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WATER PRODUCTIVITY AND AGRICULTURE IN NORTH BIHAR

REENA KUMARI

M.A. (GEOGRAPHY, N.O.U. PATNA, UGC NET)

ABSTRATCT:

Water Resources and Agriculture in north Bihar is base of economy. Irrigation scheduling many researchers have attempted to find out the lower limit of available water in the assumed shallow root-zones of crops at which the irrigation must be applied to avoid yield reduction. Though this approach is still prevalent, but it suffers from a few serious drawbacks. Firstly, the assumption of a fixed root-zone runs counter to the dynamic and ever deepening character of crop roots during the greater part of the growing period. Secondly, the periodical determinations of root-growth and soil-water depletion are beyond the know-how and means of the common farmers. Whatever short comings are in this approach, it helped in fixing irrigation schedule earlier.

The sowing time available water storage achieved through heavy pre-sowing irrigation which is a common practice is an insurance against the irrigation-deficits during the growing period. The irrigation depth for post-sowing watering depends upon the water storage deficit of the root-zone which is determined by the time-interval between irrigation and ET demand.

KEYWORDS:

Water Resources, Agriculture, Irrigation, Agricultural Economy.

INTRODUCTION:

In this chapter it has been tried to assess the implication of water productivity charge. To increase productivity of crop at higher cost will not be helpful for cultivators. Hence rationalization of irrigation charge must be taken into consideration before fixing irrigation charge.. But where land is more plentiful in comparison to the irrigation water, the major objective becomes more production per unit water. These objectives can be realised by proper scheduling of irrigation to crops based on their requirements and their relative sensitivity to water deficits at different stages of growth.

Wastage of irrigation water in the field usually results from faulty irrigation methods, lack of proper land levelling and grading, over irrigation and untimely application of water. Thus, efficient management of water, a limited resource as it is, of utmost importance for sustaining and increasing agricultural production. Competing demands of water for domestic uses, sanitation, industrial and recreational purposes make it all the more essential to maximize the efficiency of water by adopting proper irrigation scheduling.

The growers broadly face two situation with respect to water supplies viz. (i) where adequate water is available at demand and their aim is to produce maximum yield per unit of land without wasting water, and (ii) where only limited quantity of water is available, the main aim is to maximize production per unit of water by rationalizing its distribution over the available land applying water at relatively more sensitive stages of crop growth. For the former situation, an optimum irrigation schedule is that time sequence of the amount of the needed minimum irrigation schedule which eliminates over-irrigation or under-irrigation and ensures optimum crop yield with high water use efficiency. In simpler term it must answer two questions, viz. (a) When to irrigate a crop, and (b) how much water to apply at each time. For the second situation, the limited irrigation water over the growing season in such a manner that maximum crop yield is obtained.

Rainfall in command and catchment area

Rainfall is the basic source of irrigation water. When rainfall is adequate in the catchment area of the reservoir there will be adequate storage of water in the reservoir. When the rainfall in the command area of the project is normal, the consideration of the effective rainfall in the net water requirements of the crop is met. Reduced rainfall is in catchment area of the reservoir result in low inflows and shortfall in water for irrigating the entire command area. Reduced rainfall in the command area results in increasing demand for irrigation form the water stored in the reservoir. Reduced rainfall both in catchment area and command area leads to severe water scarcity. The surface storage irrigation systems are mostly designed taking 75% dependable annual inflows into consideration. It means that scarcity of water in inevitable once in four years. Rainfall, at a place varies not only from year to year but also from month to month. Such variation in rainfall distribution may lead to periods of water scarcity or excess even though the total rainfall and storage may be normal. Excess water (flood water) due to heavy rainfall can be stored in balancing reservoirs for supply during deficit period or for raising nurseries prior to release of water in the canal. A project is designed for conjunctive use of surface and ground water could be another solution to mitigate scarcity. Such alternatives are not ordinarily provided. Hence, other strategies to match the avoidable supplies of water in scarcity periods have to be considered.

FORMAT 1

Daily budgeting of water balance in rice fields for monitoring rainfall contribution (mm) (crop period)

Month & date	Opening balance	Average water loss	Water gains from			Closing balancing (2+3+4+6)
			Irrigation	Rainfall total rainfall in 24 hrs.	Effective rainfall in 24 hrs. restricted to Z-(2-3+4) or (5)	
1.	2.	3.	4.	5.	6.	7.

Note: Z= Maximum pounding depth equal to 100 mm. The data under column (5) represents the actual rainfall that occurred on that day, even though in practice they are recorded on the next day morning at 800 a.m.

FORMAT 2

Daily budgeting of water balance of light irrigated crop fields for monitoring soil water depletion level

Month & date	Water loss		Rainfall			Irrigation deliveries Actual			Adjusted accumulated daily effective rainfall restricted to (3-9 or 6) whichever is less	Soil water depletion level adjusted to effective rainfall restricted to {(3-9)-10)}
	Daily	Accumulated	Daily	Accumulated daily	Accumulated daily effective rainfall	Planned	Daily	Accumulated daily		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.

FORMAT - 3

Estimation of effective rainfall (mm) for wet season paddy and light irrigated crops

Month and date	Daily (24 hrs) rainfall	Effective rainfall (0.7)	Effective rainfall accumulated over consecutive day of						Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10

Note: The data under column (2) represents the amount rainfall as recorded on that day (morning) and considered for computing the effective rainfall for that day.

The crop water demand in the wet season is partly met through rainfall and partly through irrigation water supplies from the reservoir. The seasonal water allocations for the project are made on the basis of simulation studies taking average inflows, average rainfall, and notional cropping pattern into consideration. The allocation is adequate to meet the crop water demand where average rainfall is received. If there is any charge in rainfall and inflows, scarcity or excess may result.

Water scarcity is, therefore, shortfall in the water allocated to meet planned irrigation demand either due to reduced inflows as a result of shortfall in the catchment area or shortfall in rainfall in the command area resulting in increasing demand for water or due to both causes. The management of water scarcity should, therefore consider not only shortage of water storage in the reservoir but also the response of canal operations to rainfall in the command area.

METHODOLOGY:

The study will involve the study of water productivity variations across farms within the same type of crops and with same pattern of irrigation; secondly, irrigation types from wells, tube-wells, canals and conjunctive use of water will be taken into consideration. Consideration of agro-climatic condition within the study area will also be done.

All these works would be based on collection of data on parameters governing water productivity in crop production such as cropping system, cropping pattern, cropped area, crop inputs, water use, irrigation schedules, soil-water movement crop output and method of irrigation. In addition to this, there would be additional samples for each type of irrigation source. The sampling plan to be used in the work will be based on basin-wise, number of locations, number of agro-climates, no of different sources of irrigation and total sample size. In case of purely irrigated crops, water productivity would be estimated at farm level involving formula.

Farm level water productivity of crop (i) and farmer j = yield or Net Return (ii) The mean values of farm level productivity applied water in canal irrigation, well irrigation and conjunctive use would be compared for irrigated crops.

The approach used in the study would be case study based using primary surveys. Four river basins in North Bihar are selected for the study. They are Gandak basin; Burhi Gandak basin; Bagmati & Kosi river basin. The study analyzed water productivity variations across: 1) farms within the same type of crops and with same pattern of irrigation; and 2] irrigation types from wells, canals and conjunctive use; and 3] agro-climates within the same basin, it involved collection of data on parameters governing water productivity in crop production such as cropping system, cropped area, crop inputs (bio and chemical fertilizers, farm labour, irrigation water use, irrigation schedules, and crop technology), crop output (main product, by product, market price of crops), and method of irrigation.

OBJECTIVE:

For all round growth and development of agriculture more availability of water does not work. Human civilizations have witnessed in the past both glorious and gloomy effect of water. The main objectives of efficient irrigation management are as such:

(a) high yield of good quality.
(b) high water use efficiency:
(c) least damage to soil productivity and
(d) low irrigation cost

This entire objective can be attained by following optimum irrigation schedules for different crops. In the study area, schedules of watering standing crops are not in practice consequently, farmers are following vague irrigation practices which result is either under-irrigation or over-irrigation of crops. In both these conditions agriculture is adversely impacted and production per unit of water applied continues to be low. Despite tremendous surface water supply through the Tirhut canal and Kosi canal production, productivity and diversification of crops have not taken place to the desirable level.

The growers broadly face two situation with respect to water supplies viz. (i) where adequate water is available at demand and their aim is to produce maximum yield per unit of land without wasting water, and (ii) where only limited quantity of water is available, the main aim is to maximize production per unit of water by rationalizing its distribution over the available land applying water at relatively more sensitive stages of crop growth. For the former situation, an optimum irrigation schedule is that time sequence of the amount of the needed minimum irrigation schedule which eliminates over-irrigation or under-irrigation and ensures optimum crop yield with high water use efficiency. In simpler term it must answer two questions, viz. (a) When to irrigate a crop, and (b) how much water to apply at each time.

CONCLUSION:

Irrigation system operation is the process of releasing, conveying and diverting water in the canal systems to ensure predetermined flows at prescribed times for specified duration at all designated points of delivery. The operation pain takes into account the water available in the reservoir at the beginning of each crop season and spells out the starting data of release of water, the mode of supplies i.e. whether intermittent or continuous the detailed schedule of releases and the closing data of release of water.

The operation plan is prepared with active participation and involvement of farmer's representatives so that it may be implemented without any resistance from the farmers to plan their crop production operations properly. This will reduce wastage and better utilisation of irrigation water.

The object of systematic canal operation is to ensure equitable distribution of available flows at the heads of all off takes on a distributor. A schedule of canal operation has to be prepared in advance. For instance, a distributor may be divided into seven reaches each covering one or more off-takes whose total discharge is about a seventh of the designed discharge of the distributor. One seventh of the total discharge can be saved on each day by closing the off-take in each reach far 24 hours in succession in a week. This water can be made available to tail-enders. This will result in saving water besides not having dry tail-enders problem.

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