

Introducing Rotational System of Irrigation, in management of Ground Water, in different M.I. Schemes under Govt, of West Bengal.

Written By: **SRI TAPAS KUMAR GANGULY, A.E. (A-I)**

1. Introduction :

More than 90 percent of the fresh water on this planet (excluding that which is contained in the polar ice caps and glaciers) is located underground. Generally supplying of ground water are more reliable, more readily available and less cost to develop, as compared to the surface water supplies. But it is not practical to extract all of this ground water because of economic Ft other reasons. Therefore greater importance on the development and use of underground sources of water throughout the World must have to be given.

In West Bengal demand of underground water supplies was increased severally for the extensive agricultural production during last few decades in addition to the human consumption and for the Industrial and other purposes. To meet the water requirements for extensive Agricultural Production, a large number of shallow tube wells, Heavy duty Tube well, Medium Duty Tube wells & Light duty Tube wells have been installed under different project schemes in addition to existing normal D.T.W Ft Shallow Tube well schemes. Naturally withdrawal of underground water has increased extensively and as such water table has shown a trend of declining in overexploited areas. The development of ground water resource and its greater utilisation in some areas has created special problems. It requires an adequate knowledge of the extent of the storage, the rate of discharge, rate of re-charge of the ground water body and the use of economical means of extraction or the practicable rate of withdrawal without depletion of the resource.

In West Bengal at present there is no rational system of utilising the underground water of the existing Deep Tube wells or M.D.T.W's & L.D.T.W's. The volume of water per irrigation delivered has no basis on the actual water needs of crops. There is also no quantitative control on the application of irrigation.

Under the present system the Operator is obliged to supply water to a farmer as frequently the farmer choose and in as much quantity as he demands after paying the scheduled water rates for the respective crops. Under this system the farmer can not be convinced about the proper utilisation of irrigation water. As a result there is always a huge loss of water and maximum time is required to cover the entire command area. Further supply of irrigation water to the lands at distant end of the command can't be ensured. Under the present system pressure of influential farmers on the operator to get most of the water, prevents the small and marginal farmers from getting the adequate water for their lands.

2. Object of the Proposed Rotational system of irrigation.

By application of the proposed rotational system of irrigation it has been aimed to increase the Command area of the respective D.T.W./H.D.T.W./M.D.T.W. during the Rabi & Boro season by about at least 10% of what it was previously done within the existing command area, To attain this it has to be ensured that the farmers of distant ends of command also get water according to their crops needs. For this purpose it is found to be essential to introduce a rotational system of irrigation, where each farmer will get his required share of water according to the crop grows. If this system is operated regularly this will eliminate uncertainty that most of the farmers suffered from, in getting the irrigation water timely and present system of day & night operation during summer season, in all most all installations, would be minimised to a great extent. The rotational system proposed to be introduced in such a manner that each farmer comes to know, well ahead of the season, the date when his turn for irrigation will come and also the period for which he will get irrigation from a particular spouts since the measured volume of water according to crops will be supplied within the fixed period of time in every week and this will motivate the farmers to utilise the irrigation water judiciously and it may be possible to further increase the command in subsequent years.

Subject Committee on irrigation Et water ways, W B L.A. 1994-96 on his 8th. Report, instructed the "Water Investigation & Development Department" to lay adequate stress on the survey and investigation works so as to ensure prevention of indiscriminate use of ground water and recommended for construction of a powerful co-ordinating and monitoring cell to ensure proper survey and scientific utilisation of both surface water and ground water immediately.

To fulfill the views of the subject committee' Report it is essential to introduce the proposed Rotational system of irrigation in all the M.I. Installations i.e., D.T.W /H.D.T.W./M.D.T.W. as per process given below.

3. Design of the Schemes ; For D.T.W's with old system of Distribution Line.

a) (i) In D.T.W's with old system of distribution line through a surge Tank, the existing total Command area has to be fixed under total Nos. of existing spouts i.e., spout wise Command area has to be fixed and schedule of land of each farmer is prepared. Then in consultation with the farmers and according to soil condition of the land cropping pattern under different spouts have to be fixed as given in **Annexure-1**.

ii) In H D.T.W./M.D.T.W. schemes under WBMIP with the new system of distribution line with Elevated Distribution Chamber where the whole area of command has been divided in 3 Blocks covering 13 Hc, approx., per Block and each Block is covered with the distribution line with maximum 5 Nos-, spout points which covers 2-3 Hc. per each spouts. As in (a) (i) cropping pattern under different spouts have to be fixed in **Annexure-II**.

In preparing the spout wise cropping pattern the role of Agricultural Experts under Block level i.e., A.D.O. is most important.

b) In case of D.T,W's with old system of distribution line where discharge of individual spouts may vary from spout to spout due to several reasons, So measurement of discharge, in different spout combination of 2, 3 or 4 spouts have to be recorded in Cu. Sec. and converted into M³/Hr. The above mentioned records of discharge of spouts in combination would be noted as per example given in TABLE-"A"

c) According to spout wise area and cropping pattern under different spouts as recorded in Annexure-I, requirement of Volume of Water of different crops under each spouts per week/per Hc, have to be calculated from the formula -

$$Vm^3 = \frac{A \times E.T. \times D \times 10}{E}$$

Where "A" is area in Hectre, E. T. (Evaporation & Transporation) = different value for different crops in mm/day. D= 7 days & E = Efficiency.

Values of E.T.

- i) For Wheat - 2.5mm/day
- ii) For Mustard - 1.7mm/day
- iii) For Potato & other vegetables - 2.7mm/day
- iv) Paddy (Aman & Boro excluding puddling)
..... 5mm/day
- v) Jute 5mm/day.

Values of "E"

- i) For boro crops & Wet land crops, Jute etc,
.....80%
- ii) For Dry land crops, Wheat, Vegtb., Mustard etc.
..... 60%

With this required volume of water for different crops per hectre (or from the ready made chart available) total quantity of water required under each spout command per week have to be calculated and as per measured discharge of each spout total time required per week has to calculated. Spout wise required volume of water and time to be taken for supply of this volume of water have to be noted in Table - "A" also.

With this chart of TABLE -A. operation schedule for every crop season is to be prepared in TABLE -"B" Form. The TABLE-B (Operation Schedule) chart would be prepared in such a way that the pump will run from Monday to Saturday i. e., 6 days in week, having each spout wilt run 2 days in a week as per spout combination schedule and will cover fully the required time of each spout in a week as per TABLE-A. If there is any power failure or the pump does not work due to break down in any days, in such cases attempt would be made to provide irrigation to the affected spouts or plots by working the pump for extra hours on the same day and Sundays.

ANNEXURE – I

Cropping Pattern in different spouts within the C. C. A.

Spout No.	Area under each spout	Area under crops				Remarks
		Aus.	Khariff or Aman	Rabi	Boro	
1.						
2.						
3.						
4.						
5.						
6.	And so on.					

deliver in 13 Hc, area in each Block and in case of M.D.T.W., the total discharge 100m³/Hr. has been divided into 2 equal streams of approx., 50m³/Hr, to deliver in 10 Hectre area in each Block.

As in the new design system in case of H.D.T.W. the flow of 66m³/Hr, is the desirable rate of delivery to the individual cultivators, with the respective Block of approx. 13 Hc. area and the flow is to be taken in rotation among cultivators within that area, served by each pipe line, but always at a single point at any time in each Block and where as spout wise Command area alongwith land schedule has been fixed only cropping pattern under each spout have to be made and to be noted in the form as in Annexure-II.

ANNEXURE-II

Cropping Pattern in different spouts within the C. C. A.

Spout No.	Area under each spout	Area under crops			
		Aus.	Khariff or Aman	Rabi	Boro
A/1.					
A/2.					
A/3.					
A/4.					
A/5.	And so on.				

- (b) Then total quantity of water reqd. Under each spout, for each spout (fixed at a single point delivery) calculated in the same formula as stated in old D.T.W, Schemes and time required per week for this calculated volume of water under each spout is to be made and entered in Table-A (i) Form.

TABLE – A(i)

Spout wise Reqd. volume of water & time per week (excluding puddling) for crop season.

Name of spout in combination	Discharge (fixed for all spout)	Total Aus / Khariff / Rabi / Boro area in each spout.	Water requirement per week in M ³	Running Hrs. of individual spout per week

TABLE "A"

Spout Combination	Discharge of individual spouts in combination	Total area of Aus/Rabi/Aman/Boro under each spout.	Water requirement per week in each spout.	Running Hrs. of individual spout per week	Remarks

TABLE - "B"

Operation Schedule for D.T.W. Centre for crop season, w.e. from 1st week till harvesting.

Day	Spout combination	Time (with 1.00 Hr. rest after continuous running of 5.00 Hrs.)	Total running Hours.	Remarks
Monday	Say 2, 5, 10, 11			
Tuesday	Say 1, 6, 8, 9,			
Wednesday	Say 3, 4, 7, 12.			

Monday Say 2, 5, 10, 11

Tuesday Say 1, 6, 8, 9,

Wednesday Say 3, 4, 7, 12.

and so on covering all the spouts in 3 days i.e. Monday to Wednesday. Again operation of same spout combination will repeat from Thursday to Saturday so that every spout can operate 2 days in a week.

For H.D.T.W's/M.D.T.W's with new system of Distribution line with Elevated Distribution Chamber.

- a) In H.D.T.W/M D.T.W. schemes under WBMIP, has been provided with the new system of distribution line with the provision of Elevated Distribution Chamber. In case of H.D.T.W. Schemes the whole area of culturable command has been divided in 3 Blocks (A, B, C) covering 13 Hectre approx. per Block and each Block is covered with the distribution line with maximum 5 outlet points (Spouts) which cover 2-3 Hectre area per each spouts, In case of M.O.T,W, schemes, the whole area of culturable command has been divided in 2 Blocks (A, B) covering 10 Hectre approx. per Block and each Block is covered with the maximum 4 outlet points (Spout) which covers 2-3 Hectre area per each spout.

With the provision of Elevated Distribution chamber the total discharge 200m³/Hr, in case of H,D.T.W, is divided into three streams of approx. 66m³/Hr. to

A1 B1 C1 66M³ /Hr.
 A2 B2 C2

and so on.

Spout combination may be altered as per cropping programme made and as required according to site position.

- c) With this chart of Table - A(i) operation schedule for each crop season per week is to be prepared and to be published in the Tubewell centre in the Form of TABLE - B(i).

TABLE - B(i)

Weekly operation Schedule for H.D.T.W/M.D.T.Wcrop season, w.e, from 1st week till hervastings.

DAY	Spout combination	Time	Total running Hours.	Total running Hrs. per day	Remarks
MONDAY	A1 B1 C1	8 A.M. to 1 P.M.	5.00 Hrs.	8.00 Hrs.	
	A2 B2 C2	2 P.M. to 5 P.M.	3.00 Hrs.		

and so on covering all this spouts in 3 days ie from Monday to Wednesday and again the same time schedule will repeat from Thursday to Saturday so that every spout can operate 2 days in every week as per calculated time required in Form TABLE - A(i).

Any way to introduce this Rotational system cropping pattern in each scheme, as stated above, is most essential and to be made in proper way according to nature and quality of land.

First year the calculated schedule may be operated as an experimental basis and if there is any change of time is required the whole scheme would be re-adjusted after taking the discharge of spouts in various other combinations or by changing of cropping pattern.

Further if programme, for construction of pucca field channel from the spouts (outlet Point) approx. 250 mt. to 300 mt. length, specially for the Rabi or Aus command area is, taken, the proposed operation schedule prepared as state above would be operated most successfully.

In conclusion, it is utmost necessary to take up the programme of cropping pattern and Rotational system of irrigation as per proposed scheme each and every M.I, installation to avoid the unnecessary wastage of ground water and to prevent the indiscriminate use of ground water which are being done at present in all most all the M.I. Installations and the success of the proposed Re-Organisation of the operational system will depend upon the followings :

- a) Prompt maintenance of defective pipe line, operating valves, pump sets etc.
- b) Pro- payment of water Taxes by all the cultivators.
- c) All the beneficiaries must take interest and participate to follow up the operation schedule.
- d) Spout wise committee are to be formed with one leader who will control the plot wise irrigation under each spout.
- e) Irrigation should have to be started from the farthest and of spouts command.
- f) Existing water rates are to be increased on the basis of present market value of agricultural production.
