



THE AFRICAN ORIGINS OF CAROLINA RICE CULTURE

Judith Carney

This paper examines the cultural origins of rice cultivation in the United States, arguing that its appearance in South Carolina with settlement of the colony from 1670 is an African knowledge system that transferred across the Middle Passage of slavery. The origins of this wetland farming system are explored in relationship to other ethnic groups found in the colony at the time, the English, French Huguenots and native Americans. Also discussed is the development of scholarship on rice origins in West Africa and why scientific knowledge of this issue remained unexplored until this century. The final section addresses the significance of gendered practices in African rice cultivation and processing, and the role of female knowledge systems in the crop's diffusion across the Atlantic basin to South Carolina.

Twenty-five years ago historian Peter Wood broke with prevailing accounts of Carolina rice beginnings by attributing the crop's successful adaptation to slaves. Building upon earlier ideas of Converse Clowse, who showed rice slaves as anything but unskilled laborers, *Black majority* argued that the candidates for rice origins were the 'unlikely innovators' from West Africa's extensive rice-growing region.¹ Archival evidence led Wood to challenge numerous accounts written by apologists of slavery, planters and their descendants, celebrating the 'ingenious' achievements of their ancestors in finding a crop so eminently suitable to the low country of South Carolina.²

One enduring achievement of Wood's scholarship was to direct research interest beyond the Carolina shores and eastwards across the Atlantic Ocean to West Africa. His thesis in effect would demand an intellectual journey, one that reversed the direction followed by slaves across the Middle Passage. The early history of Carolina rice cultivation asked new questions about African contributions to the agricultural history of the Americas. But this journey demanded a different type of research optic, one similar in spirit to that pioneered by French historians of the *Annales* school with its attention to space and time, or geography and history, for understanding long-term historical processes. Fernand Braudel in particular illuminated the possibilities of such an approach

in his focus on the Mediterranean as the appropriate geohistorical unit for analysing the history of capitalism.³ Wood's attribution of rice beginnings to West African slaves similarly required an innovative framework, one that would emphasize the Atlantic basin. It is within this holistic approach, focused on the Atlantic world, that this article is written.

Three themes related to rice history and the role of slaves in its diffusion to the Americas are considered in this article. One builds upon the research of historian Daniel Littlefield and geographer Carville Earle.⁴ In examining the cultural origins of rice cultivation in South Carolina, Littlefield illuminated its African antecedents. Earle's parallel interest in the intersection of geography with history draws attention to agriculture as the connective tissue between nature and culture, and thus to its potential for investigating questions of culture, technology and the environment. This article emphasizes the identification of distinctive farming systems and their location in specific regions of the world as the result of indigenous knowledge formed *in situ* over time. The second theme, which reviews scholarship on rice origins in West Africa, addresses the manner in which scholars learned that a separate rice species evolved there, and the question why scientific knowledge of this fact remained unexplored until this century. The significance of gendered practices in the cultivation and processing of rice, especially the role of female knowledge systems in the crop's diffusion across the Atlantic from West Africa to South Carolina, forms the third theme.

An African agricultural system in South Carolina

Until Wood's 1974 pathbreaking book, *Black majority*, accounts of rice beginnings in South Carolina routinely attributed the crop's introduction and adaptation to Europeans rather than Africans. Rice was promoted by English pamphleteers as a potential commodity for their American colonies as early as 1609 and, as historian Daniel Littlefield observes, rice figured among the promising crops mentioned in 1648 by one Virginia pamphleteer in a letter sent to England:

The Governor Sir William [Berkeley], caused half a bushel of Rice (which he had procured) to be sown, and it prospered gallantly and he had fifteen bushels of it, excellent good Rice, so that all those fifteen bushels will be sown again this year; and we doubt not in a short time to have Rice so plentiful as to afford it at 2d a pound if not cheaper, for we perceive the ground and Climate is very proper for it as our Negroes affirme, which in their Country is most of their food, and very healthful for our bodies.⁵

While the development of the tobacco economy over the next decades would overshadow further consideration of rice cultivation in Virginia, the quotation reveals several key points. From an early period of settlement planters were aware of rice cultivation in Africa even though the consolidation of slavery during the ante-bellum period effaced the common knowledge of an earlier era. Secondly, Virginia colonists actually grew rice, although no direct statement indicates how

the crop was cultivated. However, if rice was to become a successful plantation crop, it depended upon developing wetland cultivation, not the lower-yielding upland or rain-fed system.

The type of rice cultivation that characterized the Virginia experience of the 1640s can be inferred by examining early historical references. The crop's brief appearance and disappearance in favour of tobacco reveals little, but in 1709 Lawson reported the planting of a red rice with rainfall in the adjoining colony of North Carolina, which suggests that the earliest type of cultivation by Virginia settlers was likely also a rain-fed system.⁶ Certainly this form of rice farming figured among the earliest crops established with settlement of South Carolina from the 1670s.⁷ Already in 1690 rain-fed rice is described in a letter sent from the colony by one Scottish settler, John Stewart, who mentions the crop being grown ' "as barley", . . . broadcast' and in rows – that is, with rainfall, in the way Europeans traditionally sow their cereals.⁸

Yet at the same time another system of rice-growing made its appearance in South Carolina, one that developed in tandem with the establishment of African slavery. This was the cultivation of rice under submergence in low-lying swamps. Perhaps an early reference to its existence can be inferred from Stewart's correspondence from 1690, when he claimed to have experimented with planting rice in more than 20 environments in an area characterized by abundant and diverse types of lowland swamp.⁹ In any case, it was not Stewart who actually grew the rice but slaves. By the first decades of the eighteenth century this more productive wetland system had displaced upland or rain-fed rice in South Carolina, which Alexander Hewatt in 1779 glibly attributed to Carolinians having 'exhausted their strength in raising it on higher lands'.¹⁰ The Carolinians in this case would have been black and enslaved. Their labour in lowland rice would result in far greater physical demands and such high rates of mortality that Thomas Jefferson over the decade of the 1780s to 1790s would struggle futilely to reintroduce rice cultivation on higher lands.¹¹

The English settled Virginia as they did South Carolina, with the first colonists initially arriving from Barbados in search of land to extend the plantation system. Colonists from England, as well as Protestant Huguenots displaced from France, soon joined them. Slaves figured prominently among the first settlers of South Carolina, arriving on the mainland via Caribbean plantations or directly from West Africa. An examination of the cropping systems known to Europeans and Africans in the initial decades of settlement of South Carolina from the 1670s illuminates which ethnic tradition should be credited with the development of Carolina rice cultivation. There exists a lingering doubt as to African agency in colonial rice history, because English settlers in Virginia heeded the advice of pamphleteers to experiment with rice during the seventeenth century. But the key to rice history in colonial America lies in understanding the types of farming system known to both black and white settlers of the southern colonies. This evidence suggests that the rice briefly planted in Virginia was of the upland type, reliant solely upon rainfall. It formed part of a rain-fed farming system known to both European and African. But only West African slaves knew the wet rice farming system.

At the time of their emigration, the English and French practised an agricultural system based on the cultivation of crops by rainfall. With settlement of the southern colonies, they adjusted this farming system to subtropical conditions and began planting crops new to them, such as rice and tobacco. When early experiments in Virginia during the mid-seventeenth century showed that rice would produce a 'gallant' harvest with adequate rainfall, colonists thus added another plant to their existing farming system, even though its potential as an export crop would be later abandoned in favour of tobacco. However, just a few decades later, at the end of the seventeenth century, an entirely new way of growing rice had developed in South Carolina. This form of cultivation involved planting the crop under submersion in low-lying swamps. Mark Catesby, one of the first naturalists to visit South Carolina and to report on agricultural systems, in 1731 mentions, rice being grown, not by rainfall, but 'wholly in water'.¹² By the time of his visit the process of planting rice under submersion, a process that dramatically increases yield, was firmly established in the colony, as newspaper notices of land for sale along river floodplains demonstrate during the 1730s.¹³ But cultivation of wetland rice depended upon knowing how to grow the crop under anaerobic conditions. The European settlers of South Carolina, as those of Virginia, did not practise a cultivation system that involved planting crops in standing water. Instead, theirs was a rain-fed farming system, with rice cultivated by rainfall in the same manner as oats, wheat and barley. Wetland rice farming, on the other hand, demands a sophisticated understanding of lowland landscapes and their skilled manipulation for irrigation, drainage and tidal farming. West Africa is the likely source of origin for the wetland rice system that emerged in South Carolina during the early colonial period.

Could tidal rice cultivation have been learned elsewhere, through, for example, the Dutch? Masters of reclaiming land from the sea and protecting it from the flow of marine tides, the Dutch did not figure among the migrants to the Carolinas. Could the English then have learned these techniques by the time of the colony's establishment in the Americas? Littlefield's review of fenland swamp cultivation in England during the seventeenth century in fact reveals the role of Dutch engineers in teaching proper drainage techniques for reclaiming inland marshes, following the procedures they had mastered to reclaim land from the sea for agricultural expansion in Holland. But the principles used in draining waterlogged soils did not result in cultivation by submersion. Instead, in both Holland and England land reclamation served to expand the existing farming system into new areas. The result was cultivation by rainfall, rather than cropping in standing water. Such drainage and reclamation methods were not widely known in England by the founding of the colony of South Carolina in 1670.¹⁴ Thus, with no evidence for English or Dutch expertise in wet rice farming in South Carolina in the second half of the seventeenth century, the origins of rice culture must lie elsewhere.

In 1650, just a few years after the report discussing rice cultivation in Virginia, a pamphleteer in England asked, since rice grew 'in the Fenny places of *Milan*, . . . why may it not grow in our Fens?'¹⁵ The quotation indicates English aware-

ness of rice farming in the Piedmont area of northern Italy. Although not cultivated in England, the crop had been grown in Italy since the fifteenth century, where Arabs introduced it either via Spain or Sicily. But the system of rice farming in Italy proved again quite different from the one that developed on Carolina floodplains.¹⁶ In southern Europe the crop was grown on alluvial deposits built up over centuries in the manner of the levees found along the Mississippi River, where rice cultivation in the United States shifted from the 1880s.¹⁷ This form of cultivation is really a rain-fed system, similar to the one that appeared in Italy where land use rotates between rice, other cereals and pulses. While irrigation canals deliver water in crucial deficit periods, cultivation does not involve growing the crop by submersion in the manner of the paddy rice systems of Asia.

The historical record does not, moreover, indicate the presence of Italian rice varieties or cooking styles in South Carolina, which would suggest a lineage of tidal production with southern Europe. The small, round Italian rice, with its hard endosperm and resistance to breakage with milling, did eventually arrive in South Carolina but only after the American Revolution, in 1787, through the intercession of Thomas Jefferson. By introducing the Piedmont rain-fed variety, he hoped to reverse the Carolina emphasis on swamp rice, because 'the kind they now possess, which requiring the whole country to be laid under water during a season of the year, sweeps off numbers of the inhabitants annually with pestilential fevers'.¹⁸ Jefferson's efforts to re-establish cultivation of rain-fed rice in the period following the American Revolution came to naught because its yields proved lower. Italian varieties consequently were not adopted in the US South, nor was the distinctive risotto method of its preparation, which involves sautéing the rice with butter or oil and the gradual adding of liquid with stirring.¹⁹

Since European antecedents for the introduction of wet rice cultivation to South Carolina cannot be established, only two possibilities remain for its cultural origins, Native American or African. North American Indians did in fact gather rice from lowland swamps. But this was a wild rice, the grass *Zizania aquatica*, not a true rice of the *Oryza* genus, as historian Daniel Littlefield reminds us. The preparation of wild rice for consumption by native Americans also failed to influence the direction of rice preparation in South Carolina. To render *Zizania* comestible, the grains were first scorched or parched so that the burning assisted in removing the hulls, a method distinctly different than the mortar and pestle technique employed on Carolina plantations during the colonial period.²⁰

At the time of settlement of the South Carolina colony, the tidal rice system existed in only two areas of the world, Asia and West Africa. Contact with Asia during the period of Carolina settlement, however, was indirect and brokered by English mariners and merchants, whose interest was trade goods, not agricultural systems. No evidence from the crucial period of rice development in South Carolina, from the 1690s to 1750s, indicates that Europeans possessed a comprehensive understanding of the Asian rice system, which relied on the techniques of transplanting, irrigation and drainage. Even memoirs of

planter descendants lend indirect support for this contention when celebrating the ingenuity of their forebears in discovering the principles of wet rice cultivation. The intent of such accounts is to demonstrate planter aptitude and intelligence in developing the most lucrative plantation system in North America.²¹ However, the type of rice cultivation that developed along Carolina floodplains differed in one crucial respect from that of Asia. It did not involve transplanting, and in this sense reveals the linkage of the Carolina rice system to West Africa.

In fully evolved wetland farming systems such as those that developed in Asia and West Africa, human beings act as geomorphological agents on a grand scale, transforming swamp into rice paddy through a sophisticated understanding of lowland gradient and water flow. The Asian rice system responded to land scarcity with the development of techniques like transplanting to increase yields.²² The rice systems of West Africa unfolded along a different trajectory, of labour rather than land scarcity. Under such circumstances the labour-intensive practice of transplanting developed only in response to specific environmental constraints, as a way to improve seed survival along floodplains swept by high tides, in areas menaced by seasonal saltwater intrusion or by the irregular onset of rainfall. In these circumstances rice seeds are first established on higher ground and then the hardier seedlings transplanted. Otherwise rice is direct-seeded on floodplains in the same manner that characterized Carolina tidal cultivation.²³

While *sativa* varieties from Asia transferred to the emergent rice economy of South Carolina during the seventeenth century, long in advance of any migration of Asians to North America, the seeds became established because human beings already familiar with wet rice farming would grow them. These were slaves, among whom were many already familiar with rice cultivation in West Africa.

The origins of rice cultivation in West Africa

There has never been scholarly doubt as to Asia being a centre of rice domestication, even though the exact area of the crop's origins and its antiquity has been disputed. Archaeological excavations throughout Asia now indicate the domestication of rice, *Oryza sativa*, some 7 000 years ago. The species probably evolved independently, albeit concurrently, in multiple sites over a broad belt that extended from the Gangetic plain below the foothills of the Himalayas near Assam, across upper Burma, northern Thailand, North Vietnam and into south-west China near Yunnan.²⁴ Asian rice was probably first domesticated on floodplains as a shallow or deep-water crop, with cultivation later extended to the rain-fed uplands. By the second to third century BCE large-scale, centrally managed irrigation systems were in place, and the practices of ploughing with water buffalo, manuring and transplanting were already established in the early Christian era.²⁵

Information on the beginnings of African rice cultivation is far less extensive, although recent research offers new insights. Until the twentieth century the

cultivation of rice in Africa was viewed as the result of the diffusion of systems from Asia. But this view proved problematic, since the earliest observations of rice cultivation were from West and not the geographically more proximate East Africa. The crop's cultivation along the upper Guinea coast captured the interest of Portuguese mariners from their earliest voyages. In 1453, decades before ships would reach India and Asian rice systems, the Portuguese chronicler Gomes Eanes de Azurara visited the mouth of the Gambia River and recorded the first European mention of West African rice cultivation:

They arrived sixty leagues beyond Cape Verde [Senegal], where they met with a river which was of good width, and into which they entered with their caravels . . . they found much of the land sown, and many . . . fields sown with rice . . . And . . . all that land seemed . . . like marshes.²⁶

Over the following decades, Portuguese commentaries observe the importance of rice as a dietary staple and its widespread cultivation along the West African coast south from Senegal to Liberia. Portuguese ships came to depend upon the availability of rice for provisions, as did mariners of other European nations who began competing with Portugal for the West African trade from the second half of the sixteenth century.²⁷

As a crucial dietary staple for millions in West Africa, rice sustained the dense populations of numerous societies subsequently swept into the Atlantic slave trade. While rice was cultivated principally as a subsistence crop, the deepening of Atlantic slavery resulted in its being planted as a commodity near the Atlantic Coast and slave markets. African captives were often forced to cultivate food staples for armies or for sale to slave ships. Europeans visiting Senegambia during the eighteenth and nineteenth centuries mention *rumbdés*, villages where slaves cultivated the 'plantations' of their owners and provided cereals to dependent military retinues.²⁸ As the Atlantic slave trade augmented, so did the demand for rice, with slave ships purchasing the cereal to provision its human cargo across the Middle Passage.²⁹

Remarkably, until the twentieth century scholars routinely attributed rice origins in West Africa to Portuguese introduction from Asia. When evidence this century showed that Africans grew rice prior to the arrival of Europeans, the attribution of origins shifted only slightly: Asia remained the centre of rice origins, but its diffusion to Africa probably resulted from Arabs who introduced the crop over land routes between the eighth and fourteenth centuries.³⁰ Even more decades were to pass before the antiquity of rice cultivation in sub-Saharan Africa was established. The view that Africans failed to domesticate crops, a process so fundamental to the development of civilization, proved an enduring legacy of the Atlantic slave trade well into the twentieth century.

This unquestioned view impeded the advance of scholarship on the agricultural achievements of Africans even when evidence suggested the need for its recasting. For instance, when sorghum and millet were established this century as African domesticates by the Russian botanist Vavilov, historians dismissed them as insignificant contributors to global seed exchanges. The Portuguese Orlando Ribeiro assigned these cereals a minor role while conceding a far greater one in Africa to introduced plants like rice from Asia and maize, cassava and peanuts

from the Americas.³¹ Like many other scholars, Ribeiro could not imagine an African contribution to world agricultural history other than as subsistence farmers on the continent and unskilled labourers on New World plantations. The failure to critically engage commentaries that affirmed rice cultivation along the upper Guinea coast during the earliest period of European navigation perpetuated belief that the Portuguese first brought rice to West Africa.

The bias against Africa in European scholarship ran so deep as to make little impact on perceptions, even when evidence suggested otherwise. For instance, the botanical research and classification that resulted in the formation of scientific societies charged with plant exchanges included requests by Thomas Jefferson for rice seeds from West Africa.³² However, the idea that the crop might also have originated in Africa was not even considered. Long aware of the association of rice with Asia, Linnaeus (1707-78) listed only one species in his botanical classification, Asian rice or *Oryza sativa*. Nor did Alphonse de Candolle consider an African provenance in his celebrated compendium on the origin of cultivated plants, published in 1886.³³ Specimens of rice formally collected in West Africa during the nineteenth century also presumed the presence of Asian *sativa*. The French botanist Leprieur, for instance, attributed the seeds he collected in Senegal between 1824 and 1829 to the *sativa* species, as did Edelstan Jardin in his collection of rice from islands off the coast of Guinea-Bissau in 1845-8.³⁴

A careful examination of the Jardin collection by the botanist Steudel in 1855, however, led him to conclude that the collected samples represented a rice species quite distinct from Asian *sativa*, which he named *Oryza glaberrima* for its smooth hulls.³⁵ But Steudel's research did not make the claim that this rice was of independent African origin. The longstanding assumption that rice origins were Asian pervaded even the work of noted Russian geneticist Vavilov, whose pathbreaking research on indigenous centres of plant domestication received widespread attention in the 1920s. Vavilov made no mention of *glaberrima* as he, too, assigned rice solely an Asian origin.³⁶ Although the first to credit Africans with plant domestication in his identification of an Abyssinian centre of agricultural origins in the Ethiopian highlands, Vavilov did not consider West Africa as a centre of plant domestication.³⁷

However, from the turn of the century such views were being steadily questioned. Botanists working in the French West African colonies began to suspect an African origin for a widely cultivated red-hulled rice with distinctive characteristics. Their suspicion led to the rediscovery of Steudel's research conducted half a century earlier, and a re-examination of the Leprieur herbarium collection, which also indicated *glaberrima* rice. On the basis of plant geography and botanical distributions, by 1914 French botanists were advancing the hypothesis for an indigenous and independent centre of rice domestication in West Africa.³⁸ Their research on rice developed in response to growing metropolitan concern over the food shortages and famines that were accompanying the colonial emphasis on export crops. Planted on swampland unsuitable for the export crops, peanuts and cotton, rice received increasing attention for its potential to alleviate food crises associated with abandonment of the traditional rain-fed

cereals, millet and sorghum.³⁹ The French botanical research centred on the inland delta of the Niger river located in Mali, a major location of rice cultivation in West Africa and where *glaberrima* species predominated over *sativa* varieties.⁴⁰

Strengthening the hypothesis for an independent West African centre of rice domestication, numerous botanical collections revealed wild relatives of *glaberrima* without locating equivalent *sativas*.⁴¹ But the claim for a separate centre of agricultural domestication in West Africa met considerable resistance, especially during a period that privileged the Near East for the initial emergence of agriculture and its diffusion from there to other areas.⁴² While conceding the existence of rice cultivation in Africa before the arrival of Europeans, researchers still looked to Asia for its diffusion. Efforts initially focused on the crop's introduction by Arab traders, perhaps with the expansion of Islam from the ninth century.⁴³ One account in Arabic from 1068 mentions the cultivation of rice in the western Sahel, suggesting that the cereal may have reached West Africa via overland trans-Saharan trade routes at an earlier date.⁴⁴ Certainly by the year 1000 emperors of the Songhay state, located in the inland delta of the Niger river, had become Muslim. When Islamic scholar Ibn Battuta travelled through the kingdom of Mali in the middle of the fourteenth century, he noted the extensive cultivation of rice and the role of women in selling the crop to travellers: 'When [the traveller] arrives in a village, the women of the Sudan come with millet, milk, chickens, the flour of lotus, rice . . . The voyager buys from them what he desires.'⁴⁵

Comments from the eleventh to the fourteenth centuries by Muslim scholars journeying overland to the western Sudan thus establish the presence of a fully evolved rice culture. Rice was widely consumed, traded and grown over a broad area, factors that suggested a production system of greater antiquity. But there were no references to rice in ancient Egyptian tombs, which suggests that the Asian species had not yet reached the Nile.⁴⁶ The Greek geographer Strabo's mention of rice cultivation at an oasis in Cyrenaica (Libya) during the first century CE provides the earliest documentation for the presence of rice on the African continent. But the linkage of the oasis to West African as well as Mediterranean trading networks may also actually imply the cultivation of *glaberrima*.⁴⁷ While these findings did not dispute a Muslim role for the introduction of *sativa* rice via East Africa, research steadily undermined the idea that the origins of rice cultivation in West Africa were Asian.

Linguistic evidence provided additional support for West Africa as an independent centre of rice domestication. In regions of Africa where rice cultivation was unknown before the arrival of European traders, the local words borrow the names of those who introduced it, and thus the Arabic and European names *eruz*, *eruz*, *arroz*, *riz*, *rijst* and *rice* are used. However, in the areas already established to rice cultivation or where the crop formed part of an active trade in cereals, no borrowing of names occurs. Along the upper Guinea coast, where the Portuguese first witnessed rice cultivation, and continuing inland to Lake Chad for nearly 2 000 Km, the names for rice derive from African languages.⁴⁸ For example, in Senegal and Gambia, reached by the Portuguese in the mid-

fifteenth century, the terms *mano* (Mandinka), *malo* (Wolof) or some derivative of *maro* are employed for the native African rice. These same names were later extended to the Asian varieties introduced by the Portuguese and other Europeans between the sixteenth and eighteenth centuries.⁴⁹

French botanist Roland Portères identified two foci along the West African coast where Asian varieties took root in African rice farming systems during this period. One was located between the Casamance and Cacheu rivers in Guinea-Bissau and Senegal, the other in the region between Guinea-Conakry and Buchanan, Liberia (Figure 1).⁵⁰ Asian rice became established in the region during the Atlantic slave trade because of the presence of ethnic groups skilled in its cultivation and the crop's availability for purchase. In fact, European slavers often referred to this stretch of the upper Guinea coast as the Rice Coast. In noting the establishment of *sativa* in an area of Africa with a history of *glaberrima* cultivation, Portères underscored a crucial point: that the adoption of Asian varieties presupposed populations already skilled in the techniques and practices of growing transplanted rice under submersion.⁵¹

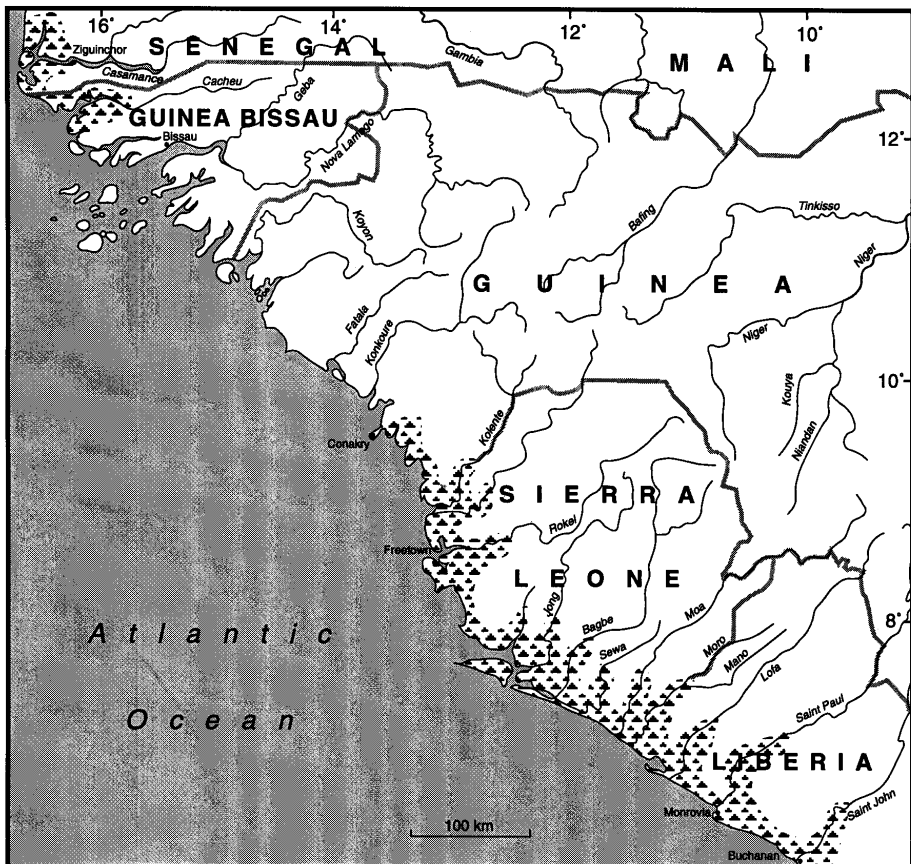


Figure 1 ~ Asian rice introduction along the West African coast from the sixteenth to eighteenth centuries

In the same manner that West Africans adopted crops like maize, manioc and peanuts of New World origin into their rain-fed farming systems, so too they added *sativa* varieties to their system of wetland rice cultivation. But the complicated preparation of maize into tortillas did not transfer eastward across the Atlantic. That depended upon the diffusion of the alkali soaking process, a gendered knowledge system, developed by Amerindian women to remove the hulls.⁵² Similarly, with the introduction of manioc from South America in the seventeenth century, the adoption of bitter varieties lagged behind the sweet ones until African women learned to leach out the poisonous alkaloids (hydrocyanic acid) by steeping the roots in water.⁵³ The introduction of *sativa* varieties to West Africa from the sixteenth century similarly occurred within a pre-existing cropping and milling complex, with the Asian species becoming initially established in the area specialized in transplanted rice. In 1594 the Portuguese trader André Alvares de Almada recorded the transplanting of rice in this region, along floodplains experiencing saltwater intrusion, as did the English captain Richard Jobson in similar environments during his visit to the Gambia river from 1620 to 1621.⁵⁴ Introduced *sativa* varieties were cultivated and milled with a mortar and pestle in precisely the same manner as *glaberrima*.

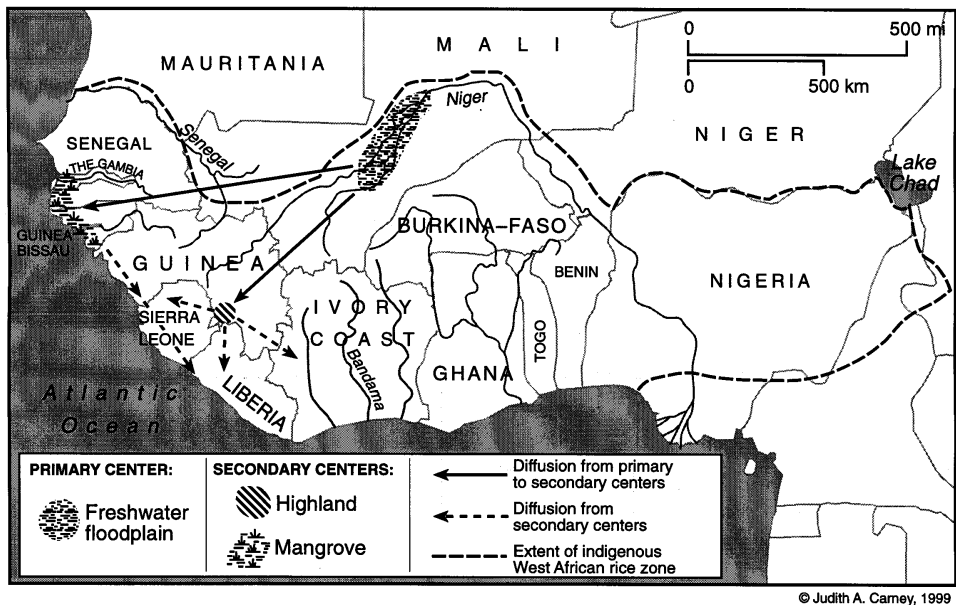
The diffusion of Asian rice to West Africa thus unfolded in the context of existing knowledge systems of cultivation and food processing. West Africans incorporated *sativa* seeds into pre-existing farming, milling and food preparation methods. These knowledge systems were ethnic as well as gendered. The global transfer of seeds with European voyages, often referred to as the Columbian Exchange, has received a great deal of attention, but it privileges European and male agency in their diffusion. At times, entire cultivation and processing systems were transferred as well. And, as with rice in the Americas, when this occurred it was because the bearers of the indigenous knowledge system were also mobile.

The information on seed varieties and cultivation techniques that characterized botanical exchanges among members of scientific societies interested in rice during the eighteenth century served precisely the same purpose as the informal methods developed during the initial generations of slavery. The objective was to improve yields, reduce grain breakage with milling and satisfy consumer preferences for white rice.⁵⁵ While scholarship honours the contributions of Europeans, Asians and Amerindians to the global larder, the role of Africans in agricultural history has scarcely advanced beyond their portrayal as unskilled labourers on American plantations. The history of rice cultivation surrounding the Atlantic basin, however, suggests that the crop's appearance in South Carolina was not the outcome of European agency and ingenuity but the result of a sophisticated knowledge system of wetland cultivation brought by involuntary black migrants.⁵⁶

By the 1970s the pioneering French botanical research on *glaberrima* had become widely known within the international scientific community, which accepted the conclusion that the species was indeed of independent African origin. Of more than 20 species of rice found on the planet, only two were domesticated, one in Asia (*Oryza sativa*), the other in West Africa (*Oryza glaberrima*).

Botanical research indicates that the domestication of *O. glaberrima* occurred over a broad region that extends along the West African coast from Senegal southwards to Liberia and inland to the shores of Lake Chad (Figure 2). The *glaberrima* species was originally domesticated in the wetlands circumscribing the inland delta of the Niger River in Mali, an area where rice is planted nearly within sight of desert sand dunes.⁵⁷ Genetic evidence suggests that *glaberrima* then diffused to two secondary centres of varietal development, one adjusted to planting along the lower reaches of river floodplains experiencing seasonally saline water conditions. Portères locates this area north and south of the lower Gambia river between the rivers Sine and Casamance in Senegal, while placing the other centre of varietal development in the well-watered Guinean highlands between Sierra Leone, Guinea-Conakry and Liberia (Figure 2).⁵⁸ The primary centre of *glaberrima* domestication in Mali as well as the Gambian secondary centre involve wetland cultivation, with transplanting having developed in response to the salinity problem only along coastal river floodplains. The Guinean secondary centre of *glaberrima* domestication that developed in a region where rainfall reaches 2000 mm/year is a rain-fed rice system.

Certain characteristics of African rice distinguish it from most *sativa* varieties. One is the red colour of its husks, which shifts between purple and black tones in different varieties. Even in the black-and-white photograph represented as Figure 3, where Diola women of Casamance, Senegal display bundles of *glaberrima* (left) and *sativa* (right) rice they planted in their fields, the colour difference between the two is apparent. But the 'great red rice of the hook of the Niger River' is not confined to *glaberrima*, as many wild *sativas* bear the red pericarp or skin characteristic of African rice, like some cultivated Asian types found



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Figure 2 ~ Centres of origin and diffusion of West African rice, *Oryza glaberrima*

in subtropical Himalayan valleys.⁵⁹ Although generally lower-yielding than *sativa*, African rice varieties reflect broader tolerance to environmental stress associated with soil acidity, salinity, flooding, phosphorus deficiency and weed competition. Nor does African rice readily cross with Asian varieties. Its suitability for commercial purposes is additionally weakened by a tendency to break more easily than *sativa* with mechanized milling.⁶⁰

During the 1950s the French botanist Roland Portères made the first attempt to speculate on the antiquity of African rice cultivation. Based on preliminary radiocarbon dates of megalithic stone sites located along former river courses in the rice region, he attributed *glaberrima* domestication to about 3500 years ago.⁶¹ Recent archaeological evidence establishes a later date. In the primary centre of rice domestication in West Africa, at the inland delta of the Niger River



Figure 3 ~ Diola women in Casamance, Senegal with bundles of African and Asian rice

at Jenne-jeno and near Timbuktoo and other early urban centres in Mali, archaeologists have established a date for the presence of *glaberrima* by CE 300.⁶² The earliest occupation of Jenne-jeno dates from the second century BCE, not long after the appearance of iron-smelting in the area which enabled the making of metal tools and, critically, the exploitation of the inland delta's heavy soils for wet rice cultivation.⁶³ Archaeological research in the West African centre of domestication is meagre in comparison with the Asian one, and primary archaeological evidence for rice cultivation extremely rare.⁶⁴ However, available evidence establishes the cultivation of rice in the area for at least 2000 years.

Domestication of rice in West Africa, therefore, occurred long before any navigator from Java or Arabia could have introduced the crop to Madagascar or the East African coast.⁶⁵ Millennia later, rice crossed the Middle Passage of slavery to the Americas as food in ship cargoes, as an indigenous knowledge system known to many of the Atlantic slave trade's victims, and in the processing and culinary traditions of African women. The gendered aspects of African rice systems and their import for South Carolina are discussed below.

Gendered practices in African rice culture and linkages to South Carolina

In recent years a great deal of attention has focused on whether a gender division of labour characterized work patterns on Carolina rice plantations. Evidence from archival and historical sources as well as illustrations yield clues on the labour system, which indicates that female slaves constituted the majority of 'prime hands' on Carolina and Georgia rice plantations.⁶⁶ Women were especially involved in the tasks of sowing the seeds, weeding and hoeing, their group labour with long-handled hoes described by one observer of an ante-bellum rice plantation as a 'human hoeing machine'.⁶⁷ The association of females with field labour in rice cultivation, which planter descendant Duncan Heyward termed 'woman's wuck', is represented in an engraving from the era (Figure 4). A field labour force that was disproportionately female characterized rice cultivation, with the less arduous 'skilled' work assigned to male bondsmen.⁶⁸ An examination of the division of labour on Carolina rice plantations consequently reveals the importance of gender for the allocation of work, but the resulting feminization of rice culture probably resulted from men's greater involvement in non-agricultural tasks, which left fieldwork disproportionately to women. However, as the principal rice growers in West Africa and in the preparation of rice for consumption, African women would have played an important role in the transfer of rice culture to South Carolina.

Most of the techniques constituting West African rice cultivation developed in three principal environments, identified in Figure 2. Two of these are wetland systems that developed first along floodplains of the inland delta of the Niger river before spreading later to coastal tidal flats and estuaries that faced seasonal salinity. The other secondary centre of rice domestication, located in the high-precipitation regime of the highlands straddling Sierra Leone, Guinea-

Conakry and Liberia, was a rain-fed farming system. Wherever rice cultivation occurs in West Africa, women are involved. Rice is either a female crop or one cultivated with a sharply demarcated gender division of labour, men preparing the land for cultivation and women in charge of sowing, weeding and hoeing.⁶⁹

From the earliest European observations of rice culture in West Africa, the crop is associated with female labour. While discussing food purchases by Dutch traders at Cape Mount near the Liberian border in Sierra Leone in 1624, Samuel Brun claimed that rice was 'the ware of women', while Francis Moore noted along the Gambia River in 1738 that the 'Men work the Corn Ground and Women and Girls the Rice Ground'.⁷⁰ In addition to the production systems where rice was a woman's crop, the role of female labour in the coastal systems, which involved both men and women, is also described. Samuel Gamble's dis-



PLANTING THE RICE.

Figure 4 ~ A group of female slaves hoeing rice on a rice plantation in South Carolina. Reproduced from an original engraving in *Harper's New Monthly Magazine*, November 1859, volume 19, pp. 721-738 in an article by T. Addison Richards, 'The Rice Lands of the South'.

cussion of the gender division in rice cultivation among the Baga of Guinea-Conakry in 1793, notes that they were 'very expert in Cultivating rice and in quite a Different manner to any of the Nations of the Windward Coast [Sierra Leone] . . .' and that 'Women & Girls transplant the rice'.⁷¹ Golberry commented on a similar gendered rice system in Sierra Leone, with women involved in transplanting and hoeing the crop.⁷² Females accomplished this task with a specialized tool, a long-handled hoe known as the *baro* (Mandinka), nearly the height of a woman. The use of this iron-bladed instrument, worked in an upright position to break up soil for weeding and transplanting, continues as an exclusive female tool into the present (Figure 5).⁷³

During the time of the Atlantic slave trade, therefore, wherever rice was grown it was a crop that involved women. Their knowledge would have proved critical in developing the cultivation of rice in the Americas, even if the gendered practices informing the cropping system became transformed under slavery. The significance of female knowledge for cultural practices becomes especially evident when examining rice processing and cooking.

While the successful transfer of rice culture to South Carolina depended on learning how to raise the crop in wetland environments, of equal importance to its development as an export crop was knowledge of how to process or mill rice for international markets, a point implied in a report by Edward Randolph to the Council of Trade and Plantations in 1700: 'They have now found out the true way of raising and husking rice.'⁷⁴ Throughout the colonial period, rice



Figure 5 ~ A group of Mandinka women preparing a rice field in The Gambia (photo courtesy of David P. Gamble)

processing took place with a mortar and pestle, a method that involves placing rice in a cavity formed in a hollowed-out log so that the indigestible hulls can be removed by striking with a heavy wooden pestle (Figure 6). This is the



Figure 6 ~ Two Georgia women pounding rice on Sapelo Island, Georgia c. 1915 (courtesy of the Georgia Department of Archives and History) Atlanta, GA.

manner in which all cereals and root crops are processed in Africa. Where rice is cultivated, women alone are involved in its milling, a fact that English trader Richard Jobson noted as early as 1620-1 along the Gambia river:

I am sure no woman can be under more servitude, with such great staves wee call Coole-Staves (pestles), beate and cleanse both the Rice, all manner of other graine they eate, which is onely women's work, and very painefull.⁷⁵

Research on agriculture too often focuses solely on cultivation, ignoring the significance for seed or crop adoption of the related processes of milling and cooking. Across the world this is traditionally women's work. As with all food preparation in Africa, rice was hand-milled by women, in the manner of cereals throughout most rural areas of the continent. Even during the period of Atlantic slavery, the crews on slave ships recognized that the processing of rice was female work, with references to ship captains requiring female captives to mill the unhulled rice for consumption.⁷⁶

Knowing how to mill rice without breakage proved crucial for the adoption of rice culture in South Carolina, thus illustrating a transfer from Africa of a gendered knowledge system. Perhaps indirect recognition of the importance of women's skills in growing and processing rice is behind Thomas Nairne's observation in 1710 that female slaves in the colony fetched the same market price as males.⁷⁷ And perhaps the value of female knowledge of rice culture may explain the unusual feature of the Carolina slave trade in its tendency to import more females than other plantation systems.⁷⁸

Unlike the cereals planted by Europeans, where grain is pulverized to produce flour, the processing of rice aims to minimize grain breakage as the heavy wooden pestle bears down upon the hulls. This represents a skilled operation and one that is not easily mastered.⁷⁹ Until the 1780s, when machines finally managed to perform the operation without breaking the grain, the entire export crop, some hundreds of millions of pounds of rice, required milling by hand in the African manner, with a mortar and pestle.

Two other aspects of Carolina rice culture represent the transfer of a female knowledge system across the Atlantic: the device used for winnowing, and the manner of cooking rice. On Carolina plantations, rice hulls were winnowed in a straw basket, known as a fanner basket. Dale Rosengarten's careful study of the origins of these baskets establishes their affinity with West Africa. She shows that the weaving style is not Native American, since those of the south-east Indians employed a twilled or plaited design. Fanner baskets are coiled, as can be seen in the ones marketed by African American female vendors in the Charleston area today. Woven in the identical manner as those used for winnowing during the period of rice plantations, these baskets derive from a prototype used by African women in the secondary centre of rice domestication located in the Senegambia area (see Figure 2).⁸⁰

An examination of rice cooking provides additional evidence for the transmission of a female knowledge system from Africa to South Carolina. Despite the familiar logo of Uncle Ben on the converted rice marketed by that name in the United States, it was African women who perfected rice cooking in a dis-

tinctive manner that characterizes both African and Carolinian culinary traditions. The objective was to prepare dishes to prevent rice from clumping together, as in the Asian style, a plate where every grain remained separate. The method involved steaming and absorption, boiling rice first for 10-15 minutes, draining off excess water, removing the pan from direct heat for the grains to absorb the moisture, and leaving the pot covered for at least an hour before eating.⁸¹ This is the same manner in which rice is traditionally prepared throughout the West African rice region, where wood is scarce for cooking and the task for its procurement often the additional responsibility of women. A similar method of cooking rice is found in other areas of the African diaspora, for example among descendants of Saramaka maroons in Surinam who fled coastal sugar plantations for freedom during the seventeenth and eighteenth centuries.⁸²

Conclusion

For at least 2000 years rice culture in Africa has been practised over a broad area of the upper Guinea coast and its hinterland. Rice is either planted solely by women or organized in a system where males and females assume gender-specific tasks. The transfer of rice cultivation by slaves from this region of Africa, whence derived more than half those brought to South Carolina in bondage during the eighteenth century, involved the diffusion of cultural practices from one part of the Atlantic basin to another.⁸³ A crucial component of the successful establishment of rice cultivation in South Carolina was the transfer of a farming and crop processing system deeply associated with female knowledge.

In reversing the direction of the Atlantic slave trade back to West Africa, this research reveals the role of Africans and African women in introducing an important agricultural system that forever changed the food culture of the Americas. Rice formed the crucial component of the gumbo, bouillabaisse and Hoppin' John that distinguish southern regional cooking. Through the cultivation and preparation of rice in slavery and freedom black men and women reaffirmed their cultural identity in the Americas. The fact that their role is only becoming fully understood at the close of the twentieth century speaks volumes concerning the pernicious legacy of human bondage.

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*Department of Geography
University of California at Los Angeles*

Notes

- ¹ See P. Wood, *Black majority* (New York, Norton, 1974); C. Clowse, *Economic beginnings in colonial South Carolina 1670–1730* (Columbia, University of South Carolina Press, 1971). The term ‘unlikely innovators’ is from C. Earle, *Geographical inquiry and American historical problems* (Palo Alto, CA, Stanford University Press, 1992), p. 262.
- ² See e.g. U. B. Phillips, *American negro slavery* (New York, Appleton, 1918); R. Flanders, *Plantation slavery in Georgia* (Chapel Hill, University of North Carolina Press, 1933); C. Lovell, *The golden isles of Georgia* (Boston, Little, Brown, 1932); D. Heyward, *Seed from Madagascar* (Chapel Hill, University of North Carolina Press, 1937); D. Doar, *Rice and rice planting in the South Carolina low country* (Charleston, SC, Charleston Museum, 1970); H. Sass and D. Huger Smith, *A Carolina rice plantation of the fifties* (New York, Morrow, 1936).
- ³ F. Braudel, *The Mediterranean and the Mediterranean world in the age of Philip II* (New York, Harper & Row, 1966).
- ⁴ D. Littlefield, *Rice and slaves* (Baton Rouge, Louisiana State University, 1981); Earle, *Geographical inquiry*.
- ⁵ Littlefield, *Rice and slaves*, p. 100.
- ⁶ J. Lawson, *A voyage to Carolina* (1714) (Chapel Hill, University of North Carolina Press, 1967) pp. 77–8; A. Hewatt (1779), quoted in Littlefield, *Rice and slaves*, p. 102.
- ⁷ *Ibid.*, pp. 101–2; J. Otto, *The southern frontiers, 1607–1860* (New York, Greenwood, 1989), pp. 30–2, 105–14.
- ⁸ Quoted in Littlefield, *Rice and slaves*, p. 102.
- ⁹ Wood, *Black majority*, p. 58.
- ¹⁰ Littlefield, *Rice and slaves*, p. 101.
- ¹¹ On Jefferson, see E. M. Betts, *Thomas Jefferson’s garden book, 1766–1824* (Philadelphia, American Philosophical Society, 1944); M. D. Peterson, *Thomas Jefferson: writings* (New York, Library of America, 1984). On mortality rates on Carolina rice plantations all the way through the ante-bellum period, see W. Dusinger, *Them dark days* (Oxford, Oxford University Press, 1996).
- ¹² Catesby (c. 1731), quoted in Littlefield, *Rice and slaves*, p. 102.
- ¹³ Advertisement for land sale dated 19 January 1738 appeared in the *South Carolina Gazette*. J. Clifton, ‘The rice industry in colonial America’, *Agricultural History* 55 (1981), pp. 275–6.
- ¹⁴ Littlefield, *Rice and slaves*, p. 104; W. TeBrake, *Medieval frontier* (College Station, Texas A&M University Press, 1985).
- ¹⁵ Littlefield, *Rice and slaves*, p. 104.
- ¹⁶ G. Biroli, *Del riso: trattato economico-rustico* (Milan, Giovanni Silvestri, 1807); G. Spolverini, *La coltivazione del riso* (Milan, Classici Italiano, 1813); G. Guida, *Manuale di risicoltura* (Novara, P. Busconi, 1838); O. Bordiga and L. Silvestrini, *Del riso e della sua coltivazione* (Novara, Rivista di Contabilità, 1880); L. Messedaglia, ‘Per la storia delle nostre piante alimentari: il riso’, *Rivista di Storia delle Scienze Mediche e Naturali*, 20 (1938), pp. 1–15; H. A. Tempany, ‘The Italian rice industry’, *Malaysian Agricultural Journal* (1932), pp. 274–92; M. Lecce, ‘Un’azienda risiera veronese nel xvii e xviii secolo’, *Economia e Storia* 1 (1959), pp. 64–80; P. Bullio, ‘Problemi e geografia della risicoltura in Piemonte nei secoli xvii e xviii’, *Annali della Fondazione Luigi Einaudi* 3 (1969), pp. 37–112; Littlefield, *Rice and slaves*, p. 105.
- ¹⁷ P. Daniel, *Breaking the land: the transformation of cotton, tobacco, and rice cultures since 1880* (Urbana, University of Illinois Press, 1985); H. Dethloff, *A history of the American rice industry* (College Station, Texas A&M Press, 1988). Rice cultivation in Louisiana, Arkansas and east Texas is known as ‘Providence rice’ because it depends upon rain-

- fall. The extension of rice cultivation to these areas at the end of the nineteenth century involved adapting rice farming to techniques used in mechanized wheat cultivation and the use of groundwater and streams for channelling water to provide supplemental irrigation.
- ¹⁸ Quoted in K. Hess, *The Carolina rice kitchen* (Columbia, University of South Carolina Press, 1992), p. 19. As ambassador to France, Jefferson had made a trip to Italy in 1786 to find a rain-fed rice variety for the US because he believed wet rice 'a plant which sows life and death with almost equal hand'; cited in Betts, *Garden book*, p. 120.
- ¹⁹ On cooking methods and food traditions with Italian arborio rice and others, see Hess, *The Carolina rice kitchen*.
- ²⁰ Cereals in Africa are milled in this way: G. Stickney, 'Indian use of wild rice', *American Anthropologist* 9 (1896), pp. 115–22; Littlefield, *Rice and slaves*, pp. 105–6.
- ²¹ See sources listed in n. 2.
- ²² The uprooting of rice involved in transplanting promotes tillering, a process that multiplies the number of shoots produced at the base of the stem. Tillering can increase rice yields in transplanted plots by as much as 40% over direct-seeded ones. See F. Bray. 'Patterns of evolution in rice growing societies', *Journal of Peasant Studies* 11 (1983), pp. 3–33.
- ²³ On Asia, see Heyward, *Seed from Madagascar*, pp. 9–10; on African methods, see J. Carney, 'Landscapes of technology transfer: rice cultivation and African continuities', *Technology and Culture* 37 (1996), pp. 5–35.
- ²⁴ F. Bray, *The rice economies* (Oxford, Blackwell, 1986), pp. 8–9; R. Barker and R. Herdt, with B. Rose, *The rice economy of Asia* (Washington, DC, Resources for the Future, 1985), p. 14.
- ²⁵ *Ibid.*
- ²⁶ G. E. Azurara, *The chronicle of the discovery and conquest of Guinea* (London, Hakluyt, 1899) II, pp. 263–4.
- ²⁷ See F. Moore, *Travels into the inland parts of Africa* (London, Edward Cave, 1738), pp. 165–82; M. Adanson, *A voyage to Senegal, the Isle of Goree and the River Gambia* (London, Nourse, 1759), p. 105; W. Rodney, *A history of the upper Guinea coast, 1545 to 1800* (New York, Monthly Review, 1970), p. 21; J. W. Blake, *West Africa: quest for God and gold, 1545–1578* (London, Curzon, 1977), pp. 91–92; G. Brooks, *Landlords and strangers: ecology, society and trade in Western Africa, 1000–1630* (Boulder, CO, Westview, 1993), p. 260.
- ²⁸ On the production of cereals by African captives, see Moore, *Travels into the inland parts*, p. 43; G. Mollien, *Travels in Africa* (London, Richard Phillips, 1820), p. 110; W. Rodney, 'African slavery and other forms of social oppression on the upper Guinea coast in the context of the Atlantic slave trade', in J. E. Inikori, ed., *Forced migration* (London, African Publishing Co., 1982), pp. 6–70; C. Robertson and M. Klein, 'Women's importance in African slave systems', in C. Robertson and M. Klein, eds, *Women and slavery in Africa* (Madison, University of Wisconsin, 1983), pp. 3–28.
- ²⁹ B. Martin and M. Spurrell, *The journal of a slave trader (John Newton), 1750–1754* (London, Epworth Press, 1962), pp. 20, 27–49, 78–9; E. Donnan, *Documents illustrative of the history of the slave trade to America* (4 vols, Washington, DC, Carnegie, 1930–35), esp. I, pp. 393–4, III, pp. 61, 158, 293, 373–8; W. Rodney, *Upper Guinea coast*, p. 78; K. G. Davies, *The Royal African Company* (New York, Atheneum, 1970), pp. 228, 279; Wood, *Black majority*, p. 59; J. Walvin, *Black ivory* (Washington, DC, Howard University, 1992), pp. 50–1.
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- ³¹ Ribeiro, *Aspectos e problemas*, pp. 27, 49, 143.
- ³² For instance, Thomas Jefferson knew that rice was cultivated in West Africa. When he wanted rain-fed varieties, he contacted captains trafficking the West African coast to bring him samples. See Paul Richards, 'Maintenance of African rice', in S. Brush and D. Stabinsky, eds, *Indigenous people and intellectual property rights* (Washington, DC, Island Press, 1996), pp. 209–29.
- ³³ A. de Candolle, *Origin of cultivated plants* (1886) (New York, Hafner, 1964).
- ³⁴ A. Chevalier, 'Sur les riz africains du groupe *Oryza glaberrima*', *Revue de Botanique Appliquée et d'Agriculture Tropicale* 17 (1937), pp. 413–18; R. Portères, 'Présence ancienne d'une variété cultivée d'*Oryza glaberrima* en Guyane Française', *Journal d'Agriculture Tropicale et de Botanique Appliquée* 11 (1955), p. 680.
- ³⁵ A. Chevalier and O. Roehrich, 'Sur l'origine botanique des riz cultivés', *Mémoires de la Société de Biogéographie* 6 (1914), pp. 307–22; A. Chevalier, 'Époques auxquelles des plantes cultivés et des mauvaises herbes pantropiques se sont répandues dans les pays chauds de l'ensemble du globe', *Revue de Botanique Appliquée et d'Agriculture Tropicale* (1925), pp. 443–8, esp. p. 443, and 'Sur le riz', p. 413.
- ³⁶ N. I. Vavilov, *The origin, variation, immunity and breeding of cultivated plants: selected writings* (New York, Ronald Press, 1951).
- ³⁷ It should be mentioned, however, that Vavilov might have explored further centres of crop domestication in Africa had he survived a purge by Stalin.
- ³⁸ Chevalier and Roehrich, 'Sur l'origine,'; R. J. Rochevitz, 'Documents sur le genre *Oryza*', *Revue de Botanique Appliquée et d'Agriculture Tropicale* 135 (1932), pp. 949–61; A. Chevalier, 'L'importance de la riziculture dans le domaine colonial français et l'orientation à donner aux recherches rizicoles', *Laboratoire d'Agronomie Coloniale* (1936) pp. 27–45; 'La culture de riz dans la vallée du Niger', *Revue de Botanique Appliquée et d'Agriculture Tropicale* 17 (1937), pp. 44–70; 'Le Sahara, centre d'origine de plantes cultivés', *Mémoires de la Société de Biogéographie* 6 (1938), pp. 307–22; P. Viguier, *La riziculture indigène au Soudan Français* (Paris, Larose, 1939).
- ³⁹ J. Carney, *The social history of Gambian rice production: an analysis of food security strategies* (PhD, University of California at Berkeley, 1986).
- ⁴⁰ Chevalier, 'Sur le riz,' 'La culture de riz'; Viguier, *Riziculture indigène*; P. Péliissier, *Les paysans du Sénégal* (St Yrieix, Fabrique, 1966); R. Portères, 'African cereals: Eleusine, Fonio, Black Fonio, Teff, *Brachiaria*, *Paspalum*, *Pennisetum*, and African rice', in J. Harlan, J. De Wet, and A. Stemler, eds, *Origins of African plant domestication* (The Hague, Mouton, 1976), pp. 409–52.
- ⁴¹ Rochevitz, 'Documents sur le genre', p. 950.
- ⁴² V. G. Childe, *Man makes himself* (New York, Mentor, 1951); Mauny, 'Notes historiques'; C. O. Sauer, *Seeds, spades, hearths and herds* (Boston, MIT University Press, 1975).
- ⁴³ Rochevitz, 'Documents sur le Genre'; Mauny, 'Notes historiques'; R. Charbolin, 'Rice in West Africa', in C. L. A. Leakey and J. B. Wills, eds, *Food crops of the lowland tropics* (Oxford, Oxford University Press, 1977); Carpenter, 'History of rice'.
- ⁴⁴ T. Lewicki, *West African food in the Middle Ages* (Cambridge, Cambridge University Press, 1974), p. 22. On rice introduction through Arabs, see A. Carpenter, 'The history of rice in Africa', in I. Buddenhagen and J. Persley, eds, *Rice in Africa* (London, Academic Press, 1978), pp. 3–10.
- ⁴⁵ Mentioned in J. Dey, *Women and rice in The Gambia: the impact of irrigated rice develop-*

- ment projects on the farming system* (PhD, University of Reading, 1980), p. 4.
- ⁴⁶ D. H. Grist, *Rice*, 4th edn (London, Longmans, Green, 1968), p. 7.
- ⁴⁷ A. Chevalier, 'Les céréales des régions subsahariennes et des oasis', *Revue de Botanique Appliquée et d'Agriculture Tropicale* (1932), pp. 742–59; Lewicki, *West African food*, p. 34.
- ⁴⁸ 'The Upper Guinea Coast' commonly refers to the countries from Senegal south to the Ivory Coast.
- ⁴⁹ The suffixes of *-lo*, *-ro*, and *-o* in these languages of the Niger-Congo group mean food and nourishment, while the prefix *-ma* is applied to foods or liquids with the meaning of 'full': R. Portères, 'Primary cradles of agriculture in the African continent', in J. D. Fage and R. A. Oliver, eds, *Papers in African prehistory* (Cambridge, Cambridge University Press, 1970), pp. 47–8. On Portuguese introductions of *sativa* rice, see Pélissier, *Les paysans*, pp. 709–59.
- ⁵⁰ Portères, 'Primary cradles', p. 49.
- ⁵¹ *Ibid.*, p. 48.
- ⁵² See S. H. Katz, M.L. Hediger and L. A. Valleroy, 'Traditional maize processing techniques in the New World', *Science* **184** (1974), pp. 765–73; B. Fussell, *The story of corn* (New York, Knopf, 1992). Maize soaking in an alkali solution to break down the hulls to prepare the dough (*masa*) for tortillas did not transfer to Africa, for it depended upon native women teaching the techniques. Instead, maize was either eaten 'green' as corn on the cob or dried and then pounded into bits for making into a porridge. See M. Miracle, *Maize in tropical Africa* (Madison, University of Wisconsin Press, 1966).
- ⁵³ W. O. Jones, *Manioc in Africa* (Palo Alto, CA, Stanford University Press, 1959). Jones attributes at least one instance of bitter manioc adoption to the settlement of freed slaves from Brazil in Nigeria: *ibid.*, pp. 102–11. On manioc, also see S. K. Hahn, 'An overview of African traditional cassava processing and utilization', *Outlook on Agriculture* **18** (1989), pp. 110–18; D. Dufour, 'Effectiveness of cassava detoxification techniques used by indigenous peoples of Amazonia', *Interciencia* **14** (1989), pp. 86–91, and 'Cassava in Amazonia: lessons in utilization and safety from Native peoples', *Acta Horticulturae* **375** (1994), pp. 175–82; F. Nweke and M. Bokanga, 'Importance of cassava processing for production in Sub-Saharan Africa', *Acta Horticulturae* **375** (1994), pp. 401–12.
- ⁵⁴ De Almada noted, 'The Blacks make rice fields in these plains; they make ridges from the earth because of the river, but in spite of that the river breaks them and inundates many a time. Once the rice has sprouted they pull it up and transplant it in other lands better drained where then it becomes grain' (my translation from the Portuguese), quoted in Pélissier, *Les paysans*, p. 714. The English trader Jobson also noted in 1623: 'but in Rice they do set it first in smal [*sic*] patches of low marish grounds, and after it doth come up. Disperse the plants, and set them in more spacious places, which they prepare for it, and it doth yield a great increase': R. Jobson, *The golden trade* (Devonshire, Speight & Walpole, 1904), p. 59.
- ⁵⁵ L. Brockway, *Science and colonial expansion: the role of the British Royal Botanic Gardens* (New York, Academic Press, 1979); J. Kloppenburg, *First the seed* (New York, Cambridge University Press, 1990); J. Chaplin, *An anxious pursuit* (Chapel Hill, University of North Carolina, 1993); J. Carney, 'Rice milling, gender and slave labour in colonial South Carolina', *Past and Present* **153** (1996), pp. 108–34.
- ⁵⁶ For preliminary research on the African linkages to rice cultivation in Brazil, the Guianas and the Caribbean, see J. Carney, 'The role of African rice and slaves in the history of rice cultivation in the Americas', *Human Ecology* **26** (1998), pp. 525–45.
- ⁵⁷ Portères, 'Primary cradles'; D. Catling, *Rice in deep water* (London, International Rice Research Institute (Macmillan, 1992), p. 356.

- ⁵⁸ Portères, 'Primary cradles'.
- ⁵⁹ National Research Council (NRC), *Lost crops of Africa* (Washington, DC, National Academy Press, 1996), p. 17.
- ⁶⁰ *Ibid.*, pp. 29, 36.
- ⁶¹ Portères, 'Primary cradles', based his estimates for *glaberrima* domestication on the presence of megalithic stone sites in the savanna from Mali to Senegal. These large erect stones with associated burials are thought to mark ancient water courses, and thus rice cultivation sites, in the West African rice region. In Portères' time these stone sites were dated between 1500–800 BC, but research subsequently established a later date of 750 AD, with some occurring in the fourteenth century: see G. Connah, *African civilizations* (New York, Cambridge University Press, 1987), pp. 113, 178.
- ⁶² S. K. McIntosh and R. J. McIntosh, 'The early city in West Africa: towards an understanding', *African Anthropological Review* 2 (1984), pp. 73–98; 'Cities without citadels: understanding urban origins along the middle Niger', in T. Shaw, P. Sinclair, B. Andah and A. Okpoko, eds, *The archaeology of Africa: food, metals and towns* (New York, Routledge, 1993), pp. 622–41.
- ⁶³ D. Phillipson, *African archaeology* (Cambridge, Cambridge University Press, 1993), p. 174.
- ⁶⁴ *Ibid.*, p. 144.
- ⁶⁵ Portères, 'African cereals', p. 49; NRC, *Lost crops*, p. 23. Rice introduction to Madagascar is also relatively late, the unpopulated island only reached by Indo-Malayan (Malagasy) people sometime during the European Middle Ages. The rice varieties they brought with colonization share names and other features with those found in South India.
- ⁶⁶ These included reminiscences by planter descendants, interviews with elderly slaves in the Depression-era Federal Writers' Project, plantation records and drawings that depict slave labour in rice cultivation. For discussions of gendered divisions of labour in rice cultivation, see L. A. Pruneau, 'All the time is work time: gender and the task system on antebellum lowcountry rice plantations' (PhD, University of Arizona, 1997); L. Schwalm, *A hard fight for we: women's transition from slavery to freedom in South Carolina* (Urbana, University of Illinois Press, 1997); D. Ramey, '“She do a heap of work”: an analysis of female slave labor on Glynn County rice and cotton plantations', *Georgia Historical Quarterly* 82 (1998), pp. 707–34.
- ⁶⁷ F. Kemble, *Journal of a residence on a Georgia plantation in 1838–1839* (1863) (Athens, University of Georgia, 1984), p. 156.
- ⁶⁸ I. Berlin, *Many thousands gone* (Cambridge, MA, Harvard University Press, 1998), p. 168; L. Pruneau, 'All the time', p. 15.
- ⁶⁹ See J. Carney and M. Watts, 'Disciplining women? rice, mechanization, and the evolution of Mandinka gender relations in Senegambia', *Signs* 16 (1991), pp. 651–81. For a detailed description of African rice practices that bear on Carolina systems, see Carney, 'Landscapes of technology transfer'.
- ⁷⁰ Quoted from George Brooks, *Landlords and strangers: ecology, society and trade in Western Africa, 1000–1630* (Boulder, CO, Westview Press, 1993), p. 318. Also see, Moore, *Travels into the inland parts*, p. 127.
- ⁷¹ Quoted in Littlefield, *Rice and slaves*, pp. 93–5.
- ⁷² S. M. X. Golberry, *Travels in Africa, performed during the years 1785, 1786 and 1787, in the western countries of this continent*, trans. William Mudford, R. Bent and J. Mudie (2 vols, London, 1803), II, pp. 351–32; cited in J. Day, 'Women and rice in The Gambia: the impact of irrigated rice development projects on the farming system' (PhD, University of Reading), p. 33, n. 3.

- ⁷³ F. Sigaut, 'Essai d'identification des instruments à bras de travail de sol', *Cahiers ORSTOM*, ser. Sci. Hum. **20** (1984), pp. 359–74. In this special issue of *ORSTOM*, the antiquity of the long-handled hoe and the relationship of specialized instruments to the diffusion of African rice are discussed. The technological linkage of these hoes to those used on Carolina rice plantations is discussed in J. Carney, *Black rice* (Cambridge, MA, Harvard University Press, forthcoming).
- ⁷⁴ Quoted in A. S. Salley, *The introduction of rice culture into South Carolina* (Columbia, Bulletin of the Historical Commission of South Carolina, 1919) VI, pp. 1–23, esp. p. 7.
- ⁷⁵ Jobson, *The golden trade*, p. 68.
- ⁷⁶ Donnan, *Documents illustrative* III, p. 376.
- ⁷⁷ Quoted in Wood, *Black majority*, pp. 106–7.
- ⁷⁸ *Ibid.*, p. 67.
- ⁷⁹ Slavery broke down this gender division of labour as women taught young boys as well as girls rice mortar and pestle processing: see J. Carney, 'Rice milling, gender and slave labour'.
- ⁸⁰ 'Senegambia' refers to Senegal and Gambia, which share borders, culture and a similar geographical setting: D. Rosengarten, 'Social origins of the African-American low-country basket' (PhD Dissertation, Harvard University, 1997).
- ⁸¹ Interestingly, the reduced time cooking rice involved in this process does in some respects resemble converted rice: Hess, *The Carolina rice kitchen*, esp. pp. 2–26.
- ⁸² S. Price, *Co-wives and Calabashes* (Ann Arbor, University of Michigan Press, 1993), p. 32.
- ⁸³ D. Richardson, 'The British slave trade to colonial South Carolina', *Slavery and Abolition* **12** (1991), pp. 125–72.