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ORIGINAL ARTICLE

Economics Of Water Management

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Abstract:
Water management depends on the interrelationship between a variety of factors including irrigation practices, land use and cropping pattern, individual and collective system of irrigation and overall economics. The saving of water is extremely complex since the development, operation and maintenance of the water supply system is the responsibility of the government, but the saving of water can only be obtained with the full cooperation of the farmers. The total water obtained as rain in the entire country works to about 400 m. ham per annum. The area irrigated at present in India is 25 per cent of the sown area and it is expected to increase to about 52 per cent of the cropped area in the year AD 2025.

One of the major deficiencies in water management in irrigated agriculture in India is the inadequate attention paid tot he proper utilization of water at the farm level in all the irrigation projects. To achieve the ultimate goal of irrigation and to derive the maximum benefit from the existing irrigation facilities, water resources have to be harnessed, managed and utilize more economically and efficiently.

KEYWORDS: Irrigation, Percolation, Reservoir, Debris, Dry land

INTRODUCTION

Water is a vital natural resource. Its wise use for crop production must be the concern of every citizen of the country. With the growth of population and consequent need for larger agricultural production, the requirement of irrigation has increased a great deal. Irrigation is required not only in low rainfall areas and during non-rainy seasons, but also during long breaks in rains in good rainfall areas. India is blessed with plenty of natural resources including water, but it cannot be said that the available water is used judiciously to get maximum agricultural production. The total water obtained as rain in the entire country works to about 400 m. ham per annum. The area irrigated at present in India is 25 per cent of the sown area and it is expected to increase to about 52 per cent of the cropped area in the year AD 2025. The demand of water is increasing day by day but the availability remains the same every year. The increasing scarcity of water and its implication for the economy of the country have become one of the most pressing concerns of the government and it may be expected that this will increase in the years to come.

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Modern research has highlighted the importance of adequate soil moisture during the crucial stages of plant growth and in consequence of adequate irrigation facilities. In many instances, the land now being irrigated could be adequately served with half the water now being used, through efficient handling and use of irrigation water.

WATER MANAGEMENT

Water management may be defined as the skill of coordination of water resources tapping, receipt, storage, conveyance, branching, diversion, delivery and distribution, consistent with the soil capability and the crop requirement under the prevailing constraints arising out of ecological, natural or other parameters for maximizing irrigation efficiency and economic returns. Hence the scope of water management depends on the interrelationship between a variety of factors including irrigation practices, land use and cropping pattern, individual and collective system of irrigation and overall economics. The saving of water is extremely complex since the development, operation and maintenance of the water supply system is the responsibility of the government, but the saving of water can only be obtained with the full cooperation of the farmers. The management of irrigation water at the farm level has been neglected so far, but there is great scope to improve the position by saving at least 20-50 per cent of water and the water thus saved could be diverted for bringing more area under irrigation in the arid and semi-arid zones of the country. Similarly, the rain water falling on 'dry land' is not being properly harnessed and utilized to obtain more production. There is again ample scope to conserve this rain water where it falls, and utilize it for the crop in order to increase the yield by 10-25 per cent.

ECONOMICS OF WATER MANAGEMENT

Water management problems are different in different locations and situations. The problem of water management is not a sectional problem, but a national one because more than 80 per cent of the available water is used for irrigation; agriculture is the biggest consumer of water.

The economics of water management may be broadly classified into two groups:
i)Economics of water management in irrigated lands.
ii)Economics of water management in dry lands.

ECONOMICS OF WATER MANAGEMENT IN IRRIGATED LANDS

Irrigated lands can be grouped as (a) areas irrigated by canals and tanks, and (b) areas irrigated by wells. In many of our irrigation projects (major/medium), the engineers construct the dam and canals and leave the water for irrigation to be taken care of by the farmers. The distribution and drainage works at the farm level are thus left to the individual farmers. Unimproved irrigation practices are often extremely wasteful. Although prevailing practices vary widely, estimates indicate that farmers, on an average lose more than half the water they receive at the head gate through evaporation, runoff, or deep percolation. It is seen that only 40-50 per cent of the water delivered at the source is reaching the fields and the water application efficiency is 50-70 per cent and hence the overall efficiency is as low as 25-40 per cent in almost all the irrigation projects. This may be mainly due to the irrigation practices adopted by the farmers in the traditional manner which has been followed from times immemorial. It is a herculean task to convince them to adopt the advanced methods especially when there is no extension agency in the field of specialization to demonstrate and convince them of the latest techniques for saving water. As mentioned earlier, since water is available abundantly the farmers are not interested in saving water in the national interest to adopt the improved practices. Another reason for the free use of water in project areas is the cost of irrigation water.

The cost of irrigation water varies greatly, depending on its source. The cost of water diverted from a free flowing stream is probably the cheapest. Construction of a storage reservoir to bring fresh areas under irrigated coverage and/or for supplementing water to stabilize the existing command involves capital investment and is done by the state or central governments. In India, irrigation charges in these areas vary considerably,not only with regard to the amount but also in the method of payment and pricing policy. Differences in irrigation charges are encountered even within a state. Several commissions and committees have discussed the problem of water pricing and they generally agree that the only sound basis for fixing irrigation charges is the net additional benefits arising from irrigation. In India charges are levied per hectare on the basis of crop criteria, keeping the rates more for water-extracting crops. The cost of water in India is Rs.40 per hectare for rice, Rs.50 for cotton, and Rs.25 for sugarcane on an average.
The nature of the problem takes a different form under well irrigated situations, where investments are

made by individual farmers in digging up open wells and installing pumping machinery. Fixed capital investments are very high in such cases, where the strata are of hard granite formation, requiring 'blasting'. In soft earth formations as well as hard formation, the investment costs are very high. 'Caving in' of earth is a common occurrence in loose soil formations, needing the buttressing of the side of the well with reinforced concrete rings and sliding them down as the wells are deepened further. Blasting and removal of debris in the case of hard granite formations inordinately mount up the investment costs.

The investment ranges in the construction of open wells, exhibit wide extremes because of changed geophysical formations even at frequent intervals. The approximate cost is estimated at anything from Rs.25,000 to nearly Rs.1 lakh for each well. Drilling a bore well costs from Rs. 17,000 to Rs.30,000 depending upon the size of and depth of the well. An enormous amount of capital and labour have been invested in these thousands of wells and these investments have grown each year. Deepening as a regular ritual is performed every year and definitely so when the monsoons fail. Fluctuations in the rainfall over the years as well as during the seasons are of considerable importance for the wells to maintain their output.

Wide fluctuations in the supply position of irrigation water introduced changes in cropping patterns, increase or decrease in crop coverage and at times risks in expectations in cases of severe fall in irrigation output. All these issues complicated the process of computation of the cost of irrigation.

Table gives the total cost (overhead cost and operation cost) of lifting water for a particular case of five output levels. The overhead cost (interest on investment outlays, charges on depreciation of pumping machinery and equipments) per ha.cm of water lifted was Rs.2.40 for the output level of 2000 ha.cm per year, whereas for the output levels of 100 ha.cm per year it was Rs.48.00. The operation cost per ha.cm of waterlifted remained the same for both the output levels. It would be evident that the overhead costs per unit quantity of water decreased with higher volume of output, while the operation costs remained constant.

TOTAL COST OF LIFTING WATER FOR A PARTICULAR CASE OF FIVE OUTPUT LEVELS

S. No.	Volume of water lifted per year per ha.cm.	Overhead charges per ha.cm. in Rs.	Operation cost per ha.cm in Rs.	Total cost for lifting one ha.cm in Rs.
1.	100	48.00	4.56	52.56
2.	300	16.00	4.56	20.56
3.	500	9.60	4.56	14.16
4.	1000	4.80	4.56	9.36
5.	2000	2.40	4.56	6.56

Source: Sivanappan, R.K. and Aiyasamy, P.K., 2007, Cost of Well Water in Coimbatore Region, Irrigation and Power Journal, 35(4), p. 513.

The cost of well irrigated water is very high compared to canal and tank irrigation. Hence it is imperative that utmost care is taken to save water. It is estimated that the conveyance loss is about 14-19 per cent in the garden land and this amount of water could be saved by providing prefabricated cement concrete or soil cement channel and also by conveying through a low pressure underground pipeline system. Necessary control and diversion structures for open lined channels and alfalfa valves for the underground pipelines may be provided to avoid wastage of water and to reduce the cost.

ECONOMICS WATER MANAGEMENT IN DRYLANDS

Of the total area of 109 mha, under rain fed cultivation about 31per cent fall in the high rainfall (1,150 mm and above) region, 34.5 percent in the medium rainfall (750 mm to 1,150mm) region and the remaining 34.5 per cent in the low rainfall (up to 750 mm) region. It is estimated that about 45 per cent of the nation's food grain is produced through dry lands. In dry farming areas, the loss of moisture is more serious than loss of soil. A relatively small increase in moisture supply may give a marked increase in yield.

If the yield per hectare in dry lands is increased by a marginal amount, the total quantity will be very substantial as the area under this is more than 75 per cent of the cultivated area. To increase the national

income and thereby the per capita income, it is very essential to pay more attention to the vast dry tracts. In order to conserve the soil and water in dry land tracts, the points to be considered are:

a) To increase infiltration into the soil,
b) To reduce runoff in case of heavy storms,
c) To collect and flow excess water to use the same where needed,
d) To utilize the maximum extent of land for crop production, and
e) To increase and maintain the yields.

Such achievements would decrease the disparity between irrigated and non-irrigated lands and generate interest for future investment.

CONCLUSION

One of the major deficiencies in water management in irrigated agriculture in India is the inadequate attention paid to the proper utilization of water at the farm level in all the irrigation projects. Since the price of water is based on the acreage irrigated rather than the quantity drawn, the farmers take large quantities of water which not only affects the yield, but also adds to the problem of drainage. Hence, the use of water may be charged on a volume basis. Irrigation costs are less where efficient methods of irrigation are used. If the irrigator buys his water, he enjoys direct savings in reduced water costs. If he pumps water on the farm, either from a well or from a stream or ditch, each reduction in the amount of water handled brings a corresponding reduction in the operating expense.

To achieve the ultimate goal of irrigation and to derive the maximum benefit from the existing irrigation facilities, water resources have to be harnessed, managed and utilize more economically and efficiently.

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