenant Campbell's opinions no doubt a good many of the errors into which he has fallen would have been prevented.

11. *7th Reason.*—The selling price of paddy as compared with dry grains. It is not clear how this cause could have been generally operative in the Eastern and not in the Western Delta. Taking their connection with markets into account, the relinquishment of wet cultivation for this cause would commence first in the Western Delta.

12. *8th Reason.*—Excessive water-tax. This would seem to need no remark. The tax can be excessive only under exceptional circumstances, for otherwise the general extension of irrigation in the Western Delta would not have occurred.

13. In paragraph 16, Lieutenant Campbell gives a summary of the remedial measures he suggests. The first and fourth are administrative reforms which are necessary, and which should be attended to at once. The 1st of June rather than the 15th should be fixed as the latest date allowable for irrigation canals to be closed.

Work may of course be gone on with to a later date if water to supply them be not available, but in that case it should be understood that after that date the arrangements must be such as to admit of the canal being opened the moment water becomes available, *e.g.*, if a sluice is being built the canal must not be kept closed to complete it, but it must be cut off from the canal until finished, water in the meantime being passed down.

The second measure, viz., the enhancement of the assessment of lands cultivated dry after being irrigated for some years may be desirable if there be not practical difficulties in the way. As a means of making a ryot pay for benefits obtained it would be equitable.

The third measure, the charge to another head than irrigation of part of the cost of drainage, can of course have no influence on the extent of irrigation.

The fifth and last measure—the substitution of numerous for few irrigation offtakes—would be a very improper step to take. It would certainly involve the enlargement of every canal, and would occasion indefinite waste of water. Side channels, if by that term is meant parallel channels, may or may not be proper in any particular case, but single distributaries as a rule to considerable areas are essential to economy both of outlay and water.

14. What is certainly wanted is an examination in detail into the circumstances of every distributary, and into the requirements of each tract of irrigation which may be found to be not well and properly supplied. Numerous offtakes from primary distributaries or from any distributaries supplying more than one village are unnecessary and prejudicial to efficiency, while they render efficient regulation of the water-supply difficult if not impossible. The proper point for taking off water from a distributary for each part of the irrigation under it should be determined; at that point proper means of regulation should be provided; this regulation should be effected under the orders of the Range Officer by the conservancy establishment and thereafter all irregular practices should be firmly repressed. Without a complete revolution in the system of payment for irrigation, water could not be supplied by volume, and without this latter arrangement a system of numerous offtakes would be without the only safe-guard which would make it practically feasible.

15. Referring now to the circumstances noticed in this office memorandum No. 64 G.D., in respect of variations of area irrigated under certain canals in the Western Delta, it is apparent that these are in great part due to mistakes in the entries under particular canals, *e.g.*, the irrigation under the following canals for 1874-75 is given by the Public Works Officers and the Revenue Officers respectively as follows:—

	Public Works Officers.	Revenue Officers.
Mukkamala Canal	2,552	11,481
Bank Canal	16,389	7,167
	18,941	18,648

Difference 293 Acres.

The two canals water the same tract of country, and all that is necessary is that the Revenue Officers should be furnished with proper information as to the sources of supply of particular villages or parts of villages.

On the other hand, such explanation does not account for the apparent decrease of irrigation shown in 1874-75 compared with 1873-74 under these two canals as shown in the Collector's statements:—

Proceedings of the Madras Government, Public Works Department,
6th October 1876. *No.* 2,697.

	1873-74.	1874-75.
Mukkamala Canal	11,224	11,481
Bank Canal	10,614	7,167
	21,838	18,648

Difference ... 3,190 Acres.

Again, the difference in irrigation under the Yennamadurru drain is due clearly to the Revenue Officers not having been informed of changes in the source of irrigation, whereby land formerly irrigated from the drain has now been brought under canals of irrigation. The District Engineer should carefully examine and review the yearly statements, and then inaccuracies can be readily and at once be corrected. This office can deal only with the figures given, and can only notice discrepancies without being able to explain them.

16. It has to be noticed that the record of water levels in canals without similar information as to that in rear of the head sluices of distributaries, and a comparison of the latter with the normal full supply level can afford no information of value as to the adequacy or otherwise of water-supply to individual areas. The information given as to water levels in the several reaches of canals indicates considerable variations from the proper full supply levels, as also apparently that more attention to regulation is required. Such statements need that normal full supply level should be noted as well as actual level.

OOTACAMUND,
9th September 1876.

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

To the Secretary to Government, Public Works Department.

From Lieutenant D. McNEIL CAMPBELL, R.E., Executive Engineer in charge, Godavery District, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation and Joint Secretary to Government, Public Works Department, dated Dowlaishweram, 22nd August 1876, No. 1,426.

WITH reference to your memorandum, No. 64 G. D., dated 21st June 1876, I have the honor to forward the following report.

1 Original Report, No. 174, of 31st July 1876, from the Western Delta Division Officer.
1 Comparative Statement of wet cultivation from Central Delta Division Officer.
3 Statements of water-supply and rainfall from do.
1 Report No. 158, of 15th August 1876, from do.
1 Statement of water-supply and rainfall from Eastern Delta Division Officer.
1 Statement B.
1 Statement A.

2. As regards the wet cultivation in the Western Delta, I do not think there is any cause for uneasiness, for, from the figures given below, it will be seen that there has, for several years, been a steady increase in area:—

AREA, 1ST CROP.
Western Delta.

Year.	Area wet cultivated.	Revenue.	Remarks.
		RS.	
1871	219,657	9,04,796	Areas are taken from Divisional Officer's statement.
1872	242,719	10,35,710	
1873	243,885	10,53,116	
1874	253,453	10,89,082	
1875	270,014	Unknown.	

It cannot be expected that there will always be the same amount of cultivation under each canal, and, so long as there is an increase in the whole delta, it may be considered satisfactory. It must be remembered that the ryots sometimes like to let some fields lie fallow for a season, and there are other causes that would make the area vary slightly in different years.

3. I forward herewith a letter from the Western Delta Division Officer in which he brings to notice the very great difference between the areas of wet cultivation under some of the canals as shown by the Revenue Authorities and as given by this department and which renders it impossble for him to give the reason why there should be an increase under some canals and a decrease under others.

4. The area of wet cultivation in the Central Delta has not been decreasing regularly as shown below :—

1st Crop.

Year.	Area wet cultivated.	Revenue.	Remarks.
		Rs.	
1871	82,133	3,97,928	Areas are taken from Divisional Officer's statement.
1872	90,810	4,75,833	
1873	92,184	4,70,223	
1874	89,722	4,75,104	
1875	90,987	Unknown.	

A statement prepared by the officer in charge of Central Delta, together with a letter from him giving his opinion on the subject, is herewith submitted.

5. From inquiries I made when I visited the Central Delta a short time ago I believe the reasons will be found to be the same as Nos. 1, 2, and 7 given hereafter when considering the decrease in the Eastern Delta.

6. That the decrease of wet cultivation in the Eastern Delta is a most serious matter and one requiring that the most careful inquiry regarding the causes should be made can be seen from the following statement :—

1st Crop.

Year.	Area wet cultivated.	Revenue.	Remarks.
		Rs.	
1871	138,653	6,51,572	Areas are taken from Divisional Officer's statement.
1872	134,447	6,55,739	
1873	132,597	6,62,226	
1874	131,263	6,48,721	
1875	127,220	Unknown.	

N.B.—A more detailed statement accompanies this Report.

I have consequently done all I can to obtain correct information on the subject, by inquiring from village authorities, from ryots, from delta superintendents, and from other subordinates of this department ; however, it may perhaps be as well to ascertain the opinion of the Collector and the Revenue Authorities. I have not done so myself as it would have delayed this report considerably, and moreover having had a

E 2556

experience in irrigation mattrs, and knowledge of peculiarities of ryots, able to form a correct opinion in the matter.

requested in your memorandum under reply, I forward herewith a wing the height of water in the several reaches of each of the main week in each of the years 1873 and 1874, and it will be seen from that a sufficient supply in both years. The statement I consider to be useless nt supply of water in the main canal would not account for a decrease in cultivation, though it might be the cause of decrease of revenue owing to ng given. An insufficient suply in one year might cause a decrease in e next ; but such was not the case in the years included in the statement.

first mention the various reasns that have been given for the decrease ion by the several authorities I have consulted, and then discuss each ing my own opinion on it. These reasons are —

(1.) Water being supplied late in the season.
(2.) Paragraph 1 of Rule II of Revenue Circular No. 5.
(3.) Preference of ryots or dry crops.
(4.) Improved drainage.
(5.) Project being in prgress.
(6.) New side channels.
(7.) Fall in price of pady.
(8.) Excessive water-ta

Reason.—The ryots state that unless water be given for their fields in st, they cannot raise a good crp ; whether this is the case or not I do not should say not, for in the Kistna District the ryots seldom commence planting seed beds till the middle of July and often as late as the end I do not think the crops are inferior ; of course, there is more chance of g destroyed by floods. The ryots in this district have been accustomed s to get water early, and being a very obstinate set of people, they are get water at the same time as formerly, otherwise they will not take it example of this, I may mentio the following :—Some ryots having land tta canal said to me last May: "If we get water soon we will culti-, we will plant dry crops, we do not care, it will be your loss, not ours." te supply of water is the *chief* cause of the relinquishment of land. In lta where water is given earl, generally about May or June, the wet been steadily on the increase though there are other reasons for this, mentioned hereafter. The reason why water has been given late is he project works being in progress ; but, in my opinion, these works llowed to interfere in any way with the water-supply, for chiefly from oss to Government in the five years has been considerable.

ntion that this year every canal was opened by the 23rd May, except , into which water was admitted on the 18th June, and, though there decrease this year, many of the ryots say that, if they had known water supplied so early, they would have again taken up the land they had

d Reason.—It is well known that dry crops grow better on land that has owing to the silt that has been deposited on it serving as manure, which,

moreover, saves bond, so vator the expens of using other manure; consequently in cases where the land is raised so as to be free from danger of floods, the ryots often find it pays them better to raise two (sometime three or four) crops of dry grain than one crop of paddy, and they thereby save paying water-tax; therefore it frequently happens that a ryot waits till his land has been thoroughly irrigated for two or three seasons and then grows dry crops for a season o two gaining the benefit of previous year's irrigation for his dry crops. There is no doubt that the principle of allowing a ryot to cultivate what he likes and to take or reuse water is correct, but it is, in my opinion, doubtful whether he should not pay for te benefit his dry crops have received from previous year's irrigation, and I think this matter is deserving of consideration. I would also bring to notice another circumstance I observed the other day, which was, ryots cultivating acres upon acres of dry paddy just outside the bank of a main canal in which the water was well above the level of the country; they thus obtained the advantage of water by percolation, but avoided paying water-tax. This second reason is the one given by nearly all the Delta superintendents as the cause of the decrease of wet cultivation, and there is doubtless a good deal of truth in it.

11. *Third Reason.*—On certain land ryots prefer to cultivate dry, and I am not at all sure that on any high land that is thoroughly drained they would not rather cultivate dry than wet, and many of them say that the former gives them more profit. I have endeavoured to ascertain the cost of cultivating each kind and the profits derived therefrom, but it is almost imposible to get reliable information on this point; however, I have given the result of my inquiries in statement B attached. A very good example of the preference for dry crops is found in the land under the Bank canal; here the ryots will not take water except near the end where the ground is low, and my opinion is that the anticipated wet acreage under this canal will never be taken up; some water may be used for dry crops, and perhaps a little rice may be grown for the use of the ryots themselves, but that paddy will ever be extensively cultivated under this canal I do not believe, and I understand that every officer (except Colonel Fischer) who has been in the Eastern Dlta is of the same opinion.

12. *Fourth Reason.*—By the execution of the new drainage channels, the country has been much improved, and land that was formerly liable to be flooded is now fit for dry cultivation; it will be seen from this that, though drainage is a heavy item charged against irrigation, its tendency may be will be if the drainages are carried out in the complete manner proposed) to cause a reduction in revenue under that head, for, as far as wet crops are concerned, I believe that if water be given, so that seed beds can be planted in June, no (or at least very trifling) damage will be caused by rainfall, even supposing the drainage channels were only half their present size, for, until the burst of the north-east monsoon in October, there is seldom any flooding as the ground absorbs a large quantity of rainfall, and by that time the crops would be well grown, in which case they can, I believe, stand, being entirely submerged for ten days consecutively. It will be observed from this that it is the dry crops that are principally benefited by the drainage channels, the entire cost of which is debited to irrigation. It must not be far a moment supposed that I do not think drainage channels necessary; all I mean is that, as far as wet crops are concerned, they would be amply large if only half their present size; and that making any very extensive system of drainage with large channels to carry off the rain almost as soon as it falls is very

likely to; in fact, I believe, will cause a decrease in wet cultivation and increase in dry; it must also be remembered that what I am writing only refers to the circumstances of this Eastern Delta; there are cases where large channels are necessary, such as to reclaim swamps and being waste land under cultivation. I believe the principal cause of increase of wet cultivation in the Western Delta is that there is a large quantity of low-lying land that is not fit for any other kind of cultivation, so that as soon as water is supplied the ryots commence growing paddy, as no other grain is suitable for the land.

13. *Fifth Reason.*—The project being in progress has doubtless had a great deal to do with the falling off of wet cultivation, not only because it delayed the opening of the canals, but also because the ryots were suspicious of the new works, and were afraid they might not get a proper supply of water.

14. *Sixth Reason.*—Side channels are, I consider, one of the principal causes of the decrease of wet cultivation; it is with great reluctance that I give this opinion, as so many of them have been sanctioned and carried out by officers of a great deal more general experience than I have had, but it is a subject to which I have given great attention, more especially since I have been here, and I believe the following remarks will show that I am not altogether wrong:—

Side channels were originally (I believe) introduced in the Kistna District where, in consequence of navigation, it was necessary to keep the velocity in the main canals low; and, in order to prevent the excessive deposit of silt which would be caused by carrying a large body of water at a low velocity, they were taken off as high up the main canal as possible; other advantages also were gained, such as reducing the cost of widening the main canals and getting a better command over the country. This system appears to have been introduced to this district without the different circumstances of the two districts being fully considered; these are as follows:—

In the Kistna water the silt is much heavier, and requires a higher velocity to keep it in suspension; in fact, the velocity required is such that it would seriously interfere with navigation; hence it was deemed advisable to separate navigation and irrigation as much as possible; but in the water of the Godavery the silt can be held in suspension by a velocity that admits of very fair navigation, consequently navigation and irrigation can be conveniently combined.

In the Kistna District the side channels are taken off above locks, and consequently have a considerable command over the country; but in this delta, though some are taken from above locks, this is by no means the case always; therefore they sometimes have no more command over the country than the main canal. They have not in every case the advantage of diminishing the cost of widening the main canals, as in most cases the main channel is well suited for direct irrigation, the side channels being an after-thought, so that really the side channels are an extra expense. Having shown that side channels possess no advantages in this district, I will now point out their great disadvantages.

Formerly nearly all the irrigation was direct from the main canals by means of palmyra spouts in the banks; the practice was decidedly objectionable, and for this reason side channels were introduced; formerly each set of ryots had their own small channel and their own spout, and they arranged amongst themselves regarding the supply of water, and there were no disputes. Now the side channels irrigate the lands

of many villages, and many different sets of ryots, each of whom look out for themselves, and do not consider in the least the interests of others; consequently the side channels are a series of cross bunds and breaches; the disputes amongst the ryots are endless, and numerous petitions are received daily by the officers of this department, and there is no doubt that what is stated in these petitions is quite true; for I know myself that the lands at the ends of these channels scarcely get any water. I have seen as many as five cross bunds in a distance of one mile. It will be remarked on this that the members of this department should not allow these irregularities, but I maintain that it is impossible to prevent them, unless the strength of the conservancy establishment be trebled. If a breach is closed one day, it is cut during the same night; if a bund is removed one day, it will be replaced a few days afterwards, and the existing rules are, that, unless we can actually catch a man in the act of cutting a breach or putting up a bund, it is no use attempting to prosecute any one, though we know perfectly well who are the only men who would be benefited by the Act; as the mischief is always done at night, it is of course next to impossible to detect the culpit, and, though he has sometimes been seen, it has generally been by a Delta Lascar whose word does not go far against that of influential village ryots; consequently, though all the irregularities I have mentioned go on daily, I do not remember a single case of a ryot being punished. All these evils would have been avoided, if, instead of digging the side channels, small masonry sluices or iron pipes had been substituted for the palmyra spout. Side channels taken off above locks are not so liable to be bunded across, and perhaps the cultivation could be carried on without raising the water artificially, but the case is different with side channels taken off at any point of a canal; take for instance the side channels to the Samulcottah canal now being excavated, the average length of these is about 4 miles, the fall of water surface is 1 foot a mile, that of the main canal being ·086; consequently in each mile the water in the side channel gets ·914 feet lower than in the main canal; there is also a loss of head of 1 foot through the head sluice, so that at the end of the side channel the water is 5·570 feet lower than in the main canal which is an obvious waste of power.

The side channels under the Ingeram canal have been nearly completed, and, as a consequence, a large area of wet cultivation has been given up this year, and from the ryots who have cultivated, I have had petitions that the water did not rise sufficiently high.

The only canal about which I have not received one single complaint is the Samulcottah, the cultivation under which is entirely by palmyra spouts, the side channels not yet being ready. The ryots have a great objection to the side channels, and under several, noteably the Mundapetta north and south side channels, a large area has been given up. There are in existence other large channels taken off from the main canals and irrigating a considerable area of land; but, as the fall of the country is generally greater away from the main canals than is a line with them, these channels have, as a rule, a better command over the country than side channels taken off at the same point would have; but even in the case of these when their length is any thing considerable (over 3 miles), the difficulty of watering the lands at the end is very great; as an example, I may mention the Pedapudi and Sampara channels. Theoritically it would seem to be a very easy matter to regulate the supply with a head sluice and a side channel irrigating a large known area; but practically it is not,

as the banks of the side channel are cut in all parts, and if, instead of the one sluice, there were, say, twenty iron pipes, each of the same diameter, and placed at such a level as to give a certain discharge with a certain depth in the main canal, the distribution would then be just as easy. Another disadvantage of side channels is that they take up land close to the main canals that would otherwise most probably be cultivated with wet crops, and compensation has to be paid for that land, while for the small channels that the ryots would dig they would claim nothing.

Yet another disadvantage is that the cheapest line cannot be chosen as the channel must follow the line of the main canal, whatever the cutting or banking may be, or else there is a space of ground between the main canal and branch which cannot be drained. I am not well acquainted with the circumstances of side channels in the Western Delta, but I hear that there are none that do not take off main canals from above locks.

15. *7th Reason.*—The selling price of paddy as compared with dry grain has been steadily falling, so that ryots find they do not make the same profits as they used to do by cultivating the former.

16. *8th Reason.*—There were only two people I consulted who gave this reason, and my own opinion is that it has nothing to do with the decrease of cultivation. The ryots are certainly as wealthy in 1876 than they were in 1871 when they cultivated more. In zemindari land the amount charged for water rests with the Zemindars, and they may perhaps charge high; this is said to be the case, but I have no certain information on the subject.

17. Having now given as much information as I can regarding the decrease of wet cultivation, I would beg to make the following suggestions as to what should be done to prevent a still further decrease:—

1st.—That water should be given by the 15th June in every year at the latest and earlier if possible.

2nd.—That ryots should be charged extra for dry crops grown on land that has been irrigated for a series of years.

3rd.—That dry lands should pay towards drainage, and that all the cost should not be debited to irrigation.

4th.—That the project works should not be allowed to interfere with the supply of water at the proper time.

5th.—That no more side channels (unless from above locks) should be dug, and that water should be supplied instead through cast iron pipes on troughs in the banks of the main canals.

I am firmly convinced that, if the foregoing suggestions are carried out, there will be a steady increase of wet cultivation.

Statement showing the Area of Wet Cultivation, 1st Crop, under each of the Main Canals in the Eastern Delta, Godavery, and the dates on which these Canals were opened from 1871 *to* 1875.

Cocanada Canal.			Samulcottah Canal.			Mandapett Canal.			Ingeram Canal.			Cottipoll Canal.			Bank Canal.		
Year.	Area.	Date Canal was opened.	Year.	Area.	Date Canal was opened.	Year.	Area.	Date Canal was opened.	Year.	Area.	Date Canal was opened.	Year.	Area.	Date Canal was opened.	Year.	Area.	Date Canal was opened.
1871 ..	37,827	24th June.	1871 ..	24,837	29th March.	1871 ..	27,925	25th June.	1871 ..	13,441	22nd June.	1871 ..	24,554	20th June.	1871 ..	10,769	20th June.
1872 ..	38,987	26th do.	1872 ..	22,675	Open throughout.	1872 ..	25,389	26th do.	1872 ..	13,305	27th do.	1872 ..	25,113	24th do.	1872 ..	8,978	25th do.
1873 ..	37,324	20th March.	1873 ..	22,208	9th July.	1873 ..	25,492	27th March.	1873 ..	13,420	15th do.	1873 ..	24,700	14th do.	1873 ..	9,493	14th do.
1874 ..	37,821	1st July.	1874 ..	22,845	3rd do.	1874 ..	24,945	2nd July.	1874 ..	13,070	4th July.	1874 ..	24,157	2nd July.	1874 ..	8,425	3rd July.
1875 ..	38,014	5th do.	1875 ..	24,231	18th May.	1875 ..	23,180	5th do.	1875 ..	11,140	12th do.	1875 ..	23,720	13th do.	1875 ..	6,935	19th do.

(Signed) D. McNEIL CAMPBELL, Lieut., R.E.,
Executive Engineer in charge, Godavery District.

Proceedings of the Madras Government, Public Works Department,
6th October 1876. *No.* 2,697.

B.

Statement showing the Cost of Cultivation, Dry and Wet Crops, respectively, and the Profit derived therefrom.

DRY CROP PER ACRE.

	Rs.	A.	P.
List for land per acre	3	8	0
Road Fund, &c., do.	0	3	0
Hire for ploughing land per acre	1	8	0
Seeds per acre	0	8	0
Rooting up plants in the field per acre ...	1	4	0
Reaping crop and heaping per acre ...	1	0	0
Threshing crop per acre	0	8	0
Expense per acre ...	8	7	0

Description of Crops.

		Rs.	A.	P.	Rs.	A.	P.
1st year's crop.	Paddy on dry land per putty	15	0	0			
	Cotton, &c., do	3	0	0			
	Produce ...	18	0	0			
	Deduct Expenses ...	8	7	0			
	Profit to the ryot per acre ...				9	9	0
2nd year's crop.	Cholum per three-quarter putty ...	15	0	0			
	Gingly seeds quarter putty	10	0	0			
	Produce ...	25	0	0			
	Deduct Expenses ...	8	7	0			
	Profit to the ryot per acre ...				16	9	0

(Signed) D. McNEIL CAMPBELL, Lieut., R.E.,
Executive Engineer in charge, Godavery District.

WET CULTIVATION.

1st Sort.

	Rs.	A.	P.
List per acre...	4	0	0
Water-tax per acre	4	0	0
Local Fund do.	0	3	0
Seeds do.	0	8	0
Transplantation, &c., per acre	2	0	0
Reaping crop and heaping per acre...	1	8	0
Ploughing per acre	2	0	0
Threshing per acre	1	4	0
Servant's wages per acre	2	0	0
Expenses per acre ...	17	7	0

Description of Crops.

	Rs.	A.	P.	Rs.	A.	P.
Paddy one and three-quarter putty at Rs. 16...	28	0	0			
Deduct Expenses ...	17	7	0			
				10	9	0

(Signed) D. McNEIL CAMPBELL, Lieut., R.E.,
Executive Engineer in charge, Godavery District.

N.B.—This statement is the result of taking the average figures given by several ryots; the prices of grain are those for 1875.

From Lieutenant A. R. F. DORWARD, RE., Assistant Engineer in charge, Western Delta Division, Godavery District, to the District Engineer, Godavery, dated Camp at Mamundur, 31st July 1876, No. 174.

REFERRING to your endorsement, No. 1,57, of 13th instant, on the memorandum of the Chief Engineer for Irrigation, No. 64 G.D., d 21st June 1876, I have the honor to report as follows:—

In paragraph 2 the Chief Engineer gves the ayacut as 550,121 acres. I cannot find that this area was ever reported by this office. The Curnam of each village gives yearly the ayacut for his own village. These are added together, and very often the total disagrees with that of former years. The correct ayacut has probably not been reported, and I do not know what it is.

In paragraph 3 the Chief Engineer ponts out differences in the statements of ultimate expected area of irrigation under different canals for the two years. The statements sent to your office from this both agree (copies enclosed to be returned) and are identical with that forwarded when the project estimates were sent up for auction.

With reference to paragraph 6, I am quite unable to understand the figures given by the Chief Engineer for Irrigation. To take he Bank canal, under which the great falling off in area took place, I find the irrigated area for 874-75 put down as 7,167 acres. This is manifestly wrong. According to the figures furnished by Tahsildars and Curnams to this office the irrigated area was in 1874-75, 16,224 acres. The area for the previous year was 15,419. In 1874-75 there was an increase of about 800 acres instead of a decrease of 3,477 acres as shown by the Chief Engineer. I am certain that the figures I have given above are nearly correct.

The irrigation under the Mukkamala canal has never yet reached 3,000 acres, the expected ultimate area. Yet the Chief Engineer puts down the area of irrigation under that canal in 1873-74 as 11,224 acres and in 1874-75 as 11,481 acres.

Under the Yenamadurru drainage 2,874 acres as shown as irrigated in 1874-75, there being no irrigation shown for the previous year. This is wrong. There was a considerable area of irrigation under the Yenamadurru in 1873-74, carried on by means of palmyra spouts through the banks.

The arrangement was a dangerous one, and means were taken to supply the lands so irrigated from other canals.

The result was that the area under the Yenamadurru was reduced to 89 acres in 1874-75. In 1875-76 there was no irrigation at all under the Yenamadurru, and there will never again be any.

The main canal has never yet irrigated 1,422 acres as shown for 1873-74. When asked, the Collector has given as a reason for the differences in figures shown by him and by this department the fact that we only take notice of land *actually* irrigated.

As regards the revenue derived from irrigation I know nothing, and cannot explain why, for instance, there should have been a falling off under the Attali canal in 1874-75.

The increase under that canal in irrigated area was about 700 acres (in this the Collector's figures agree with those in this office). Instead of a corresponding increase in revenue, however there seems to have been a decrease of Rupees 961. In 1874-75 the canal was in a much more efficient state than in 1873-74. The supply to all lands under the canal was good and better than in 1873-74. The only lands injured by drainage water were low-lying ones at the end of the canal, and the amount of injury those lands sustained was not nearly so great as in 1873-74. The Undi canal is by far the most inefficient in the range; the means of regulating water-supply to channels are very imperfect, and the channels are badly laid out. The Bank and Attali canals, which the Chief Engineer wishes brought up to the same standard of efficiency, are much more efficient. For irrigation purposes the Attali canal is the most efficient in the range. A great portion of the land under the Attali canal and the Venkia and Loyeru is zemindari. This may have something to do with the decrease of revenue under those canals.

Proceedings of the Madras Govern ent, Public Works Department,
6th October 1876. *No.* 2,697.

No. 104. ORDER THEREON, 6th tober 1876, No. 2,697.

IRRIGATION, No. 14.

THE foregoing papers containing the nions of the officers in charge of the odavery Delta Ranges on the causes of the decrease of irrigation and revenue in 1 4-75, and a review by the Chief Engineer for Irrigation of the reasons adduced that decrease, particularly as regards the Eastern Delta, deal with a very import subject, and will be communicated to the Revenue Department and to the Superintending Engineer, Kistna; and Major Beatty having been absent from the distri t when the papers were transmitted, Government would wish to know what his vi ws are on the subject.

2. Of the eight reasons adduced by ieutenant McNeil Campbell to account for the marked decrease of irrigation in the Eastern Delta, some can be dealt with immediately by the District Engineer and the Canal Officers. These are numbered 1, 5, and 6, and refer to lateness of water-supply for irrigation, interference of improvement works with water-supply, and inefficiency of the distribution arrangements; the remarks of the Chief Engineer for Irrigation should receive attention, and with regard to distribution the best way of securing economy of water and of outlay, as well as the efficient and convenient supply in each case, should be carefully considered.

3. Of the other reasons, the effect of p agraph 1 of Rule II of Revenue Circu-

No. 2. l No. 5 will be referred to the Board Revenue, but His Grace the Governor in Council is not disposed to consider that any enhancement of the dry assessment of lands which have been irrigated would be desirable even were it clear that they have been improved for dry cultivation by being irrigated in previous years, and were there no practical difficulties in the way of revising the assessment. The

No. 3. preference of ryots for dry cultivation,
No. 4. the effect of drainage works in making
No. 7. land fit for dry cultivation, the variation
No. 8. in the selling price of paddy compared

with that of dry grains, and the effect of the present rates of water-tax are all points which it will be well to watch, and on which the opinion of the Revenue Officers will be of value.

4. The influences affecting the area of irrigation need careful investigation not only as regards the Godavery Delta, but for the Kistna and other important fields of irrigation also.

(True Extract.)

Major-General, R.E.,
Secretary to Government.

To the Revenue Department.
,, District Engineer, Godavery.
,, ,, Kistna.
,, Chief Engineer for Irrigation.
,, Board of Revenue.
Exd. A. Grubert.
76 Spare Copies

10-10-74 - 76 -
24-4-71 - 102 -
12-3-74 - 664 Rod.

Chapman des fontaines

No 4444

Gobt. of [1876] Madras

PUBLIC WORKS.

To

The REVENUE DEPARTMENT.

Dated October 6th

Issued

Read 27.

Recd.

G. O., 6th October 1876, No. 2,007.

OCTOBER.

Nos. 100-101.

Ver 468/78

No 2556

Recorded

2d Nov 76.

Irrigation in the Godavery Delta.—Passing orders on Note by the Chief Engineer for Irrigation, submitting, with observations, opinions of the officers in charge of the Godavery Delta Barrage on the effects of the decrease of Irrigation and Revenue in 1875-76.