

Review of the Enhancement of Irrigation Potential of Ans River, Rajouri by Proposing Measures for Reduction of Losses in Its Canal Network

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Abstract: *The present study is an attempt to review the irrigation potential of the Ans River in Rajouri, Jammu and Kashmir. Keeping in mind the scenario of water in the present times, it is necessary to set in place an irrigation system to supplement the local agricultural practices so as to improve the food grain production and also to put in place suitable irrigation structures and to adopt the measures which will reduce water losses due to varied reasons especially the seepage losses in the canals. Steps need to be taken to ensure judicious use of water, eliminating the losses at different stages such as conveyance and storage.*

Keywords: *Ans Canal; Rajouri; Water Losses; Lining; Seepage; Irrigation; Hydrology*

INTRODUCTION

Water is extremely necessary for the sustenance of life of all living things including human beings. Water is used for innumerable purposes including cooking, washing, recreation and irrigation. However, with fast increase in population and ever growing industrialization, there is currently very high demand of water and this demand is increasing day by day. This has caused adverse impacts on water resources and resulted in depletion of reservoirs at higher pace and our globe is heading to a scenario of severe water scarcity. In the times to come, little water will be available for the important purposes like food production, industrial and municipal uses etc.; water available for the higher demand of food grains will be drastically affected due to the population increase at a rapid rate (Molden 2007; FAO 2013). By the year 2025, world population is expected to increase by over 1.5 billion; this will in turn increase the water demands by twice the rate of population increase (Rosegrant et al. 2002; Cruz et al. 2007; FAO 2011). Higher demand of water and the consequent depletion of water reserves compel us to think about alternatives or implement the conservative measures and improve the management practices in the utilization of water. Historically, civilizations have been relying on agriculture and establishment of irrigation system was a major advancement to ensure their food security as well as economic development. In India, canal-system of irrigation has been mainly employed since ancient times. There were many canal systems laid in early times, which were epitomes of engineering marvels but with the passage of time, these canal systems experienced some failures and consequently became defunct because of damage of canal linings, erosion or reduction in reservoir storage and so on. But, it will be entirely loss to the economy and society if the use of such elaborate systems of canal irrigation abandoned. Therefore, it is quite sane and logical to review the canal network as a whole and to carry out research regarding the main causes of the failure or inefficiency of the system and then to suggest appropriate measures for implementation and revival of such canal system. The steps proposed for revival of such system should include the factors like benefit-cost ratio, region, water available, irrigation practices, economy, etc. (Maghsoud et al. 2013; Rather et al. 2019).

The present study is an attempt to review and harness the irrigation potential of Ans River in the district Rajouri of Jammu and Kashmir. A detailed study of the canal system was done. Since for every canal there are continuous losses in the canal system right from the canal head works where the main canal takes off to tail end of the water course where the water is applied to the agricultural field. These losses are known as transmission losses and are quite substantial particularly when the canals are unlined. It is estimated that about 25 to 50% of the water that enters the canal at the head works is lost in transmission. Same is the case with the Ans Canal; and hence the study was conducted to propose some measures for seepage control in the system.

Study Area

The proposed area is located in Tehsil Kotranka, Rajouri and Kalakote of District Rajouri of J&K state falling to the east of Rajouri town between 74°20' to 74°32' and latitude 32°22' to 33°27'. Take off point of water conductor from Ans River in the upper catchment of Nallah in Khandal area which is at a distance of 42 km from Rajouri town.

There has been long standing demands of the zamindars, locals, Hon'ble MLA and other leaders of these villages viz: Peeri, Gakhrote, Swari, Dhan Sakri, Merrra Nagrota, Bindi, Ladote, Kalal, Kass, Dhangri and Bal Jaralan for providing irrigation facilities to their land which at present are put under dry crop cultivation. These chunks of land forming the right bank of Khandal nallah accounts for about 1100 hectares i.e. 2750 acres and left bank of Jamola Nallah accounts for about 900 hectares i.e. 2250 acres of land. Besides this the same nallah which is the main source of supply of water for irrigation to the land filling on their left banks under villages namely Rehan, Gujran, Charan, Farwala, Palma, Nagrota, Saranoo, Jamola etc runs low supply during May and June. So a necessity has been felt for providing an assured

water supply for irrigation to stabilize the existing systems. The cultivable command area is 2000 hectare under new irrigation.

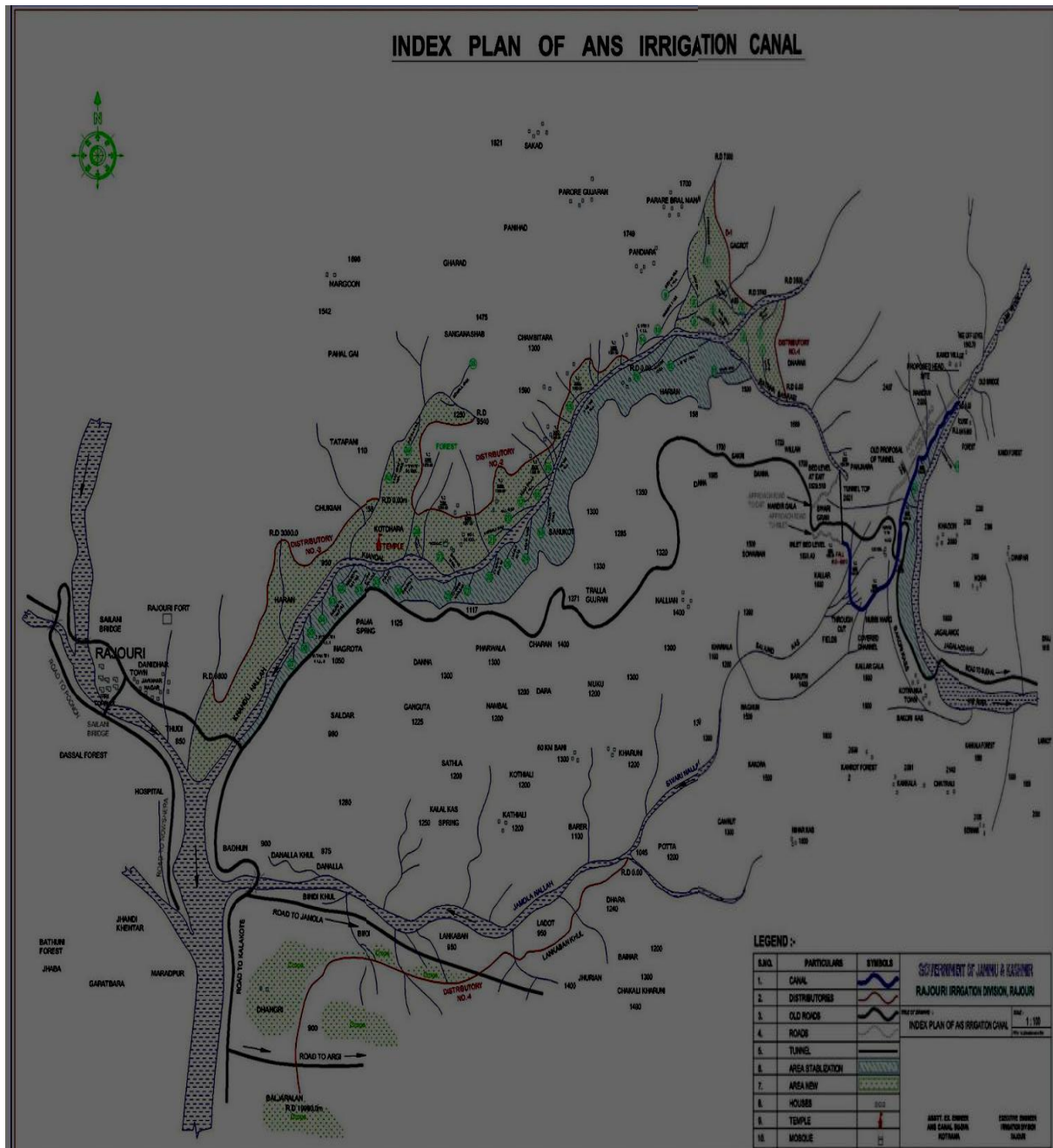


Figure 1. Plan of the Ans Irrigation Canal [Source Irrigation Div. Rajouri]

Hydrology of the River

The water for irrigation of the proposed areas is taken from Ans River which is dependable and perennial source of supplies, it being snow fed. It also forms the tributary of river Chenab emanating from the foot hills of Peer Panchal range near Kandi in Tehsil Kotranka (Budhal). It has been observed that Ans River runs a lean discharge of 50 Cusecs (1.41 cumecs) minimum during winter months and a normal discharge of 300-400 cusecs (8.5 to 11.3 cumecs) during summer months. The discharge in rainy season has been computed as 22000 cusecs (630 cumecs). Hence the discharge of 3.4 cumecs i.e. 120 cusecs is proposed to be diverted to the proposed Ans canal during summer months which shall easily be available.

Proposed Measures

One of the effective measures proposed in the present study is the lining of Ans Canal. The canal lining prevents the water logging of the land to a large extend. Seepage from unlined canal raises the water table. When the water table comes close to the root zone of crops, water logging occurs. It may lead to salinity and alkali formation at the land surface. The crop yield is considerably reduced and, the land becomes useless for cultivation. In the lined canals, these

problems are considerably reduced. Thus the lining plays an important role for maintaining the fertility and productivity of the land.

Before actual construction of lining a canal, its cost and benefits should be evaluated for comparison. Canal lining diminishes the losses caused by seepage of irrigation water by providing an impermeable membrane to the edges of the trench. These losses approximately range between 30 to 50 percent of irrigation water from canals. Hence by lining a canal we can add more efficiency to our irrigation systems. Lining also increases the velocity of flow in a canal because of the smooth texture of the canal surface.

The significant benefits of lining are:

1. Seepage Control:

One main reason for lining a canal is normally the reduction in water losses and the water losses in an unlined canal due to seepage are generally prominent. Depending upon the type of lining provided in a canal, the losses can be appreciably or almost completely eliminated. If the banks of canal are more permeable, more water will be lost and the condition will be even worse in arid conditions and water-table is low. In rainy seasons when the water-table is high, the seepage of water may cause waterlogged conditions on adjacent fields or inundate the roads. However if lining of canals with low-permeability material is done, such problems can be solved.

2. Command Improvement:

By providing proper lining in a canal a high velocity could be maintained. The normal value of silt factor for lined canals is $f = 1.2$ and the maximum permissible velocity is from 1.8 m/s to 2.5 m/s. Such higher values of velocity of water in canals pave our way for increasing the command area and ensure better supply of water.

3. Water Conservation:

Lining can reduce the water losses to an impressive extent as we are aware that the water losses in an unlined canal are usually quite high. The unlined canals which carry a discharge at a certain velocity flow may experience loss of flow because of seepage through porous soil and existing weeds which decrease the velocity of flowing water. Although lining of canals cannot completely vanish the losses but can minimize them upto 70%. Reduction of water losses is extremely important especially in places where irrigation water is to be pumped out.

4. Reduction in Canal Size:

It is already known that the roughness of a lined canal is much less than the unlined canal because of its smooth texture due to which the velocity of flow in a lined canal is greater than the unlined canal keeping the canal bed slope same. Also this lining is hard in nature and hence does not get eroded very easily thereby allowing the higher permissible velocity in lined canals; thus the canal cross-section of a lined canal can be smaller than unlined canal.

5. Reduced Maintenance:

The maintenance cost of a lined canal is much lower than the unlined canal because of the fact that the surface lining provided is made of concrete, plastic or brickwork which prevents the growth of weeds and attack by termites, hole-making rodents or burrow making animals. Besides the higher permissible velocity the soil particles in water do not settle down to cause siltation. The bed and sides of the lined canal are also much resistant to erosion and are easy to maintain than unlined canals.

6. Lining Cost:

The cost of lining could be high or low depending on the type of the materials and their availability. Cost also depends upon the labour, skill and craftsmanship required which varies from place to place. The commonly used materials for lining purpose include concrete, mortar, bricks, stones, compacted clay, plastic etc. Concrete lining is adopted if cement, sand and gravel are easily available at reasonable rates. The advantages of concrete lining are its durability, low permeability and low maintenance cost but such lining demands high initial investment. If bricks and other materials are available at cheaper rates then brick lining is preferred. If a sufficient amount of clay is available at a certain place and there are financial constraints then compacted clay lining could be adopted such lining demands high maintenance cost.

Implementation of the Proposed Measures

The construction of a canal-lining starts with the earthwork. In India the canals are normally constructed in earth except flumes or pedestals which are required on or above the ground. In order to lay clay lining, the soil subgrade should be excavated and compacted to the exact grade, shape and alignment of the canal. Due attention is demanded by the foundation of the canal lining particularly when fills are involved which should be made, compacted when moist and wetted before laying of lining material.

Concrete lining can be placed in different ways e.g., hand placing and plastering on sides and bed. The concrete mix should not be watery to prevent it creeping downward from the sides

Shattering should be provided to hold the concrete in place on steep-side slopes, until it sets. Concrete lining can also be laid by alternate panel method where guide forms are employed. The sections can be poured alternately, with finished

sections used as forms for the sections in between. Spaces/joints at intervals of 1.5 m to 3 m are required for the expansion and contraction and are filled with asphalt being flexible material to fill in and to prevent leakage of water. The Linings for rectangular and trapezoidal canals are easy and generally done on flat ground. The bottom section is constructed first followed by the construction of the vertical sides.

Conclusion

The study is a preliminary step to implement a sustainable irrigation canal network. The main aim is to maximize the irrigation potential of the Ans canal network and simultaneously minimize the conveyance and transmission losses due to seepage. In the present times, it is very important to take steps for water conservation and management especially in the irrigation systems which involve detailed planning and implementation. The study discusses the measures proposed for minimizing seepage losses economically.

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