

Agriculture at Kalibangan – Evidences and Excavations

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Abstract- the early Harappan habitation at Kalibangan is part of the matrix such sites of this period found along the Hakra Ghaggar, the old bed of the Saraswati and paleo-channels of the Sutlej. This ecological scenario provided a unique subsistence pattern at Kalibangan consisting of raising livestock coupled with agriculture, which is evidenced by the furrow marks in two directions, cutting at right angles to each other, furrows are closely spaced which indicates mixed crops cultivation and it has great similarity to such growing of double crops even in modern times. The terracotta model of plough from Banawali of the Harappan period could give the idea of the ploughshare in the antecedent early Harappan culture.

Keywords- Harappan, Ploughing, Gypsum Calcium Sulphate.

Introduction

Sir John Marshall, Director General of archaeological survey of India on Sep. 20, 1924 announced in illustrated London News that a civilization as old as great as the Mesopotamian flourished in the Indus valley. This announcement took the historians and archaeologist all over the world by surprise. The preliminary excavations at Harappa and Mohenjo-Daro exposed large brick buildings and hundreds of antiquities including seals with writings on them.

With the partition in 1947, the Harappan, Gandhara, and Taxila sites were passed on to Pakistan where Indian archaeology had concentrated its major efforts. The early heritage authenticating the antiquity of Indian society and culture was suddenly lost. This created a great vacuum and necessitated intense archaeological research to discover similar cultural remains. This was of course, a big challenge to Indian archaeologists. The excavations at Kalibangan in Hanumangarh district of Rajasthan were carried out over 1960-69, by the archaeological survey of India, jointly directed by BB Lal and BK Thapar, besides imparting training to the students of the school. The report was published by ASI in 2003 with the title- **Excavations at Kalibangan- The Early Harappans**. The excavations at Kalibangan brought three important aspects- (i) beginning of habitation on the virgin soil in the early Harappan levels, (ii) the twin mound system, a characteristic feature of mature Harappan town planning, (iii) the absence of the late Harappan remains.ⁱ

Kalibangan literally black bangles, from the sight of the countless fragments of weather stained terracotta bangles strewn over the surface of the site, lies some 310 km northwest of Delhi, along the left bank of the dry river Ghaggar in the northern part of the Rajasthan. Anciently the river,

often identified with Saraswati, reached to its Hakra branch in Bahawalpur, Pakistan.

Discussion

The site of Kalibangan comprises of the three mounds with the smaller designated as KLB-I located to the west, KLB-II to the east, KLB-III a low mound to further east. The KLB-I mound is roughly a parallelogram. However, in the mound KLB-I, the maximum early deposit is overlain by the massive structure of the Harappan period. While in KLB-II there has been an overlap of early Harappan and Harappan cultures right from the beginning. KLB-II has not yielded any early harappan structures exclusively. The early Harappan pottery continued with the Harappan in that mound upto the middle level. KLB-III has yielded ritualistic structure such as fire alters and the pottery consists of mainly the Harappan pottery but few early Harappan sherds are also found in the milieu.ⁱⁱ Other important findings from Kalibanga include small size of blades of chalcedony and agate, sometimes serrated or banded, beads, variously steatite shell, carnelian, terracotta and copper, bangles of copper, terracotta objects like a toy cart wheel and a bull, quern stones with mullers, bone point, and copper Celts including a curious axe.

B B Lal placed the early Harappan settlement at Kalibangan broadly between 3000 to 2700 BCE on the bases of the C-14 dates available from eleven samples dealt by Tata Institute of Fundamental research, Mumbai.ⁱⁱⁱ However, BK Thapar opines that Kalibangan would have begun around 2300 BC and lasted up to 1750 BC.^{iv} JM Casal on the basis of the comparison of the material equipment of Kalibangan I with that of corresponding cultures at Harappa, Amri, and Kot Diji. He argues that it is seen that while these village town cultures share a common level of

economic subsistence, they are marked by regionalization with an uneven traditions.^v

BK Thapar supported the JM Casal's view when he says that 'the correlation assemblages would indicate that the so called pre Harappan communities appeared in northern Rajasthan somewhat later than on sites in Baluchistan and the Indus Valley proper, as though reflecting a "sloping horizon" of cultural level from west to east.^{vi} RC Thakran considers it north eastern movement of the people on the bases of his findings. He argue that 'at the early Harappan levels Ghaggar shared only a meager 14 sites of 131. Likewise in the mature Harappan levels it harboured only 35 sites of the total 120. In the late Harappan levels the Ghaggar received 169 settlements of the total 618. And in the PGW levels 319 sites out of total 615, which is above 50 percent. The sudden increase of late Harappan sites in the Ghaggar basin and decrease in the south and south western parts underlines the north eastern movement of the people from the central Indus Valley.'^{vii}

The development of arts, crafts, science, and technology of Harappan was possible because there was enough surplus food available to sustain the non-agricultural population,^{viii} if so, the question that arise are did they apply scientific knowledge to agricultural operation? And did they have balanced diet? Before answering these questions it is necessary to examine the food crops that they cultivated, which itself demands a knowledge of environment, rainfall, soil, method of cultivation agricultural tools use of fertilizers and method of storing grains. It also involves a study of animals domesticated for food, transport and other purposes.

The river Saraswati/Ghaggar which provided abundant water and rendered plains with alluvium during the pre-Harappan and mature Harappan periods lost its two main tributaries, the Yamuna and Sutlej, resulting in gradual drying up of the river. However, hundreds of small, de-urbanised rural settlements sprang up in Gujrat, Haryana, Punjab, and Sindh in the late Harappan period. SR Rao opines that it is interesting to find that the late Harappan not only knew the presence of the groundwater even in the sandstone and basalt beds of the Saurashtra and other regions, but also exploited them. There is reference in the Mahābhārata, to Sri-krisna shooting an arrow and getting potable water to quench the thirst of Rukmini near dwarka. Even now, there is plenty of groundwater in Okhamandal, where dwarka is situated.^{ix} The epic Mahābhārata describes the plants and animals in the forests around Dwarka. However, BD Chattopadhyaya has poited out that the textual information needed to be stratified independent of archaeological evidence before it could be meaningfully applied to raw archaeological correlations.^x RC Thakran also

opined that the historicity of such texts and narratives was not always beyond the doubt. Similarly local traditions are invented, appropriated and transported spatially and temporally and thus cannot be relied upon for historical interpretation in the absence of any epigraphical evidence.^{xi}

JP Joshi^{xii} thinks that the Kalibangan environmental reconstruction is quite complex, however on the basis of the C-14 dates, the palynological researches from salt lakes of Lunkaransar, Sambhar, Didwana in Rajasthan and a few soil samples from early Harappan levels of Kalibangan indicate the time span called "Phase IV, Sub Period A, i. e. 3000 BC to 1800 BC", which was the period of the maximum wetness and during this period early Harappan and also mature Harappan cultures flourished at Kalibangan.^{xiii}

The early Harappan habitation at Kalibangan is part of the matrix such sites of this period found along the Hakra Ghaggar, the old bed of the Saraswati and paleo-channels of the Sutlej. This ecological scenario provided a unique subsistence pattern at Kalibangan consisting of raising livestock coupled with agriculture, which is evidenced by the furrow marks in two directions, cutting at right angles to each other, furrows are closely spaced which indicates mixed crops cultivation and it has great similarity to such growing of double crops even in modern times. The terracotta model of plough from Banawali of the Harappan period could give the idea of the ploughshare in the antecedent early Harappan culture.^{xiv} However, no remains of either plough or ploughshare or a coulter have so far been obtained from the excavation.^{xv}

HT Lambrick observes, "Wheat and barley, the principal food grains on the flood plains are cultivated without ploughing, manuring, or producing additional water. This may be the manner by which the Harappan produced the crops.^{xvi} But there is positive evidence from Kalibangan-I to prove that during the pre-Harappan phase itself, the field was ploughed. According to BK Thapar an outstanding discovery of the excavations was a ploughed field situated to the southeast of settlement, outside of the town wall. This is perhaps the earliest ploughed field excavated so far, showing grid of furrows with one set more closely spaced (about 30 cm apart) running east-west and the other widely spaced (about 1.90 m apart) running north-east. The former seem to have been ploughed first. The pattern bears a remarkable resemblance to modern ploughing in the neighborhood, wherein two types of crops (pulse in one direction and mustered in the other) are grown in the same field, the combination being dependant upon the size and growth behavior of the plants.^{xvii} BB Lal further says that present agricultural field are also furrowed on the same criss cross pattern. Today the farmers grow chickpea in the short distance furrows and

mustered in the distance ones. Lal was told by the farmers that this is what their forefathers had been doing generation after generation. Lal goes on to say that during the winter when the northern hemisphere moves relatively away from the sun, the shadows are much longer. Further, to be noted is the fact that the mustered plant is much taller than that of the chickpea. Thus, in order to ensure that shadows of the long mustard plant do not cover up the chickpea plant, the former are grown in the north-south furrows and the later in the east-west furrows. If they were grown in reverse directions, the result would be disastrous.^{xviii}

At Banawali, RS Bist found two terracotta models of ploughs, one of which is intact.^{xix} A partly broken terracotta plough was found at the Lothal also. It is, therefore, obvious that the Harappans used plough. It is assumed by the excavators that since cultivation during Kalibangan I, period depended upon flood irrigation supplemented by seasonal precipitation, only the winter crop (rabi) was grown and that too in autumn after the river flood had subsided. Although no cereal were found in the course of excavation, cereal type pollen has been attested to in good number in the deposits of period I.^{xx} It appears that the people were capable of dealing with the demands of the river. Field may have been surrounded by earth embankments in the Harappan period as is done even now in Saurashtra. The natural fertility of the alluvium was exploited together with the annual inundation.

The varieties of barley cultivated at Kalibangan are hulled barley grains. Naked barley producing varieties were less common. The hulled barley grains were produced by a sixed variety. Wheat (*triticum sphaerococcum*): the small number of these grains occurring along with hundreds of barley grains possesses, characteristics intermediate between wheat and barley. They may be aberrant forms or the result of a few wheat plants that grew in the barley field.^{xxi}

JP Joshi thinks that Large number of bones of *bos indicus* found during the excavations suggest the use of bullocks for agricultural activities. The occasional flooding of the Saraswati, which brought rich alluvial soil, added to the productivity and fertility of the soil. From the early harappan levels at Kalibangan both mono and dicotyledonous grains have been recovered of which the former wheat and barley used for staple diet whereas the later pea was used as a cereal.^{xxii} The use of barley identically apart from wheat flour being exclusively used for making roti mixture of floor barley, wheat and gram was also possibly used as it is even today in wide use as *sattu*, a fast food many parts of northern India which is most nourishing a balanced diet. Besides, these cereals were used individually also. Since cultivation during that period seems to have depended on flood irrigation supplemented by precipitation, it is

reasonable to infer that only the winter crop viz. the rabi was grown, the sowing being done in the autumn after the river flood resulting from tropical monsoon had subsided.

The excavations at Kalibangan give evidences of use of manures. The Kalibangans used gypsum calcium sulphate ($\text{CaSO}_4 \cdot \text{Zn}_{20}$) as a chemical fertilizer. Kalibangan and Lothal suggested it by storing the chemical.^{xxiii} At present gypsum is used to reclaim saline land and make it fertile. Ground gypsum is used in agriculture as surface plaster for conserving moisture in the soil in order to aid nitrogen absorption from manure to reduce salinity and alkalinity, as in case of Rajasthan and parts of Sabarmati estuary.

The find of gypsum in a potsherd from early levels is a pointer that the early Kalibangans perhaps used gypsum as a fertilizer to reclaim saline land and render them productive. It is perhaps during early Harappan times the artificial system of irrigation was evolved which were further advanced during the mature times. S. Dange remarks that the stud bull was also used for symbolic fructification of the field by making the beast walk and urinate in the field.^{xxiv} The plough was sprinkled with soma juice and stone axes symbolically sharpened the ploughshare. This is clear indication of Neolithic antecedents of the Vedic culture as was the case with Harappan culture. Bullocks and horses were used for dragging the cart and as beasts of burden.

Saddle querns, mullers and pestles were used for grinding and making paste and powder of these cereals. Interesting evidence regarding cooking practice was revealed by the presence of ovens, inside the houses, both the underground and above ground variety. These are very much similar to present day tandoors in the region. The husking through of fabric 'D' though heavy were perhaps used for cleaning the grains of different cereals having husk. Besides meat of fowl, pig and goat was also possibly part of dietary. Equally, noteworthy was the existence of cylindrical pits lined with lime plaster, possibly for storing grains.

Kalibangans were conscious of smoke pollution as they deliberately choose to locate the tandoors in the northwestern corner of courtyard of the house, as for major part of the year the wind direction in the region is from north-east to south-west. This is also further corroborated by the location of the cemetery of the succeeding Harappan. The alignment of the houses, no less than the size of the bricks used, was significantly different from those of the succeeding Harappans. Five phases of building activity have been noticed. The alignment of house was slightly deviated from the succeeding Harappans who strictly followed cardinal directions.

Conclusion

The lack of the any historical record does not mean that interesting and important insights into the Harappan civilization are beyond the grasp of archaeologists. The Harappan civilization is no more confined to the Indus valley. It extended from the border of Iran on the west to beyond Delhi in the east, Turkmenia and Kashmir in the north to the Godavari valley in the south, covering an area of more than 1.5 million sq. Km. More than 300 sites of this civilization have been discovered in the ancient Saraswati valley in Punjab, Haryana and Rajasthan.

Before the discoveries of the ancient cities of Mohenjo-Daro and Harappa there was no hint in historical literature that an historical era has predated the Mauryan Empire of the third century BC. In fact prior to the 1924 earliest secure date in ancient Indian history was the spring of 326 BCE and Alexander the Great raid into the northwestern borders of the region. We do not know what these

people called themselves or their cities towns and villages. We have no king lists or internal chronology, no historical sense of provinces and districts of the civilization. There is no historical record of commerce, production, consumption or technological skills and processes. Historical records at the moment can only observe that while the Indus people were certainly literate and therefore had their own historical record. Those who study the culture are left with the disadvantage of having study it within the confines of proto-history. As soon this proto-historical period will come into confine of the historical period, we would be able to tell about agriculture and agricultural technology of the Harappans and the great habitants of Kalibangan.

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- ^{vi} Thapar, B. K., (2002). The Harappan Civilisation: some Reflections on its Environments and Resources and Their Exploitation, in GL Possehl ed. *The Indus Civilisation: A contemporary Perspective*, Altamira Press, 3-13.
- ^{vii} Thakran, R. C., (2000), Implications of Partition on Protohistoric Investigations in the Ghaggar-Ganga Basin, *Social Scientist*, Vol. 28, No. ½ (jan-Feb.), 42-67.
- ^{viii} The most outstanding achievement of Indus Valley Civilization is the cultural integration. Different groups of people urban and rural folk, pastoral people and forest dwellers live by peaceful means. Common economic interests brought them together. With competent leaders at the centre and in the provinces, people enjoyed not only material prosperity but also freedom to observe ones faith. For instance, the worship of the mother goddess, popular in the Indus valley, hardly known in Kalibangan and Lothal. On the other hand fire worship and offer of the sacrifice were practiced in the Saurashtra., Rajasthan and Haryana. Yet the cultural integration of the forest dwellers venerating the tiger and elephant deities with the fire worshippers is clearly indicated in the so called pasupati seal in Mohenjodaro.
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- ^x Chattopadhyay, B. D., (1973). Irrigation in Early Medieval Rajasthan, *Journal of the Economic and Social History of the Orient*, Vol. 16, No. 2/3 (Dec.), 298-316.

- ^{xi}Thakran, R. C., (2000). Implications of Partition on Protohistoric Investigations in the Ghaggar-Ganga Basin, *Social Scientist*, Vol. 28, No. ½ (jan-Feb.), 42-67.
- ^{xii}The wetness may be attributed to the high rainfall and presence of the Saraswati affording appropriate environment for a high level of floral and faunal diversity possibly having gallery forests. This might have resulted in a moist vegetation comprising evergreen forest type and range lands. The clues indicate that the forest reaches its climate climax. The vegetation of the early Harappan period consist of Acacia (Babul), Anogeissus springs (Dhak), which could be attested to by the Charcoal samples leading to the presumption that besides using the timber of these trees for construction purposes, it was also used for tool handles of agricultural implements e.g. plough and furniture. The bark of Acacia could have been used as fire wood also. It interesting to note that four charcoal samples, Baul, Dhak, Shisam produce more heat less smoke, leading to better combustion. However teak is not a good fire wood and gives smoke. It appears that Pipal and banana were grown as these are well represented in the painted pottery-in Lal B. B., et el (2003). Excavations at Kalibangan- The Early Harappans, Delhi, ASI.
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- ^{xv}The Neolithic food producers did not plough the field. They used to dig pits with a pointed wooden stick, at the top of which a stone ring for weight was fixed. This method continued for some time even after metal came into use-B B Lal opines in Lal, B B (1997). *Ancient civilization of South Asia*, New Delhi, Aryans Books, 1997.
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- ^{xxiv}Ibid.