SENEGAL

A Report on the Charred Botanical Remains from Sincu Bara, A Mid-First Millennium AD Middle Senegal Valley Site

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Abstract

This paper presents results from the analysis of charred plant remains recovered from the mid-first millennium AD site of Sincu Bara. Similar to other sites in the Middle Senegal River Valley, the plant portion of the diet appears to have focused mainly on the grains of pearl millet and on the fruits of local wild or cultivated trees and shrubs. Although organic preservation at the site seems reasonable, the diversity of taxa was generally low and did not increase through time, providing little evidence for agricultural intensification or the development of regional/inter-regional trade in subsistence goods.

Background to the Research

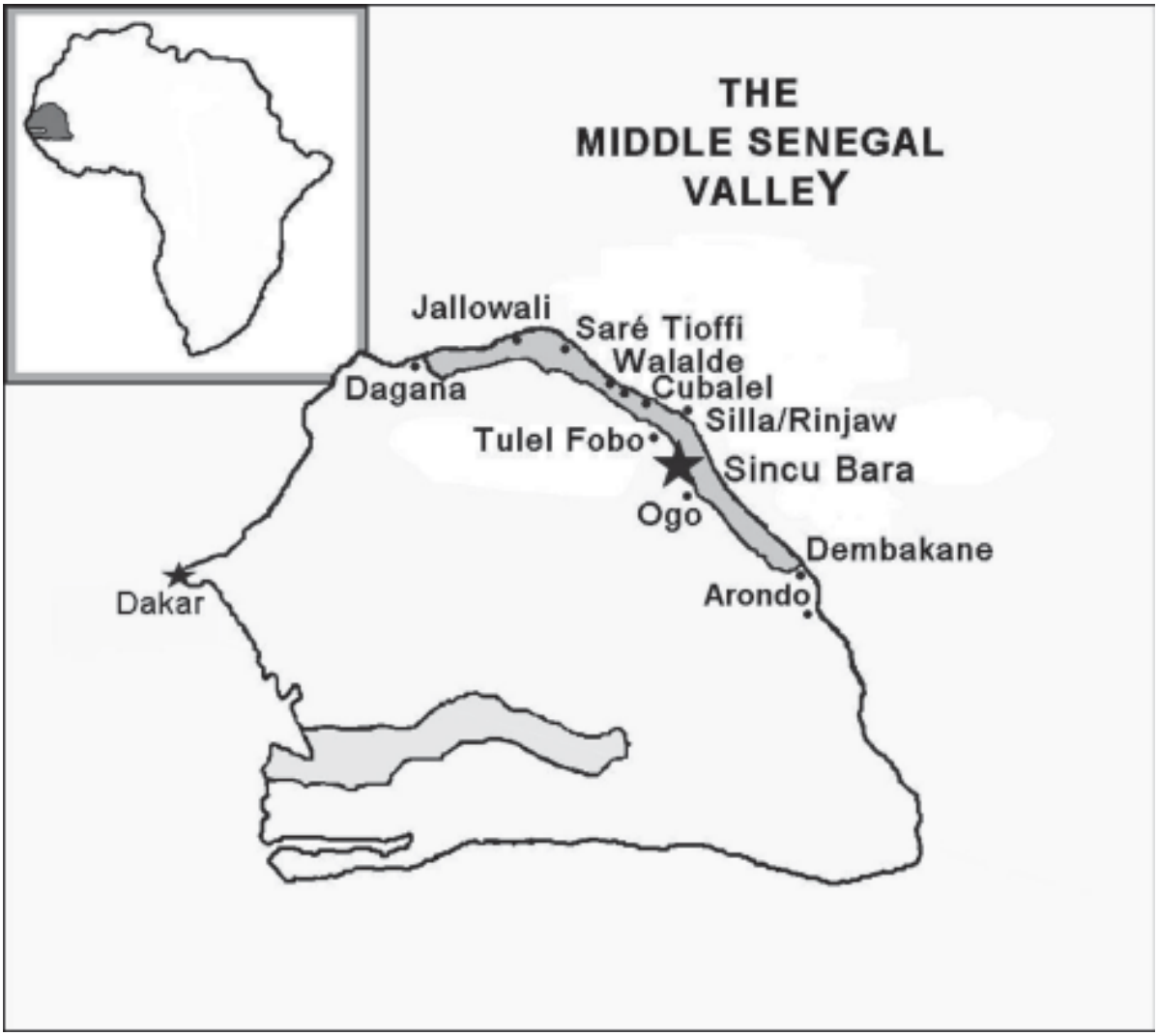
In the early 1990s, several large habitation mounds were surveyed and excavated in the floodplain of the central region of the Senegal River (Figure 1). These excavations resulted from a joint collaboration known as the Middle Senegal Valley Project, co-directed by Hamady Bocoum, Susan Keech McIntosh, and Roderick McIntosh (McIntosh et al. 1992, McIntosh and Bocoum 2000). The project was designed to collect basic data and address questions raised in earlier work by Thilmans and Ravisé (1980:77) concerning the chronology and nature of human settlement in the Middle Senegal Valley (hereafter, MSV). One of the largest of the MSV sites, Sincu Bara, was originally interpreted by Thilmans as the likely capital of the Kingdom of Silla, based on Arabic writings, the size of the site, and on the abundant finds of brass artifacts that implied an elite presence. Early copper works at Sincu Bara were also considered evidence of a precocious metal working industry dating from the fifth to eleventh centuries AD.

Excavations by Bocoum in 1991 and 1992 however, found that the deposits dug by Thilmans were significantly disturbed. Further work in portions of the site with greater stratigraphic integrity indicated that although occupation did occur throughout the first millennium AD, evidence of copper metallurgy was not present until early in the second millennium (McIntosh and Bocoum 1998). Generally, results from these later excavations, much of it in agreement with Thilmans' work, showed that the people of Sincu Bara herded cattle and ovicaprines, occasionally hunted wild animals such as elephant, warthog, turtle, crocodile, and birds, and fished species of *Lates*, *Clarias*, Tilapinae and *Gymnarchus*. They also processed and worked iron, as evidenced by the abundant slag found at the site, as well as several furnaces (one with tuyeres), and artifacts such as a bracelet and a ring, and blades, points, and tangs. Some copper and brass artifacts were also recovered. Possible trade goods included shell beads and pendants, cowries, enameled North African pottery, and exotic stone and glass beads (Bocoum and McIntosh 2002, Thilmans and Ravisé 1980).

Of the excavated MSV sites, Sincu Bara is considered one of the largest. It measures roughly 67 hectares in area, and unlike other MSV floodplain mound sites, it consists of lateritic gravel concentrations, some 100 or more, rising only about 40 cm above the modern ground surface. It is located in the *jeeri*, a part of the floodplain situated above the inundated zone. Some 13 ponds presently exist in and around the site. As a Middle Senegal Valley site, Sincu Bara is located in the semi-arid Sahelian zone, receiving an average rainfall of about 150 to 500 mm per year. A more arid steppe exists to the north and south of the river valley system. Radiocarbon dates at Sincu Bara range from 388-652 cal AD in the earliest levels of the site (SB1, Level 23, AA14226) to 667-990 cal AD in the uppermost levels (SB1, Level 5, Beta 52117) (Bocoum and McIntosh 2002:89).

Macrobotanical samples were also collected from Sincu Bara, and it is on these samples that this report focuses. Such studies, small as they may be, can help increase understanding of the spread of plant domestication and agriculture across regions

Figure 1. Map of Middle Senegal Valley sites. Adapted from Bocoum and McIntosh (2002).



of West Africa. While the site of Sincu Bara is relatively late for contributing to studies of early crop domestication, the record of plant foods recovered there can aid in better defining exploitation patterns already formed by other studies. Overall, organic materials were relatively well-preserved at the site and it is now possible to add Sincu Bara to the growing record of agricultural case studies across West Africa. Other analyses of archaeological plant remains recovered from MSV sites can be found in Gallagher (1999), Murray and Deme (in press), and Murray, Fuller and Capezza (2007). The excavation details reported here come from Bocoum and McIntosh (2002), unless otherwise indicated.

Method of Analysis

At Sincu Bara, systematic flotation was carried out by Mr. Mamadou Ndiaye on a total of 45 samples. The results presented below include only 33 of those samples: 28 from SB1, 4 samples from SB2, and a single sample from SB3. The remaining twelve samples came from the highly disturbed units of SB3 and SB4, and are not further discussed. The sample analyzed from SB3, Level 16 was recovered from intact deposits underlying the disturbed area. All samples consisted of 8 liters of excavated sediment, or the entire contents of a feature in the case of ash-filled hearths. Cecilia Capezza initially sorted

eleven of these samples and identified some of the specimens, and Daphne Gallagher was further consulted on some of the identifications. All samples were carefully size-sorted by this author (Murray) into >1000, 1000-500, and <500 micron fractions. Each fraction was then systematically examined using a 7 to 45 x binocular dissecting microscope, except the <500 micron fractions, which were quickly scanned. All charred specimens were removed, identified, and placed into labeled micro-centrifuge tubes for curation.

In this study, only charred plant materials were considered the residues of ancient human behavior. All uncharred residues were assumed to be contaminants from more recent activities such as rodent burrowing or erosion, and although identified in most cases, these materials were left in the samples. Identifications of seeds and other botanical materials were made using a comparative seed collection, photographs, drawings, and seed identification manuals. Since the comparative collection was limited in scope, many identifications, particularly those in the grass family, were either identified to more general taxonomic designations or given a "cf." to mark them as more tentative assignments. Charcoal was also not identified due to the lack of a comparative West African wood collection, and, in most cases, the charcoal pieces were highly fragmented and likely unidentifiable.

Context of the Samples

The 33 archaeobotanical samples presented here came primarily from two excavation units: SB1 and SB2. The first unit, SB1, measured 3 x 3 meters and was situated at the highest part of the site, where a slight mounding occurred. The total depth of deposits was roughly 2.6 to 3.2 m. The youngest deposits, Levels 1 through 7, consisted of structural remains from two episodes of domestic occupation (Level 1 and Levels 5 and 7) and a slowly accumulating fill (Level 3) that was present between the two habitations. Levels 8 and 9 represent another gradual building of fill, while Levels 10 through 16, indicate a period (or periods) of intense domestic activity, evidenced mainly by the presence of multiple large and small pits, and deposits of bone, ash, and pottery. A period of disuse is apparent in Levels 18 and 19, and the oldest habitation is represented in Levels 20 through 23. Several features were present in these earliest levels, including two hearths and a hole/pit. Wood charcoal from Level 23 produced a date of 388-652 cal AD (Bocoum and McIntosh 2002:39, 89).

Unit SB2 was placed on a flatter part of the site, approximately 150 m to the south of SBA1. It was 9 m^2, and contained a depth of about 1.5 m of cultural deposit. Feature 3 represents the youngest of these deposits and consisted of burned structural material present inside a large pit that was visible on the modern ground surface. Level 6 was associated with a period of little activity and slow accumulation of material, whereas Levels 11 and 13 encompass the earliest episodes of habitation. Two inhumations were also found in these oldest levels. A single flotation sample was collected from unit SB3, Level 16, which marks an early undisturbed deposit dating roughly 414-657 cal AD (Bocoum and McIntosh 2002:44, 91).

Plant Variation across Space and Time

The archaeological plant materials preserved at Sincu Bara provide evidence for a subsistence approach that incorporated both intentional cultivation of domesticated plants and the gathering of wild plant resources. A minimum of 37 different taxa were identified in the samples from SB1 (Table 1) and SB2 (Table 2); the majority of these were from the grass family (Poaceae). Only two of the taxa are known domesticates: pearl millet (*Pennisetum glaucum*) and what was identified as pearl millet/sorghum (*Pennisetum glaucum*/*Sorghum bicolor*), although others, such as the tree and shrub fruits of baobab (*Adansonia digitata*), jujube (*Ziziphus*), and *Vitex*, have a long history of use across much of Africa. Of the wild plants, some 45% were grasses, and these seeds likely formed an important part of the diet. Wild grass harvesting, often by swinging basket or by broom and rake, has been observed throughout Africa (Harlan 1995), and was possibly the method of grain recovery.

When comparing the samples from SB1 and SB2, the botanical record at SB2 is clearly more limited than at SB1. This difference is likely only a result of the different numbers of samples collected from each unit. The same kinds of taxa, including domesticated pearl millet, are present in both areas of the site, although there appears to be a greater number of uncharred specimens recovered from SB2, perhaps indicating higher levels of stratigraphic disturbance.

Table 1. Counts of macrobotanical remains from SB1 *(continued on next page).*

SB1 Sample Provenience (Level)		L. 1 (LRF1)	L. 3 (LRF4)	L. 3 (LRF4)	L. 5 (LRF6)	L. 7 (LRF9)	L. 8 (LRF10)	L. 10 (LRF13)	L. 11 (LRF14)*	L. 11 (LRF14)	L. 12 (LRF15)	L. 12 (LRF15)	L. 12 (LRF16)	L. 12 (LRF16)	L. 13 (LRF17)
Sample Volume (ml)		11	18	14	-	31	8	22	48	13	-	32	18	23	12
Taxon	**Part**														
Adansonia digitata - cf	seed														
Adansonia digitata - cf	fruitshell/seed						2						1	7	
Asteraceae - cf	achene										8				
Borreira	seed										26				1
Cheno-am	seed					1					1				
Commelina cf benghalensis	seed														
Crotalaria - cf	seed														
Cyperus - cf	achene												1		
Fabaceae	bean/cotyledon										5	1	1		
Indigofera - cf	seed										25				
Physalis	seed														
Physalis/Solanum	seed													3	
Poaceae															
Acroceras - cf	caryopsis										1				1
Andropogoneae - cf	caryopsis										9				
Aristida - cf	caryopsis										3				
Chloridoideae cf.	caryopsis										8				
Digitaria - cf	caryopsis										1				
Dactyloctenium aegyptium	caryopsis														
Echinochloa cf colona	caryopsis										1				
Eleusine indica	caryopsis										1				
Eragrostideae - cf	caryopsis														1
Hackelochloa - cf	caryopsis														
Paniceae	caryopsis					2							4		
Panicum - cf	caryopsis										13				
Panicum laetum - cf	caryopsis														
Paspalum orbiculare	caryopsis										2				
Pennisetum - cf	caryopsis					1		1					5		
Pennisetum - cf wild	caryopsis										21				
Pennisetum glaucum	caryopsis										85				
P. glaucum globosum type	caryopsis														
P. glaucum typhoides type	caryopsis													1	
Pennisetum/Sorghum	caryopsis														
Setaria - cf	caryopsis														
Sporobolis - cf	caryopsis														
unknown Poaceae	poorly preserved	1									14			2	
unknown Poaceae	caryopsis-short, round														
unknown Poaceae	embryo										3		5	1	3
Portulaca foliosa	seed														
Scirpus - cf	achene													1	
Sclerocarya birrea	operculum														
Solanum	seed														
Solanum cf nigrum	seed												15		
Trianthema pentandra	seed						1				1				
Unknown botanical	embryo										3				
Unknown botanical	fruitshell frags		2	1	1			2		5			21	12	
Unknown botanical	seed							1			198		10	1	5
Unknown botanical	tissue														2
Unknown botanical	wood-charcoal														
Vitex	stone fragment											1	3		
Ziziphus	stone fragment													1	

U = uncharred specimens recovered; *Sample contained no identifiable items

Samples without volumes were originally size sorted by Cecilia Capezza, but most determinations were made by S. Murray

Table 1. Counts of macrobotanical remains from SB1 *(continued from page 59).*

SB1 Sample Provenience (Level)		L. 14 (LRF19)	L. 15 (LRF20)	L. 15 (LRF22)	L. 16 (LRF21)	L. 16 (LRF23)	L. 18 (LRF26)	L. 19 (LRF27)	L. 20 (LRF28)	L. 22 (LRF32)	L. 22 Foyer (LRF32)	L. 22 trou (LRF32)	L. 23 (LRF34)	L. 23 foyer (LRF34)	L. 23 (LRF34)
Sample Volume (ml)		33	21	-	32	16	28	104	8	-	50	21	30	-	-
Taxon	**Part**														
Adansonia digitata - cf	seed	1				10								1	
Adansonia digitata - cf	fruitshell/seed			50										20	100+
Asteraceae - cf	achene														
Borreira	seed	1													
Cheno-am	seed	24									1				
Commelina cf benghalensis	seed				1										
Crotalaria - cf	seed	2													
Cyperus - cf	achene														
Fabaceae	bean/cotyledon	14	2												
Indigofera - cf	seed														
Physalis	seed	2													
Physalis/Solanum	seed			1											3
Poaceae															
Acroceras - cf	caryopsis														
Andropogoneae - cf	caryopsis				5										5
Aristida - cf	caryopsis														
Chloridoideae cf.	caryopsis														
Digitaria - cf	caryopsis	1													
Dactyloctenium aegyptium	caryopsis														U
Echinochloa cf colona	caryopsis														
Eleusine indica	caryopsis													2	U
Eragrostideae - cf	caryopsis													2	1
Hackelochloa - cf	caryopsis													1	
Paniceae	caryopsis	9		2											
Panicum - cf	caryopsis														2
Panicum laetum - cf	caryopsis	1			1										
Paspalum orbiculare	caryopsis														
Pennisetum - cf	caryopsis	11			22							1			
Pennisetum - cf wild	caryopsis				26										
Pennisetum glaucum	caryopsis					2									
P. glaucum globosum type	caryopsis	9	148	2	39								4	2	
P. glaucum typhoides type	caryopsis		45	2	54									2	1
Pennisetum/Sorghum	caryopsis														1
Setaria - cf	caryopsis				1										
Sporobolis - cf	caryopsis												1		
unknown Poaceae	poorly preserved	7	58	5	41	3			1	1				8	
unknown Poaceae	caryopsis-short, round	2			5										
unknown Poaceae	embryo	6	4	2		2							2	1	
Portulaca foliosa	seed									1				1	
Scirpus - cf	achene														
Sclerocarya birrea	operculum												1		
Solanum	seed	2													
Solanum cf nigrum	seed														
Trianthema pentandra	seed		1		1	1							2	2	18
Unknown botanical	embryo														
Unknown botanical	fruitshell frags	11			1					6		7	7	4	
Unknown botanical	seed				20	5	1					1	2	1	
Unknown botanical	tissue			15		1									
Unknown botanical	wood-charcoal							4		10		1			
Vitex	stone fragment							1							
Ziziphus	stone fragment		2												

U = uncharred specimens recovered; *Sample contained no identifiable items

Samples without volumes were originally size sorted by Cecilia Capezza, but most determinations were made by S. Murray

Table 2. Counts of macrobotanical remains from SB2 and SB3.

SB2 and SB3 - Sample Provenience		Feature 3 (LRF35)	Level 6 (LRF46)	Level 11 (LRF98)	Level 13 (LRF86)	SB3 Level 16 (LRF90)
Sample Volume (ml)		70	66	34	7	68
Taxon (charred only)	**Part**					
Adansonia digitata - cf	seed frag					12
Amaranthus - cf	seed	1	2			
Borreira	seed			1		
Celtis integrifolia	drupe					U
Cyperus	achene			U		
Fabaceae	bean (seed)					1
Monocotyledon	stem					1
Physalis/Solanum	seed		2			
Poaceae						
Brachiaria ramosa - cf	florets	U				
Dactyloctenium aegypticum	caryopsis		U			
Panicum laetum - cf	caryopsis	U	U			
Pennisetum - cf	caryopsis		2			
Pennisetum glaucum globosum type	caryopsis			1		7
Pennisetum glaucum typhoides type	caryopsis		2		1	
Setaria - cf			U			
Unknown Poaceae	caryopsis			U		6
Unknown Poaceae	embryo		1			
Trianthema pentandra	seed			2		
Unknown botanical	charcoal	12				
Unknown botanical	fruitshell frag		1			
Unknown botanical	seed		4			1
Unknown botanical	tissue					9

The remainder of this paper focuses only on the assemblage from SB1.

Overall, the excavations in SB1 revealed a total of four periods of occupation in this part of the site. The earliest habitation, marked by Levels 20-23 and dating 388-652 cal AD, was dominated by the remains of baobab (*Adansonia digitata*) fruits and seeds, wild grasses, and the weedy *Trianthema pentandra*. Caryopses of domesticated pearl millet (*Pennisetum glaucum*) occurred in two forms, the short and wide *globosum*-type and the more elongated *typhoides*-type. Both types have a characteristic club-shape that distinguishes them from other grasses. One caryopsis recovered from these earliest levels was discernable only as *Pennisetum/Sorghum*. It seems more likely to be a large *Pennisetum* grain than *Sorghum*, simply due to the potential early age of the grain and the recovery history of *Sorghum* (see a recent review in Fuller 2003:251-256). Measurements of this specimen are length: 2.5 mm, width: 2.1 mm, and thickness (dorsal to ventral): 1.9 mm; unfortunately the grain was too fragile to photograph. This caryopsis might be attributable to the Leonis group, a larger *Pennisetum glaucum* type that is known to occasionally occur in Senegal (Brunken et al. 1977; Kahlheber 2004:182).

The greatest quantity of plant materials was found between Levels 12 and 16. These deposits were

characterized by numerous pits and hearths, indicating concentrated domestic activity. Seeds or fruits of wild and weedy herbaceous plants (*Borreira, Chenopodium/Amaranthus* and *Physalis/Solanum*), shrubs and trees (*Indigofera, Ziziphus, Adansonia* and *Vitex*), and wild grasses (mainly members of Paniceae) were relatively numerous and dominated the assemblage, pointing to continued gathering of wild and possibly cultivated resources. The only domesticated crop was pearl millet (*Pennisetum glaucum*), signifying some reliance on farming. Except for pearl millet, most of the taxa recovered from these deposits date only to this phase of the site, indicating that a diversity of food gathering activities took place during this period of occupation. The greatest presence of animal remains (large, medium, and small bovids, *Bos*, ovi-caprids, dog, and turtle) also coincides in these levels (Bocoum and McIntosh 2002:96).

The presence of structural remains, hearths, and pits in Level 1 and in Levels 5 and 7 defines the latest two phases of occupation (cal AD 667 to 990). Besides seeds and grains from Amaranathaceae and pearl millet, few plant materials were associated with these contexts. This lack of organic presence, possibly due to the fewer number of samples collected or to the episodic nature of occupation in this period, makes it difficult to identify later agricultural developments. In general, there is little evidence to indicate a change from the mixed economy of farming and wild plant exploitation that was evidenced in earlier occupations to one based on more intensive farming.

The charred botanical assemblage from Sincu Bara compares well with other excavated sites along the Senegal River. Thirty-three macrobotanical samples from the site of Arondo (AD 400–1000), located near the confluence of the Senegal and Faleme Rivers, most commonly contained seeds/grains or fruits of jujube (*Ziziphus*), baobab (*Adansonia digitata*), and pearl millet, as well as a mix of wild grasses, particularly *Paspalum orbiculare* (Gallagher 1999). Domesticated sorghum (*Sorghum bicolor*) was also present at that site. At Cubalel (AD 0–900), the 80 samples analyzed thus far, indicate extensive use of the staple domesticated grasses pearl millet and fonio (*Digitaria cf. exilis*), and the wild grass *Panicum cf. laetum*. Other wild grasses (*Echinochloa, Brachiaria, Paspalum*, and *Setaria*) were also present in smaller numbers, as were seeds of various members of the Leguminosae family and the seeds/fruits of jujube (Murray et al. 2007). An assemblage dominated by grains of domesticated pearl millet and the seeds/fruits of jujube similarly characterized the 20 samples from the earlier site of Walaldé, dating roughly 800–550 BC to about 200 BC. Other wild plant species, particularly the shrub/tree fruits of *Celtis integrifolia, Sclerocarya birrea* and *Grewia*, and the wild grass *Setaria* were recovered from that site (Murray and Deme, forthcoming).

Summary

Based on microscopic analysis of 33 flotation samples, subsistence at Sincu Bara appears mainly to have been based on the cultivation of pearl millet and the harvesting of wild plant foods, particularly grasses. The absence of other domesticated crops, especially African rice and sorghum, is notable. Prior to the second millennium AD, sorghum has been documented only in the Upper Senegal drainage. The focus of the MSV sites excavated to date seems to be on pearl millet. Further, there appears to be little evidence at Sincu Bara for increased agricultural intensification through time or in the development of an inter-regional trade in subsistence goods, suggesting that this town was not the site of a bustling regional capital.

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