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Early agricultural economy in north-eastern Vindhyas: An archaeological perspective

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ABSTRACT

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The present article seeks to highlight an overall synthesis of information on the pre- and proto-historic agriculture based subsistence economy, in north-eastern Vindhyas. The vast area stretching over the plateau region and alluvial tract in adjacent plain, envelope a large number of early settlements, which reveal the gradually evolving sequences of farming communities from primitive metal-free stages of Neolithic Cultures up to the advanced Iron using Cultures. Excavations at Koldihwa, Mahagara, Malhar in Vindhyan region and Lahuradewa in Ganga Plain have revealed the beginning of agriculture evidenced by a domesticated form of rice (*Oryza sativa*) during 7th-6th millennia BC. The diverse crop assemblage, includes remains of Near-Eastern, African, Eurasian, Central Asian and Indigenous crops. Collective evidence shows that the double cropping system was followed in the summer and winter seasons during 2200-700 BC. In view of the fully established agricultural system in the region of north-eastern Vindhyas, the cultural relationships of the farming communities has been established with altogether diverse cultures in the distant north-western regions. However, the complex process of the dispersal of winter crops in terms of diffusionary trends is not fully demonstrable in the present state of archaeological knowledge. Future archaeobotanical studies in this region is expected to fill-up gaps in time and space of exploitation of crop plants.

Key-words—Early agriculture, Archaeobotany, Vindhyan region, Belan River Valley.

उत्तर-पूर्वी विंध्य में प्रारंभिक कृषि अर्थव्यवस्था : एक पुरातात्विक परिदृश्य

अनिल के. पोखरिया

सारांश

वर्तमान लेख उत्तर-पूर्वी विंध्य में पूर्व एवं आद्य ऐतिहासिक कृषि आधारित जीविका अर्थव्यवस्था के एक समग्र संयोजन की विशिष्टता का अन्वेषण करता है। पठार प्रदेश तथा जलोढ़ प्रदेश के नजदीक में फैला हुआ विस्तृत मैदानी क्षेत्र, प्रारंभिक व्यवस्था के बड़ी संख्या में आवरण जो कि खेतीहर संप्रदाय के धीमे विस्तार हो रहे अनुक्रमों के नवपाषाणी संस्कृति की आदिम धातु-रहित अवस्थाओं से विकसित लौह प्रयोग संस्कृति को व्यक्त करता है। विंध्य प्रदेश में कोल्डीहवा, महागड़ा, मल्हर तथा गंगा के मैदान में लहुरादेवा के उत्खननों से 7वीं-6वीं शताब्दी पूर्व के दौरान चावल (औराइज़ा सैटाइवा) के रुप में गृहकृषि द्वारा खेती शुरु करने के प्रमाण मिले हैं। विविध फसल समुच्चय, पूर्व-समीप, अफ्रीकी, यूरेशीय, मध्य एशिया एवं देशी फसलों के अवशेषों को सन्निहित करके हैं। सामूहिक साक्ष्य दर्शाते हैं कि 2200-700 ईसा पूर्व के दौरान शीत एवं ग्रीष्म ऋतुओं में दुहरी फसल प्रणाली अपनाई गई। उत्तर-पूर्व विंध्य प्रदेश में पूर्णतः स्थापित कृषि प्रणाली के मद्देनजर, दूरस्थ उत्तर-पश्चिम प्रदेशों में कुल मिलाकर विविध संस्कृतियों सहित खेतीहर संप्रदायों की साँस्कृतिक संबंधता स्थापित की गई है। फिर भी, शीत-ऋतु फसलों का परिक्षेपण विसरणी रुख के सिलसिले में जटिल प्रक्रम पुरातात्विक ज्ञान की वर्तमान स्थिति में पूर्णरुपेण प्रदर्शनीय नहीं है। इस क्षेत्र में भावी पुरातात्विक वनस्पतिक अध्ययनों से तत्तकालीन काल-क्षेत्र की फसलों के दोहन संबंधी जानकारी के अंतर को भरने की आशा की जाती है।

संकेत-शब्द—प्रारंभिक कृषि, पुरातनवनस्पतिविज्ञान, विंध्य प्रदेश, बेलन नदी घाटी।

INTRODUCTION

INVESTIGATING agricultural systems of past human societies is one of the central questions in archaeobotany (Harvey & Fuller, 2005). It depends on macroscopic plant remains coming into contact with fire so that they are preserved by means of charring. This can occur in a number of ways (Hillman, 1981): (i) during drying or parching of the crop product; (ii) accidental burning during cooking or the destruction of a house by fire; (iii) use of crop waste as fuel and incorporation of waste into dung used as fuel; (iv) burning of diseased crop. Archaeobotanical investigation in Vindhyan region and Ganga Valley is much recent, systematically starting in the beginning of 1980's. Earlier, archaeologists used to send a few incidentally recovered plant remains, generally much small in quantity and collected unsystematically, to botanists for identification. The development in the region of Vindhyas and elsewhere, to a large extent during last two decades, has been due to some archaeologists, who realized the importance of botanical remains in shaping economic potential of cultural settlements. Credit goes to the scholars of the AIH, Culture and Archaeology Departments of Allahabad University, Allahabad and Banaras Hindu University, Varanasi and the State Archaeology Department of Uttar Pradesh, Lucknow. As a result, the data contributed towards understanding the ways in which pre- and proto-historic people of the region, may have exploited useful plants in their environment and reconstruction of agricultural economy.

The present information on plant remains has been synthesized from selected cultural settlements in diverse locations (Fig. 1), excavated to ascertain the varied phases of Neolithic, Chalcolithic and Iron Age Cultures in the region, from about 6500-700 BC. The data on the origin of agriculture are still insufficient. Thus, it is difficult to establish, when the agriculture actually started, and how the diffusion of Harappan crops took place to a far distant Vindhyan region. Future research in the region is expected to fill-in gaps in time and space.

CULTURE vs PLANT REMAINS

Neolithic-the beginning of agriculture

Vindhyan Neolithic is characterized by sedentism, characteristic pottery, rounded polished stone objects, bone tools, chert blades, scrappers, and an economy based on domesticated cattle and rice agriculture (Pandey, 1988; Allchin & Allchin, 1997; Mandal, 1997). Most of the Neolithic sites in India that were initially regarded to represent the transition from the stage of food-gathering and hunting to that of incipient agriculture, have subsequently proved to represent relatively

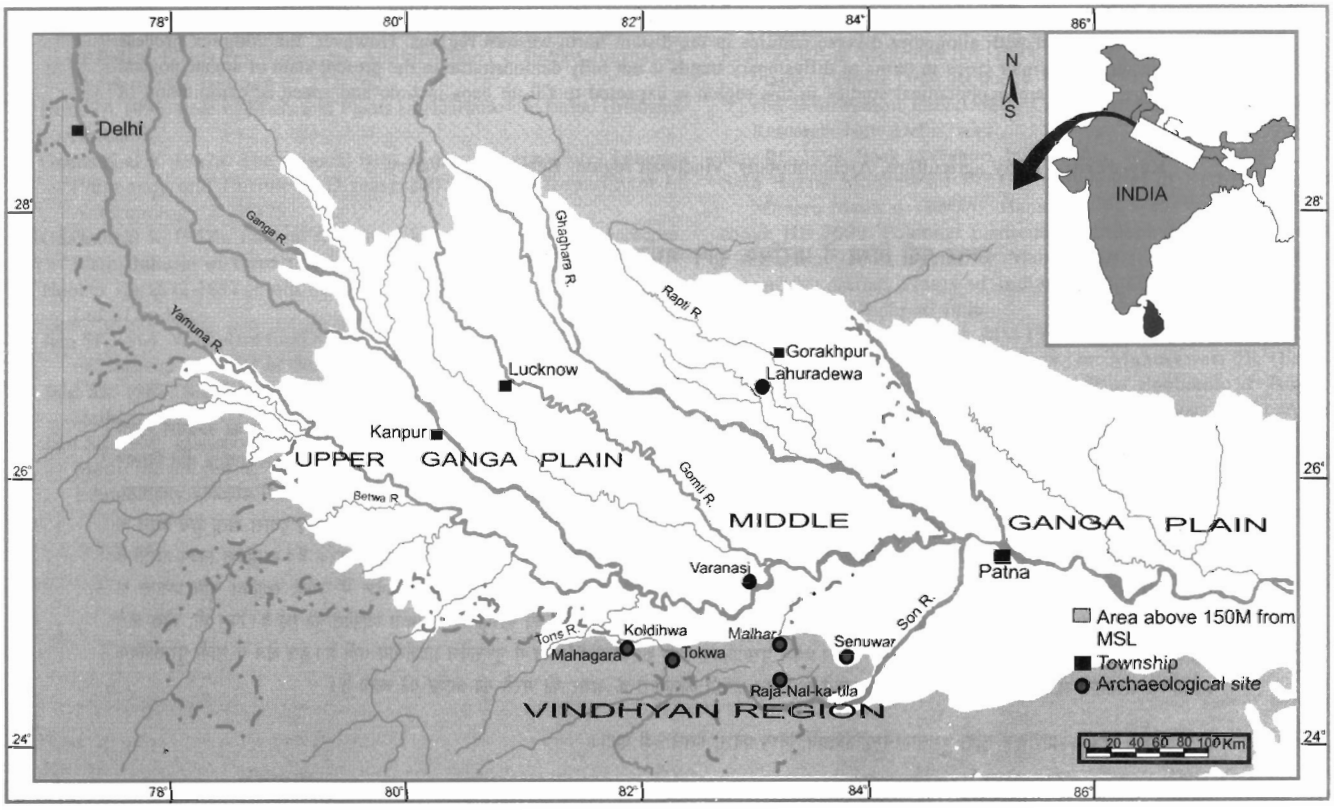

Fig. 1—Map showing archaeological sites discussed in the text (modified after Tewari, 2004).

Taxa	Koldihwa (6500-1500 BC)	Mahagara (2200-1800 BC)	Tokwa (7^{th}-2^{nd} millennium BC ?)	Senuwar (2200-700/ 600 BC)	Malhar (1900-800 BC)	Raja-Nal-Ka-Tila (1600-700 BC)
Oryza sativa L. (Cultivated rice)	N	N	N, C	N, NC, C	PI, EI	PI, EI
Hordeum vulgare L. emend. Bowden (Hulled barley)		N	N, C	N, NC, C	PI, EI	PI, EI
Triticum aestivum L. emend. Thell. (Bread wheat)			N, C	NC, C	PI, EI	PI, EI
Triticum sphaerococcum Perc. (Dwarf wheat)			N	N, NC, C	PI, EI	PI, EI
Sorghum bicolor (L.) Moench (Jowar millet)				N, NC, C	EI	EI
Eleusine coracana (L.) Gaertn. (Ragi millet)				N	EI	PI, EI
Setaria italica (L.) P. Beauv. (Italian millet)					PI	PI
Paspalum scrobiculatum L. (Kodon millet)				NC	EI	EI
Panicum cf. *miliaceum* L. (Panic millet)						PI, EI
Lens culinaris Medik. (Lentil)		N	N, C	N, NC, C	PI, EI	PI, EI
Pisum arvense (L.) Poir (Field pea)			N, C	N, NC, C	PI, EI	PI, EI
Lathyrus sativus L. (Grass pea)		N	C	N, NC, C	PI, EI	PI, EI
Cicer arietinum L. (Chick pea)				NC, C		EI
Macrotyloma uniflorum (Lam.) Verdcourt (Horse gram)			C	NC, C	EI	EI
Vigna radiata (L.) Wilczek (Green gram)		N	N, C	NC, C	PI, EI	PI, EI
Vigna mungo (L.) Hepper (Black gram)		N				
Vigna unguiculata (L.) Walp. (Cow pea)						EI
Vigna aconitifolia (Jacq.) Marechal (Moth bean)				C		EI
Cajanus cajan L. (Pigeon pea)		N				
Linum usitatissimum L. (Linseed)			N	C		EI
Brassica juncea L. Czern. & Coss (Field brassica)			N	C		EI
Carthamus tinctorius L. (Safflower)				C		EI
Sesamum indicum L. (Sesame)				C	EI	EI
Ricinus communis L. (Castor)				C		
Allium cepa L. (Onion)						EI
Citrullus lanatus (Thunb.) matsumiura et Nakai (Watermelon)				C		

Fig. 2—Record of field-crops from archaeological sites in Vindhyan region. Koldihwa (Savithri, 1976; Sharma, 1985), Mahagara (Savithri, 1976; Dixit Aruna S, 1987; Harvey & Fuller, 2005), Tokwa (Pokharia, 2005, 2008), Senuwar (Saraswat, 2004b), Malhar (Saraswat, 2004a), Raja-Nal-Ka-Tila (Saraswat, 2002; Saraswat & Pokharia, 2003b). Abbreviation: N=Neolithic; NC= Neolithic-Chalcolithic; C= Chalcolithic; PI= Pre-Iron Phase; EI= Early-Iron Phase

much late stage of crop husbandry as compared to classical areas (Saraswat, 1992). Some of the sites studied in the region of Vindhyas represent a sequence of transition from the stage of food-gathering and selective hunting through incipient food producing to settled village farming in the Neolithic times (Sharma *et al*., 1980; Sharma, 1985; Singh, 1990). Economy of the Neolithic settlers was based on hunting and farming, as evidenced by the occurrence of both wild and domesticated plants and animals. The early dates of Koldihwa and Mahagara (6570 ± 210 BC and 5440 ± 240 BC; Sharma *et. al*., 1980; Sharma, 1985), Malhar (6570 ± 110 BP: 4620 ± 110 BC; Tewari *et al*., 2000, Saraswat, 2004a), and Tokwa (6850 ± 200 BP: 5976-5561 BC, Pokharia, 2008) draws our attention. The beginning of agriculture of rice on the basis of evidence from Neolithic Koldihwa and Mahagara was regarded to date back to 7th-6th millennium BC (Sharma *et al*., 1980). However, the authenticity of the evidence of rice remains at these sites was doubted by Dixit (1987) in view of the presence of barley in the same Neolithic strata. The evidence of Harappan crops such as barley, wheat, lentil, pea, etc. from other sites in this region also supports this view. We need a quest to unravel the problems of chronology that beleaguered the investigators to pinpoint the sequence of events that led from a period of broad-spectrum hunting/gathering towards early agriculture in this region. Only fresh excavations can resolve the validity of early Holocene agriculture. Saraswat (2004a) while investigating the carbonized material recovered from a pit buried by a layer of Iron Age habitational deposit at Malhar, recorded the grains of *Oryza sativa* along with wild perennial *Oryza rufipogon* and *Setaria* cf. *glauca* dated to 4620 ± 110 BC, cal. 5475 (5358, 5351, 5340, 5329, 5223) 5262 BC (BS-1614), 3000 yrs. earlier than the beginning phase of the Iron Age occupation at this site. The remains of rice in association with charcoal may, however, indicate early antiquity of agriculture. These evidences show long term stability and continuing strengthening in the techno-economic aspects of early hunting-gathering community, which led to the plant-animal husbandry in Neolithic times.

The much expected evidence for agriculture at an early date received additional support from Lahuradewa, an early lake-side Neolithic settlement in Middle Ganga Plain from the excavations conducted by Tewari *et al*. (2003). In the preliminary investigations the presence of domesticated rice (*Oryza sativa*) has been recorded in the lowermost layers of two trenches YA_1 and YA_2 (subperiod IA) in association with wild form (*Oryza* cf. *rufipogon*) and foxtail-millet (*Setaria* sp.). The wood charcoals associated with these remains dated to 6th-5th millennia BC (BS-1951: 5320 ± 90 BC, cal. 4320-3997 BC; BS-1967: 6290 ± 140 BP, cal. 5464-5059 BC) ascribing human activities and the agricultural practices during early post-glacial times (early Holocene) (Saraswat, 2005; Saraswat & Pokharia, 2004; Tewari *et al*., 2003, 2006). Equally important has been the AMS radiocarbon date determination of husk-piece of domesticated rice by Physikalisches Institüt der Universität Erlangen, Nurnberg, Germany, indisputably put forward the age to 7532 ± 58 yrs. BP: cal. 8259 yrs. BP or 6409 BC (Saraswat & Pokharia, 2004). This would prima facie constitute the sound background to surmise that the idea of domestication and cultivation was ever invented for a long, in wide-ranging hunting and gathering stages of early post-glacial communities several millennia before the record at Lahuradewa (Saraswat & Pokharia, 2004; Saraswat, 2005). The record of cultivated rice *Oryza sativa* in the regions of Haryana and Punjab during 3rd millennium BC is also important to be discussed here. It may only have been possible when its potential as a cultigen, outside its natural habitats receiving much higher rainfall, would have been realized at much early dates (Saraswat & Pokharia, 2002, 2003a; Saraswat, 1995). Rice husk impressions in mudclods and pot-sherds at Kunal and Balu in Haryana, which could be incidental or due to tempering, give a broad indication that rice might have established as a staple crop at these settlements, in all likelihood, in the surrounding regions as a whole. Archaeological evidences from China in the middle and lower reaches of the Yangtze River reveals that cultivated rice was present around 10,000-9000 cal. yr BP, shortly after then termination of the last glaciation (You, 1995; Wang & Sun, 1996). Yasuda (2002) has narrated the rice cultivation to the Neothermal Age (15,000-10,000 yrs. BP). Zhao (1998) has identified a rice horizon dated to 13000 yr BP from the Diaotonghuan cave in the northern Jiangxi Province along the middle Yangtze River. Another evidence of cultivated rice comes from Yuchanyan in Hunan Province, dated to 12,000-14,000 cal yr BP (Wenxu & Jiarong, 1998).

Vavilov (1951) credited rice to his Indian Centre of Origin, wild varieties can also be found across a broad belt extending eastwards through SE Asia and South China (Chang, 1989, 1995: Oka, 1988). Chang (1976a, b, 1985, 1989) has suggested "Cultivation in South-eastern Asia could have occurred independently and concurrently". Evidences from China have come out because of comprehensive and objective oriented research strategies, in relation to a complex scenario of environmental changes in the Holocene. However, the progress in the Vindhyas and Ganga Plains, is due to the efforts of a few archaeologists from Allahabad University, Allahabad, Banaras

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Fig. 3—Weeds and wild taxa associated with crop remains. Koldihwa (Savithri, 1976; Sharma, 1985), Mahagara (Savithri, 1976; Dixit Aruna S, 1987; Harvey & Fuller, 2005), Tokwa (Pokharia, 2005, 2008), Senuwar (Saraswat, 2004b), Malhar (Saraswat, 2004a), Raja-Nal-Ka-Tila (Saraswat, 2002; Saraswat & Pokharia, 2003b). Abbreviation: N=Neolithic; NC= Neolithic-Chalcolithic; C= Chalcolithic; PI= Pre-Iron Phase; EI= Early-Iron Phase

Taxa	Koldihwa (6500-1500 BC)	Mahagara (2200-1800 BC)	Tokwa (7^{th}-2^{nd} millennium BC?)	Senuwar (2200-700/ 600 BC)	Malhar (1900-800 BC)	Raja-Nal-Ka-Tila (1600-700 BC)
Oryza rufipogon Griff.	N	N		N, NC	PI	
Oryza nivara Sharma et Shastry	N					
Coix lachryma-jobi L.			C	N	PI	EI
Setaria cf. *glauca* (L.) P. Beauv			N, C	N, NC, C	EI	PI, EI
Panicum sp. L.				N	PI, EI	EI
Echinochloa colonum Link.						PI, EI
Vicia sativa L.			N	N, NC, C	PI, EI	PI, EI
Vicia hirsuta (L.) S.F. Gray				N		EI
Dactyloctenium aegyptium (L.) Willd					EI	PI, EI
Chenopodium album L.			N	C		PI, EI
Amaranthus sp. L.				N		PI
Ischaemum sp. L				NC		PI
Rumex dentatus L.				N, C		PI, EI
Polygonum sp. L.					EI	EI
Bromus sp. L				N		
Cenchrus ciliaris L.				C	EI	
Mimosa cf. *himalayana* Gamble				C		PI
Eleusine indica Gaertn.				C		
Lathyrus aphaca L.				NC		
Ipomoea pes-tigridis L.				N	EI	
Coccinia cordifolia Cogn.				NC		
Asphodelus tenuifolius Cavan				C		EI
Trianthema portulacastrum L.			N			EI
Fimbristylis sp. L.			N, C			PI, EI
Commelina benghalensis L.						EI
Euphorbia sp. L				NC		
Cyperus sp. L					PI, EI	PI
Leonotis nepetaefolia Br.					PI, EI	PI, EI
Indigofera hirsuta L.						PI
Indigofera sp. L.				C		
Cleome sp. L.						EI
Cannabis sativa L.				C		
Datura sp. L				NC, C	EI	
Nigella sativa L.						EI
Celosia argentea L.					PI, EI	PI, EI
Corchorus sp. L.						EI
Oldenlandia sp. L. (smooth)					EI	EI
Oldenlandia sp. L. (pitted)						PI, EI
Silene conoides L.					PI	PI
Argemone Mexicana L.						EI
Scleria sp. Berg.						EI
Melilotus sp. L.				NC		
Melilotus indica L.					EI	EI
Solanum nigrum L.					PI	
Murraya koenighii (L.) Spreng.						EI
Perilla frutescens L. Britton				C		PI, EI
Gardenia sp. Ellis						PI, EI
Vitis tomentosa Roth in Schult				NC		EI
Ziziphus nummularia (Burm f) W & A			N, C	N, C	PI, EI	PI, EI
Ziziphus oenoplia (L.) Mill.				NC	EI	EI
Ziziphus mauritiana Lam.				C		EI
Vitis vinifera L.						EI
Annona cf. *squamosa* L.			N			EI
Phoenix dactylifera L.						PI, EI
Crataeva L.						EI
Buchnania lanzan Spreng.						EI
Emblica officinalis Gaertn.					EI	PI, EI
Terminalia chebula Retz.						EI
Terminalia bellerica (Gaertn.) Roxb.						EI

Hindu University, Varanasi and U.P. State Archaeology Department, Lucknow. We need more evidences of early farming communities in these regions. Little information is available from eastern India, in early Holocene context. This is a serious gap in our knowledge, which can of course be filled in due course of time when promising sites with plant remains are excavated and published.

Advancement in the crop husbandry in this region can be assigned to a general time-bracket of 2200-1500 BC., evidenced by the appearance of hulled barley (*Hordeum vulgare*), hexaploid forms of wheat (*Triticum aestivum, Triticum sphaerococcum*), ragi-millet (*Eleusine coracana*) and jowar-millet (*Sorghum bicolor*). Other than the cereals, remains of seeds of lentil (*Lens culinaris*), field-pea (*Pisum arvense*), Green-gram (*Vigna radiata*), black-gram (*Vigna mungo*), horse-gram (*Macrotyloma uniflorum*), Grass-pea (*Lathyrus sativus*), pigeon-pea (*Cajanus cajan*), Indian-mustard (*Brassica juncea*) and linseed (*Linum usitatissimum*) have also been recovered (Dixit, 1987; Harvey & Fuller, 2005; Saraswat 2004a, b; Pokharia, 2005).

In addition to the crop remains, the seeds of many other plants, which do not differ in any way from those of wild forms, may have, however, been in close relationship with prehistoric man. These plants are included in the category of weeds and wild taxa (Fig. 3). *Oryza rufipogon* (wild rice), *Setaria glauca* (foxtail grass) and *Coix lachryma-jobi* (job's tear) come in this category. Seeds of these grasses are gathered and eaten by the tribals in Bihar and Orissa (Haines, 1925). Besides, these there were probably other minor cereals such as *Echinochloa colonum*, *E. crus-galli*, *Panicum miliaceum*, *Paspalum scrobiculatum*, *Dactyloctenium aegyptium*, etc., which could have been grown then, and later abandoned. It is not necessarily the botanical classification to differentiate between the gathering and agricultural systems in prehistoric economies (Saraswat, 2004b). Morphological studies of the remains are of limited use in establishing simple gathering or intentional cultivation. Their cultivation may, therefore, not be ruled out. Practice of mixed cultivation has been reported in SE Asia, in which field crops which are cultivated with rice vary from small-seeded millets to large-seeded job's tear (Harris, 1977). It is hoped that studies on weeds and wild taxa in association with field crops, will open new perspectives and problem areas for future researchers in India.

Chalcolithic- the agricultural expansion

The Chalcolithic culture of the Vindhyas is characterized by Black Slipped Wares, Black and Red Wares and Red Wares. It is regarded that the metal technology heralded a new change in the cultural advancement, and accelerated the agricultural development. Studies at Senuwar (Saraswat, 2004b), Malhar (Saraswat, 2004a), Raja-Nala-Ka-Tila (Saraswat, 2002; Saraswat & Pokharia, 2003b) and Tokwa (Pokharia, 2005) have revealed the remains of rice (*Oryza sativa*), barley (*Hordeum vulgare*), wheat (*Triticum aestivum* and *Triticum sphaerococcum*), ragi-millet (*Eleusine coracana*), jowar-millet (*Sorghum bicolor*), kodo-millet (*Paspalum scrobiculatum*), Italian-millet (*Setaria italica*), panic-millet (*Panicun miliaceum*), lentil (*Lens culinaris*), field-pea (*Pisum arvense*), chick-pea (*Cicer arietinum*), grass-pea (*Lathyrus sativus*), horse-gram (*Macrotyloma uniflorum*), green-gram (*Vigna radiata*), moth-bean (*Vigna aconitifolia*), linseed (*Linum usitatissimum*), sesame (*Sesamum indicum*), Indian-mustard (*Brassica juncea*), safflower (*Carthamus tinctorius*) and castor (*Ricinus communis*). These evidences show that the authors of Black Slipped Ware tradition belonged to skilled farming communities. *Citrullus lanatus* (water melon), native of South Africa (Whitaker, 1976), recorded in the crop assemblage, was also grown for its luscious fruits, in the Vindhyan region (Saraswat, 2004b). It becomes apparent that in addition to the indigenous crops in which rice was most important, a substantial expansion in the kinds of subsistence resources of the Mediterranean and African regions made considerable dynamism in the agricultural economy. Of further importance in the Vindhyan region are the records of Eurasian millets such as *Setaria italica* and *Panicum miliaceum*. Both these millets had been the stuff of life for Yang-shao people in China about 6000 yr BP. These have been regarded as native of China (Candolle, 1886; Vavilov, 1951; Ho, 1969, 1977). The record of these millets from Neolithic sites in Europe during 6th millennium BP (Murray, 1970) has led to confusion whether these were domesticated in the West and moved forward to China or *vis-à-vis*. Their independent domestication seems to be likely explanation (Harlan, 1977).

Iron Age Culture

Towards the end of second millennium BC., discovery of iron, heralded a new era in the cultural advancement in the Indian subcontinent in general and Vindhyan Plateau in particular. Excavations at Malhar (Tewari *et al*., 2000), Raja-Nal-Ka-Tila (Tewari & Srivastava, 1997, 1998) and Tokwa (Misra *et al*., 2001) have revealed the occupational phases of Iron-using Black Slipped Ware and Northern Black Polished Ware Cultures. Food economy of the iron-using cultures is similar as in preceding phases. However, in the advancing state of our knowledge on the field-crops, onion (*Allium cepa*) seeds have also been encountered at Raja-Nala-Ka-Tila (1300-700 BC; Saraswat & Pokharia, 2003b). In this group of onion and allies, the remains of garlic cloves were recovered at Balu, Haryana during Mature Harappan times (Saraswat & Pokharia, 2002). The primary centre of origin of onion is Central Asia (Vavilov, 1951). The introduction of onion encountered in the farming culture of the Vindhyan Plateau region, is to be accounted for in terms of biogeographical distribution, genetics, etc. Evidence of onion, and *Vitis vinifera* (grape) denotes practice of horticulture.

DISCUSSION AND CONCLUSION

The Neolithic sites located in Vindhyan region are surrounded with controversies over claims of early dates of rice domestication (Harvey *et al.* 2005). About three decades back ca. 7th-6th millennium BC was suggested for the beginning of agriculture of rice on the basis of evidence from Neolithic Koldihwa and Mahagara (Sharma *et al.*, 1980). This was however, not supported by many scholars (Pal, 1986; Kajale, 1991; Possehl & Rissman, 1992; Singh, 2002; Fuller, 2002). Recently, Lahuradewa in the adjoining Ganga Plain, has provided new evidence for early agriculture during later half of 7th millennium BC by the macro-remains, recovered in the environment of settlement (Saraswat & Pokharia, 2004; Saraswat, 2005; Tewari *et al*., 2006), prop up by phytoliths of domesticated rice (Saxena *et al*., 2006) in the lake profile around the same time (8300 yr BP). Another evidence of Cerealia and cultural pollen in the lake sediments around 5000 yr BC (7000 yr BP) through palynological investigations (Chauhan *et al*., 2004) supports this view. These evidences if, taken together, show that the rice cultivation was in practice in the vast region of Middle Ganga Plain extended between Himalayan foothills and north-central Vindhyan Plateau region. More focused archaeobotanical, phytolith as well as palynological investigations at archaeological mounds and appropriate lacustrine cores in future would certainly provide evidence regarding the cultivation and domestication of rice, in the region.

Mahagara (Lat. 24º54'50" N; Long. 82º3'20" E), Koldihwa (Lat. 24º51'30" N; Long. 82º2' E) and recently excavated Tokwa (Lat. 24º54'20" N; Long. 83º21'65" E) are the early farming settlements that appeared in the Belan River Valley. Sedentary agriculture is indisputable from the mid/late 3rd millennium BC. However, the subject matter in this region is the beginnings of sedentism, ceramic production, and the transition from the foraging of wild rice to its cultivation (Harvey *et al*., 2005). The Mahagara and Koldihwa are situated about 85 km south-east of Allahabad on the banks of river Belan and Tokwa is situated at the confluence of Belan and Adwa rivers in SE direction from Mirzapur city in U.P.

Summary of the crop remains recorded in this region is presented in Fig. 2. This region received loans of a large number of crops of Near-Eastern complex (barley, dwarf-wheat, bread-wheat, field-pea, lentil, grass-pea, chick-pea, linseed and safflower), African (jowar-millet, ragi-millet, cow-pea, water-melon, castor and sesame), Eurasian (Italian-millet and panic-millet), Central Asian (Onion) and Indigenous (rice, kodo-millet, green-gram, black-gram, moth bean, pigeon-pea, horse-gram and Indian mustard) in origin. The record of crop remains shows that initial occupants, characterized by Black and Red and cord-impressed potteries of Neolithic traits, practiced persistently self-sufficient arable agricultural system consisting of winter and summer season crops, characterized probably by the rotation of crops during 3rd-2nd millennium BC. The agriculture in the Neolithic set the desired foundation of economic basis for the succeeding Chalcolithic and Iron using cultures. The expansion of agriculture facilitated by the copper and iron tools apparently provided only an additional "techno-environmental efficiency" as put forth by Harris (1975).

Remains of weeds and other wild taxa (Fig. 3) recovered in the form of impression, glumes, seeds and fruits in association with food grains are also of considerable importance to draw some meaningful conclusions to deduce picture of ground vegetation, state of agricultural field and their use in native medicines. Species of *Oryza rufipogon*, *Echinochloa colonum*, *Ischaemum* sp., *Panicum* sp., *Cyperus* sp., *Cenchrus ciliaris*, *Celosia argentea*, *Silene conoides*, *Rumex dentatus*, *Polygonum* sp., *Oldenlandia* sp., *Commelina benghalensis*, *Fimbristylis* sp., *Trianthema portulacastrum*, *Ipomoea* sp., *Vicia sativa*, *Vicia hirsuta*, *Lathyrus aphaca*, *Melilotus* sp., *Chenopodium album*, *Amaranthus* sp., *Asphodelus tenuifolius*, *Indigofera* sp., and *Solanum nigrum* occur as weed in crops-fields, marshy places and along the ditches, ponds and streams (Anonymous, 1948, 1950, 1952, 1959, 1962, 1966, 1969, 1972, 1976), whereas *Bromus* sp., *Indigofera* sp., *Mimosa* sp., *Trianthema triquetra*, *Coccinia cordifolia*, *Eleusine indica*, *Scleria* sp., *Argemone mexicana*, *Euphorbia* sp., etc may have come from fallow or grasslands (Anonymous, 1948, 1950, 1952, 1962, 1972, 1976). Quite a good number of plants represented in the collection may also have been used in native medicines, as spice or eaten raw such as *Ziziphus nummularia*, *Ziziphus mauritiana*, *Ziziphus oenoplia*, *Vitis vinifera*, *Annona squamosa*, *Buchnania lanzan*, *Phoenix dactylifera*, *Crataeva* sp., *Murraya koenighii*, *Datura* sp., *Cannabis sativa*, *Emblica officinalis*, *Terminalia chebula*, *Terminalia bellerica*, *Perilla frutescens*, *Leonotis nepetaefolia*, *Euphorbia* sp., (Anonymous, 1948, 1950, 1952, 1962, 1966, 1969, 1976) etc. The traditional uses of these wild plants may be regarded meaningful, which the farmers at ancient sites, in all likelihood, could have not afforded to neglect. Incidental evidences warn us not to take for granted that the wild and weed plants are of no economic importance.

As agriculture developed incrementally from the stage of food-gathering, it is not possible to exactly define when it first occurred. Only fresh excavations and direct dating of the archaeobotanical material will help in understanding the origin of agriculture in this region.

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