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Settlement Archaeology of the Yamuna-Hindon Doab

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Abstract
The Yamuna-Hindon doab has brought to light a large number of ancient sites associated with Proto-historic, Painted Grey Ware (PGW), Northern Black Polished Ware (NBPW), early historic, Gupta, Post-Gupta and Medieval cultures. However, there is lack of horizontal excavations in the region. As a result, we do not have a clear picture of early settlements, their pattern of distribution, spacing of settlements in different cultural periods and the role of ecological factors in shaping these aspects of cultures. The present work suggests that in the background of lack of horizontal excavations, the study of settlement archaeology can perhaps fill some of the gaps and help in reconstruction and understanding of the ancient past.

Keywords: archaeology, doab, Hindon, history, India, Yamuna

Introduction

The Yamuna-Hindon doab, as a part of the larger Ganga-Yamuna doab, and its neighbourhood occupy a significant place right from the ancient times as the region gave birth to a number of pre-historic and proto-historic cultures as well as it saw a rise of number of empires over the period of time. The doab and its neighbourhood are recognized for possessing a considerable number of sites representing Late Harappan culture, which may have persisted until at least c. 1000-900 BCE; Ochre Coloured Pottery (OCP) culture, which was contemporary of Late Harappans, and was rural and agricultural in nature; Painted Grey Ware culture (PGW), which is a pre-urban Iron Age culture of the western Gangetic plain and the Ghaggar-Hakra valley, and is dated c.1200 to 600–500 BCE; and Northern Black Polished Ware culture (NBPW), an urban Iron Age culture lasting c. 700–200 BCE. The region also possesses a large number of early historic, Gupta, Post-Gupta and Medieval sites.

In the textual sources, the earliest references of the Yamuna-Hindon doab and its neighbourhood are to be found in the famous Epic, the *Mahabharata*, which recounts the war between two groups of cousins, Kaurava and the Pāṇḍava, in Kurukshetra and their fates. B. B. Lal has recognized several sites that are referred in the *Mahabharata* in *Ancient India, Vol. 10 & 11, 1954-55*. However, there is almost no reference in the literary sources about the social, economic, and political conditions of the area during the period before the legend of *Mahabharata* war. It has to be noted that the historicity of the *Mahabharata* war is itself controversial. Again, there is no reference of the developments during the centuries between the *Mahabharata* war and the settlement of Tomars in Delhi. Moreover, the ancient literary sources are religious in nature, engulfed with mythologies, while the dates of many literary sources are uncertain and debated.

Considering the scarcity of references in the textual sources, an archaeological investigation of the Yamuna-Hindon doab occupies an important place. The architectural remains, other artifacts or remains of the past that would reflect the history of the Yamuna-Hindon doab lie mostly covered by the soil and wreckage. However, due to large scale urbanisation of the area, we have lost most of these remains of the past. Wherever the sites have not been destroyed by construction activities, one can still notice mounds that show their occupations over centuries. And whenever, some of these mounds are disturbed or cut away, such as when someone decides to install a handpump or build a house or a well or to level the ground to grow crops on, the remains of the past are exposed. We can notice most of these sites in the rural areas. This was one of the reasons for investigating the Yamuna-Hindon doab as the study area because much of this area is still rural and the process of urbanisation has not yet destroyed some of the sites.

Identification of considerable number of Late Harappans, OCP, PGW, NBP, and early historic, Gupta, post-Gupta and Medieval sites in the region is the second reason for taking up the Yamuna-Hindon doab as the study area. A significant case in point is the findings of the excavations conducted at the site of Sinauli in Baghpat by the Archaeological Survey of India (ASI) in 2003-04, 2005-06 and in 2018. Chariot burials and Copper Hoard Weapons were found at the site in 2018. These findings suggested that there might be some other sites of ancient past in the area that have not yet been identified. The possibility of locating unidentified sites in the area was further strengthened by the fact that generally early humans in their struggle for existence settled down in places that were close to sources of water and food, and as far as possible are safe and pleasant. The Yamuna-Hindon doab was a right place in this context.

Study of settlement history of the Yamuna-Hindon doab is also important because of the lack of horizontal excavations in the region. As a result, we do not have a clear picture of the pattern of distribution, spacing of settlements in different cultural periods and the role of ecological factors in shaping these aspects of cultures. Other aspects like the changes in the settlement patterns due to change in the population density, technology and exploitation of economic resources also remain unknown. However, some systematic surveys and explorations conducted in the region and the conclusions drawn showed that even in the absence of horizontal excavations there is ample evidence for us to study the settlement pattern of the Yamuna-Hindon doab, which has still not seen the massive urbanization as

experienced by Delhi. This was another factor that encouraged a study of settlement history of the Yamuna-Hindon doab.

With this background, one realizes that in archaeology, the study of settlement pattern can perhaps fill some of the gaps that we face in the reconstruction of the past, particularly ancient past, created by the absence of horizontal excavations. Several settlement pattern studies have been undertaken in Europe, America, and the Middle East. The concept of settlement pattern is basically derived from the geography. Makkhan Lal (1984) has pointed out that "…settlement pattern studies by and large have revolved around the tradition initiated by Gordon R. Willey. The emphasis is one extensive regional survey, within regions of several hundreds to several thousands sq. km. In order to define the extent of the system, delineate the broad problems like migration and diffusion, and formulate hypotheses regarding site function, demography and polity, which can be tested and redefined through subsequent intensified investigations. Inferences have been mainly drawn from the gross outlines of settlement configuration, from surface indications of different architectural complexity within and between sites, from site locations with features and form the changes in these variables through time."

The settlement pattern studies also involve finding out the manner in which human settlement are arranged over the landscape in relation to the physiographic, geographic, and environment (Chang 1958) [10]. Over a period of time settlement pattern studies have further developed (Adams 1965, Chang 1962, Trigger 1968, Flannery 1972, Renfrew 1972, Clarke 1972) [1, 48, 28, 40, 12]. In India too, several significant studies on the settlement pattern have been undertaken (Dhavalikar and Possehl 1974; Bhan 1979; Possehl 1980; Paddayya 1982; Makkhan Lal 1984; Erodsy 1988; Paul 1999-2000) [16, 16, 5, 39, 36, 27, 37].

In the present work, an extensive survey of the identified micro region of the Yamuna-Hindon doab has been taken up in an attempt to study the settlement pattern of this region. Further, due to feasibility factor, in the present work more emphasis is on a comparatively study of the protohistoric and early historic cultures *i.e.* the period from 1800 B.C.E. (late Harappan) to 300 C.E. (early historic). There are several limitations in this kind of work, as the hypotheses given are not absolute as they are not based on extensive horizontal excavations and the element of probability is always there. Nevertheless, as Makkhan Lal (1984: 3) has aptly said:

"such exercises have to be undertaken if we are to progress beyond a knowledge of material culture to the process underlying cultural change."

Painted Grey Ware Culture (PGW)

In the Yamuna-Hindon doan and its neighbourhood, the ancient sites of Alamgirpur, Allahapur, Hulas, Kaseri, Mandoli, Khurd Banhera, Loni, Garhi Kalanjari, Mukari, Pashuram ka khera, Baghpat, Katha and Mandaula have yielded significant amount of PGW, showing that during this period, the Yamuna-Hindon doab provided the required ecological, environmental, and the socio-economic base for the settlements. In fact, the entire Yamuna-Hindon doab is densely concentrated with PGW sites.

Stratigraphic Position of PGW

PGW is found in four stratigraphical contexts:

1. At Alamgirpur, Hulas and Mandoli, it is preceded by Late Harappan culture but with a gap between the two cultures.
2. At Kaseri, Hastinapur and Ahichchhatra, it is preceded by OCP culture. At Hastinapur and
3. Ahichchhatra, there is break between OCP nad PGW cultures. However, in the excavation report on Kaseri (IAR: 1969-70: 43) it is not specified whether there was a gap between OCP and PGW cultures.
4. At Bhagwanpura in Haryana, and Daheri, Kathpalon and Nagar in Punjab, the PGW has an interlocking phase with the Late Harappan culture.
5. At Atranjikhera in Uttar Pradesh and Noh and Jodhpura in Rajasthan, the PGW is preceded by the BRW culture with a break in between the two cultures.

Explaining the reason for a break between the Late Harappan culture and the PGW culture at sites like Alamgirpur and why there is an interlocking phase between the two cultures at Bhagwanpura, Joshi (1993: 24) opines that the Late Harappan culture at Alamgirpur was earlier than the Late Harappan culture at Bhagwanpura and the PGW culture at the former site was later than the PGW culture of Bhagwanpura IB. Thus, while there remained a gap at Alamgirpur, the same was bridged at Bhagwanpura. It is pertinent to note that almost everywhere PGW overlaps with the NBPW culture.

Settlement Pattern

The settlements of the PGW culture are generally located on rivers banks. The average distance between two sites is about 10-12 km and in favourable ecological zones it is even 5 km. It is interesting to note that the average distance between Mandoli, Loni, Mandaula, Katha, and Baghpat on the Yamuna is about 8-9 km. And, the average distance between Kaseri, Khurd Banhera, Garhi-Kalanjari. Mukari and Pashuram ka khera along the Hindon River is 6-7 km. Thus, the settlements along:he Hindon are more closely spaced as compared to the settlements along the Yamuna. However, the settlements along the Yamuna are bigger in size than those along the Hindon and other tributaries of the Yamuna. The habitations are basically small villages with average size of 1 to 4 hectare. The population of these villages was also moderate. However, as the villages grew up on banks of rivers, particularly those along the bigger river, the Yamuna, for various natural advantages, the need of fortification to safeguard against floods and attacks of enemies was becoming more pressing. An increase in population led to growth in the number of settlements both along the rivers and away from them.

As far as trade is concerned, none of the objects, such as copper and iron ores, and semiprecious stones like agate, jasper, carnelian, chalcedony and lapis lazuli are found in the Yamuna-Hindon doab, suggesting occurrence of trade in the area. The settlements on the Yamuna, which is better suited for transport and commerce, were perhaps mainly involved in this trade and were probably served and fed by a group of small village settlements on the peripheries of these settlements. For example, evidences from Allahapur suggest presence of a bone and antler industry. This industry could well have been a part of the local trade, in which probably apart from Hastinapur, Loni, Manduala and Katha also played an important role.

As per the spread of PGW, it must be mentioned here that the stratigraphic evidence show that PGW in western Uttar Pradesh is younger than PGW culture of Haryana, Punjab and Jammu. Thus, there seems to be an eastward movement of PGW people from neighbouring areas of Haryana, Punjab and probably Jammu into the Yamuna-Hindon doab. In spite of being extensive, PGW in Western Uttar Pradesh is homogenous and has got its own individuality. During this period a considerable portion of the country was on the threshold of urbanization.

Subsistence Pattern

Agriculture was their main source of livelihood. Due to increase in the population, large areas were brought under cultivation. Side by side, people also practised animal husbandry, hunting and fishing.

Evidences from Hastinapur (Lal 1954-55: 123) and Atranjikhera (Chowdhury et. al. 1977: 63) [11] suggests that PGW people cultivated rice (Oryza sativa), wheat (Triticum compactum), barley (Hardeum vulgare), peas and some other legumes. However, finding of only rice at Hastinapur and quantity of rice being more at Atranjikhera than wheat and barley suggests that rice dominated the staple diet of the PGW people.

Bones of goat, deer, horse, bull and pig have been found at Allahapur, Hastinapur and Atranjikhera suggesting the role of animal husbandry in their economy. Spearheads and arrowheads found at sites, such as Alamgirpur and Allahapur indicate towards animal hunting. Similarly, fishing could also well have been a part of the subsistence economy. Fish-hooks were found at several PGW sites, such as Atranjikhera. Bones have also been found from Mandaula, Katha, Mukari and Loni. However, their exact cultural context cannot be derived at. Though the bones from Katha were found from the layer that had PGW potteries.

Structural Remains

The following are examples of some of the structural remains unearthed from the sites in and around the Yamuna-Hindon doab:

1. Alamgirpur: large lumps of clay, sometimes burnt, with red impressions, suggested that the houses had been built of reeds plastered over with a thick layer of clay.
2. Allahapur: closed and open-mouthed hearths, mud floors with post-holes and burnt reed- impressed mud plaster were noticed.
3. Mandoli: houses of rammed-mud floors and post-holes, suggesting that it was a village settlement, were noticed.
4. Kaseri: as structural remains, only an oval-shaped hearth was located.

The post-holes at Mandoli and Allahapur suggests that during the PGW period the houses were made by using wooden or bamboo screens and then they were plastered with mud, as suggested by the remains of lumps clay, bearing reed or bamboo impressions from Alamgirpur, Allahapur and Hastinapur. Evidences from Hastinapur suggest that husk of rice was used to reinforce the mud or mud walls with plaster. Floors were made of rammed floor as observed at Mandoli. As the rains are expected to be heavy in the region, mud could not be relied upon for roof. The roof may have had a wattle-cum-thatch base (Roy 1983: 137) [43].

It is wrong to suggest that the occupation of the entire Ganga-Yamuna doab would not have been possible without iron. We have already seen that a large number of Late Harappan sites and OCP sites have been identified in the Saharanpur, Muzaffarnagar, Bulandshahr, Meerut and Ghaziabad districts. However, introduction of iron seems to have brought changes in the all round promotion of the civic life in PGW culture, which provided the base that ultimately ushered in the second urbanistion. Historically, the PGW Period is pre-Mauryan and is pre-urban in nature. Chronology

Lal (1954-55: 21-23) based on the data recovered from Hastinapur and the literary sources has placed PGW in a time bracket of 1100 B.C.E. to 800 B.C.E. The PGW at Bhagwanpura has been dated to 1400 B.C.E. to 1000 B.C.E. Roy (1983: 123) [43] after making a critical study of C-14 data argues that the sites like Hastinapur, Allahapur, Alamgirpur and Hulas, which do not give the evidence of any pre-PGW (BRW) phase, cannot be dated earlier than 7th to 6th centuries B.C.E. He further highlights that the C-14 dates from Hastinapur and Allahapur suggest that PGW continued up to 350 B.C.E. However, Makkhan Lal (1984: 90), also after making a critical study of C-14 data places PGW between 1300 B.C.E. to 700 B.C.E. Therefore, it seems that one is not justified in assigning a uniform date to PGW.

Northern Black Polished Ware Culture (NBPW)

The Northern Black Polished Ware (NBPW) culture in the Yamuna-Hindon doab marks an extensive use of iron, well stratified and economically strong society, introduction of coinage and expansion of Jainism and Buddhism, emergence of states with monarchical system of government in which control of agricultural land and rights to succession played a major role.

In the Yamuna-Hindon doab the typical NBP pottery has been reported from few sites, such as Hulas, Barnawa and Baghpat. However, at other sites, such as Allahapur, although no NBP was found, but the phase was marked by the presence of some of the basic traits of the NBP assemblage, such as burnt bricks, discs, iron objects like spear-head, arrowhead, blades etc., beads, copper nail parer, awls, bone points, stone querns and pestles. Regarding Period III of Alamgirpur, T. N. Roy (1983: 33) [43] suggests that the find of pear-shaped vases, cooking vessels with nail headed rim, burnt bricks and unlined soak-wells correspond with Period III of Hastinapur (Late Phase of NBP). At Kaseri, late phase of NBP has been reported from period III. It was represented by plain grey ware of thicker fabric and its associated miscellany of finds (though not a single sherd of NBP was found). Similar potteries were found during explorations from Khurd Banhera, Loni, Katha, Mandaula, Siti, Mukari, Pashuram ka khera and Baghpat. Thus, all PGW sites except Garhi-Kalanjari have yielded NBPW associated potteries. Hence, it can be said that in western Uttar Pradesh, the NBPW is preceded by PGW, except in few cases.

Settlement Pattern

An efficient village cum town economy of the preceding phase, i.e. PGW phase, gave rise to certain cities during the NBPW period. During the NBPW period the number of settlements as well as their increased considerably. The significance of rivers as an ideal place for settlement

remained but new factors, such as trade, administration and population pressure led to new settlements even away from riverbanks. The NBPW culture on some sites is represented by the structural phase of NBP while on others by defence phase. During the structural phase the NBPW occurs in good number while BRW and PGW occur in restricted number. The settlements were still rural and punch-marked coins and burnt bricks structures are absent. In the defence phase, the black-and-red, black slipped and PGW of the preceding phase almost disappears but NBP continues but its frequency is less. The phase was culturally more prosperous. This is reflected by the introduction of structures of baked bricks, ring wells, drains, and soakpits and fortifications.

Subsistence Pattern

Though, no study has been yet made on the grains cultivated during the NBPW phase in the Yamuna-Hindon doab, Makkhan Lal (1984: 76-77) presents a good picture by taking evidences from Purana Qila, Atranjikhera and Radhan. The evidences suggest that the NBPW people cultivated:

1. Rice (Oryza sativa): Atranjikhera, Radhan
2. Wheat (Triticum compactum host?: Atranjikhera, Radhan
3. Barley (Hardeum vulgare L.): Atranjikhera, Radhan
4. Urad (Phoseolus mungo L.): Atranjikhera
5. Pea (Pisum arvense): Radhan
6. Millet: Purana Qila

The evidences from Hastinapur (Lal 1954-55: 107-120) suggest that meat of sheep, deer, horse, cattle, goat, pig and fish substituted their plant economy.

Structural Remains

At Allahapur, the use of baked bricks of different sizes (33 × 16 × 5.5 or 39 × 19.5 × 5) with rice husk as a degraissant was noticed. Remains of a few mud walls, a circular mud walled room containing some hearths, burnt floors, post-holes and also baked bricks were the other structural remains. This suggests that the houses were made by using wooden or bamboo screens and then they were plastered with mud. Husk of rice was used to reinforce the mud or mud walls with plaster and floors were made of rammed floor. The roof may have had a wattle-cum-thatch base. The structure seems to have followed the tradition of the preceding phase but an important aspect was that the mud bricks were now replaced by burnt bricks. At Hastinapur (Lal 1954-55), a wall of burnt brick was found to run for nearly 8 m, and three mud walls (Walls 2, 3 and 4) suggested the existence of two rooms one of which measured about 4.56 × 4.56 m. An impressive burnt brick floor was found at Atranjikhera (IAR 1962- 63: 34).

Some settlements were fortified with a mud or brick wall and moats were constructed encircling it. The fortification was done for embankment (for example, at Kausambi) and defence purpose (for example, at Ahichchhatra). Kautilya's Arthasastra also talks about the significance of fortification and how they should be built. However, it seems that the settlements along the Hindon, such as Kaseri, Alamgirpur and Allahapur are not urbanized during the NBP period and remained a small village settlement. Roy suggests that Kaseri, together with Alamgirpur and Allahapur were village settlements serving the nearby urban settlements, such as and in particular Hastinapur. He argues that these sites were away from the main trunk route and were not situated on the important rivers (such as the Yamuna) having perennial source of water. Therefore, they remain a rural settlement. (Roy 1983: 256). If we take this view, then it goes on to suggest the role of Katha, Manduala, and Loni situated on the banks of the Yamuna, having perennial source of water, as important urban settlements i.e. administrative and trade centers. Again, being in close proximity to Delhi (Indraprastha) the inhabitants of these areas could have benefited from Delhi's position as an important administrative and trade center.

That houses as well as streets were provided with surface drains, to carry off rain water is attested from a drain of more than 7 metres found at Hastinapur (Lal 1954-55). It was sunk about a metre deep from the ground level and was provided with a brick floor and lining. It appears that houses had soakage arrangement. Several jars were placed vertically, one above the other, in a deep pit and the bottom of every jar was perforated so that water could pass down. Ring wells were also found. Deeper wells were used for carrying out water while shallower wells were used as refuse pits. At Alamgirpur, unlined soak-wells were found.

Chronology

Lal (1954-55: 21-23) based on the data recovered from Hastinapur and the literary sources has placed NBPW in a time bracket of early 6th century B.C.E. to 3rd century B.C.E. However, Makkhan Lal, on the other hand after making a critical study of C-14 dates and comparative analysis places NBPW between 700 B.C.E. to 200 B.C.E. Historically, this is Maurya-Sunga period.

Early Historic Culture

The chronology of the early Historic period is 200 B.C.E. to 300 C.E. Historically, it is Sunga- Kushan period, represented by Red Slipped Ware, seals, epigraphs, copper plates and coins bearing names of kings.

Settlement Pattern

With the beginning of the early Historic period the population in the Yamuna-Hindon doab has increased considerably. The demographic and settlement pattern would have been also affected by the arrival of the lndo-Greeks, the Shakas, the Parthians and the Kushanas. Consequently, there was large-scale colonization of the area due to increasing population pressure on the economic and natural resources. People started making settlements even in those ecological zones that were less favourable, such as away from the river banks. As noticed in our study region, two new settlements, Baragaon and Khatta Pahladpur, seem to be established during this period. It is not feasible to enumerate the total number of settlements of the entire Yamuna-Hindon doab but the density of the colonization can be imagined by the fact that all the fifteen ancient settlements (first list) of our study region represent the Early Historical period. And, most of the villages inform about discovery of bricks that seems to be early historic bricks. In fact, even the beginning of archaeological studies in the Yamuna-Hindan doab goes back to an early Historical site, Behat, discovered by P.T. Cautley (JASB III 1834: 43-44, 221-27), in 1834.

Subsistence Pattern

The subsistence economy of the preceding phases continued and was even diversified with time, with the commingling of the lndo-Greeks, the Shakas, the Parthians and the Kushanas with the local tradition. At Mathura, an inscription of Huviska (Lal, Makkhan 1984: 86) [33] gives a list of food items such as barley meal (saktu), salt (lavana) and flour (saktu-saktu) and some green vegetables. These were the food of the poor, as the inscription informs that these items should be distributed dailyamong the hungry and the thirsty. An ethnographical parallel shows that even today in the rural areas of the Yamuna-Hindon doab these constitute the chief food items. For a more exhaustive list of food items, one can turn to literary evidences (Lal, Makkhan 1984: 87) [33]. Among the cereals, we have rice, barley, wheat, fried and parched grains; types of oil included, seeds of mustard and til; and wag pulses we have arhar, moonga and masha. The fat included milk, ghee and oils. Among sweets we harre rough sugar (guda) and candy (sarkara). The animals and fish also formed a main part of their food economy.

Structural Remains

During this period, houses were made of mud bricks as well as burnt bricks. The use of burnt bricks had proliferated during this period. All the fifteen ancient sites (first list) have reported early Historic burnt bricks, out of which Katha and Manduala have the most impressive burnt brick structures. The archaeological and historical evidences together with the local tradition suggest that these were well-fortified regional centers. Loni also seems to fall in the same category. Several towns came up, which were well-fortified, made of burnt-bricks, had houses as well as streets provided with surface drains, however, the rural landscape of the Yamuna-Hindon doab more or less continued to be dominated by the houses made of wattle and daub and a thatched roof, though houses were also made of mud and sun-baked bricks. This rural character of India continues even in the modern times but very few kachha houses in the villages of the study region were noticed. These villages have been significantly affected by the material prosperity of the neighbouring cities and towns, such as Delhi, Meerut, Saharanpur, Muzaffarnagar, Bulandshahr and Ghaziabad. However, at the same time, they have not yet lost their basic rural character.

Late Historical and Medieval Periods

The political stability provided by the Guptas (320 C.E. - 550 C.E.) would have lead to an increase in population and consequently, a large-scale colonization of the Yamuna-Hindon doab. Again, the arrival of the Hunas would have affected the demographic and settlement pattern of the region. We know from the oral tradition of the Tyagis of Mandaula village that they were sent from Bihar to this region in order to defend the Gupta Empire from the attacks of the Hunas. And, later they got settled here.

Similar developments continued throughout the period of history. During the post-Gupta period and later during the medieval period, the demography and the settlement pattern of the Yamuna-Hindon kept on transforming due to two factors, first, increase in population, and second, continuous arrival of new people, such as the Gujara-Partiharas, Chauhans, Tomars and other Rajputs, later Muslims, Gujars, Jats and Sikhs also entered the region. Consequently, a large number of caste and religion based villages were settled. Though still the banks of the rivers, particularly the Hindon, were favourite for the settlements, now defence also came to play an important role, as the region was prone to attack from the invaders who desired to loot or control the Gangetic doab. People of a particular caste or religion preferred to settle closeby and around a petty fort. Within villages also there was increasing internal differentiation based on caste and religion. Presently, the situation in the doab is such that in the areas neighbouring Delhi, construction companies and agencies, both private and Government, have acquired land from the villages and are bringing in the next wave of people into the region. Since most of these people are not dependent on agriculture for their income, the proximity to water and natural resources are no longer a priority. I have referred to villages like, Jagaula, which have been totally taken over and destroyed by the Ghaziabad Development Authority to make apartments. The present settlement pattern is governed more by the factors of cheap residential colonies (as compared to Delhi), well connectivity (transport and communication) with Delhi and neighbouring towns, and less pollution.

Conclusions

Notwithstanding the difficulties coming in way of a complete presentation of the settlement pattern of the Yamuna-Hindon doab, a broad picture as gleaned from this study. The relief of the Yamuna-Hindon doab exhibits Bangar land rising upto 15-60 metres above the adjoining floodplains, the Khadar. This relief would have enabled settlers to make dwelling settlements on the higher land zones, while the adjoining floodplains, rich in alluvium, is ideal for any economy based on agricultural activity. Most of the settlements are situated on the top of the high banks of the Yamuna and the Hindon. Though on the banks of the Hindon, land zones of even average height were also selected for settlements, as its floods were less threatening than the floods of the Yamuna. Two settlements, Baragaon and Khatta Pahladpur, are away from the river-banks but these have been settled only towards the early centuries of Christian era, when increasing population pressure forced people to settle in the ecologically less favourable zones.

In summers, the melting of the snow and heavy rainfall causes considerable rise in the river; the stream is then very deep and strong, and in time of heavy flood the rivers approach close to the outskirts of the settlements. But they do little damages because the rivers are fairly regular in habits. On the other hand, the small areas of lowland on its banks are actually benefited by the alluvial deposits brought down by the rivers. The Gazetteer of Meerut (1922) [25] reports that the land inundated by the rivers is occasionally cultivated for the rabi crops, and the harvests are of excellent quality.

The climate is sub-humid, the annual rainfall is between 80-100 cm and the plains are rich in alluvium. Consequently, the region is ideal for cultivation. Such soil types and the fertility of the soil are important factors determining the location of human settlements, especially in the case of agricultural communities. The empires and the invaders of the past were aware of the fertile land of the doab and its prosperity, and hence this area witnessed frequent attempts by these forces to control the doab. O.H.K. Spate and A.T.A. Learmonms (1963) [47] also state that in the past defence played an important part in defining the settlement

pattern of a village, especially in the areas open to constant disturbance, such as the Sutlej-Yamuna and the Yamuna-Ganga doabs. Villages are severally grouped around a petty fort. Moreover, the sites along the Hindon were away from the main trunk route and the Hindon was not as suitable for long distance navigation as the Yamuna was. Therefore, these sites remain a rural settlement.

Along the Yamuna, the distance between Loni and Mandaula is 8 km, between Mandaula and Katha is 8 km and between Katha and Baghpat is 6 km. However, along the Hindon, the distance between Banhera and Siti is 2 km, between Siti and Hateva is 1.5 km, between Hateva and Garhi Kalanjari is 2 km, between Garhi Kalanjari and Mukari is 13 km. However, if we include the sites given in the second list of 20 sites, then the gap between Garhi Kalanjari and Mukari is filled by sites, such as Singauli, Gauna, Shahbanpur, Laliyana, Chamrawal and Haresia. And, the average spacing between all these villages is 1.5-2 km. Thus, the sites along the Hindon are more closely spaced than the sites along the Yamuna. This could be due to number of factors:

1. According to Bruce Trigger (1968) [48], a number of factors affect the settlement pattern. He opines that, "the overall density and distribution of population of a region is determined to a large degree by the nature and availability of the natural resources that are being exploited. As long as areas with the soil, their economic resources and favourable climate are available, settlers tend to avoid areas that are naturally poor or where disease or other dangers are common." We know that the economic resources and climate of the Yamuna-Hindon is more or less same. Further, it is not that the banks of the Yamuna were affected by a disease that was not present in the area along the Hindon. Therefore, the third factor left is that of "other dangers". This seems to be quite a possibility because the settlements along the Yamuna were more prone to direct attacks by the invaders from the west. Perhaps, precisely this was the reason that settlements such as, Loni, Katha and Mandaula were made as forts that would safeguard the settlements along the Hindon that were more closely spaced.
1. Further, a group of village settlements along the Hindon were needed to support the regional centres of trade and administration along the Yamuna.
2. Also, the floods in the Yamuna are more threatening to settlements than the floods in the Hindon. Therefore, while only high banks of the Yamuna were selected for settlements, along the Hindon, banks with even average heights were selected. This is reason that why we have lost most of the site along the Hindon, as it was easier to convert the low mounds into agricultural lands.

None of these factors worked in isolation, they together seem to create the ecological, socio-economical and political base determining the settlement pattern in the region.

At macro level, it appears that the Late Harappan settlements in the Yamuna-Hindon doab were established by way of migration from the adjoining Haryana and Punjab regions where the Harappan settlements had been established from a much earlier period (Dikshit 1985: 58). The Harappan culture complex at Alamgirpur and Baragaon were found more influenced by the material remains of Sutlej Valley, whereas Hulas appears to have its mooring in the Sraswati-Drishadvati complex of Haryana (Dikshit 1985: 57). Thus, in the Yamuna-Hindon doab both these cultural waves are present and it appears that in the doab only late mature phase entered and survived.

In the Yamuna-Hindon doab, the migration took place along the river system. The settlements in the Yamuna-Hindon doab are generally located on the higher banks of the rivers and are small in size. The settlements depended upon the nature of soil and easy availability of water for irrigation and domestic use, and rich vegetation.

The presence of the varied species in the region and the fact that in the past the area had a much richer vegetation shows that the region, the Yamuna-Hindon doab, was easy attraction for human settlements. The rich vegetation together with rich agriculture (facilitated by the fertile alluvium soil and the perennial sources of water, the Yamuna and the Hindon) would have easily met the food requirements of the people. In fact, the vegetation of the area could provide at least the bare minimum subsistence to the people even when there were natural disasters, such as famines.

Also, as the Gazetteer of Meerut (1922) [25] highlights, the comparative vicinity of the mountains and the high altitude combine to render the region one of the healthiest parts of the plains of India.

Riverine setting plays an important role in the choice of the settlements. As Possehl has aptly said (1980: 85), an obvious advantage to a riverine location is, reliable supply of water for human and animal consumption as well as for general domestic use. Further, it also afforded a potential for irrigation. Out of 15 ancient sites, five sites, such as Baghpat, Katha, Mandaula, Loni and Mandoli are located along the Yamuna; eight are located along the Hindon, these include Kaseri, Khurd Banhera, Siti, Hateva, Garhi-Kalanjari, Mukari (both Mukari Village and Mukari Pir site), Valmiki Ashram and Pashuram ka khera; and two, Baragaon and Khatta Pahladpur, are located away from both the rivers, towards the centre of the doab. Out of 20 medieval sites, 11 are located along the Hindon. Eight settlements are more towards the middle of the study region. But among these 8 settlements also, for 4 settlements, the Hindon is the closest river. And, for the other 4 settlements, the Yamuna is the closest river. Only 1 site, Gokulpur, is along the Yamuna. But the settlements in the middle of the study region were dependent more on the Hindon (for example, a canal was built on the Hindon to bring water to the Ranap village). This dependency of the settlements on the Hindon was due to the fact that being a small stream, it was easier to make canals on the Hindon. Further, its floods were less threatening than those of the Yamuna.

There are also other significant sources of water that play a crucial role in the agricultural economy of the region and thereby influence the settlement pattern *viz*. wells (as the water table of the region is very high) and the annual rainfall between 80-100 cm. The two major sources of irrigation are canals and wells (Gazetteer of Meerut, 1922) [25]. Panini mentions that villages depended for their water supply on wells (kupas) to which were attached water trough (nipanas) from which the cattle would drink (Agrawal 1953: 141). Also, the famous legend of Lakkhi banjarra (a nomad) shows that it was easy to dig up well as the water level was very high.

The economic and ecological factors also affected the size and spacing of the settlements. The average size of an inhabited area is about 200 metres in length and 150 metres

in breadth. The average spacing between two settlements is from 8 to 12 km. Though in the Saharanpur district it is between 5 to 8 km.

The duration of these settlements must be short as evident from the limited thickness (between 1-2 m) of occupational deposit. The average size of the settlements (200 metres in length and 150 metres in breadth) shows that the inhabitations belonged to small cluster of families. One can notice both the linear and circular pattern of settlement. In the Yamuna-Hindon doab in the absence of large settlements, the cultural complex cannot be viewed from the point of urban network. The OCP settlements are also more or less on the pattern of the Late Harappans. The Late Harappan and OCP people practised agriculture and cultivated rice, wheat, barley and gram, together with domestication of animals, such as Canis familiaris Linn, Bos indicus Linn, Bubalus bulalis Linn, Capra hircus aegagrus Erxl, Ovis vignei Blyth, Sus cristatus Wagner. The structural remains and the material culture show a degenerating state of economy and the houses were made of wattle and daub.

The settlements of the PGW culture are generally located on rivers banks. The average distance between two sites is about 10-12 km and in favourable ecological zones it is even 5 km. The settlements along the Hindon are more closely spaced as compared to the settlements along the Yamuna. However, the settlements along the Yamuna are bigger in size than those along the Hindon and other tributaries of the Yamuna. The habitations are basically small villages with average size of 1 to 4 hectare. Iron was introduced during the PGW period but copper remained the chief metal. PGW people cultivated wheat, rice, barley, gram, urad and pea and practised animal husbandry, hunting and fishing. A village cum town economy seems to exist during this period.

The PGW culture in western Uttar Pradesh, is younger than PGW culture of Haryana, Punjab and Jammu. Thus, there seems to be an eastward movement of PGW people from neighbouring areas of Haryana, Punjab and probably Jammu into the Yamuna-Hindon doab.

The houses were made by using wooden or bamboo screens and then they were plastered with mud, husk of rice was used to reinforce the mud or mud walls with plaster. Floors were made of rammed floor. The roof may have had a wattle-cum-thatch base.

During the NBPW period, a considerable increase in population resulted in increase in number of settlements as well as their size. The significance of rivers as an ideal place for settlement remained but new factors, such as trade, administration and population pressure led to new settlements even away from river-banks. The period was marked by an extensive use of iron, well stratified and economically strong society, introduction of coinage and emergence of monarchical states. An efficient village cum town economy of the preceding phase, i.e. PGW phase, gave rise to certain cities during the NBPW period.

People cultivated, rice, wheat, barley, urad, pea and millet. Meat of sheep, deer, horse, cattle, goat, pig and fish substituted their plant economy.

The previous pattern of houses continued but an important aspect was usage of burnt bricks. Some settlements were fortified with a mud or brick wall and moats were constructed encircling them. However, it seems that while the settlements along the Yamuna, such as Katha, Mandaula and Loni were urbanized, becoming an important administrative and trade centers, those along the Hindon, such as Kaseri, Alamgirpur and Allahapur remained a small village settlement that served the regional centres of trade and administration.

With the beginning of the Early Historic period, there was an increase in colonization of the area due to increasing population pressure on the economic and natural resources. The size of the settlements also increased. Many settlements now came up in the areas away from the banks of the rivers. The houses were made of mud as well as sun dried and burnt bricks. The subsistence economy of the preceding phases was diversified with time.

Throughout the Late Historical and Medieval period the twin factors of increase in population and influx of people into the Yamuna-Hindon doab resulted in a large-scale colonization of the doab. A large number of caste and religion based villages were settled. Though still the banks of the rivers, particularly the smaller streams were favourite for the settlements, now defence also came to play an important role. The population pressure forced people to compromise on the natural and ecological advantages and to settle on areas away from the banks of the rivers. However, since the economy of the region still depended on agriculture people of these areas took to canal and well irrigation and became more dependent on rains.

The present work underlines that in the past, the ecological conditions played a particularly significant role during the earliest phases of the human history when people had a comparatively limited repertoire of resources and skills with which to control, manipulate, and exploit their surroundings. However, as necessity is the mother of all inventions, with time, factors, such as increase in population pressure necessitated developments of resources and skills. Consequently, the settlers learnt to control and exploit even the ecologically less favourable surroundings, as compared to the surroundings along the banks of the rivers, and one witnesses proliferation of human settlements not only along the banks of the rivers but also in the areas that are away from the rivers. The number of settlements and their sizes kept on increasing from the Late Harappan period itself, through the BRW, PGW and NBPW period up to the historical and medieval times. These necessitated developments in the social, political and economic structures too. Among themselves, the settlers worked out the relationship of core and periphery, though the essential of basic self-sufficiency in rural areas remained, yet there was never a closed society.

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