

MADRAS RECORD OFFICE.

Government of Madras.

Revenue DEPARTMENT.

G.O. No.	2748	Press
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361.362		
Dated	20 - 11 -	1867.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Revenue Department,
20th November 1867.*

No. 361. Read the following Circular from the Government of India, Public Works Department, (Irrigation,) to the Secretary to Government, Public Works Department, dated Simla, 11th September 1867, No. 87:—
Quantity of water required for the proper irrigation of crops of various kinds.

Read the following papers:—
Letter from the Government of Madras, No. 1,972, dated 3rd July 1867, and enclosures.

OBSERVATIONS.—It is very desirable to obtain trustworthy data as to the quantity of water required for the proper irrigation of crops of various natures.

2. In general terms it may be said that, what is to be aimed at in artificial irrigation, on a large scale, from Government canals, is to secure the *largest* amount of produce from the application of a *given* quantity of water. To an individual proprietor of a limited area of land the object will be somewhat different. He will desire to obtain the largest quantity of produce possible from his particular holding. The distinction is important to the community at large, the interests of which demand that, with the fixed and limited means of irrigation at their disposal, the greatest aggregate quantity of produce shall be obtained.

3. The problem for the Canal Engineer to solve, therefore, is, not to ascertain what supply of water will produce the largest crop from a fixed area, but what is the largest possible quantity of produce that can be raised, with complete security and with most profit, by a given quantity of water.

4. To illustrate these remarks attention may be drawn to the results of some experiments lately made in the Madras Presidency on the irrigation of rice-crops. These experiments are not sufficiently complete to afford trustworthy data, but they will serve to explain what has been above pointed out.

5. It was found that land supplied with 3 cubic yards per hour, on an average of the whole period of cultivation, the supply being given every second day, gave a crop of 3,350 lbs. of paddy per acre. Also a supply of 1 cubic yard per hour, on the average period of cultivation distributed every fourth day, gave, in another case, a crop of 2,070 lbs. of paddy.

6. Now, supposing that the quality of the produce had been alike in both cases, we should have for the expenditure of 3 cubic yards of water per hour, in the first case, a produce of 3,350 lbs., and in the second of three times 2,070 lbs., or 6,420 lbs., shewing an advantage of 3,070 lbs. in the second case, or 1,023 lbs. per cubic yard of hourly supply. So far as the *produce* alone was concerned, the water would have been nearly doubly as profitable in the second case as in the first. Thus the apparent result, judging from the produce per acre, would be quite fallacious as to the real advantage of the two systems of supply.

7. It will of course happen, however, that, with the smaller ratio of produce per acre, the relative cost of cultivation will be greater, because, to obtain such an advantage as has been spoken of, three times the area of land must be under crop. The question, therefore, arises, whether the value of the 3,070 lbs. of paddy is in excess of the entire cost of cultivating two additional acres of land. If the data taken were trustworthy, it might be safely affirmed that the additional produce in question would considerably exceed the extra cost of cultivation, and therefore that the practice of giving 1 cubic yard of water per hour was better than that of giving 3 cubic yards.

8. It is not to be understood that this illustration is put forward as in any sense proving the position to which it brings us. The data, as was before said, are not sufficiently trustworthy to prove anything. But the possibility of such a result is indicated, and the great importance of arriving at a correct perception of the proper rules to adopt in this matter is fully established.

9. The Government of India will, therefore, be glad to see attention paid to the collection of data to throw light on this subject, which shall be really trustworthy. It does not seem necessary to suggest any particular mode of operation in prosecuting such an enquiry. All that is desirable is to inculcate the importance of taking great care that all disturbing influences shall, as far as possible, be removed. That the land operated upon shall be of ascertained good quality, neither too rich nor too poor; that the seed shall be sound, defined in quantity, and of a known description or quality that can be recognized for future purposes of experiment; that the entire produce shall be accurately weighed in a corn-crop, the weight of straw being given as well as that of the grain, and care being taken that the whole shall be in a fair average state of dryness; that the quality of the produce shall be described in such a manner as shall admit of comparison with other cases; that in stating its value, reference should be made to the way of making the estimate, whether it be a village value, or a value when sent to market; that the charges for the land revenue, water-rate, landlord's rent (when such a charge exists), and probable cost of cultivation, should be mentioned. Full details should also be given of the time of sowing; of beginning and ending irrigation; of reaping; of the rain-fall during the period; of the temperature if possible; of the quantity of water supplied; of the nature of the surface drainage, whether free or otherwise. Any further information as to nature of the tillage, how many times the land was ploughed, how deep is the soil disturbed, what was the crop last on the ground, when was that crop cut, whether the land had been manured, and how, and other like points, will all serve to give precision and value to the enquiry.

10. At the same time it will be not less useful to obtain similar data as to the produce of average lands under cultivation without irrigation, and with well irrigation. A comparison of the produce from the unirrigated lands of a district, with the known produce of like crops when irrigated, will often be a useful guide in considering whether artificial irrigation is likely to be of importance to agriculture, where a doubt exists on such a point.

11. It is requested that the measures proposed to be taken for carrying out these enquiries may be communicated to the Government of India; the Local Governments and Administrations considering themselves, however, at liberty to take any action at once in the matter at their discretion.

12. An abstract of the Madras experiments referred to is annexed.

Madras.
Bombay.
Bengal.
N. W. Provinces.
Panjab.
British Burmah.
Rajpootana.

Ondh.
Central Provinces.
Mysore.
Coorg.
Hyderabad.
Central India.

ORDER.—Ordered that this Resolution be forwarded to the Local Governments and Administrations marginally noted, for guidance.

(Signed) C. H. DICKENS, Colonel, R. A.,
Secretary to the Government of India.

EXPERIMENT IN SOUTH ARCOT DISTRICT.

One acre of the highest ground on the Vellaur, near Porto Novo, was selected for the experiment, and a masonry cistern was constructed on the west of the ground. This cistern was supplied by peccottah.

The ground chosen was among other paddy-fields, a turf ridge was thrown all round it, and being higher than the adjoining lands, was easily drained, and admitted of no percolation.

The soil is sandy, with a moderate amount of alluvial deposit. The season was good, but the sowing was a month behind time owing to want of an adequate water-supply.

The seed-paddy was sown on separate ground on 1st September 1866, but the cistern not being ready till the end of the month, the experiment embraces the period from the time the ground received the transplanted paddy to the cutting of the crop.

The details of the experiment are as follows :—
The supply of water and the rain-fall were—

Months.	No. of days.	RAIN-FALL.			WATER FROM CISTERN.		TOTAL WATER.		
		Inches.	Cubic yards.	Cubic yards per hour.	Cubic yards.	Cubic yards per hour.	Cubic yards.	Cubic yards per hour.	
September ...	30	5.49	76	0.105	38	0.053	114	0.15	The quantity of water is the proportion required for one acre of crop. The water obtained from rain-fall is reduced by 605 cubic yards drained off.
October ...	31	12.00	1,008	1.355	705	0.948	1,713	2.30	
November ...	30	10.25	1,378	1.914	547	0.760	1,925	2.67	
December ...	31	13.15	1,767	2.375	697	0.937	2,464	3.31	
January ...	25	0.50	67	0.112	1,008	1.680	1,075	1.77	
Total ...	147	40.39	4,296		2,995		7,291		
General average	...	...	...	1.22		0.85		3.07	

The mean temperature was 78 degrees Fahrenheit.

The ground was ploughed up on the 1st and 2nd October, and planted out on the 3rd. On the 25th January 1867 the supply of water was stopped, and only once it was found necessary to drain off a small quantity of water.

The produce amounted to 504 Madras measures of paddy (about 1,782 lbs), and 35 bundles of straw, the weight of which is not given.

The value of this crop was—				RS.	A.	P.
Paddy	...	...	...	35	9	3
Straw	...	...	...	8	12	0
Total	...	...	...	44	5	3

If one-fourth be taken as the cost of cultivation, it will leave a return of Rupees 33 per acre, from which, perhaps, Rupees 7 should be taken for land revenue, giving a net profit of Rupees 26 or £2 12s. per acre.

EXPERIMENT IN THE KISTNA DISTRICT.

In the Kistna District, an acre was divided off into 16 equal beds, of which (1, 2), (3, 4), (5, 6), and [7, 8] were supplied with 4, 3, 2, and 1 cubic yards per hour of water respectively, and watered daily.

(9, 10, 11, and 12) were watered once in four days, and (13, 14, 15, and 16) every other day, with 4, 3, 2, and 1 cubic yards per hour of water respectively.

The plants were transplanted into the several beds between the 12th and 21st of September 1866, and from that time to the end of September received about 9 or 10 cubic yards per acre per hour, including rain-fall. This large supply seems to have been needed for ploughing and setting the young plants. The beds were supplied with water after the 13th and 14th October, in the proportions and at the intervals above named. From the beginning of October to those dates the watering was irregular, but there was constant rain. The irrigation to beds 1 and 2 was stopped

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20th November 1867.

on 5th January 1867, and to beds 3 to 8 on 18th idem. The remaining beds received no water after the 31st December 1866.

The supply of water and the rain-fall were as follows for the whole acre :—

Months.	Average No. of days.	RAIN-FALL.		WATER FROM TANK.		TOTAL WATER.	
		Cubic yards.	Cubic yards per hour.	Cubic yards.	Cubic yards per hour.	Cubic yards.	Cubic yards per hour.
September ...	17	566	1.38	2,916	7.15	3,482	8.53
October ...	31	589	0.79	1,629	2.19	2,218	2.98
November ...	30	204	0.28	1,770	2.46	1,974	2.74
December ...	31	48	0.06	1,860	2.50	1,908	2.56
January ...	5			170	1.42	170	1.42
Total ...	114	1,407	0.51	8,315	3.05	9,752	3.56

The results of the experiment may be shewn as follows :—

Average results of cultivation of rice with varying supply of water for one acre.			Average results of cultivation of rice with varying period of watering for one acre.		
Supply per hour, cubic yards.	Weight of paddy per acre.		Interval of watering.	Weight of paddy per acre.	
4 yards ...	lbs. 2,372	The waterings were made on the several plots at different intervals, viz., of 1 day, 2 days, and 4 days. The average interval will be 2½ days.	Every day ...	lbs. 2,262	The supply of water varied from 1 cubic yard per hour to 4 cubic yards per hour, the average being 2½ cubic yards per hour.
3 ..	2,574		.. second day	2,883	
2 ..	2,478		.. fourth ..	2,278	
1 yard ...	2,262				

The total quantity of water supplied, including rain-fall, during a period of 114 days, was 9,752 cubic yards, or 3.56 cubic yards per hour per acre.

Deducting the rain-fall, the water amounted to 7,825 cubic yards, or 3.05 cubic yards per hour per acre.

The plots in detail give the following results :—

No. of plot.	Cubic yards water per hour including rain.	Interval of watering.	Crop of paddy.
	Yards.	Days.	lbs.
14	3	2	3,350
13	4	2	3,310
15	2	2	2,806
11	2	4	2,630
16	1	4	2,374
10	3	4	2,342
7 and 8	1	1	2,302
3 and 4	3	1	2,302
5 and 6	2	1	2,233
1 and 2	4	1	2,206
12	1	4	2,070
9	4	4	1,766

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No. 9 plot was apparently bad soil.

The total produce of the whole acre was 2,421 lbs. of paddy, valued at Rupees 44, and 2,574 lbs. of straw, valued at Rupees 12; total Rupees 56. If one-fourth is supposed to represent cost of cultivation, Rupees 42 is left, from which deducting Rupees 7 for land revenue and water-rate, we have Rupees 35 net profit, or £3 10s. per acre.

The actual cost of the experiment, however, was Rupees 346.

Lieutenant-Colonel Winscom, in sending up the account of this experiment, states that the Kistna works in 1866, with an average hourly discharge of 144,000 cubic yards, irrigate 73,484 acres, being at the rate of a little less than 2 cubic yards per hour per acre.

The same Officer states that Lieutenant-Colonel Anderson found in 1864, that a supply of about 1½ cubic yard per hour was just sufficient to prevent rice-crops from perishing. But the rain-fall is not stated in this case.

Referred to the Revenue Department, with reference to the Orders in that Department, No. 2,945, dated 31st October 1866.

(Signed) CHARLES A. ORR, Colonel, R. E.,

FORT ST. GEORGE,
7th October 1867.

Secretary to Government.

No. 362. ORDER THEREON, 20th November 1867, No. 2,748.

Irrigation. No. 13.

1. Communicated to the Board of Revenue, who will instruct Collectors to obtain and supply to the Superintending

Engineers of their districts the most accurate information they can gather as to the produce of average lands under cultivation without irrigation and under well irrigation.

2. It is observed that the experiment to ascertain, with some degree of exactitude, the quantity of water necessary to mature a wet crop on a given area is being conducted under the Department Public Works, and it seems desirable to keep the whole subject in one department.

3. The Officiating Director of Revenue Settlement will furnish the Joint Secretary to Government, in the Public Works Department for Irrigation Works, with a tabular statement of the information as to the produce values of soils which has been collected by his department.

4. The sum of Rupees 3,000 will be provided in the Budget for the coming year, to meet the cost of continuing the experiment as to water-supply needed for cultivation.

(True Extract.)

(Signed) W. HUDLESTON,
Secretary to Government.

to the Board of Revenue.

to the Officiating Director of Revenue Settlement.

to the Department Public Works.

to the Accountant General.

Ed. S. T. Augustin.

Comm. to the
 H. Sec. David H. May
 Col. 2. Obtain an estimate
 of the cost of the
 most accurate info. they can
 gather as to the products of
 average lands under cult.
 in the irrig. & under self
 irrigation. It is observed
 that the Government Description
 is a true description of the
 quantity of water necessary
 to maintain a belt of land
 given area is being conducted
 under the Dept. of Agriculture
 & that the whole subject is under
 deliberation. The Director of the
 Soil Survey is the only one who
 has a complete list of the
 information as to the products of the

The sum of \$3000 will be required in
 the State of California for the purpose of
 conducting the survey in the year 1869.
 The sum of \$3000 - 1869 - 1869

3rd July / by 1971-1972
Ct: 31 October 1867

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GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
IRRIGATION.

Referred to the Revenue Department with reference to the orders in that Department of 29th 1866.
dated 31st October 1866.

CIRCULAR No. 87 PUBLIC WORKS.

Dated SIMLA, September 11, 1867.

Received
one

7/11/67
Colonel R.E.
Secretary to Government
Port St George
7th October 1867

To The Secretary to Govt.
Revenue Department.

Quantity of water required for the proper irrigation of crops of various kinds.

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