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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 2676	Press
532-533	Mis.
Dated 24-8-	1866.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
24th August 1866.*

No. 532. Read the following Endorsement of the Under Secretary to the Government of the North-Western Provinces, Public Works Department, Irrigation Branch, dated Nynce Tal, 23rd July 1866, No. 397 I:—

Resolution by the Honorable the Lieutenant-Governor of the North-Western Provinces, Public Works Department, Irrigation Branch, under date the 8th of June 1866, No. 370 I.

Comparison of water-rates for Irrigation and for other purposes.

Read a Memorandum No. 132, dated 20th November 1865, recorded by the Chief Engineer, Irrigation Works, on the above subject.

REFERENCES.

1. Resolution, dated 31st May 1845, by Government, North-Western Provinces, giving effect to Act VII. of 1845, on Eastern and Western Jumna Canals, and the Beejapoor, Rajpooor, and Nugeenah Canals.
2. Notification No. 219A., dated 30th January 1855, by Government, North-Western Provinces, giving effect to same on the Ganges Canal.
3. Settlement Report on the Goordaspooor District, in the Punjab, by R. H. Davies, Esquire, C. S.
4. Lieutenant Dyas' Baree Doab Canal Project of 1850 (p. 53), and letter No. 798, dated 30th August 1856, from him as Director of Canals in Punjab, to Secretary to Chief Commissioner, being report on Lieutenant Crofton's Baree Doab Canal Revised Estimate of 1856, paragraphs 33 to 36 (pages 8 and 9).
5. Resolution No. 1,584, dated 24th August 1860, by Government, Punjab, Public Works Department, giving effect to Act VII. of 1845, on Baree Doab Canal.
6. Revenue Reports of Baree Doab Canal, 1862-63 (paragraph 35) and 1863-64 (paragraph 18).
7. Letter No. 777C., dated 31st July 1865, from Secretary to Government of India, to the Secretary to Government, North-Western Provinces, Public Works Department, and enclosures.
8. Letter No. 1,066, dated 17th October 1865, from ditto to ditto, and enclosures.

ABSTRACT.

1. References 3 to 7 show that the direct charge for irrigation in the Punjab is Rupees 2-6-8-64 per acre per crop, or 1 Rupee for 18,000 square feet of land irrigated; and that the additional indirect charge due to enhancement of Land Revenue consequent on the irrigation, makes the total charge by Government for irrigated land at least 4 Rupees per acre. The charges in the North-Western Provinces, on land assessed since irrigation was supplied to it, are now very much the same on the average; and it so happens that 4 Rupees an acre per crop is also the rate charged by the Madras Irrigation Company, from the operations of which, Government, I believe, derives no profit whatever in the shape of enhancement of Land Revenue.

The Madras rate is otherwise stated as "8 Rupees per annum for a cubic yard of water per hour," which is equivalent to 1,066 $\frac{2}{3}$ Rupees per cubic foot per second.

2. References 2 and 5 show that for purposes other than irrigation, water is sold in the Punjaub at the rate of 1 Rupee for 2,500 cubic feet, and in the North-Western Provinces, at the rate of 1 Rupee for 6,000 cubic feet. These two rates bear pretty nearly the same proportion to each other (1 : 2·4) as did the old average North-Western Provinces, and the Punjaub area rates of Rupee 1-0-0 and Rupees 2-6-8-64; and it may be presumed that the Punjaub rate was deduced in this way from the North-Western Provinces' rate.

3. References 7 and 8 show that in Madras the corresponding rate has recently been raised from 1 Rupee for 13,500 cubic feet to 1 Rupee for 10,800 cubic feet of water; and the principle has been broached that water issued from an Irrigation Canal for purposes other than irrigation, ought to pay at double the rate fixed for irrigation water.

REMARKS AND RECOMMENDATIONS.

4. The great discrepancy between these corresponding rates in Madras and in Northern India calls for consideration, and I have included the Punjaub in the present inquiry at the instance of the Chief Engineer of Irrigation Works in the Punjaub.

5. It is evident that the first step towards the formation of an opinion in this matter is the reduction, to common terms, of the quantities of water, as used for irrigation and for other purposes respectively.

6. Now, at first sight, the task would appear to be simple enough; but on a closer view it will be seen to involve so many elements of uncertainty that a fair solution of the question is by no means easy.

7. The Consulting Engineer to Government, Madras, for the Madras Irrigation and Canal Company, cuts the knot by disclaiming the idea of the existence of any connection between the rates of water when used for irrigation and when used for other purposes. Still the irrigation rates have been used as a standard in fixing the other rates in Madras.

8. It is evident that some standard of comparison is necessary in fixing, for the first time, rates to be charged by a monopolist; and, on works constructed primarily for irrigation, it seems but natural that the standard should be the irrigation rate. At all events, it would appear to be necessary to adjust the two rates relatively to each other, in such a manner that it may not be found advantageous to speculate in buying water for other purposes in order to retail it for irrigation. And again, if it be considered how largely water used in irrigation adds to the general material prosperity of the country, in how many indirect ways its influence must be felt, and, above all, how invaluable it is in averting famine as well as the effects of bad seasons, it would appear reasonable that the diversion of any portion of the very limited supply we have, to other purposes, (possibly of mere luxury, and, at all events, more finite in their beneficial effects,) ought not to be encouraged, but ought rather to be discouraged to a certain extent, by issuing it for those purposes at a rate considerably higher than the irrigation rate.

9. In Madras, again, the formula of "one cubic yard of water per hour being sufficient to irrigate throughout the year one acre of land" appears to be considered satisfactory. This quantity of water (the charge for which is Rupees 8) is

equivalent to 0·0075 cubic foot per second for one year, or to 236,677 cubic feet of water altogether; and it follows that in Madras 266 $\frac{2}{3}$ acres is considered to be the annual "irrigating duty" of one cubic foot of water per second.

10. In Northern India, however, owing to the very great diversity of crops, climate, soil, and water, our most trustworthy estimates of average irrigating duty are expressed in terms of the quantity of water received into a Canal at its head. But a cubic foot actually delivered on to the fields, and a cubic foot of water at the head of a Canal, are two very different things. Before the water can pass from the Canal head to the head of the water-course through which it is issued to the cultivator, it has to make a long journey, and it has to pay heavily on the road for the privilege of transit. Absorption and evaporation combine in levying toll from the flowing water. The rainfall which is received on the way might be set off on the opposite side, were it not that when rain falls, the Canal is generally sufficiently full at the head, and can accommodate no more water; so that the rain-water has to be let out again at the escapes, along with a goodly portion of the real Canal supply.

11. Hence it follows that a necessary preliminary is an enquiry into the average loss of water by evaporation and absorption, and the amount of waste by escapes and tails.

12. From a series of observations very carefully made on the Baree Doab Canal in 1860-61 by Major H. Drummond, R.E., and Mr. J. D. Smithe, I have come to the conclusion (after tabulating the results) that the loss by evaporation and absorption combined, in the main channels of an ordinary irrigating Canal in Northern India may be set down 20 per cent. of the full supply at the head of the Canal; and we may allow 10 per cent. more for the similar loss on rajbuhās and by escapes combined, or say 30 per cent. altogether.

13. That is to say, for every cubic foot of water conveyed to the head of a water-course, 1 $\frac{3}{4}$ cubic foot must pass into the head of the Canal, or in other words, one cubic foot of water at the head of a Canal results in only seven-tenths of a cubic foot at the head of a water-course.

14. Again, measurements by Major Brownlow, R.E., on the Eastern Jumna Canal in 1860-61, gave 296 acres (76 in *khurreef* and 220 in *Rubbee*,—22 of the former being sugar-cane, and therefore irrigated in both crops) as the irrigating duty for that year of each cubic foot of water entering that Canal: hence, at 4 Rs. per acre, the value of each cubic foot of water entering the Eastern Jumna Canal would be Rupees 1,184.

15. But, seven-tenths cubic foot : 1 cubic foot :: Rupees 1,184 : Rs. 1,691·43. Hence Rupees 1,691·43 is the value of one cubic foot of water per second delivered at the head of a water-course throughout the year;

And since Rupees 1,691·43 : Rupee 1 :: 31,556,930 cubic feet : 18,657 cubic feet, 18,657 cubic feet is the quantity of water which, delivered at the head of a water-course for irrigation, is worth one Rupee.

16. Again, since 6,000 cubic feet : 18,657 cubic feet :: 1 : 3·1075, it appears that, in the North-Western Provinces, water used for purposes other than irrigation is charged about three times as much as water for irrigation;

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24th August 1866.*

17. And since 2,500 cubic feet : 18,657 cubic feet :: 1 : 7.463; it follows that, in the Punjab, water used for purposes other than irrigation is charged about seven and a half times as much as water for irrigation.

18. The Madras irrigation rate of Rupees 8 per cubic yard per hour is equivalent to Rupees $1,066\frac{2}{3}$ per cubic foot per second;

And since Rupees $1,066\frac{2}{3}$: Rupee 1 :: 31,556,930 cubic feet : 29,585 cubic feet, we find that 29,585 cubic feet is the quantity of water to be had for irrigation in Madras for one Rupee;

And since 10,800 cubic feet : 29,585 cubic feet :: 1 : 2.731; it would appear that in Madras the charge for water used for purposes other than irrigation is about $2\frac{3}{4}$ times as much as the charge for irrigation water.

19. One point remains to be considered. An irrigation water-course is not always running. During "bundee" or "tateel," it is closed for three days in the week, and every night perhaps also, in order that the limited available supply of water may be equitably distributed among the cultivators; and frequently—especially in rainy weather—the cultivator himself closes his water-course. This would not happen with a water-course used for other purposes. Its owner would, if possible, keep it running constantly, night and day. The cultivator therefore really takes (or gets) less water in the course of a year than the quantity allowed in the preceding calculations; and, in fixing rates, this ought to be taken into account.

20. On the whole, then, I think we shall not be very far wrong if we fix the quantity of water which may be sold from all Canals in the North-Western Provinces at the present Ganges Canal rate of 6,000 cubic feet of water per Rupee. This rate was fixed on the recommendation of Colonel R. Baird Smith, from the 1st May, 1855, when the Ganges Canal irrigation rate was (simultaneously) fixed at Rupees 220 per "pymanah" of 1.347 cubic foot per second, or Rupees 163.32 per cubic foot per second; while the area irrigation rate on neighbouring Canals (Eastern and Western Jumna Canals) averaged one Rupee per acre.

21. From 1st May, 1865, however the area rate for the Ganges and the Eastern Jumna Canals has been raised to an average of Rupees $2\frac{1}{2}$ per acre, nearly; hence the retention now of the existing Ganges Canal rate may well be considered equivalent to a reduction.

22. It is true that rate (6,000 cubic feet of water per Rupee) is higher than the Madras rate of 400 cubic yards (10,800 cubic feet) per Rupee; but I have shown (paragraph 9) that the present irrigating duty of water is higher in Northern India than it is in Madras. It also appears to me that the Madras rate must be again raised, and at no very distant period.

23. It would be interesting to draw comparisons with the old rates on the other Canals of the North-Western Provinces. But the rules (given in Government, North-Western Provinces' Resolution, dated 31st May, 1845) are not expressed in terms from which rates in cubic feet per second can be deduced. The rule laid down for the Western and Eastern Jumna Canals says, "Rupees 5 per 24 hours' run for every 100 square inches of opening through which the water is sup-

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plied" (when water can be spared from cultivation). Now if we suppose the water to pass through the opening with a mean velocity of $2\frac{1}{2}$ feet per second, the discharge would be 1.732 cubic foot per second, and the rate 1,50,000 cubic feet of water for Rupees 5, or 30,000 cubic feet of water per Rupee. The velocity however is not known. The rules laid down for the Doon Canals give no rate for the issue of water for purposes other than irrigation. The rule laid down for the Nugeenah Canal, in Rohilkhund, says, "Rupees 5 for 24 hours' run for every 20 square inches of opening," when water can be spared; so that on the above supposition, the rate is five times the Western and Eastern Jumna Canal rate, or 6,000 cubic feet of water per Rupee, the Ganges Canal rate.

24. In recommending that water issued from all Canals of the North-Western Provinces for purposes other than irrigation be sold at the Ganges Canal rate of 6,000 cubic feet per Rupee, I have no intention of recommending the measure as a final one. It may, I think, stand for the present, but it would of course be open to revision hereafter. The measure might be introduced from the 1st May 1866.

(Signed) J. H. DYAS, Lieut.-Colonel, R. E.,
Chief Engineer, Irrigation Works,
North-Western Provinces.

P. S.—I have kept this Memorandum back for some time, in order to get the opinion of Major Crofton and of other Officers of the Irrigation Branch, Public Works Department. The reasoning, &c., having been generally approved of, I now submit the Memorandum to Government.

OBSERVATIONS.—His Honor the Lieutenant-Governor approves of the measures recommended by Lieutenant-Colonel Dyas, and authorizes the adoption of the new rate for water issued from the Ganges Canal for purposes other than irrigation, with effect from the 1st November 1866. Notification to issue accordingly.

ORDER.—Ordered that a copy of the foregoing, together with a copy of the Notification, be forwarded to the Secretary to the Government of India, Public Works Department, with reference to Nos. 777C. and 1,066C., dated respectively the 31st July and 17th October 1865.

(Signed) J. H. DYAS, Lieut.-Colonel, R. E.,
Under Secy. to Govt., North-Western Provinces,
P. W. D., Irrigation Branch.

ORDER.—Ordered that the foregoing be forwarded to the Secretary to the Government of Madras, Public Works Department, for information.

(Signed) J. H. DYAS, Lieut.-Colonel, R. E.,
Under Secy. to Govt., North-Western Provinces,
P. W. D., Irrigation Branch.

*Proceedings of the Madras Government, Public Works Department,
24th August 1866.*

No. 533.

ORDER THEREON, 24th August 1866, No. 2,676.

CIVIL WORKS, No. 75.

Communicated to the Consulting
Engineer for the Madras Irrigation and
Canal Company.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Consulting Engineer for the Madras Irrigation and Canal Company.

Exd. S. T. Augustin.

No. 370 I of 1866.

RESOLUTION

BY THE

Hon'ble the Lieutenant-Governor,

OF THE

(NORTH-WESTERN PROVINCES,

(PUBLIC WORKS' DEPARTMENT, IRRIGATION BRANCH,

UNDER DATE THE 8TH OF JUNE, 1866.

COMPARISON OF WATER-RATES FOR IRRIGATION AND FOR OTHER PURPOSES.

READ a Memo. No. 132, dated 20th November, 1865, recorded by the
Chief Engineer, Irrigation Works, on the above subject.

REFERENCES.

1. Resolution, dated 31st May, 1845, by Government, North-Western Provinces, giving effect to Act VII. of 1845, on Eastern and Western Jumna Canals, and the Beejapoor, Rajpore, and Nugeenah Canals.
2. Notification No. 219A., dated 30th January, 1855, by Government, North-Western Provinces, giving effect to same on the Ganges Canal.
3. Settlement Report on the Goordaspore District, in the Punjab, by R. H. Davies, Esquire, C.S.
4. Lieutenant Dyas' Baree Doab Canal Project of 1850 (p. 53), and letter No. 798, dated 30th August, 1856, from him as Director of Canals in Punjab, to Secretary to Chief Commissioner, being report on Lieutenant Crofton's Baree Doab Canal Revised Estimate of 1856, paras. 33 to 36 (pages 8 and 9).
5. Resolution No. 1584, dated 24th August, 1860, by Government, Punjab, Public Works Department, giving effect to Act VII. of 1845, on Baree Doab Canal.
6. Revenue Reports of Baree Doab Canal, 1862-63 (para 35) and 1863-64 (para. 18).
7. Letter No. 777C., dated 31st July, 1865, from Secretary to Government of India, to the Secretary to Government, North-Western Provinces, Public Works Department, and enclosures.
8. Letter No. 1066, dated 17th October, 1865, from Ditto to Ditto, and enclosures.

ABSTRACT.

1. References 3 to 7 show that the direct charge for irrigation in the Punjab is Rs. 2-6-8-64 per acre per crop, or 1 rupee for 18,000 square feet of land irrigated; and that the additional indirect charge due to enhancement of Land Revenue consequent on the irrigation, makes the total charge by Government for irrigated land a

at least 4 rupees per acre. The charges in the North-Western Provinces, on land assessed since irrigation was supplied to it, are now very much the same on the average; and it so happens that 4 rupees an acre per crop is also the rate charged by the Madras Irrigation Company, from the operations of which, Government, I believe, derives no profit whatever in the shape of enhancement of Land Revenue.

The Madras rate is otherwise stated as "8 rupees per annum for a cubic yard of water per hour," which is equivalent to 1,066 $\frac{2}{3}$ rupees per cubic foot per second.

2. References 2 and 5 show that for purposes other than irrigation, water is sold in the Punjab at the rate of 1 rupee for 2,500 cubic feet, and in the North-Western Provinces, at the rate of 1 rupee for 6,000 cubic feet. These two rates bear pretty nearly the same proportion to each other (1:2.4) as did the old average North-Western Provinces, and the Punjab area rates of rupee 1-0-0 and rupees 2-6-8 $\frac{1}{4}$; and it may be presumed that the Punjab rate was deduced in this way from the North-Western Provinces' rate.

3. References 7 and 8 show that in Madras the corresponding rate has recently been raised from 1 rupee for 13,500 cubic feet to 1 rupee for 10,800 cubic feet of water; and the principle has been broached that water issued from an Irrigation Canal for purposes other than irrigation, ought to pay at double the rate fixed for irrigation water.

REMARKS AND RECOMMENDATIONS.

4. The great discrepancy between these corresponding rates in Madras and in Northern India calls for consideration, and I have included the Punjab in the present inquiry at the instance of the Chief Engineer of Irrigation Works in the Punjab.

5. It is evident that the first step towards the formation of an opinion in this matter is the reduction to common terms of the quantities of water, as used for irrigation and for other purposes respectively.

6. Now, at first sight, the task would appear to be simple enough; but on a closer view it will be seen to involve so many elements of uncertainty that a fair solution of the question is by no means easy.

7. The Consulting Engineer to Government, Madras, for the Madras Irrigation and Canal Company, cuts the knot by disclaiming the idea of the existence of any connection between the rates of water when used for irrigation and when used for other purposes. Still the irrigation rates have been used as a standard in fixing the other rates in Madras.

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equivalent to 0.0075 cubic foot per second for one year, or to 236,677 cubic feet of water altogether; and it follows that in Madras 266 $\frac{2}{3}$ acres is considered to be the annual "irrigating duty" of one cubic foot of water per second.

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12. From a series of observations very carefully made on the Baree Doab Canal in 1860-61 by Major H. Drummond, R.E., and Mr. J. D. Smithe, I have come to the conclusion (after tabulating the results) that the loss by evaporation and absorption combined, in the main channels of an ordinary irrigating Canal in Northern India may be set down at 20 per cent. of the full supply at the head of the Canal; and we may allow 10 per cent. more for the similar loss on rajbhuas and by escapes combined, or say 30 per cent. altogether.

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And since Rs. 1,691.43 : Re. 1 :: 31,556,930 cubic feet : 18,657 cubic feet, 18,657 cubic feet is the quantity of water which, delivered at the head of a water-course for irrigation, is worth one rupee.

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(4)

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19. One point remains to be considered. An irrigation water-course is not always running. During "bundee" or "tateel," it is closed for three days in the week, and every night perhaps also, in order that the limited available supply of water may be equitably distributed among the cultivators; and frequently—especially in rainy weather—the cultivator himself closes his water-course. This would not happen with a water-course used for other purposes. Its owner would, if possible, keep it running constantly, night and day. The cultivator therefore really takes (or gets) less water in the course of a year than the quantity allowed in the preceding calculations; and, in fixing rates, this ought to be taken into account.

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24. In recommending that water issued from all Canals of the North-Western Provinces for purposes other than irrigation be sold at the Ganges Canal rate of 6,000 cubic feet per rupee, I have no intention of recommending the measure as a final one.

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It may, I think, stand for the present, but it would of course be open to revision hereafter. The measure might be introduced from the 1st May, 1866.

(Signed) J. H. DYAS, LIEUT.-COL., R. E.,

Chief Engineer, Irrigation Works,
North-Western Provinces.

P. S.—I have kept this Memo. back for some time, in order to get the opinion of Major Crofton and of other Officers of the Irrigation Branch, Public Works Department. The reasoning, &c., having been generally approved of, I now submit the Memo. to Government.

OBSERVATIONS.

His Honor the Lieutenant-Governor approves of the measures recommended by Lieutenant-Colonel Dyas, and authorizes the adoption of the new rate for water issued from the Ganges Canal for purposes other than irrigation, with effect from the 1st November, 1866. Notification to issue accordingly.

ORDER.—Ordered that a copy of the foregoing, together with a copy of the Notification, be forwarded to the Secretary to the Government of India, Public Works Department, with reference to Nos. 777C. and 1066C., dated respectively the 31st July and 17th October, 1865.

LIEUT.-COL., R. E.,

Under-Secy. to Govt., N.-W. Provinces,

P. W. Department, Irrigation Branch.

Order No. 307 I of 1866.

*Order } Ordered that the foregoing be forwarded to the
Secretary to the Government of Madras, P.W.D.
for information.*

*R. W. Sept 11 1866
a general
The 23 of July 1866.*

*W. H. Dyas Lieut. Col. R. E.
This copy to the Secy. of the Govt. P.W.D.
Irrig. Branch.*

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Communicator & the Consulting
Engineer for the Alaska Pipeline Corp.

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Wm. B. Davis
No. 1 of Gov. & Sen. Agents
Feb. 24/9.

From
the Hundred Years of the Court
of the W. H. C. & D. H. C.
W. H. C. & D. H. C.

To the Secy: of the Prov.

2123 East 2nd
New England
1885
1897

forwarding a copy of
the resolution of the Feb. 27
about ~~the~~ ^{the} American regarding
the competition of anti-trust
laws and other purposes.

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With our orders

Q. 105 dust 1/16. An. 17 in.