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24

NEW RESEARCH IN BANGLADESH ARCHAEOBOTANY: POTENTIAL ISSUES AND FUTURE SCOPE

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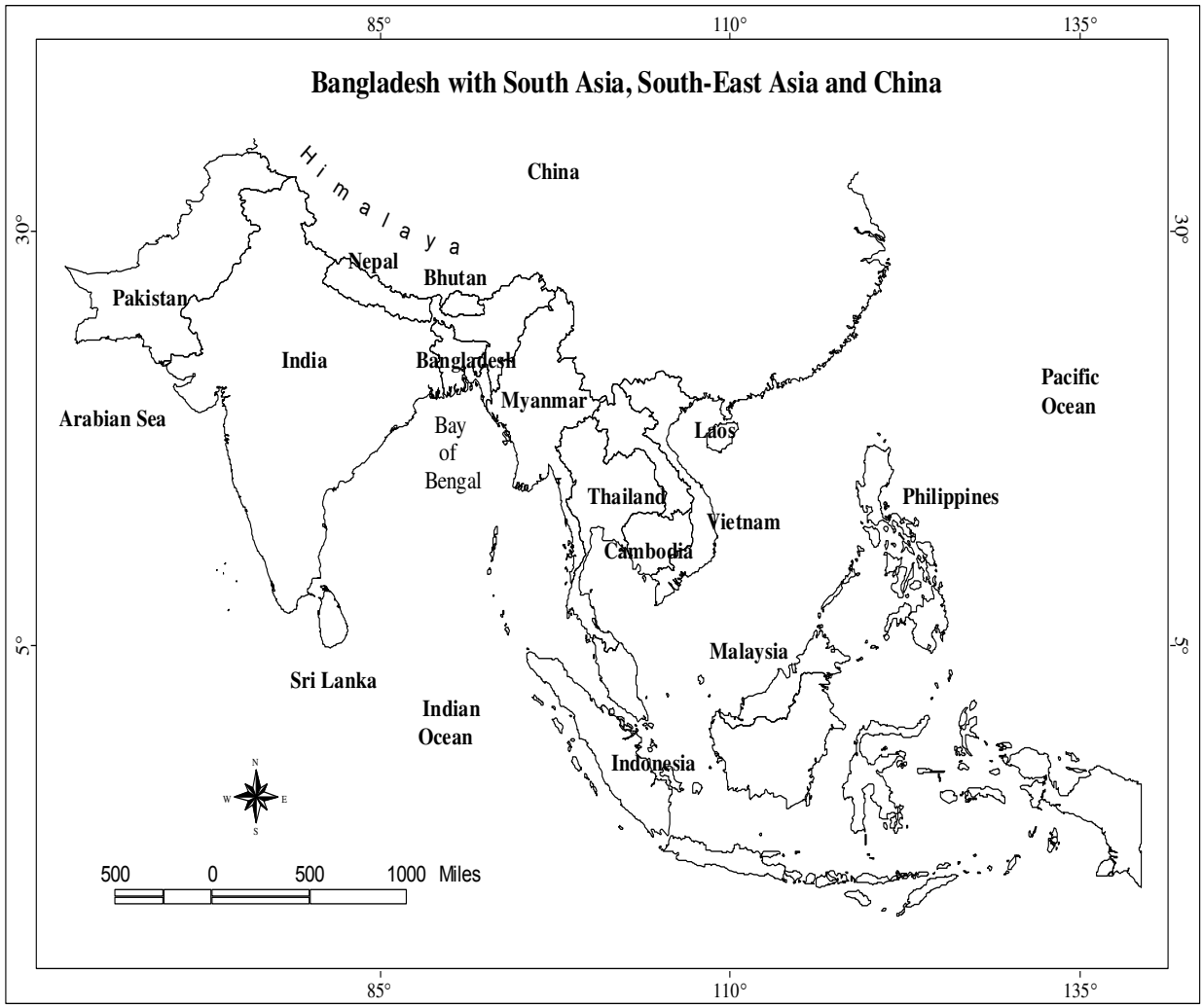
Abstract: Bangladesh is a land of rich agricultural heritage stretching back to the Palaeolithic (Chakrabarty 1992, Ahsan 2007). It has been a long-held, unquestioned assumption amongst Bangladeshi archaeologists that archaeobotanical remains cannot survive due to the tropical environmental condition found in Bangladesh and therefore no archaeobotanical research has been untaken to date. However, we wish to challenge this idea and suggest that it is possible to collect process and identify archaeobotanical samples in various archaeological contexts in Bangladesh. To support this thesis rice (*Oryza sativa* L), millet, pulses, cotton and mustard seeds from archaeological sites Wari-Bateshwar and Vikrampura have recently been recovered. The Department of Archaeology, Jahangirnagar University has initiated a preliminary collaboration with University College London, Institute of Archaeology, to begin systematic archaeobotanical research in Bangladesh. Preliminary results from this international joint venture suggest that collecting and carrying out flotation for the collection of archaeobotanical remains is worthwhile, even under tropical conditions, and can potentially shed new insights into the spread and domestication of crops, past agricultural strategies used, exploitation of wild resources and reconstruction of the natural and altered environment in Bangladesh.

Introduction:

Bangladesh, located in south Asia (**Map 24.1**), is covered by deep Holocene sediments with human habitation starting from the lower Pleistocene c. 3500 BP (Chakrabarti 1992; Ahsan 2007; Sharma 1991). Archaeologists have assumed that the Anathyan prehistoric culture spread here from Tripura, Assam and Myanmar (Chakrabarti 2007; Roy and Ahsan 2000). The landscape of Bangladesh has three distinct categories which made it suitable for early human habitation (See **Map 24.3**). Prehistoric to early modern (British Colonial period) sites have been discovered all over Bangladesh. Wari-Bateshwar and Mahasthangarh were the main urban centres during the Early-Historic period (500 BC-100 BC). Preliminary observations prove that the early inhabitants of these regions were agricultural sedentary societies. Archaeological research has been conducted here since the late 19th century (Salles & Alam 2001). However, archaeobotanical data collection and analysis have not yet been systematically employed. Therefore, the present author has taken the initiative to conduct archaeobotanical research in

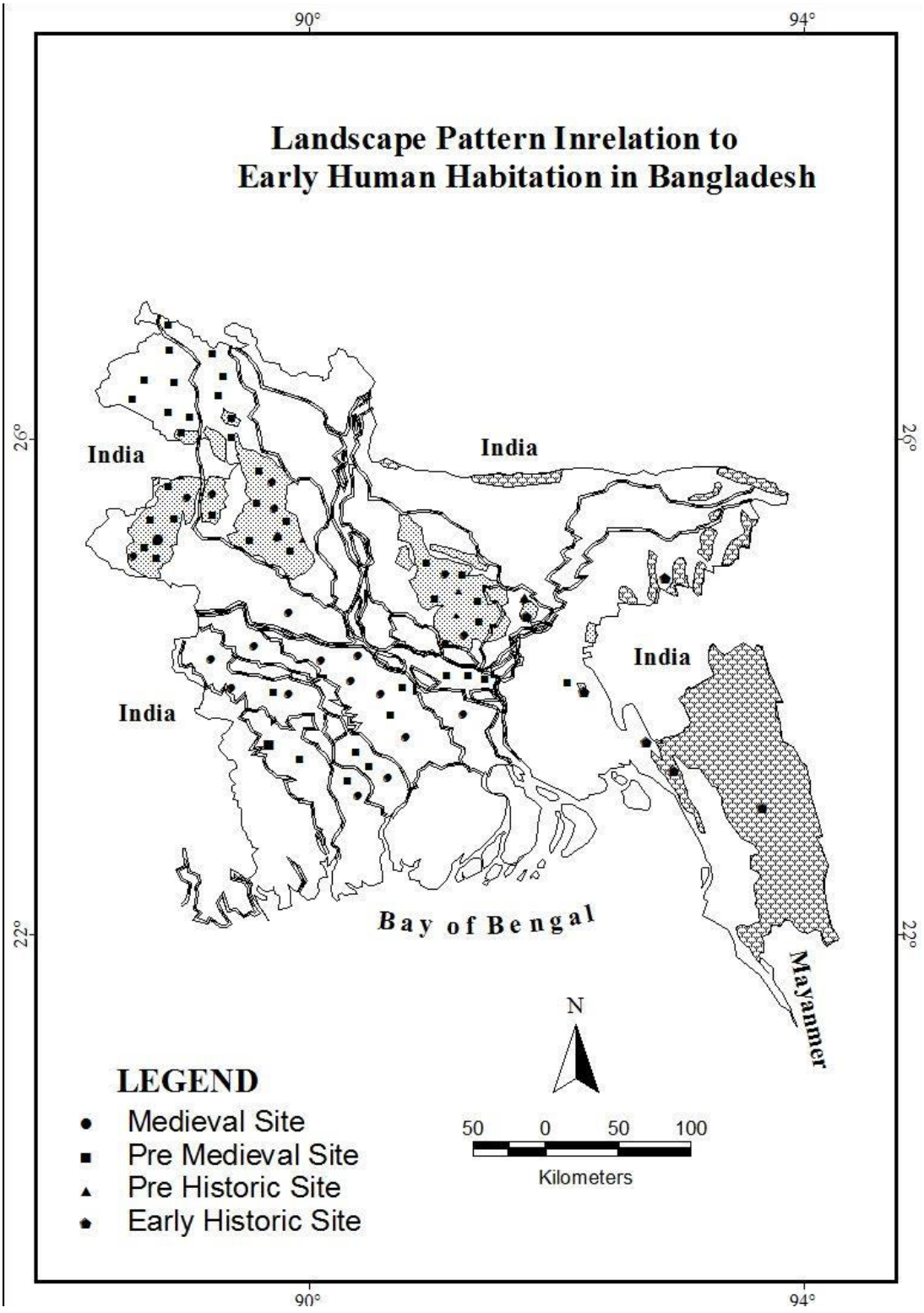
Bangladesh in collaboration with Dorian Q Fuller, Professor of Archaeobotany, Institute of Archaeology, University College London.



Map 24.1: Bangladesh along with South Asia, South East Asia and South West China.

Geographical Location:

Bangladesh is a low-lying, reverine country located between 20º 34′ to 26º 41′ north and 92º 41′ to 88º 02′ east with a large marshy jungle (710 skm) on the northern littoral of the Bay of Bengal. Formed by a delta plain at the confluence of the Ganga, Brahmaputra and Meghna rivers and their tributaries. Bangladesh's alluvial soils are highly fertile. Bangladesh is bordered on the west, north, and east by a 4,095-kilometer land frontier with India and, in the southeast, by a short land and water frontier (193 km) with Burma (Myanmar). On the south is a highly irregular deltaic coastline of about 580 kilometres, fissured by many rivers and streams flowing into the Bay of Bengal (See **Map 24.1**).



Map 24.2: Physiography of Bangladesh.

Landscape pattern in relation to early human habitation:

In broad term, there are three main physiographic features (**Map 24.2**) in Bangladesh (Morgan and Mcintire 1959).

- Tertiary hills in the northern and eastern part of the country.
- Pleistocene upland of Lalmai hills, Madhupur and Barind tract in the east, central and northern part of Bangladesh.
- Recent alluvium underlying the floodplain and estuarine areas which occupy the remainder of the country. Roughly 80% of the landmass is made up of fertile alluvial lowland (flood plain) called the Gangetic plain.

The Delta:

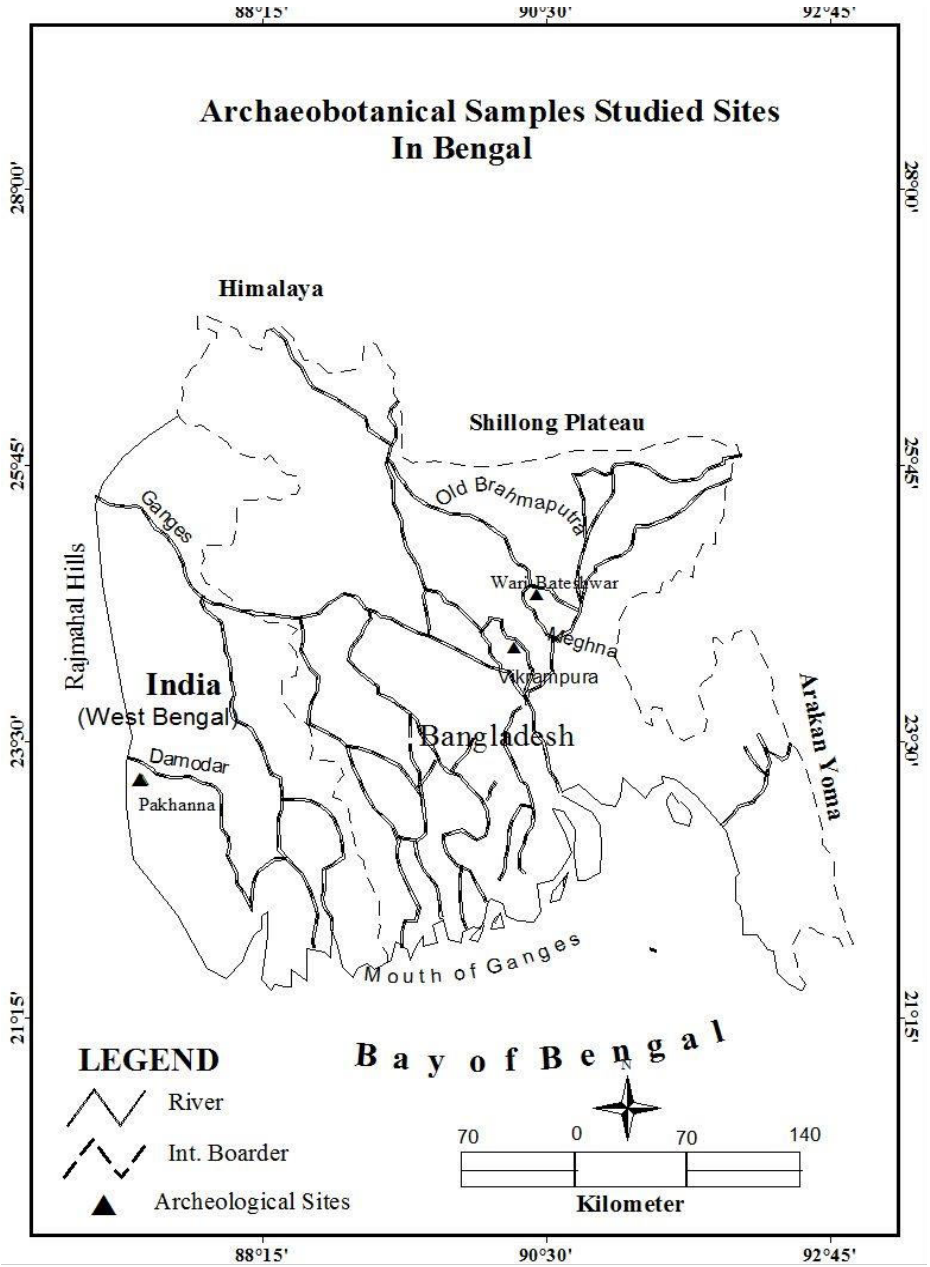
Bangladesh is the largest delta in the world. The delta formation processes are active in the southern part of the country. In terms of geological history, Bangladesh is a part of the Bengal Basin a natural unit of land mass which originated from complex tectonic activities and now covers the whole of Bangladesh and West Bengal in India. This Basin is bound by the Chhotonagpur Plateau, the Rajmahal hills and the plains of the Ganges system in the west, the relatively young Himalayan range in the north, the Meghalaya Plateau in the north-east, the much younger outliers of the Arakan Yomas in the east and the Bay of Bengal in the south (Rashid 2007). The three sides of the Bengal Basin were high and for this reason, water with large amounts of sediment passed through this land and formed the largest delta.

The tertiary hills and Pleistocene uplands were flood-free. Therefore, it was a habitable environment for humans in the past. Most archaeological sites in Bangladesh were discovered in these areas (**Map 24.3**). All prehistoric and Early-Historic sites were found in the tertiary and Pleistocene lateritic terrace of Lalmai hill region in Comilla districts and the uplands of Narsingdi, Sylhet, Habiganj, Rangamati and Chittagong districts. Most of the pre-mediaeval, mediaeval and colonial sites have been found in the flood plain landscape. It is assumed that the ancient people of this region had the foresight to choose the flood-free lands near the rivers and *beels* (Large water body) for their permanent settlements. They used the nearby alluvial plains for possible crop cultivation. Research at Mahasthangarh shows that the Pleistocene sediment is very favourable for agriculture (Salles 1998). This is likely a conscious selection to avoid natural disaster like floods and collecting available natural resources such as food, and wood fuel.

Archaeological heritage of Bangladesh:

Bangladesh is blessed with a rich archaeological heritage stretching back to prehistory. The early people preferred to form their settlements on this fertile land. Six prehistoric contexts

have been discovered in Bangladesh at Lalmai hill (Chakrabarti 1992) Wari-Bateshwar (Pathan 1989), Chaklapungi (Roy and Ahsan 2000), Chagalnaiya, Rangamati and Sitakundo (Ahsan 2007). Lalmai hills, Wari-Bateshwar, and Chaklapungi have been very influential for studying archaeobotanical remains. It is assumed that the prehistoric people began using agriculture in the Wari-Bateshwar region of Bangladesh. Wari-Bateshwar is an archaeological site with Prehistoric, Chalcolithic (C.1600 BC) and Early-Historic (525-450 cal BC) settlement.



Map 24.3: Landscape Pattern and Early Human Habitation in Bangladesh.

Mahasthangarh (C.325 BC) is another Early-Historic archaeological site located in northern Bangladesh. The site is positioned in the Barind tract (Pleistocene lateritic upland) in the valley of the Karatoya river and 133 sites have been found in this area (Rahman 2000a).

Wari-Bateshwar and Mahasthangarh are situated in relatively elevated and flood-free lands. It is assumed that, the *bydes* (naturally formed low land) were possibly used for agricultural purposes. Observations show that ancient settlement developed in those *chalas* (naturally formed high land) which were located beside any river or *beel*. Of the 133 sites in Mahasthangarh, 72 were located beside the Karatoya and Samrai *beel* while 59 were located beside ponds (Rahman 2000a). Of the 48 sites of Wari-Bateshwar, 36 were located beside Arial Kha, Gangajoli and Koyra river while 11 others were beside different *beels* (Rahman 2007b).

The Department of Archaeology, Government of the Peoples Republic of Bangladesh lists 447 archaeological sites in Bangladesh (Alam 2008) based only on structural remains (Monastary, Vihara, Temple, Mosque, Tomb etc) rather than habitation sites (Household/domestic areas) (Chakrabarti 1992). The real scenario is very different from the above mentioned list. It is estimated that more than five thousand archaeological sites belong to the Bengal delta and beyond (Rahman 2001 & 2007; Zakaria 2008).

Besides prehistoric, Chalcolithic and Early-Historic sites, Bangladesh has Pre-medieval and Medieval vihara (Buddhist architecture) temple, mosque, tomb, madrasa, pond, tank, etc.

Over the past few decades archaeobotanical research has largely been ignored in Bangladesh. The present author has shown keen interest in pursuing new research in environmental archaeology, specifically Archaeobotany, palaeoecology and landscape archaeology and implementing a new collection programme.

Archaeobotanical Collection:

In 2009 it was decided to collect archaeobotanical remains from the archaeological site of Wari-Bateshwar, situated in the central part of the country (**Map 24.4**). We had no previous experience of collecting archaeobotanical samples from archaeological sites. We used a protocol on the procedure of collecting archaeobotanical remains developed by Prof. Dorian Fuller, given to us by Prof. Sufi Mostafizur Rahman, Department of Archaeology, Jahangirnagar University. Due to the unavailability of a flotation machine archaeobotanical remains were collected by wet sieving. The size of the mesh used was 2 cm, 1 cm, 250 micron and 500 micron. In 2013, 50 samples were processed for ancient plant remains using this wet sieving method from the site of Vikrampura.

Table 24.1: List of Major Archaeological sites of Bangladesh:

Site Name	Historical Phase	Time	Important Discovery	Nature of the site
Chaklapungi (Roy et al. 2001)	Prehistoric	c. 35000 BP	Prehistoric tools	Habitation.
Mainamati (Rashid 1968)	Prehistoric & Pre-mediaeval	c. 35000 BP & 700 -1200 AD.	Prehistoric tools and Vihara	Habitation and monastery
Wari-Bateshwar (Pathan 1989)	Prehistoric, chalcolithic and early historic	c. 2000 (?) BC-100 AD.	Fort city, Unique Brick Structure, Pit-dwelling, ancient road	Habitation
Mahasthan (Ahmed 1979, 1981)	Early-historic, pre-mediaeval, and mediaeval	c. 326 BC-1500 AD	Fort city, punch marked coin, inscription, terracotta, etc.	Habitation and Monastery
Kotalipada (Rahman et al. 2013)	Pre-mediaeval	c. 500 AD	Embankment, Inscription & Coin	Habitation
Vorot-Vaina (Zakaria 2008)	Pre-mediaeval	c. 500 AD	Temple	Monastery
Vikrampura (Rahman et al. 2013)	Pre-mediaeval	c. 700-1200 AD	Vihara, Stupa and temple	Monastery
Paharpur (Dikshit 1938)	Pre-mediaeval	c. 900 AD	Vihara	Monastery
Vat Vita (Zakaria 2008)	Early Historic (?)	c. Before Christ (?)	Potsherds, Brick structure	Habitation
Vijaynagar (Rahman 2014)	Early historic (?), Pre-mediaeval	c. 500 BC (?), 1100 AD	Potsherds, Beads, Stone, Sculpture etc.	Habitation
Shat Gambud Mosque (Zakaria 2008)	Medieval	c.1500 AD	Mosque	Monastery
Jaintiapur (Ahmed et al. 2000)	Megalithic	Unknown	Stone	Burial

Data recovered from sites:

The sieved macrobotanical remains are still in the process of being identified but preliminary reports are listed below (see **Table 24.1**). There was recovered archaeobotanical material from both Wari-Bateshwar and Vikrampura, recovered from wet-sieving (**Plate 24.1**). Based upon preliminary visual inspection there is an abundance of charcoal from Wari-Bateshwar and Vikrampura. During archaeological excavation, timber (**Plate 24.2**) and betel-nut from Vikrampura was recovered. Tree bark, rice husk encased in the fabric of potsherds and bricks (**Plate 24.3**), and coconut husks were recovered. This is the first time in Bangladesh that archaeobotanical recovery has been attempted.

Plate 24.1: Wet Sieving.

Plate 24.2: Timber Sculpture from Vikrampura (C. 900-1200).

Challenges:

Bangladesh is the eastern most country of South Asia. It has a tropical monsoon characterized by heavy seasonal rainfall, high temperatures, and humidity (Rashid 1991). The state of preservation of archaeobotanical plant remains varies based upon different environmental conditions. Renfrew (1973) recognized three different survival conditions of ancient plant material: carbonization, water logging and desiccation. Temperate climates and waterlogged conditions preserve archaeobotanical material better than tropical humid environments. Castillo (2013) described several sites in Southeast Asia (Angono, Rockshelter, Bagumbayan, Dimolit, Panay Island, Gua Cha, Satingpra) where flotation was employed but did not yield any results. There are several reasons for this lack of success including poor

preservation of organic material in tropical environments due to factors such as extreme humidity, exposure to weathering, erosion and bioturbation.

Table 24.2: Showing nature of recently discovered archaeobotanical remains from Bangladesh:

Archaeobotanical Remains	**Wari-Bateshwar (c. 500 BC-100 AD)**		**Vikrampura (c. 700-1200 AD)**	
	Presence	**Absence**	**Presence**	**Absence**
Oryza Sativa L.	×	-	×	-
Oryza spikelet bases immature	×	-	×	-
Oryza spikelet bases wild	×	-	×	-
Gossypium arborium	×	-	×	-
Gossypium arborium funicular cap	×	-	×	-
Brachiaria ramosa	×	-	×	-
Setaria italica	×	-	×	-
Paspalum sp. (wild)	×	-	-	×
Pennisetum glaucum	×	-	-	×
cf. sorghum frag.	×	-	-	×
Oat/ Avena sativa	-	×	×	-
Vigna cf. mungo (cotyledon)	×	-	×	-
Vigna trilobata (cotyledon)	×	-	×	-
Lathyrus sativus (whole)	×	-	×	-
Lens culinaris (cotyledon)	×	-	×	-
Lens orientalis (wild)	×	-	×	-
Vicia faba (whole)	×	-	×	-
Barly rachis with spikelet	×	-	-	×
Sesamum indicum	×	-	×	-
sisymbrium altissimum	×	-	×	-
Sisymbrium officinale (L) scop.cf	-	×	×	-
Brassica cf. juncea	×	-	-	×
Timber	-	×	×	-
Betel-nut	-	×	×	-
Coconut husk	×	-	-	×

Though temperate humid weather can cause problems for preservation they are not impossible to overcome. Recovery of macro-remains at Khao Sam Kaeo in tropical southern Thailand suggests that they are often present but in much lower density than encountered in drier or more temperate environments; this means that more archaeological sediments need to be processed making it more difficult and time-consuming but not insurmountable. Because of these limitations in macrobotanical remains sampling, other environmental material such as palynology, phytolith, diatom analysis, and starch analysis could be used (Castillo & Fuller 2010) and may prove more relevant to the analysis of the area.

Another challenge for Bangladesh Archaeobotany is limited access to and lack of available local funds for research. Domestic donor agencies like University authority, University grant commission (UGC), Ministry of Culture and Ministry of Science and Technology of the government of the Peoples Republic of Bangladesh allocate small grants. However, the lacks of political stability and bureaucratic complexity has hindered funding innovative research in Bangladesh.

Logistical and technological difficulties are also real limitations to archaeobotanical research in Bangladesh. Currently there is no expert in archaeobotany in Bangladesh. So foreign assistance is needed, in terms of technology, expertise, and training, to develop this field of research. The department of Archaeology, Jahangirnagar University would appreciate future support in these areas. The construction of the Wazed Mia Science Research Centre of Jahangirnagar University has provided new hope on this issue and hopefully the newly created archaeobotanical laboratory is expected to be fully functional within the year.

The surviving plant remains in the archaeological sites of Bangladesh:

Thus, based upon these initial preliminary results there is a strong probability of getting archaeobotanical remains from other archaeological sites in Bangladesh. Ancient plant remains have already been found from Wari-Bateshwar and Vikrampura in Bangladesh by the author (**Table 24.1, Plate 24.4**). In addition, rice grains have been found at Mahisdal, Pandurajardhibi (Dasgupta 1964), Bharatpur (Datta 1990), Mangalkot (Ray and Mukherjee 1993), Tamluk, Dihar and Pakhanna (Ghosh et al. 2005) in West Bengal, India, mainly in the form of husks encased in the cores of potsherds (Datta 2005). At Mahisdal, (Ghosh 1984) excavated two pits containing huge quantities of carbonized rice grains (each 1.28 m in diameter and 1.25 m deep, with volumes of 1.6 cubic meters, sufficient to store 900 kg of rice paddy). Moreover diverse plant remains recovered from an archaeological site in the Bhairabdanga area of Pakhanna (**Map 24.4**), of Chalcolithic-Early-Historic periods situated on the west bank of the Damodar river, Bankura district, West Bengal, India, include food grains, wood charcoal, and palynomorphs. The food grains were identified as *Oryza sativa* L. and *Vigna mungo* L, and seeds of *Brassica* cf. *campestris* L. were also found. These indicate the agricultural practice and food habits of the ancient people living at Pakhanna (Ghosh et.al. 2006).

Plate 24.3: Rice husk encased in tiles.

Plate 24.4: Charred Plant remains floating in the bulk

Table 24.3: Showing comparative feature of archaeobotanical remains discovered from Bangladesh and West Bengal, India:

Archaeobotanical Remains	Bangladesh						West Bengal, India							
	W-B		VP		MH		MD		Pak		Mk		PD	
	P	A	P	A	P	A	P	A	P	A	P	A	P	A
Oryza Sativa L	×		×		×		×		×		×		×	
Vigna Mungo L	×		×			×		×	×			×		×
Oryza spikelet bases	×		×			×		×	×			×		×
Brassica cf. campestris L.		×		×		×		×	×			×		×
Sesamum indicum	×		×			×		×		×		×		×
Vigna trilobata	×		×			×		×		×		×		×
Lathyrus sativus	×		×			×		×		×		×		×
Gossypium arborium	×		×			×		×		×		×		×
Pennisetum glaucum	×			×		×		×		×		×		×

WB = Wari-Bateshwar; **VP** = Vikrampura; **MD** = Mahisdal; **MH** = Mahasthangarh
PD = Pandurajardhibi; **Pak** = Pakahanna; **Mk** = Mongolkot; **P** = Present; **A** = Absent

A rich array of plant remains have been found in Neolithic and Chalcolithic archaeological sites in the Ganga valley in Central India (Sharma et al. 1980; Sharma 1983; Sharma 1980, 1985; Savitthri 1976; Dixit 1987; Visnu-Mittre 1961, 1972; Visnu-Mittre et al. 1984, 1986; Kajale 1975, 1977, 1979). However, archaeobotanical data from West Bengal and Bangladesh, situated in the eastern part of the Ganga valley (Lower Ganga valley), are still scanty.

The geography and environment of Bangladesh and West Bengal of India are very similar. The climate in West Bengal is generally of tropical monsoon type, with most rainfall from June to September and relative humidity is generally very high through the year (Datta 2005). Like Pakhanna, Wari-Bateshwar is also a Prehistoric-Chalcolithic to Early Historic archaeological site and situated in a Pleistocene lateritic landscape. Similarly, the site of Mahasthangarh experienced early human habitation from Early-Historic to Mediaeval period a Pleistocene landscape. A *Brahmi* Inscription in Mauryan characters dated to the 3rd century B.C have been discovered from Mahasthangarh (Sircar 1965, Bhandarkar 1965) which states "distribute to food grains during the food shortage and after overcome the situation next year they (Inhabitant) will return food in treasury when crop will grow well" (Salles & Alam 2001).

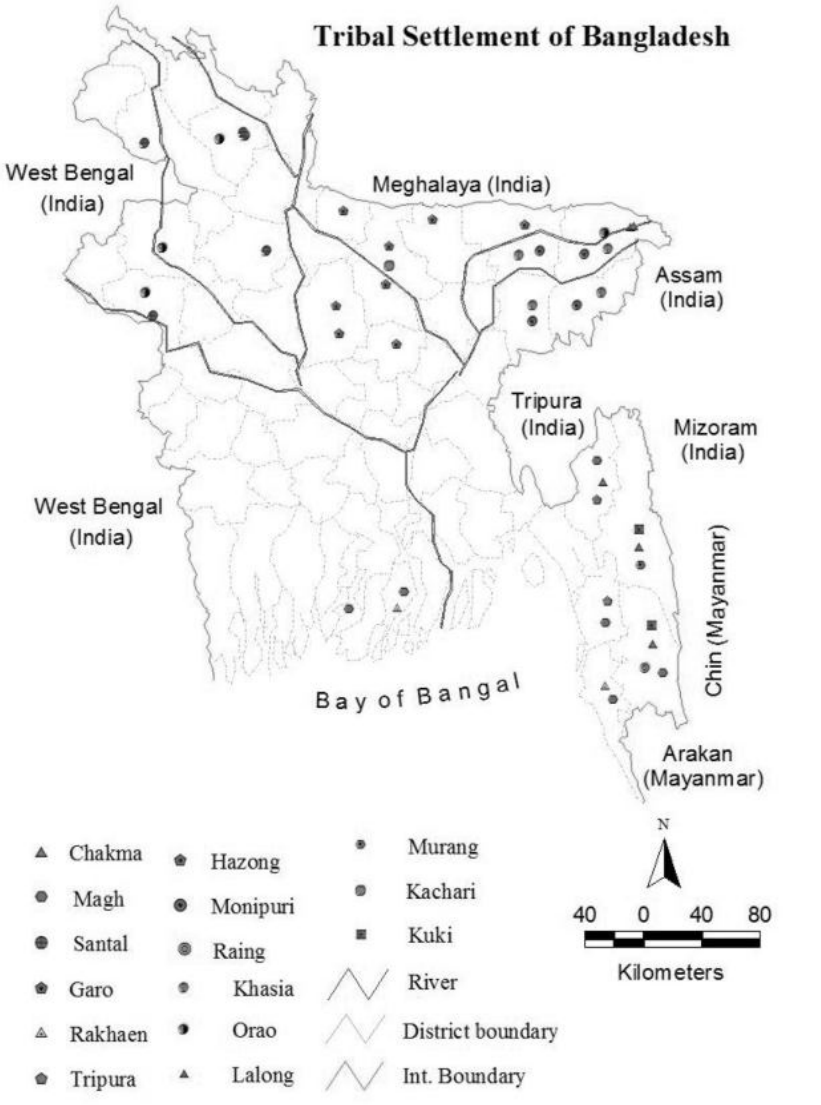
On the other hand,Mahasthan and Wari-Bateshwar were trade centres. Mahasthan was an important centre on the route from the Himalaya to the Indian Ocean. There is also evidence about the Bengal area being in close relation with China in the early centuries A.D (Salles & Alam 2001) and commercial exchanges between Bengal and Tibet, Assam, Burma and China attested to by early Sanskrit sources (Gupta 1991). Greek historian Herodotus described that the finest cotton Muslin produced Eastern India around 5th century BC (Kennedy 1898). Bangladesh is part of Eastern India and Most probably the finest cotton of the world "Muslin" was produced in Wari-Bateshwar during that time (Rahman & Pathan 2013). Wari-Bateshwar and Mahasthan also had commercial relations with South-East Asia, China and the Mediterranean region (Basa & Rahman 1998; Rahman 2000b, 2001). The earliest coins of circa 6th century BC in the subcontinent with from an earthen coin hoard have been discovered in the region. Weights of different sizes made of semi-precious stone and terracotta have also been found. Based upon archaeological evidence ancient Bengal had a great deal of connections between different countries of the world. It is possible that to migration of ancient plant remains have also occurring at different species of this time.

In addition proponents of the Austric-farming-dispersal hypothesis. (Bellwood 1996; Higham 2002) have often assumed that rice farming spread Yunnan through Assam and into the Ganges. Others suggest that indica rice came from Southwest China (i.e. Yunnan), perhaps amongst early Australoasiatic speakers (Sagart 2008) or perhaps that north-eastern India will eventually prove to be a rice domestication area and/or a staging post in the spread or rice from China to India (Van Driem 2011a,b). In the routes of the spread of rice discussed above Bangladesh is the middle, located adjacent to Assam as well as the lower Gangetic valley.

Naturally, the land of Bangladesh is highly fertile and it is easy cultivate crops especially rice, oil plants, mung bean, jute and cotton. Geographically, Bangladesh is a part of the Ganga Basin in the Himalayan foreland and forms the world's largest delta of alluvium sedimentation, supporting over 200 million people. All these aspects taken together could help to establish the presence of archaeobotanical remains from archaeological sites of Bangladesh.

Feasibility of recovering Archaeobotanical data:

The collection of archaeobotanical data from different archaeological sites of Bangladesh will be easy accessible. Three months (e.g. November-January) of the winter session are suitable to complete field work. They are not affected by either hot weather or rainy season. The There are some skilled local workers who are experienced in excavation work. In addition every year excavation is takes place at Mahasthan, Wari-Bateshwar and Vikrampura. Collecting samples and flotation will be attempted to recover ancient plant remains from any Prehistoric sites of the country. The undergraduate students of the department of archaeology, Jahangirnagar University



Map 24.4: Tribal settlement.

can participate in this regard and they will have a chance to enhance their field skills and improve practical archaeological knowledge.

There is a lot of opportunity to access ethnobotanical data from different parts of the country. The Indigenous/tribal peoples live (Chakma, Marma, Mog, Murong, Santal, etc.) in the eastern and south-eastern hilly region of the country. Some ethnic communities (Santal & Rakhain, Orao, etc.) live in the plane land of Northern and North-Eastern part of the country. They have modified practices the indigenous system of agricultural cultivation. On the other hand, the rural people of Bangladesh do not use modern cultivation system. Some farmers depend upon the natural system of production (irrigation, fertility, seed production, preservation, plough land). They use the plough with a cow instead of a tractor. They also have some indigenous techniques to preserve seeds. It has been observed that different techniques vary by different places. The system of seed preservation of the hilly region is different to the lower deltaic region. Also, different communities have different cultivation system & beliefs. All these factors influence the rice cultivation culture of the lower Ganges delta.

Conclusion:

From ancient to present times Bangladesh continues to be an agrarian based country with many different agricultural system and crops. The geographical location, geological settings, weather and climate are favourable for rice and other tropical crops cultivation. The lower Ganga plain deposit also provides one of the most significant continental records for understanding the interplay of climate and human interaction in the past. Bangladesh is blessed with a rich archaeological heritage. However, archaeobotanical research and collection in the field has to date been limited. However, preliminary archaeobotanical collection and analysis has shown that there is high probability for the presence of ancient plant remains from the archaeological sites of Bangladesh. It is hoped that future archaeobotanical material will shed new insight into such issues as the spread of domesticates, the origins of Jute, rice cultivation and trade with South-east Asia, China and Mediterranean. Department of Archaeology, Jahangirnagar University has taken initiative to carry out archaeobotanical research vis-a-vis ongoing archaeological sample collection and demonstrate that archaeobotanical research in Bangladesh holds great potential for understanding the archaeological and environmental past of the region.

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