



## Irrigation Technique during Harappan Period in Sutlej-Yamuna Divide

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**Abstract:** In our region Rabi and Kharif crops were utilized during Harappan period. The agriculture cycle needed monsoon rains like today. But if the land is not artificially irrigated, the rainfall may be insufficient to make the plants germinate (kharif crop) until late June, by which time they cannot mature before the fall frosts destroy them. Crop failure in non-irrigated areas for this and other reasons is frequent, and thus there is a strong incentive to irrigate crops.

**Keywords:** Frosts, Seasonal, Perennial , Canals.

**Introduction:** The main Harappan cereals like wheat and barley also require a supply of water at a period when the monsoon, which is erratic in these regions is over. And the big sites like Rakhigarhi needs it much. Irrigation practices are likely to have varied between sites in different areas, as between flood basin sites and sites far off from rivers etc. There are very few examples of irrigation technique of Harappans in our area or they are buried under the silt of time. But

from other areas examples we can surmise the irrigation technique of Sutlej-Yamuna Divide Harappans.

### 1. Canal Irrigation:

There are very few examples of canals from our region. There are only two examples of canals, one from Kunal and other from Banawali.

These canals may be linked with nearby flowing Saraswati and Drishdvati. The canal of Kunal coming straight from Saraswati side and enter into the site (personal experience of researchers). These canals may be used for irrigation or for domestic works or the canals may be used for protection of unwanted creatures. Artificial canals are of two types / seasonal and perennial. A strict distinction between perennial and inundation canals is not possible, since some water courses may indeed flow all the year, but their discharge becomes small at the dry season as to be practically negligible. Those canals which were perennial in this sense are cut to an extra depth and can receive water even when

the main river is low, but their main purpose is to increase the discharge during the inundation. The Harappans of Kunal dug V shape canal, so that they can stop the water easily when it is not needed.

The work of French team must be recalled on this topic. A French team from the centre National de la Recherche Scientifique (CNRS), which had been studying irrigation and the propling of central Asia, visited north-western India in 1982. The zone studied by the CNRS team is situated in a section of the Indo-Gangetic plain bounded by the Siwaliks, on the south by the Aravallis, on the east by the Yamuna and on the west by the area approaching the Pakistan border. A triangular study area of about 30 square kms was allocated to an Indo-French group made up of research workers from the CNRS and the Archaeological Survey of India. The team used SPOT imagery technology in canal research. They found fragments of lines which are clear but an accounted for. The remote sensing SPOT (multi-channel with a spatial resolution of 20 x 20 m and pan chromatic with a resolution of 10 x 10 m) allows them to study these lines and thus locate traces of small water ways. These

lines are organized in a pattern which can be related to the spatial distribution of sites. They cannot be detected from the ground itself. They mark the courses of ancient natural water ways which were used and perhaps, in some places, rerouted by man. These traces of small river channels appear to have reached all of the archaeological sites.<sup>2</sup> . Perhaps in these channels some were dug up by sites inhabitants to use the natural flow of water. But it was not cleared by the team.

Alike Ghaggar, Yamuna which is another important river of our area must have provided water through channels to inhabitants live along with it. It may be recalled, in the fourteenth century. Firuz Shah Tugluq provided a two-armed canal for Hansi and Hissar. This canal made a rabi harvest possible which contributed to an increase in revenues. The British reopened this canal in 1825, and in 1873, it was given a permanent weir at Tajewala on the Yamuna. With this the settlement pattern of Harappans (linear pattern) also give us a clue that they must have used the streams and rivers water with the help of self made canals for their use.

## 2. Well-Irrigation:



In a climate where rainfall was not substantial people had to take recourse to riverine sources for water. How else could agriculture flourish. The people of necessity had to think of ingenious modes of utilizing the river water in difficult situations as well as more amenable ones. The mode of well irrigation had been a feature of the Harappan culture. So well-irrigation was also in vogue and perhaps played a major role. L.S. Leshnik mentions that in the present times the wells are additionally used to irrigate the fields in the 'bet' lands nearest to the river in Sind and Punjab (including Haryana) and also in the 'khadir' lands in Punjab. The wells of the riverine tracts serve mainly in times of drought. In this area the wells are hardly more than hollows scooped out of earth and seldom lived. Water is raised by the shaduf. Such wells are allowed to collapse after being in use for one or two years.<sup>3</sup> In the 'khadir' land, further away from the river, the wells are often the single source of irrigational water in contrast to the supplementary character of wells in the 'bet' area. Here the wells are intended to be permanent and hence are frequently lined with bricks. The land directly adjoining the

well is the most well-watered and best cared and is sown with wheat<sup>4</sup>. The water is raised from these wells by the 'mhote' system which involves the use of bullocks, often a pair of them, to draw a bucket from the well while walking down a ramp<sup>5</sup>. We know that the domestic bullocks were used by the Harappans for drought purposes. They also might have practiced this system of drawing water from wells. The example of this type of well is coming from the site of Bohar (Rohtak, Haryana). This well is situated perhaps on the corner of the site (Early HP, Late HP) and perhaps used for cultivation of nearby fields. Some big pots were settled around the well so that first they fill up of water and then this water overflowing these pots and then used it (personal experience of researcher).

Another type of wells used by Harappan were those rises higher than the surrounding water table so that the water came from them naturally due to hydrostatic pressure. Smaller the diameter of the well, higher the water will rise. Fairservis suggests deliberately kept small in diameter so that the water level will rise, higher, and not only that, the water might overflow in artesian fashion. The well Fairservis

suggests that as the central well is located at the highest part of the site any run off from that well could be channeled wherever one wished because of the slope of the site<sup>6</sup>

The divided drain attached to the well would have assured that regular flow of well water could be moved with precision through the channels into the surrounding fields via earth cut ditches. This again was helped by the slope of the site itself<sup>7</sup>. This type of well are there helpful where the site is four or five metres higher than the nearby perennial source of water. Perhaps this type of well example is coming from the site of Banawali, where the well is situated almost in the middle of the site, but its diameter is not too short so that it flowed ownself. But perhaps drawing water is easy from this type of well and they were helpful for nearby fields, where the inhabitants can grow vegetables etc in small fields.

Perhaps, it is possible that in Harappan times water was lifted manually with rope and leather buckets, or mechanically with a shaduf type liver carrying a bucket suspended from one end and a weight at the other end, worked by hand or by oxen; or else with the use of a wheel at the well head. So the implications

of lift irrigation are significant. To water crops by manually or mechanically lifting water from pools or wells and then conveying it into conduits or channels is extremely labour intensive. A crop may require watering only two or four times, but each watering is required at a particular stage in the growth of the plants and must be completed on schedule.<sup>8</sup>.

### **3. Tank Irrigation:**

Before the days of great canalization projects in the Punjab, indigenous irrigation was largely based on tanks and still today large parts of the area. Some writers have supposed that this method originated in India. 'Tank' in the Indian usage refers to a reservoir that stores water either by demming a stream at a conveniently broad, high place, or by the diversion of its waters to some depression<sup>9</sup>, either natural or artificial. The walls of these tanks are frequently only earthen but also sometimes of masonry (example of Lothal). Some tanks are great in size, covering 9-10 square miles, while the storage capacity of others suffices only for limited local use<sup>10</sup>. In the later days of ancient India, the construction of tanks come to be considered a meritorious deed and belonged to the list

of royal duties. The earliest specific mention of this comes from Junagarh and dates to about 300 B.C.

If the fields to be irrigated the lower than the tank, the outflow of water can easily be regulated by sluice gates, the sloped sides would be no hindrance in this case. However, if the fields at the same height as the basin, then the water has to be mechanically raised. Today this is frequently done by pumps or Pession wheel, but formerly, the shaduf system prevailed. Difficulties arises however, if shaduf are to be used over sloped walls. And we assume a similar precipitation in former times.

As we understand it, the tank had a dual function: (1) it provided the farmer with a kind of assurance in the event of a monsoon failure and (2) permitted vegetable gardening throughout the dry season.<sup>11</sup>.

#### **4. Embankments:**

This technique was perhaps used by Harappans of 'bet' lands. The allchins<sup>12</sup> and Vishnu-Mittre<sup>13</sup> also suggested that fields may have been surrounded by earth embankments that fields may have been surrounded by earth embankments in 'bet' areas. Thus that the

material fertility of the alluvial soil was exploited as well as the phenomenon of annual river inundation. This time the Harappans made embankments around their fields in the rivers inundation area. After the flood they can grew 'rabi' crops in this land and it doesn't need any type of artificial irrigation. So this technique was very useful for our area settlements because the Harappans of our area settled in linear pattern (or settled along with the rivers or streams course) on mainly Hakra river. The Hakra have been an aggrading river, inundating a large area, but with a lower velocity than the Indus and less destructive. So it is possible that the flood waters of the Hakra were trapped in flat tracks bounded by embankments. Alternatively, farmers could have made small cuts in the banks of the Hakra to direct water into particular fields<sup>14</sup>.

This technique is also important for kharif cultivation. The chosen piece of land normally near the river or one of the old inundation canals, was surrounded with an earth embankment with an opening to admit the flood water in the field, and the land is ploughed and sown. While the inundation continues, potentially damaging

water is kept outside by the earth bunds and let in only when needed. The best areas for kharif cultivation are the ones in the vicinity of regular flood channels where the farmers can exercise greater control over the water. It should, however, be noted how risky this cultivation method might be. Since there is always the possibility of water overtopping the bund and destroying the fields.

And, the low-lying areas further away from rivers, collectively called 'khadir' were irrigated by the 'sailabi' technique. Here we note an extension of the 'budh' system where artificial courses of 'chhar' were dug-up, leading off from the natural channels of the 'bet' area. On these channels too lifting devices may have been used to bring water on to the fields<sup>15</sup>. In the Punjab and Haryana, the uplands locally called the 'bhanger' were chiefly utilized for grazing and cultivation of some rainfed crops like the barley.

So there were various techniques of irrigation used by Harappans of our area based on type of land.

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