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SAHARAN LEGACIES: A HISTORY OF ENVIRONMENTAL, ECONOMIC AND CULTURAL CHANGE IN WEST AFRICA DURING THE LATE HOLOCENE

Sylvain OZAINNE

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Abstract: *In Dogon Country (Mali), recent research carried out in the framework of the international project project "Human Settlement and Paleoenvironment in West Africa" allowed defining a rich chronocultural reference framework for the Late Holocene period (2500-500 cal BC). Covering the regional Late Neolithic/Later Stone Age and Early Iron Age, the sequence is punctuated by several technical and cultural transitions, which seem synchronized with some significant environmental and economic change. It appears indeed that the development of three major currents of cultural influence in the sub-Saharan zones of West Africa during the Late Holocene is mainly underlain by the expansion of herding and agriculture.*

Keywords: *West Africa, Mali, Late Neolithic/Later Stone Age, Early Iron Age, Food producing*

Résumé: *En Pays dogon (Mali), des recherches pluridisciplinaires récemment menées dans le cadre du projet "Peuplement humain et paléoenvironnement en Afrique de l'Ouest" ont permis d'établir une séquence chrono-culturelle et environnementale précise pour l'Holocène récent de la région (2500-500 cal BC). Couvrant le Néolithique récent et l'Âge du Fer ancien de la région, la séquence est rythmée par plusieurs transitions techniques et culturelles semblant coïncider avec d'importants changements environnementaux et économiques. En effet, il apparaît que le développement des principaux courants culturels qui concernent l'Afrique de l'Ouest à l'Holocène récent est principalement associé à l'expansion de l'élevage et de l'agriculture.*

Mots clés: *Afrique de l'Ouest, Mali, Néolithique récent, Âge du Fer ancien, Économies de production*

1. INTRODUCTION

Recent archaeological research in Dogon Country (Mali) allowed defining a rich chronocultural reference framework for the Late Holocene period (2500-500 cal BC). This sequence covers the end of the Neolithic/Later Stone Age and the start of the Iron Age in this part of the continent, and highlights several important transitions whose understanding required considering the contemporaneous environmental, socio-economic and cultural context across West Africa. This research has been completed in the framework of a doctoral thesis, defended on July 1, 2011, in the Anthropology Unit of the Faculty of Sciences at the University of Geneva. Its objective has been to establish the chrono-cultural, economic and environmental context for the settlement of sub-Saharan West Africa during the Late Holocene.

Fieldwork was carried out in the framework of the international project "Human settlement and paleoenvironment in West Africa", coordinated by Prof. Eric Huysecom, director of the Laboratory "Archéologie et Peuplement de l'Afrique" (APA), attached to the Anthropology Unit at the University of Geneva. The program began in 1997 after the discovery of the Ounjougou site complex on the Bandiagara plateau in the Yamé Valley (Huysecom 2002). Research progressively expanded to other zones in the Dogon Country in 2005. Between 1997 and 2008, sites attributed to the Late Neolithic were then excavated not only at Ounjougou but also on the Bandiagara cliff and the Seno plain (Fig. 1). Fieldwork done at this regional scale has a dual importance. Work at Ounjougou has enabled proposal of a chronocultural reference framework extending from the Paleolithic to historical periods, for a zone for which the archaeological context was previously nearly unknown (Huysecom 2002; Huysecom *et al.* 2004, 2009; Robert *et al*. 2003; Rasse *et al*. 2004, 2006; Ozainne *et al*. 2009; Soriano *et al*. 2010; Tribolo *et al*. 2010). The Ounjougou site complex also constitutes an exceptional paleoenvironmental archive, even more valuable since the Dogon Country occupies a strategic position to address diachronic variation of vegetal landscapes and, as a result, climatic fluctuations. As a matter of fact, the region is situated at the interface of modern Sahelian and Sudanian zones, a limit that underwent significant latitudinal displacements throughout the Holocene. This study zone was thus seen as ideal to reconstruct the history of interactions between environment and human societies (Huysecom *et al*. 2004, 2009; Le Drezen 2008; Neumann *et al.* 2009; Le Drezen *et al*. 2010; Eichhorn *et al*. 2010; Lespez *et al*. 2011; Ozainne 2011, forthcoming; Eichhorn & Neumann forthcoming).

2. THE DOGON COUNTRY LATE HOLOCENE ARCHAEOLOGICAL SEQUENCE

Based on the archaeological, chronological and environmental data collected on the Bandiagara Plateau,

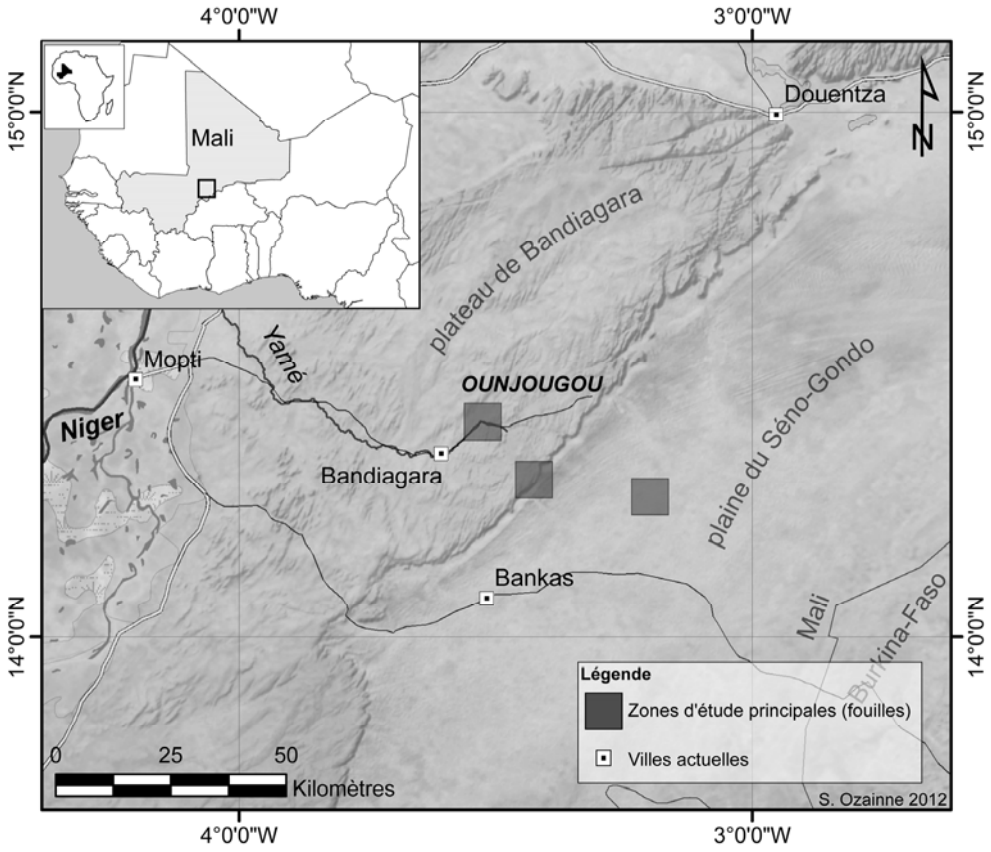

Figure 1 – Dogon country and study area location map (Data: MODIS satellite and FAO)

the cliff and the Séno Plain, the Dogon country Late Holocene sequence is divided into several principal settlement phases. Numbering of the phases builds on that of the overall Ounjougou Holocene sequence developed previously, in which the Late Holocene starts with phase 4 (Huysecom *et al*. 2004). The infrastructure of this model is based on a precise chrono-stratigraphy allowing a good diachronic view of different ceramic traditions. Geomorphological and archaeobotanical studies at Ounjougou have additionally enabled reconstruction of the main fluvial system and landscape evolutions. This very precise environmental context directly connected to the archaeological sequence allows not only understanding of the relationships between nature and human societies during the Late Neolithic in the Dogon Country, but also evaluating the regional impact of the main climatic events recorded at the scale of West Africa (Lespez *et al*. 2011).

The Late Holocene sequence starts with phase 4 (2600-2200 cal BC), corresponding to the Late Neolithic I (Fig. 2). Throughout this phase, pastoralist groups coming from the southern edge of the Sahara may have frequented the Yamé Valley during the dry season as part of their transhumance route, as is shown by the presence of large hemispheric recipients and rocking impressions (Huysecom *et al*. 2004; Ozainne *et al*. 2009; Ozainne 2011). The sequence shows then an important archaeological hiatus between 2200 and 1800 cal BC (Fig. 2). Possible abandonment of the Yamé Valley around the end of the 3rd millennium cal BC can thus be considered, as the climate underwent a brief arid episode at this time.

Phases 5a and 5b form the Late Neolithic II (Fig. 2). During phase 5a (1800-1400 cal BC), a farming population producing a new ceramic tradition settled in the Dogon Country, in a climatic context marked by a trend toward aridity but remaining wetter than today (Le Drezen 2008; Ozainne *et al*. 2009; Eichhorn & Neumann forthcoming). During phase 5a, numerous anthropogenic bushfires occur at the beginning and at the end of the dry season (Le Drezen 2008), and the cultivation of pearl millet is attested by 1800 cal BC (Ozainne *et al*. 2009; Eichhorn & Neumann forthcoming). The presence of a significant population establishing farming villages and hamlets in the Yamé Valley is confirmed during phase 5b (1300-800 cal BC). Artifacts and environmental data indicate the development of a production economy for which the impact on landscapes is certain, but it is difficult to separate climate-induced changes from those caused by the development of agriculture (Ozainne *et al*. 2009; Eichhorn & Neumann forthcoming). The lack of information on the practice of animal husbandry during the 2nd millennium cal BC at Ounjougou may be explained by the poor organic remains preservation conditions in the ferruginous sediments at the plateau sites.

During phase 6 (800-400 cal BC), which corresponds to a Neolithic/Iron Age transition period, occupation of the Yamé Valley appears to be less important, perhaps due to

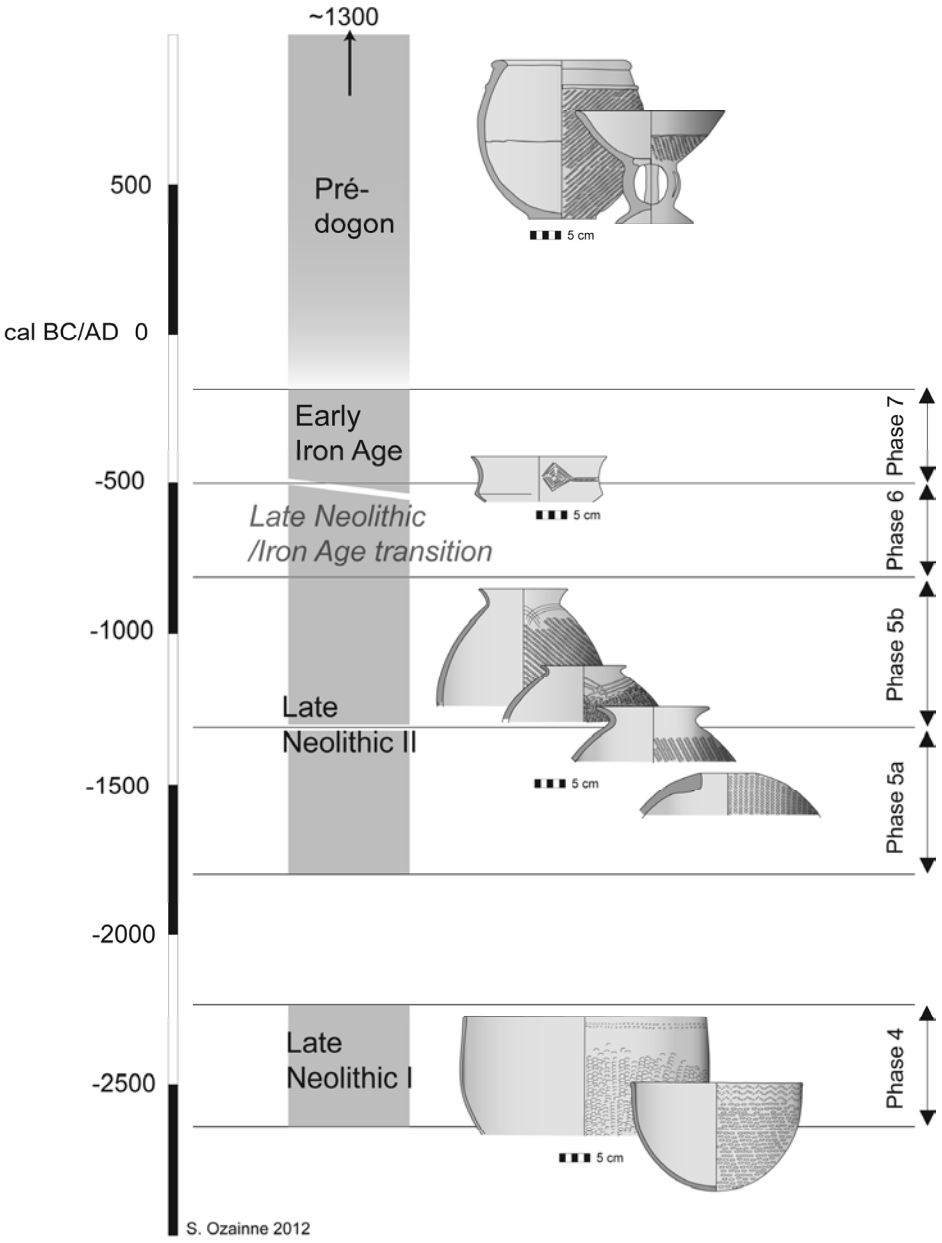

Figure 2 – Chrono-cultural sequence for the Late Holocene of Dogon country

new abrupt climatic changes (Fig. 2). During the dry season, now longer than before, the ponds of the Yamé valley are fully dried out, and anthropogenic fires are important both at the beginning and the end of the dry season (Le Drezen 2008). During this interval, new ceramic traditions, especially including carinated recipients and rolled decorations unknown on the plateau at any period, appear on the Séno Plain and the Bandiagara cliff zone (Ozainne 2011). The sequence ends with phase 7 (500-200 cal BC), which corresponds to the regional Early Iron Age. However, iron is evidenced only by fragments of objects and, so far, no data indicates ore smelting in the region during this period. Phase 7 shows also the emergence of radically new cultural elements, such as small wide carinated recipients, often polished and decorated with incised geometric motifs. Finally, the Pré-dogon period (Mayor 2011) starts between 200 cal BC and 200 cal AD (Fig. 2).

3. ENVIRONMENTAL AND ECONOMIC CONTEXT OF THE LATE HOLOCENE IN WEST AFRICA

The establishment of an environmental, economic and cultural context at the scale of West Africa is essential to understanding the cultural breaks and changes of the Dogon Country sequence. Bibliographic data indicate that major economic changes that took place in West Africa during the Late Holocene seems to coincide with certain climatic and environmental variations. After 3500 cal BC, the Saharan zones are progressively abandoned by pastoralists for other regions to the south now suitable for herding (Neumann 2003; Kuper et Kröpelin 2006). During the 3rd millennium cal BC, there is evidence of a progressive arrival of the first herders south of the Sahara as well as the appearance of the first domesticated plants around 2500 cal BC, both taking place in a context of

increasing aridity (Smith 1974; MacDonald 1996; Ozainne *et al*. 2009; Manning *et al*. 2011). During the first half of the 2nd millenium cal BC, herding rapidly expands across nearly all of West Africa (Jousse 2004, 2006; Linseele 2007). After its emergence at the southern fringe of the Sahara around 2500 cal BC, cultivation of pearl millet (*Pennisetum glaucum*) rapidly spreads across all of West Africa between 2000 and 1000 cal BC, in a general context of increasing aridity (Neumann *et al*. 1996; Amblard 1996; D'Andrea *et al*. 2001; Neumann 2003; Ozainne *et al*. 2009; Manning *et al*. 2011; Eichhorn & Neumann forthcoming). From the 2nd millennium cal BC, it becomes then difficult to separate the effects of climate from human impact on the environment, the two factors affecting vegetal landscapes very likely being entwined in an interactive cycle: changes in climate lead to opening of the landscapes, making new territories accessible to pastoralists and/or agriculturalists, the latter in their turn inducing changes in the vegetation (Le Drezen 2008; Ozainne *et al*. 2009; Lespez *et al*. 2011; Eichhorn & Neumann forthcoming).

4. THE SAHARAN CULTURAL LEGACIES OF WEST AFRICA: A SCENARIO

On a millennial scale, the correlation between settlement phenomena and significant climatic or economic events may seem obvious, but it is much more complex to associate environmental variations with the spatial evolution of techno-cultural entities. A comparative analysis of the results of research in the Dogon Country and the published literature available for the same period at the scale of West Africa allowed establishing the existence of three main "cultural influences spheres" (Ozainne 2011, forthcoming). Those spheres were mainly defined through an analysis of the most significant ceramic variables of the corpus. Sphere 1 shows evident links with the central Saharan zones, while sphere 2 appears to be an original one developing in the Sahelian belt including nevertheless obvious Saharian heritage (Fig. 3).

Sphere 3 can be regarded as specific to the Sudanian zone, and also comprises clear Saharian influences (Fig. 3). The spatio-temporal behavior of these three spheres indicates that they may have been strongly correlated with the appearance and spread of food producing economies in West Africa (Fig. 3).

Between 3000 and 2500 cal BC, pastoralists from several distinct cultural spheres but visibly sharing common origins in the Central Sahara, reach the sub-Saharan zones (Fig. 3). This phenomenon seems clearly linked to the onset of arid conditions that affect the Sahara from the 4th millennium cal BC. Around 2500 cal BC, the Dogon Country is involved in the arrival of cultural traits indicating affinities with western Niger, but is still found in advance of the pastoralism front. However, the region may have already been frequented intermittently by pastoralist groups, during seasonal transhumance or scouting for new territories (Ozainne 2011, forthcoming).

Between 2500 and 2000 cal BC, the environment in the modern Sahelo-Sudanian band undergoes significant changes, opening new areas to pastoralists who progressed rapidly from northeast to southwest. At this time, the cultural spheres 1 and 3 seem to be associated with the spread of herding in Sub-saharian zones (Fig. 3). A very rapid corridor of penetration to the south appearing between 2250 and 2000 cal BC may thus explain the advent of Saharan cultural traits in the Sudanian zone, such as bifacial armatures and rocking comb decorations on the ceramics (Ozainne 2011, forthcoming). This northern heritage seems to be incorporated, however, in a cultural ambiance unique to the Sudanian zone developing from the end of the 3rd millennium cal BC. At the same time, the cultural sphere 2 rises at the Sahara/Sahel and appears to be linked to the first agricultural populations, is particularly characterized by the presence of pottery with narrow openings and roulette decorations (Fig. 3) (Smith 1974; MacDonald 1996; Manning 2010; MacDonald & Manning 2010).

The main cultural limits of the Late Neolithic were probably established between 2000 and 1500 cal BC synchronously with the rapid spread of agriculture through West Africa. To the south, the development of the Sudanian sphere may also have followed the expansion of the first farmers. Nonetheless, it remains difficult to isolate a local substrate linked to hunter-gatherer or proto-farmers populations. In Ghana but also in the Lake Chad basin, some ceramic traits such as carinated bowls and geometric or banded decorations may have had common origins in the central and eastern Sahara massifs, or even between the Ennedi and the Nile Valley (Stahl 1994; Watson 2005; Honegger 2006; Privati 2004; Jesse *et al*. 2004; Ozainne 2011, forthcoming). To the north, the Niger Bend experiences a complex cultural situation from the 2nd millennium cal BC, given its position at the intersection of the Saharan, Sahelian and Sudanian cultural influences. At the same time, the Dogon Country seems for its part mainly attached to the Sahelian cultural sphere (sphere 2) and is now in the area gained by agriculture.

After 1500 cal BC, a broad cultural current forms between southeast Mauritania and the Lake Chad basin (Fig. 3) (Ozainne 2011, forthcoming). At the same time, the area concerned by the Saharan cultural sphere (Fig. 3:1) moves slowly to the south and reaches the confines of the Sudanian domain, climatic deterioration generally making the north of the Sahel inhospitable to populations with an agro-pastoral economy. The situation for the southern regions, however, remains difficult to interpret given the lack of information available. However, the Sudanian and Sahelian cultural sphere seems to clearly accompany the expansion of agriculture to the east (Fig. 3). The Dogon Country is still comprised in the Sahelian sphere, and is confronted in the middle of the 2nd millennium cal BC with influences from the northwest, more specifically from the Méma, but also the Dhars Tichitt-Oualata region (MacDonald 1996; Gallin 2011; Ozainne 2011, forthcoming). It is thus involved in the major cultural west-east current described before.

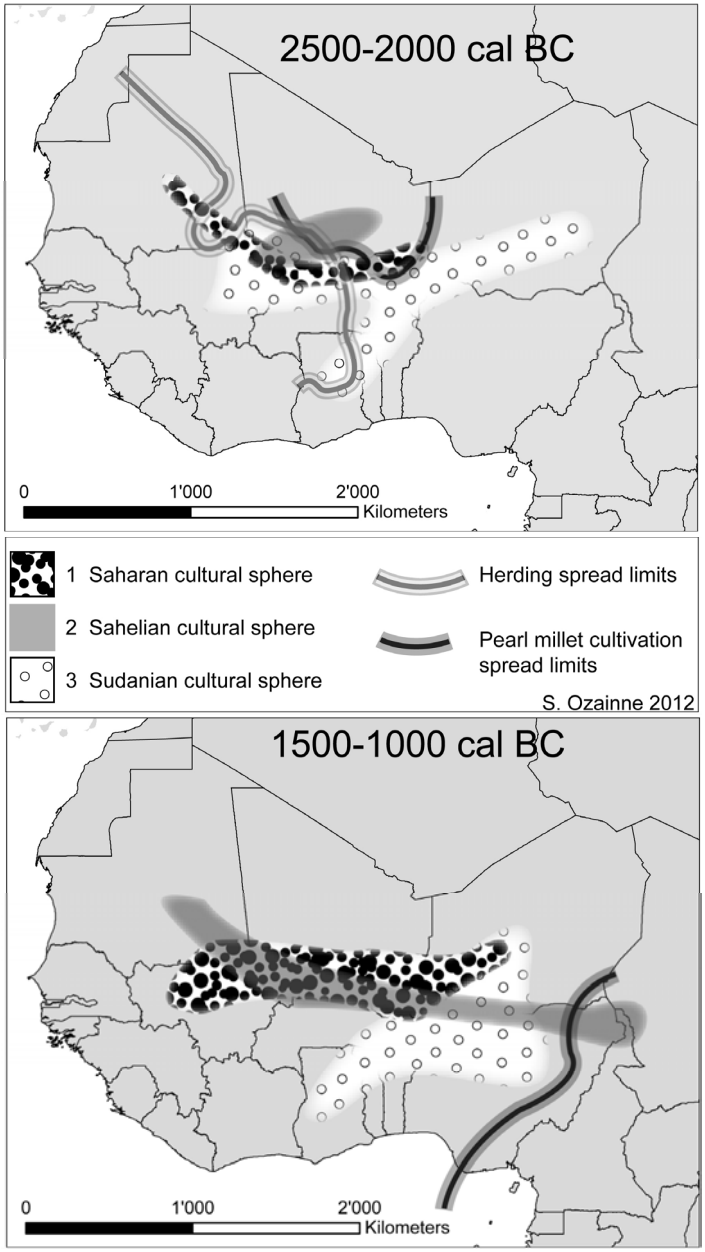

Figure 3 – Key time intervalsmaps showing the links between food production spread and spatial evolution of the main cultural influence spheres during the Late Holocene in West Africa

The start of the 1st millennium cal BC is marked by the onset of more arid climatic conditions. We still observe a pattern of displacement to the east by Sahelian and Sudanian cultural spheres. Simultaneously, an inverse phenomenon can be observed on the same axis, with the appearance in the Dogon Country of some ceramic characteristics pointing to earlier cultures of the Lake Chad basin (Ozainne 2011, forthcoming). This phenomenon remains to be confirmed, since related sites are rare. A new wave of migrations from the east-central area of the Sahara may also have occurred at the same time, as well as a spread of iron metallurgy between the Sahara and the Sahel. Data on metallurgy considered in this research, however, is insufficient to take part in the debate on the origins of iron and its possible invention south of the Sahara, the considered zone being too restricted to study this phenomenon. In the Dogon Country we observe for the last time evidence for the Sahelian cultural sphere (Fig. 3:2) on the Bandiagara Plateau, while new ceramic traits appear on the Inland Niger Delta. The Séno Plain is for its part characterized by a multiple cultural context, including a substrate of the Late Neolithic from the plateau onto which are grafted regional influences suggesting the Méma and southeast Gourma (MacDonald 1996; Gallin 2011). First evidence of iron in Dogon Country is recorded around 500 cal BC (Ozainne 2001, forthcoming).

The final centuries cal BC are characterized by little archaeological data. This final point is explained by a real lack of chronocultural data for this period, especially for the southern zone, as well as by the arbitrary chronological limit selected for this research. In the Dogon Country, only the Séno Plain and the cliff appear

to still be occupied, with a cultural context close to that present between 1000 and 500 cal BC. The presence of an eastern component reflecting the arrival of groups from the Lake Chad basin remains to be supported, but we note troubling resemblances between the geometric decorations on the Séno Plain and those around Lake Chad, themselves recalling some decorations known in the Sudan (Wiesmüller 2003; Wendt 2007; Jesse *et al*. 2004). A few carinated and grooved recipients evoke also some pottery from the Copper Age in northern Niger (Grébenart 1985). Finally, discovery in the Dogon Country of a glass eye bead of Mediterranean origin raises the question of trans-Saharan contacts clearly prior to the Islamic period (Ozainne 2011, forthcoming).

5. CONCLUSION

Due to its geographical position at the borders of the current Sahelian and Sudanian zones, the Dogon country has efficiently recorded the major environmental, economic and cultural changes that have concerned sub-Saharan zones during the Late Holocene. The research presented here has thus enabled to demonstrate that during this period, West Africa underwent a series of coherently articulating techno-economic and cultural transitions characterized by strong Saharan influences, which were linked to several migration and/or diffusion phenomena. Finally, it is important to stress that the development of three major currents of cultural influence in the sub-Saharan zones of West Africa appears to be mainly underlain by the expansion of herding and agriculture.

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