109 year old check dam with water discharge through the dam wall chamber

POSTHUMOUS AWARD FOR OUTSTANDING TECHNOLOGICAL INNOVATIONS

Padmadutt Balutiya (1826-1910) was a resident of Baluti village of Nainital district, Uttar Pradesh. A middle class farmer, his leadership qualities and profound wisdom were widely acknowledged. He was often consulted on various difficult problems and due consideration was given to his suggestions throughout the district and adjoining areas.

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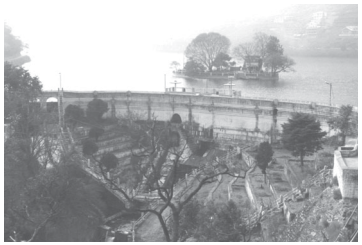


Background

A very interesting story has been passed down through generations about the building of this check dam. According to the elders in the area, in the late 1880s, the water in the Nal Damyanti Tal and its vicinity used to flow in the form of a rivulet across an area two kilometers long and down the hills to Bhabhar and Tarai area. However, the water could not be used though there was tremendous need for water for drinking and irrigation for the settlements as Bhabhar area was in the process of being settled. Robertson, the British Commissioner at the time, had a dam constructed to retain the water in Bheemtal, so that it would not be wasted and could be used when the need arose, especially during the summer. But the dam broke down during the rainy season. Colonel Ramsay, who succeeded Robertson, was a generous and intelligent officer who, at the request of farmers, decided to do something to solve the problem of water shortage. He thought that if a check dam was made, then the water from the natural source that was flowing away could be collected in the valley and could then be transported through canals. Accordingly, he put up a proposal and sent it to London through the Viceroy of India. The proposal was accepted and Ramsay decided to construct a check dam.

As soon as Padmadutt came to know that Ramsey was going to build a dam, he went to the site and checked the design of the dam. He felt that the design was flawed and told Ramsey that it would not be able to withstand the water pressure. He suggested that instead of the straight wall, if the dam could be constructed with a convex shape it would resist the pressure of water. In such a case, the force of water would not concentrate at a particular point but would be distributed evenly over the entire length, thus minimizing the water pressure. Unfortunately, Ramsay did not heed Padmadutt's suggestions and had the dam constructed 'his way'.

The dam was washed off in the first rain. Ramsay tried three more times, but each time he met with the same results. He was, however, still not ready to listen to Padmadutt and so Ramsay wrote to London, explaining his case and asking for a specialized engineer. The engineer came and started the work with a new

design. Again Padmadutt went to Ramsay and suggested that if this dam also was not able to withstand the water pressure, he should be allowed to build the dam the next year according to his design. Ramsay agreed.
Padmadutt returned to his farm, but he continuously kept on thinking about the dam, 25 kilometers away. Finally he sent one of his farm labourers to the work site and asked him to report within the first week of rain. As Padmadutt had predicted, the dam was washed away in the first rain and his man reported this to him before the official message came from Ramsay. Padmadutt immediately set out for Ramsay's office and waited outside his room. When Ramsay came out, Padmadutt told him that the dam has been washed away. Till then, Ramsay had not received any official message from the work site. Impressed by the interest and initiative taken by Padmadutt Balutiya, Ramsay called a meeting and instructed every body to follow Padmadutt's advice in building the dam.

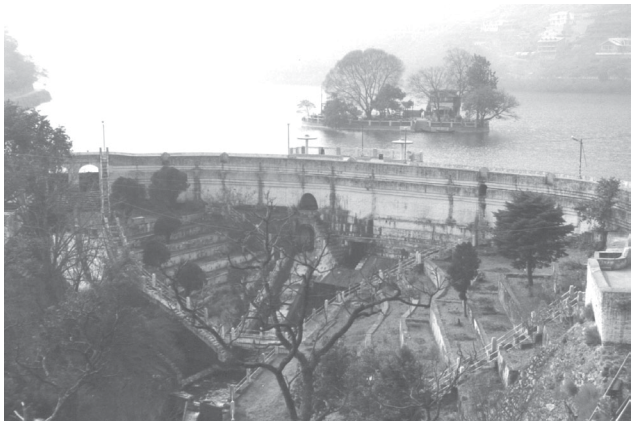
The Innovation

The 109-year old check dam in Bheemtal is truly a modern day wonder. The dam, designed by the late Padmadutt Balutiya in 1895 continues to stand strong and has not required any repairs since its construction. The dam was designed based on the old traditional method i.e. *"lehria"* method which has been used to make bunds for rice fields since ancient times. The check dam is constructed in the form of a canal shaped like an arc. Water is allowed to enter this canal so that the force of the water inside the canal reduces the force exerted by the water from the outer side. This enables the check dam to withstand the heavy force exerted by the water. The pressure on the second wall of the dam is automatically reduced, as it is not in direct contact with the larger volume of water. Several outlets are made on the second wall of the dam so that water is discharged uniformly. These outlets are at different levels so that water can be discharged in such way that it exerts minimum pressure in the process.

Among the many reasons given for this dam to stand the test of time for so many years, one is that the shape of the dam facing the flow of water is convex. Another is that, due to the presence of water on both sides of the dam, the pressure on the dam itself is lessened. In addition, instead of only one sluice gate, the check dam has four gates that dissipate the water pressure on the dam structure equally. The building material is also unusual. Instead of cement, traditional materials such as lime, flour, powdered pulses and straw have been used.

A visionary leader

One of Padmadutt's major contributions was in developing the small town of Haldwani by making the



forest areas near Kathgodam arable. For this, the British sought his help as he was familiar with the entire area. The region was difficult to access and getting labourers was not easy. Padmadutt then thought of setting up a mandli (collective farming). He managed to convince all the men and women of Baluti village (except the elderly, children and the ill) to come and work in the fields every day. They used to get up at 4a.m. in the morning and set off for the fields. Singing patriotic songs, they started work at 6a.m. and worked till 5p.m. in the evening when they would start the long journey back home. They would do the work in the fields by rotation and the owner of the field used to arrange for the midday meal.

In the evening when they had to go back, collecting people at one place was a difficult task and for this too Padmadutt had an innovative idea. He contacted the Kathgodam railway station master and requested him to order the train driver of the Kathgodam express to let out a loud whistle while passing through the forest, so that the farmers could know that it was 5 p.m. as the train passed through the forest at that time. In this way he was able to contribute to the establishment of a new city. This practice of the train letting out a loud whistle continued long after his death.

A monumental achievement

Padmadutt Balutiya used local materials, designs and his insights about the way to manage stress in a difficult terrain in building this dam. The resultant check dam has not only withstood all the vagaries of nature but has also created an example worth emulating. This 109-year old dam has now become a tourist attraction and stands as a tribute to the triumph of indigenous knowledge.

One wonders though, whether state institutions and architects of formal policy and projects, now, would let a natural genius go as far as Balutiya was let by the British officer. Especially as till now, official credit for the development of this dam which led to the prosperity of the Kumaon region is given to the British Colonel Ramsay and not the grassroot designer, Padmadutt Balutiya.

 Late Padmadutt Balutiya 109 year old check dam with water discharge through the dam wall chamber