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# GABARBAND: A BYGONE ERA PRACTICE TO HARVEST WATER, SILT AND SILT MOISTURE

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The agriculture production started during Neolithic period at Mehargarh and it gave way for the progress of crop production and improvement in the irrigation technology. Though, no evidence of dam has been reported from this site but in the opinion of Kenoyer[1] there is possible evidence of irrigation ditches which might have been helpful in agriculture production and eventually for the growth of population.

Besides this, the Neolithic revolution also marled advancement in other technological fields and one among those was a hydro-technological method which has been called as *gabarband*. Structurally, it was a dam like structure made of stones and earth materials to facilitate the agricultural practices. The evidences of these hydrological structures of by gone era have been reported from many areas in south-west Asia. However, these varied in their formation as per the area or geographical location. In Indian sub-continent, these are found in the form of stone dams and some of these are reported from Baluchistan and kutch (Kachha). These earliest phase water-structures were made up of earth materials and incorporated by brick bunds. These are also reported at Sindh, Kachhi plains (Bolan area, Baluchistan), Sabarkantha & Bhavnagar (districts of Gujarat). [2]

As mentioned above, due to ecological variation and its own kind of geographical morphology, the pre-historic people of Baluchistan, in order to produce crops, tried to utilise whatever the natural resources were available to them in that area. Thus people in Baluchistan during Neolithic period, constructed *gabarbands* either for channelizing the water or for managing water & silt. Otherwise, these could have flow from upside hills to large semi-terraced areas lying down the hills.[3]

Hargreaves,[4] on the basis of his field studies of Nal area in 1925 A.D., postulated that in Baluchistan during the Neolithic period rainfall was heavier than the present time. So, the then

inhabitants, by means of their concerted action, carefully controlled the water-flow and conserved the silt and soil. In fact, it was a collective effort of the people which paved the way for the formation of layers of alluvial soil on the dry and rocky substratum. At first glance, it looked like stairs like farmland. Such structural creation served their two fold purposes at a time. Primarily, it created the fertile deposits of soil and silt in the form of tier like farm land. Secondly, it enabled the deposited silt, to be subsequently watered by flood which used to come either from adjacent streams or by the diverted flow towards these formations. The succeeding period people not only maintained this tradition but made some improvement in it with their greater engineering skill.[5]

As said earlier, it was none but Hughes Buhler[6] who first noticed such kind of water structure of pre-historic period and brought it in to the knowledge of archaeologists. He considered the *gabarbands* of Baluchistan as the primitive form of hydraulic structure. Further, he threw light on its origin, structural features and its distribution areas. His view postulates that - these were rock, silt and soil mixed dams, which were constructed by pre-historic communities living in that area which is presently occupied by Sindh and Baluchistan. The motto behind creation of such structures was water harvesting as well as preservation of moisture containing silt/soil for domestic and agriculture purposes.

Aureil Stein also discovered such kind of primitive dams in Baluchistan, which were built across the mountain streams. As per his opinion, those constructed during the Neolithic-Chalcolithic period, were purposely meant for irrigating the agriculture land.

Wheeler too mentioned about the existence of gabarbands in Baluchistan which were strongly built by stone rubble and found to be of considerable height for holding sufficient amount of water.[7]

Furthermore, a number of *gabarbands* belonging to Neolithic period were traced out by Flam[8] in the hilly areas of Kohistan, Kirthar and Southern Baluchistan. Similarly Prof. V.K. Thakur[9] mentioned about the structural presence of *gabarbands* in Amari and Las Bela region. G.L. Possehl[10] referred its evidential presence in Kshirsara region of Gujarat. Prof. S.R.Rao attest the opinion of Possehl about its evidences in Kshirsara region (Kachha, Gujarat).[11] In this context, B.M. Pande reveals about the traces of some bunds which have been reported in the areas like Kalat Kharan, Jhalwan, Than (in Hub valley), Ahmad and Peer Mundhar (in Sasna Valley).[12]

Origin

The observations and studies of scholars working in this field it has come out that Persia (Iran) has been the origin place of Gabarbands. During ancient period, the people who used to live here were the Zorastrian people. Further, in the Persian history (*i.e.*, present Iran) it is recorded that Cyrus II, better known as Cyrus the Great, was the founder of the first Persian Empire and his empire was known as Achamenid Empire. After his death in 530 B.C., Persian rule was followed by two dynasties which were respectively named as Perthian and Sassanian empires. During these dynastic rules, the kings and his subjects, both followed the Zorastrian religion. The Zorastrians were worshiper of water and fire. They had the faith that water is the source of life and it nourishes plants, animals and human beings. Further, they also believed that water is a living element and it is guarded by its guardian angel 'Ava' to whom they called as '*Anahita*'[13] too. In order to begin their religious ceremony the ancient Persians, used to apply water for purifying their metal implement *Alat* by submerging into it. Thus water had great importance in their socio- religious and economic life.

As they used to reside in mountain regions, so normal way of agriculture - method was not possible for them in this area as it lacked two of its basic criteria. First, non availability of plane land of soil-field in this stone abundant hilly area. And second, lack of perennial source of water resources round the year such as river, lake, pond or well. Thus, in order to prepare the agriculture field they started to retain silt which used to come down either along the rain-water runoff or by means of seasonal channels. With the passes of time they prepared a structural formations which could be utilised for their agricultural purpose. In fact, such structures were the combination of bunds and agriculture field. We may consider it as the primitive form of dams and farming platforms which retained soil and soil-moisture. The Iranians during ancient period associated their such creations with their religious faith and called these (structures) Zorastrian dams. Need not to mention that the reason for this nomenclature is quite clear that is - the Perthians and the Sassanians both were followers of Zorastrian religion. During present days, these structures are called as Gabarbands. Culturally, the manufacturer of Lando ware or Ghul ware[14] are found to be associated with gabarbands.

It is significant that during the Perthian and Sassanian rules there was gradual improvement in the field of irrigation and in other agricultural practices by means of substantial investments.

BALUCHISTAN

In Baluchistan, the gabarbands were strongly built by stone rubble and their height varied between ten to fifteen feet. Those were sufficient enough to hold the good amount of silt and water.[15]

The present area of Kachhi district, located in central Baluchistan (Pakistan) was earlier known as Bolan. This area has provided us the evidences of ancient gabarbands which are normally more than one in number at one point and these are rarely found as single. At some places these have been reported to be five to six in number, lining the *nallas* or seasonally active gullies. On the whole, at a first glance, these appear like a series of stairs.

In this filed of study, the pioneer work of Hughes-Buller[16] reveals that the *gabarbands*, in general, occurred in a series along the river or seasonal mountain torrent. These were constructed by three methods. Firstly, a stepped construction (on both side) consisted at each step of two parallel masonry walls of dry–stone. Then, there was earth and rubble infilling in between the two; second type was a solid masonry wall; and the third one which was almost the same as the second one but there used to be buttresses on both faces.

According to Raikes[17] the first technique is fundamentally different from the other two. The third one is probably the refinement of the second one. Whatever their construction method was, the purpose behind the construction of these gabarbands was the same *i.e.*, conservation of runoff water along with silt in order to create terraces for crop production. By **pounding** the silt rich run off, the agriculture communities created rich alluvial fields which were later on seasonally irrigated through natural process.

Probably this may be the reason that these were built in the areas where some bunds were already gifted by nature. In this way these terrains made sufficient cultivable lands to support the small village population. Raikes bears the opinion that at primary stage its builders applied

stones but later on they created terraces of earth. (However , it is unfortunate that very little of the latter material was available ).[18]

These proto type of dams constructed purposely for harvesting flood water as well as for siltation, provided the Harappan settlers a new method of irrigation based agriculture.[19] In the subsequent period this practice spread in lower parts of Indus valley, Punjab and some parts of Rajasthan. Thus, by virtue of this such amount of crop was produced which was sufficient to sustain a small settlement. This method of cultivation is applied even today.

Sindh and Sindh Kohistan

The pre-historic Gabarbands were present in Sindh region. In western part of Sindh province, there is a barren hilly tract which is consist of outlying spurs of the Kirthar range. Here, cultivation was possible by virtue of many hill streams ( locally called *nallas*) which carried water during the rains.

Walter A. Fairservis[20] has mentioned about ancient dams in Las Bela region, which were discovered near Amari. The site is close to the upper Hub river. The river emerges from the mountain located near a village Zahari in Jhalwan area of Pakistan. Such dam like structural formations were utilised to catch the small amount of rain water flowing down in the form of rivulets from the surrounding mountain-hills. Thus stored water and alluvial silt was used to create tract for cultivation in this arid silt region.

Fairservis has also revealed about the evidences of agricultural practices and presence of bunds in south west Sindh.[21] However, his description is based on the study made by OHK Spate. Further, by the analytical study of the life of early settlers of Indus civilization who lived in the village lying on the edge of Malir oasis (Karachi), it appears that they made desperate attempts to store the water flowing down through rivulet and utilised it for agricultural production.

The earthen dams (*damans*) in the vicinity of Karachi or elsewhere in the Sindh province, serve essentially the same function *i.e.,* conservation of water and soil. However the structures present here varied considerably in their materials such as, stone, brick and earth.

The Sindh Kohistan region is located in between the main hilly regions of Baluchistan and Indus alluvial plains. This area is basically arid and occasionally receives scanty and unpredictable rainfall. Taung valley which is located in this region was surveyed by many archaeologists in the different periods of time *viz.*, N.G.Majumdar (1934 ), H.T. Lombark( 1941), Louis Flam ( 1981) and a team of Archaeologist (1997 ).

The Taung valley comprises alluvial deposits and small hills. Further, a perennial stream flowing here provided drinking water and facilitated agriculture to some extent. In this chain many small torrents formed the main stream named as Baran.

Here, ancient stone walls were built around the slopes and at points where water could be diverted and channelized into torrents that flowed towards the alluvial valley and beyond to it. Obviously these hydraulic network was meticulously planned to collect rainwater flowing through smaller rivulets into mainstream for filling low-lying depressions for cultivation purpose in alluvial valley. It appears that low-lying depression used to retain water until the next rainy season. With all likelihood, this is the reason that majority of the permanent archaeological sites are situated near perennial springs while nomadic- herding camps are spread through the region.

In the recent past, Quasid Hussain [22] has brought to light the traces of two ancient gabarbands, found in Taung valley. One of it is located near the Kirthar range. The existing wall of it measures 28 x 05 x 02 m. along the western side while along the eastern side it measures 18.30 x 5.80 x 4 meters. For its support two walls have been found. The stone slab walls erected here was filled with soil and gravels. A rivulet flowing through it destroyed its eastern portion.

Second example of it is in the form of a stone wall which was strategically built either to collect the water or to divert the flow towards the mainstream. On the whole, three walls are visible in a sequence oriented towards the vast valley in between Gaz and Khirthar.

Gujarat :

In Gujarat, the study associated with Gabarbands, do not provide much clear picture as it has been observed in Baluchistan. However, it appears that around 2300 B.C., the northern part of Gujarat was inhabited by some agricultural communities. According to Possehl, by the agriculture pattern which was adopted by its inhabitants it may be inferred that the root of their

farming pattern must be lying in the dry cropping pattern.[23] This was by means of utilisation of soil-moisture retained by Black loams (a type of soil) naturally present in this area.

In Saurashtra and in some part of northern Gujarat, the late Harappan farming communities which settled here on the banks of the fast-flowing monsoon rivulets, created gabarbands. The structural traces of these gabrbands have been traced out at a late Harappan site Vaniavadar, located near Amreli. By the careful survey of Harappan sites in Mehasana district (north Gujarat), the evidences of bunds across the rivers Rupen, Sarsvati and their tributaries have come to light.[24] . -

At Dholavira, a Harappan settlement, in Kachha (Gujarat), R.S.Bisht has traced out some proto-historic bunds or check dams which were associated with gabarbands. These were made up of rubbles and their purpose was to harvest the rain water flowing in to two seasonal channels lying in the close proximity of this site. During the hey days of this settlement, both these seasonal channels (called as Manhar ad Mansar) used to flow on either sides of this settlement. As said earlier these bunds were made up of rubbles and their purpose was to harvest rain-water passing through these streams. Bisht traced out that channel Manhar has provided evidences of three dam like structures while Mansar of the two. All these were raised across their beds. Further, going down the stream another dam site is also found. Here, huge dressed stone blocks are found which were most plausibly set in wooden frameworks as an effective reinforcement. Construction-technique of these bunds, which show its resemblance with gabarband, must have been borrowed from the neighbouring Sindh - Kohistan and Baluchistan region. [25]

A large ancient earthen enclosure located near Khilosara village, in district Bhavnagar was traced out by Possehl.[26] It was found in an agricultural plain about four miles from a river. It is oriented so as to catch the precipitation runoff and alluvium from moderately sized hill complex. The earthen enclosure is over one kilometer in length, and on average four meters (12 feet high ) approximately eight meters thick at base. The area enclosed by this earthen structure is about thirteen hectares (thirty two acres). On the whole, it used to catch rainwater from an area which is two to three times as large it is. This is evident from the structure itself and from the fact that alluvium has been deposited in the lower portion of the bund. It appears that the people of early period selected this location because of riverine tract and naturally availability of this pale.

It is found that people associated with the post urban phase of Indus valley civilisation (1900–1300 B.C.E.) used to live along the Kalubhar river which used to flow at a distance of about four miles from the bund. There are evidences of settlements of many pre-historic village-farming communities who lived along the banks of the two rivers which were explored in this area. However on the basis of scientific dating, the date of Khilosara bund can not be considered as pre historic bund as its date is likely to be 200 B.C. or a period little prior to it.

In addition to this, Prof. Mehata traced out eighteen earthen, stone and brick bunds in the district of Sabarkantha. In the local language people called it as *Palas* or *Pales*. These structures were obviously constructed to collect soil, silt and water, brought by seasonally flowing *nullas* (small drain-channel). To the surprise these are still in use in this part of Gujarat even today.

All these proto type of dams were primarily built for harvesting flood & seasonal rain water and secondly these were used for siltation of silt mixed soil which were brought along with its flow. This method provided opportunities to some early Harappan settlers for this kind of agriculture system which was based on moisture contained silt / soil.[27] Further, this practice spread in lower parts of Indus valley and in Punjab. By virtue of this, the production of crop was capable to sustain their small settlements. It continued during the subsequent period.

There is an interesting description mentioned in *Rig Veda* related to *Indra, Vritta* and *Purs* which is associated with *gabarbands*. In this text, the construction of *purs* (which earlier belonged to *dasas*), are mentioned in two perspectives. First, as fortified settlement while second is in the context of dams or bunds. The former, of course denotes fortification of their residential settlements while the latter one denotes the structure built for impounding water (flow) which otherwise used to flow down through the hill slopes, in natural course. It is inferred in Rig veda that the majority of *dasas* used to live in the upper reaches of the hilly areas of Indus. Sambara, a *dasas* chief is said to have ruled in Suvastu (Swat) valley. An event (or myth) as mentioned in it is that there was a feud between Indra and Vritta, known as Indra-Vritta feud. In this feud, Indra slew Vritta by his thunderbolt.[28] Mythological character Vritta is considered as water laden cloud. Thus, Indra got the water released from the possession of Vritta. And, for this act of his valour he has been awarded the title of '*Vitraghna'*.[29]

Indra, who is personified as the lord of rain in Rigveda, has been mentioned many times as *Purandar*. The literal meaning of this term is destroyer of fort(s). But at some occassios *pur* has been also been considered as bunds. In a nirukta[30] the term Vritta has been referred as 'cloud'. This appears to be more plausible as in one of hymn of the *Rig Veda* we come to know that Indra slew *Vritta*, burst the cloud, broke his strongholds and drove out the floods. [31] This reflects about the prevention or holding of water by some group of people which otherwise could flow down the hills where the Aryans were living in the beginning stage. This area has been identified as the upper region of Indus region It is interesting to note that such dams of ancient period have been discovered in the hilly regions of upper Indus basin. As said earlier, these happened to be small bunds. Several structures of this description have been found in Kohistan and Baluchistan.

In the opinion of Erdosy[32] the term *pur*, which has been taken to mean as a fort of *dasyus* actually denote cloud containing water. His hypothesis is based on the several references mentioned in Rigveda. The example cited above is one among these. Prof. R. N. Nandi[33] holds the opinion that even during the *dasragya yuddha* ( war fought between Sudas against the confederacy of ten kings) which was fought on the bank of river Parushni (Ravi), the enemy of king Sudas caused harm to the bunds present in his territory. Thus those bunds got damaged and ultimately burst.

This incident reflects a situation that there must be provision of prevention and storage of downward flowing water, by means of some bund like structural construction. This might have prevented the flow of water down in those locality where **some a**ryan population were residing in Indus plains. Here, it is interesting to note that remains of such water-dams of ancient period have been discovered in the hilly regions of upper Indus basin.

C. Benvensite and L. Renou mentioned *Vritta* from purely philological consideration and meant it as obstacle, barrage or *bloqauge* and not as a demon. The view of D.D. Kosambi[34] is akin to these two scholars. He postulates that Indra breaking up dams is related to the breaking of pre-historic dams called as *gabarbands*. These are still found at many water courses in the western part of the region.

When it comes the question of assigning the time-period of these *gabarbands* then it becomes rather a difficult task for both *i.e.* historians and archaeologists to decide its time period. Hence, at one hand these structural formations have been in practice during prehistoric period while on the other some of these are reported to be still in use with greater engineering skill in northern Baluchistan area it has become rather difficult for archaeologist and scholars to decide its date with precision. Perhaps, this is why R.L.Raikes[35] bears the opinion that *garbarbands* do not belong to one particular period of history. Dhavalikar[36] believes that there is little doubt that some of these may be of an early date in third millennium B.C.E. as shown by Fairservis. [37] Later on he established the association of such type of structure with that of the Amri - Nal phase at Diwana. Possehl[38] as well as Hargreves also holds the view that it belongs to Amri- Nal phases existed in in first half of the third millennium B.C.E. According to Raikes[39] the date of *garbarband* goes back to as early as Togau times, *i.e.* at the end of the fourth millennium B.C.E. But, Raikes again writes that these can not be confined to a particular period so it belong to every period from Neolithic-times to present time.

**Engineers**

The unknown men who conceived and planned these structures in the past, were among of the earliest irrigation engineers and it is sobering to consider that soil conservation is often a synonym for the control and conservation of water. In other words, the persons who successfully mastered Indus riverine environment in pre-historic times must have been skillful hydrological engineers.

**Summary**

Beyond any doubt, gabarband was the first effort made by the people of by gone eras to harvest water, pondering the silt rich run-off and conservation of water and soil for the domestic use as well as for agriculture production in the history of Indian subcontinent.

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