RICE CULTIVATION, PROCESSING, AND MARKETING IN THE EIGHTEENTH CENTURY

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Understanding Rice

Rice (*Oryza* spp.) is a member of the grain or grass family (Poaceae). A botanist would describe rice has having a morphology characterized by hollow, erect stems with long ensheathing leaves. The botanist would observe that the inflorescence is a terminal panicle of one-flowered spikelets, growing erect first, then arched. The rice may be either "bearded," meaning that there is an awn or setaceous extension, or it may lack the "beard." Generally this is no longer used as a morphological distinction.

Two species (out of about 22 recognizable species) are cultivated: *Oryza glaberrima* in West Africa and *O. sativa* in the rest of the world. The latter may be derived from the wild annual forms (*O. nivara*) in northeastern and eastern India, northern southeast Asia, and southern China (Anonymous 1999:15) and its domestication is considered to have occurred between 15,000 and 10,000 B.C. (Harlan 1975:129, 220; see also Heiser 1973:87). In contrast, African rice almost certainly domesticated from the wild annual species endemic to West Africa, with *O. barthii* the most likely candidate (Harlan 1975:200, Anonymous 1999:15).

Figure 1. Rice plant (courtesy Leeds University, UK).

Researchers generally define two broad groups (of the thousands of "varieties") within *O. sativa*, the so-called "indicas" and "japonicas." Since these two groups cannot be easily crossbreed, it is likely that they separated early in the history of rice cultivation (Baker 1978:13). The japonica types have short grains (and are known as "short-grained" rice) and are sticky when cooked, while the indica types (often called "long-grain rice") have long grains and are drier when cooked. This cooking quality of rice is determined by the percentage of the starch components, including amylose and amylopectin. If low (10 to 18%), the rice will be soft and sticky. If high (25 to 30%) the rice will be hard and fluffy.

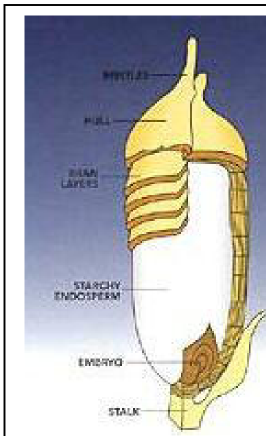

Figure 2. Rice grain composition.

All rice, however, is not so easily recognized as morphologically distinct. As a result of hybridization, the different cultivated rice species each have their own shattering types of weed rice (Harlan 1975:96). These are the bane of rice planters worldwide as the weed seed is easily self-sown, contaminating the crop. It has been noted that the Indica group has a wider range of grain shattering and greater potential to become a volunteer weed than does the Japonica group (Anonymous 1999:26). However, red rice, of either Indica or Japonica, easily shatters and has strong dormancy – becoming a weed problem in rice fields. It is observed that intraspecific hybridization between domesticated rice and weed relatives, especially red rice, occurs in many rice-growing areas. The red rice turns brown shortly after milling and has dramatically different cooking qualities – taking longer to cook (Glenn Roberts, personal communication 2003). As a result, its presence would cause a significant drop in the value of the crop. Because contamination was so easy, the only effective suppression was by hand rouging in the field.

The structure of a rice grain may be separated into three parts. The *germ* is the heart of the grain, which sprouts when the seed is planted. It is rich in the B vitamins, vitamin E, protein, unsaturated fat, minerals, carbohydrates, and dietary fiber. The *endosperm* constitutes the largest part of the grain. It is composed chiefly of carbohydrates in the form of starch, with some incomplete protein and traces of vitamins and minerals. The *bran* portion is the covering and is composed primarily of carbohydrate cellulose with traces with B vitamins (including thiamin, niacin, and B-6), minerals (including iron phosphorus, magnesium, and potassium), and incomplete proteins. The outer husk, or hull, is inedible but is often used for fuel or fertilizer.

While the entire grain is edible, the bran and germ are often removed during milling in order to reduce the chance of rancidity and to improve the storage quality of the grain (fresh milled rice bran begins to spoil within 8 hours of milling at room temperature). The resulting rice is known as milled rice, milled white rice, polished rice, or polished white rice. Historically this milling process was not only beneficial given the long shipment and delays in reaching final markets (Clowse 1971:129), but also served to meet the market demand for a polished white rice. In fact, as early as 1722 Francis Younge's tract, *A View of the Trade of South-Carolina*, commented that Carolina rice was "esteemed the best in the world" (Merrens 1977:71).

Today very sensitive whiteness meters control the process of milling. Whiteness is measured in KET units, with Carolina Gold Rice milled to KET 38 being shelf stable. Partially milled rice, however, with a KET of 35-36, while barely distinguishable at the table, results in rice with the germ and a small percentage of the bran still attached. Most authorities agree that Carolina Gold Rice at KET 35-36 is a very close emulation of African hand pounded rice. At this stage the rice retains its unique flavor – but is still perishable and would have been prepared for the table on a daily basis (Glenn Roberts, personal communication 2003).

Table 1.
Nutrients in 100 grams of various rices (adapted from USDA , Agricultural Research Service, Nutrition Data Laboratory).

Nutrient	White, short-grain, cooked	White, long-grain, cooked	Brown, long-grain, cooked	Rice flour, white	Rice flour, brown
Water (g)	68.53	68.44	73.09	11.89	11.97
Energy (kcal)	130	130	111	366	363
Protein (g)	2.36	2.69	2.58	5.95	7.23
Total lipid (g)	0.19	0.28	0.90	1.42	2.78
Ash (g)	0.20	0.41	0.46	0.61	1.54
Carb (g)	28.73	28.17	22.96	80.13	76.48
Fiber (g)	0	0.4	1.8	2.4	4.6
Fe (mg)	0.20	0.20	0.42	0.35	1.98
Mg (mg)	8	12	43	35	112
K (mg)	26	35	83	76	289

The milling process may also eliminate many important minerals. Consequently, while whole brown rice contains significant quantities of calcium, phosphorus, and iron, the milled white rice has no significant amount of B vitamins and is almost exclusively carbohydrates (Dunne 1990:242; see Table 1). There is evidence, however, that the starch content of Carolina Gold Rice is distinctly different from other rices (Glenn Roberts, personal communication 2003).

The milling also results in several "types" of rice. In addition to the "best" rice, there are broken kernels, generally defined as less than ¾ of the lengthy of whole kernels (known historically by such terms as "rice grits," and "middlings," as well as rice flour. It seems that this rice flour was generally given to the slaves for their consumption – it spoils very quickly, but when fresh has an usual, sweet taste that apparently was very highly esteemed among the slave population.

Types of Cultivation

Rice ecosystems are characterized by elevation, rainfall patterns, depth of flooding, and drainage. There are four generally recognized ecosystems or cultivation practices: upland, rainfall lowland, flood-prone, and irrigated.

Upland rice has been described in many different ways. Gupta and O'Toole follow the definition perhaps most widely adopted: "Upland rice is grown in rainfed, naturally well drained soils without surface water accumulation, normally without phreatic [ground or aquifer] water supply, and normally not bunded [banked]" (Gupta and O'Toole 1986:1). Put another way, this rice is direct-seeded in non-flooded, well-drained soil and grown in conditions without surface water, relying solely on rainfall. As a result, yields tend to be low, although this agricultural system is found worldwide. Upland rice is not only affected by drought, especially during the flowering stage (Brugnoli 1998), but may also promote dew formation on leaves, with the result of increased fungal attack (Gupta and O'Toole 1986:37).

In Africa the upland rice is further divided between pluvial and phreatic. Pluvial rice cultivation relies solely on rainfall and the soils generally support mixed woodland vegetation that is cut and burned off. Phreatic cultivation, in contrast, frees production from rainfall by the cultivation of lands in lowland swamps that trap supplemental moisture. Success depends not only on the farmer's knowledge of soil saturation properties, but also on methods that facilitate water impoundment and drainage, such as the use of inland depressions with perched water tables or catchment run-off (Carney and Porcher 1993:131).

Rainfed lowland systems have rice direct seeded in puddle soil on level, slightly sloping, or diked (i.e., bunded) fields. The depth and duration of flooding is dependent on local rainfall, so the system is subject to yield fluctuations. The difference between this approach and the upland pluvial rice cultivation is solely one of topography.

Flood-prone cultivation requires that rice be directly seeded or transplanted in the rainy season on fields that are characterized by medium to heavy flooding from rivers or deltas. The crops are grown as the rivers (and flood waters) rise and are harvested after the waters recede. In some systems this is also called "deep water" cultivation.

The final category is *irrigated rice* cultivation. Here rice is transplanted or directly seeded in puddled soil on level fields with water control, generally in lowland areas. Carney and Porcher call this fluxial, describing the rice as grown on riverine floodplains with tides supplying the water requirements (Carney and Porcher 1993:132).

While each of these is discussed as a distinct cultivation approach, there is some overlap. Other authors (see Anonymous 1999:26) also define slightly different variations (for example distinguishing tidal wetland from irrigated). In general, however, we see rice cultivation ranging from drier to wetter and from uncontrolled to more controlled conditions.

Evidence of Cultivation Today

Gresham and Hook (1982) provide a overview of what rice fields look like today in South Carolina. In 1974 they used black and white aerials with field sampling to delineate abandoned rice fields. They identified the size of the various holdings, as well as the current land cover. The land cover was broken into three broad categories: managed (impounded, spoil area, farmed, or flooded), grass-marsh (ranging in salinity from seawater to freshwater), and tree-marsh (ranging from wet to dry).

The Goose Creek area falls into their Wando, Cooper, Ashley sample. The most common cover type was managed (39.1% of the 20,572 acres). Within this category 50.9% of the area was permanently flooded. The next most common cover type was the tree-marsh (38.9%). Here the two most common covers were pine forest (42.8% of the 7,997 acres) and cypress-gum swamp (30.5%). The pine forests are dominated by loblolly and pond pines, both water tolerant species. The frequency of the cypress-gum swamps is:

> Logical because most of the rice fields were originally cypress-gum swamps that were cleared and leveled. Thus, if the rice fields were not managed by man, they could conceivably revert back to swamps, if their topography had not been significantly altered and the rising ocean level in this area were to halt or recede (Gresham and Hook 1982:132).

Historical Overview of Rice Cultivation

Introduction

Clowse (1971:123) comments that, "most of the late eighteenth and nineteenth century accounts [of rice cultivation] barely touch on the early trials and problems before launching into a discussion of tidal culture." This lack of firsthand information is probably the reason that modern authors also gloss over the first century of rice cultivation in South Carolina. A perfect example of this problem is David Doar's (1936) *Rice and Rice Planting in the South Carolina Low Country* – a bible for which we have no use since Doar confined himself to the grandeur of tidal rice cultivation, dismissing inland cultivation with virtually no attention. Yet tidal cultivation represents the culmination of socio-technological evolution and can only be understood in the context of the wider developmental sequence of rice production and economy.

Many accounts describe rice as an accidental discovery that suddenly changed the social and economic aspects of the Carolina colony (see, for example, Collingson's 1766 article in *Gentleman's Magazine* in Merrens 1977:226-228). Both Gray (1958:I:277) and Porcher (1987:1-2) explain that rice was one of the earliest crops planted to support the colony, pointing to the detailed research by Salley (1919). In 1671 a barrel of rice was brought into the colony, with another barrel sent in 1672, possibly for seed. Rice was noted as being planted in 1685 and again in 1688. By 1691 the Legislature granted a patent on an "improved engine to husk rice." In that same year a petition observed, "We are encouraged wth severall new rich Comodityes as Silck, Cotton, Rice, and Indigo, w^{ch} are naturally produced here." By 1695/6 it became possible to pay quitrents using rice (Cheves 1897:377, 390; Gray 1958:I:278; Clifton 1981:272-273).

So while we may wish to remember the Madagascar rice given to Henry Woodward around 1685, rice was very much a part of the Carolina colony for nearly two decades before that date (Whitten 1982:5). Gray remarks that, "while rice was undoubtedly cultivated in South Carolina before 1694, the various accounts point to 1694 as a significant date probably because varieties of superior quality were introduced which were better adapted to the physical conditions of the Colony than were the varieties previously employed" (Gray 1958:I:278). There is, however, general agreement that this early rice was, according to Porcher, "grown as an upland crop in the savannah lands that laced the Lowcountry" (Porcher 1987:3).

Initial Upland Culture

The 1712 account by James Freeman describes early dry culture:

> As to the manner of planting our rice, after the land is clear'd or clenged, as aforesaid, we, with hoes, trench the land something like furrows made with a plough, but not so deep, and about a foot distance between each trench: and when the land is so trench'd, in the month of April we feed it, carefully, within each trench, and cover it thin with earth, one peck and half is sufficient for to feed an acre, then, with narrow hoes made for that purpose, about five or six inches broad in the mouth, we hoe, weed, or cut up the grass, or other trash, growing between the said trenches of rice, which ought carefully to be done three times in the summer, for grass and weeds growing between the corn, pease, or rice, will otherwise destroy or spoil the crop: then, at harvest, which comes in September, we reap and carry it to barns, which when trash'd, if it prov'd a good crop, 30, 35, or 40 bushels, sometimes more (Merrens 1977:45).

This description reveals that rice cultivation was no different, either in location or technique, to the cultivation of corn or peas. Porcher provides less detail, but does indicate that this approach, in "savannah fields," was without benefit of reservoirs and "depended on rainwater at the right time to make the best crop" (Porcher 1987:3). Clifton (1981:261) examines the letters of John Stewart dating from 1690 and finds ample evidence of rice experimentation, again in the sandy pinelands. Stewart also made the very early suggestion of using swamplands. While unclear if he followed his own suggestion, his rice must have been produced in some quantity since once of his letters explains, "Our rice is better esteem'd of in Jamaica than that from Europe sold for a ryall a pound its price here new husk'd is 17/-[shillings] a hundred weight" (quoted in Clifton 1981:269).

During this early stage there is also good evidence that rice, while one of the planned commodities, was still an adjunct to other sources of revenue, most particularly ranching. Thomas Nairne, in 1710, explained that rice was "much sow'd" in the colony, not only because it was a "vendible Commodity, but thriving best in low moist Lands, it inclines People to improve that Sort of Ground, which being planted a few Years with Rice, and then laid by, turns to the best Pasturage" (quoted in Clifton 1981:273). Nairne's comment may provide information concerning how rice was perceived by the early planters. One interpretation is that rice was just something to improve the soil before turning it to pasture – a green fertilizer that almost coincidentally had market value. Another interpretation of this brief quote is that rice provided short-term, quick economic benefits that prompted swamp clearing, but the long-term economic benefits would be found in ranching.

Regardless of the interpretation, what it does reveal is that planters were, in fact, beginning a shift from dry, pluvial upland cultivation to phreatic upland cultivation if not actual rain fed lowland cultivation. This view seems to be echoed by Bagwell (2000:87), who observes that rice grows best with 60 inches of rain and while Carolina achieved this, the rain was not well distributed, leading to failed crops.

Rain Fed Lowland to Irrigated Rice Cultivation

Authors such as Gray (1958:I:279) and Clifton (1981:274) see a turning point about 1720, with rice cultivation clearly shifting from dry to wet cultivation. Francis Young's 1722 tract on trade, while not providing details on the method of cultivation, does reveal both a spike in production occurring in 1720, as well as noting that the Parliamentary constraints in trade which were causing the Carolina colony to lower the value of the crop as more was planted (Merrens 1977:70-72):

> Thus it may be seen, by the people of Carolina's making and exporting in 1721, 8,256 barrels of rice more than they did in 1719, they have lost the whole increase and £4,171.0.2 sterling, the reason of which must be, that they make more than sufficient for the northern market, and they can supply no other, nor have any vend for their rice but in Great-Britain, and must therefore (unless they are relieved by the parliament) confine themselves to a certain quantity, or be undone by their own industry, which sure no other people ever were before (Merrens 1977:72).

In 1731 Mark Catesby's *The Natural History of Carolina, Florida, and the Bahama Islands* revealed significant changes in rice cultivation. He noted that there were two "kinds" of rice, one a small "bearded" grain which could be grown only in water and the other a "larger, and brighter, of a greater increase, and will grow both in wet and tolerably dry land" (Merrens 1977:99). For the first time he also commented on the "degeneracy" caused by successive sowing of the same seed on the land, "causing it to turn red." Always the bane of rice planters worldwide, it was this red rice that shattered so easily and remained viable in the soil to cause volunteer rice. What the planters were surely seeing is the increase, year after year, of this weedy rice species.

Catesby also recounts common rice cultivation techniques:

> In March and April it is sown in shallow trenches made by the hough, and good crops have been made without any further culture than dropping the seeds on the bare found and covering it with earth, or in little holes made to receive it without any further management. It agrees best with a rich and moist soil, which is usually two feet under water, at least two months in the year. It requires several weedings till it is upward of two feet high, not only with a hough, but with the assistance of fingers. About the middle of September it is cut down and housed, or made into stacks till it is thresh'd (quoted in Merrens 1977:100).

A variety of authors expand on this account, providing details on the bunded fields and various ditches to control the water supply. For example, Porcher notes:

> The inland swamp system depended on rain-fed reservoirs to supply water for the crop. The common practice was to place a bank high up a swamp, from highland to highland. The diked area, or reservoir, was filled by rainwater. Below the reservoir, two more banks were created, an upper and lower bank. Both banks went from highland to highland, and created an area in which water could be retained. Trees were removed from within this diked

> area, and a system of check banks constructed to divide the diked area into smaller fields to ensure an even flow of water on the entire crop so it would ripen uniformly. A canal with a water control structure led from the reservoir to the rice field. A second canal and water control system led from the lower bank into an adjacent creek. With the system in place, water could be flowed onto the field from the reservoir, then drained off at a later date (Porcher 1987:3-5).

Clifton provides only a slight variation:

> Irrigation was used first in inland swamps above tidewater along the upper reaches of the numerous rivers of the Carolina lowcountry. Ridges of land standing a few feet above the swamps were enclosed by dikes on either end. The lower dike kept the floodwaters on the field; the upper dike would keep additional water from the stream from coming in. Both dikes were equipped with floodgates, that on the lower dike to drain the field when desired and the one on the upper dike to allow water to flow into the field to the desired depth (Clifton 1981:275).

Several of these secondary accounts track back to Clowse who commented:

> Sometimes in these freshwater swamps are ridges of land standing a few feet above the level of the swamp. Some imaginative planter conceived the idea that the area between two such ridges could be dammed by piling up earth at either end. The dam at the lower end of the artificially created field would keep water on the field and prevent unwanted water from being pushed into the field by the tides; the dam at the upper end of the field would control the water flow into the field or would out and divert the flow around the field. A gate was placed in the lower dam to allow water on the field to be drained off; the gate in the upper dam allowed water to flow into the field to the desired depth (Clowse 1971:126-127).

Clowse is the only account that provides any primary citations for his reconstruction. Two of the accounts post-date the period of inland rice cultivation by 50 to 100 years (Allston 1846; Heyward 1937), one other was written shortly before the American Revolution (Anonymous 1775), and only the fourth dates to the early eighteenth century (Nairne's 1710 letter, see Greene 1989). The point is, in spite of considerable research into early rice cultivation, there are no accounts of rice technology dating from 1720 through 1760 that would help refine our understanding of inland swamp cultivation and water control. The accounts which are available, such as this one from 1761 (like Nairne's letter five decades earlier), report only that the prospects for inland or swamp cultivation were great:

> The country abounds every where with large swamps, which when cleared, opened and sweetened by Culture, yield plentiful crops of Rice; Along the Banks of our Rivers and Creeks, there are also Swamps and Marshes, fit either for rice, or by the hardness of their Bottoms for Pasturage (Carroll 1836:369).

Carroll, 125 years after Nairne, identifies two types of swamp land: that land so soft as to be suitable only for rice and swamp land that, when cleared and allowed to dry, is sufficiently firm to allow ranching. This suggests that even as late as the early nineteenth century, cattle were still a viable economic resource, especially for what might otherwise be considered "marginal" lands.

Most authors agree that these early efforts viewed water control as a means to provide moisture to the plants – the use of water to control weeds and insects would not be common until after the American Revolution (Whitten 1982:6; see also Bagwell 2000:87).

There is a brief account of slaves constructing a ditch to provide water to rice fields near Jacksonborough, in Charleston County. John Bartram visited the site, explaining what he saw:

> Mr. DuPont rode out with us, lending us his own horses to favour ours. He shewed us A large ditch, 8, 10, & 12 foot deep, diging to let in the water from the river into A large piece of low ground above two hundred acres to water it for rice. The ditch was a quarter or half of a mile long, reaching from the river to the low ground. . . . There was 130 negros diging the ditch. Both men & women seemed alike in their labours, as is common in both Carolinas. The women work in the field with the men. They worked with hows; some howing up the ground & others throwing it out with their hands (quoted in Rogers et al. 1976:176).

There is likewise a 1764 account in the Laurens papers of a Mr. Bell who was retained to "throw up a Dam or Bank." Laurens explains that he did "tolerably well considering the disadvantages" including high tides and heavy winds. The work was not completed and Laurens first advertised for someone to complete the work, eventually writing to another plantation owner asking for assistance:

> assist me with a proper hand to compleat my design of banking in the whole of my Marsh. . . . I would chuse, if it were at my option, to pay a good price to some person to undertake & finish the hole according to a plan to be laid before him & within a Certain time with his own hands (Rogers et al. 1974:386).

This passage suggests that at least some planters lacked both the overseer and slaves with sufficient skills and background to perform this specialized task.

William Bull's 1770 account of rice production alludes to some of the features discussed, but fails to provide very clear details:

> Many large swamps, otherwise useless, and affording inaccessible shelter for deserting slaves and wild beasts have been drained and cultivated, with such banks as to keep our torrents of water in planting season, and, by reservoirs, supply artificial rain when wanted; thus while a nuisance is removed, a great quantity of our best land has been acquired (quoted in Merrens 1977:265).

While lacking in details, this account does suggest that Bull had come completely about from Nairne's earlier account in considering the best land to be not pasturage, but ricefields.

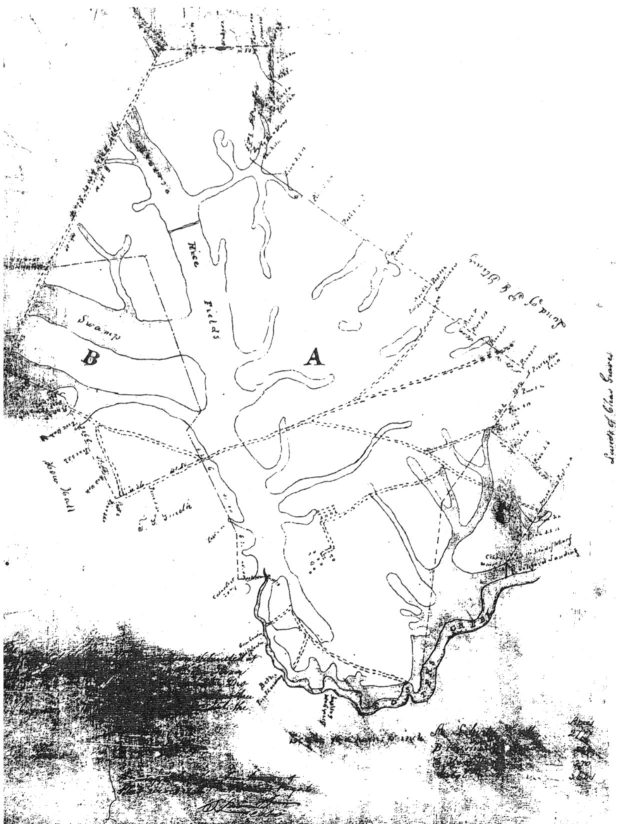

Figure 3. Liberty Hall tract showing rice fields and reserve in the postbellum (Charleston County RMC, PB B, pg. 6).

A second primary account dates from 1775 and provides considerable detail on the process of cultivation, but very little information on the technology of water control or land modification:

> Rice can only be cultivated in land which lies so low as to admit of floating at pleasure, and all such lands in Carolina are necessarily swamps. The first business in to drain the swamp, in which work they have no particular methods deserving notice, or which are unknown in England. The moment they have got the water off they attack the trees, which in some swamps are very numerous; these they cut down at the root, leaving the stumps in the earth . . . . However, they do not wait for the ground being cleared of them, but proceed to plant their rice among the stumps. In March, April, and May they plant; the negroes draw furrows eighteen inches asunder, and about three inches deep, in which the seeds are sown; a peck is sufficient for an acre of land: as soon as planted they let in the water to a certain depth, which is, during the season of its growth, repeated, and drawn off several times; but most of the growth is while the water is eight, nine, or ten inches deep on the land. The great object of the culture is to keep the land clean from weeds, which is absolutely necessary, and the worst weed is grass: if they would say a man is a bad manager, they do not observe such a person's plantation is not clean, or that it is weedy, but *such a man is in the grass*; intimating that he has not Negroes enough to keep his rice free from grass. . . . reaped, which is usually about the later end of August of [the] beginning of September (Carman 1939:275-278).

While there may be few period accounts that provide any details concerning the technology of water control, there are numerous plats – including many from the Goose Creek area – which provide graphic representations of inland swamp rice cultivation. Two examples, of literally hundreds, are provided here. The first (Figure 3), representing the study tract in the postbellum, reveals "rice fields" just below (i.e., down stream of) a dam and an area labeled "reserve." While not providing a great deal of detail, it documents at least a portion of the control system previously discussed – a bank erected between two high ground areas to hold back water used as necessary to irrigate the rice fields.

The other, shown as Figure 4, dates from 1791 and shows the 940-acre Spring Field Plantation of Alexander Mazyck. In the upper left of the plat swamp areas are shown as crosshatched, while just below them is "Reservoir about 20 acres." A dam separates this reserve from five distinct rice fields, each banked, separated by a dam, and ranging in size from 10 to 22 acres. Off Spring Field at the lower edge is "Mr. Mazyck's Reserve," referring to Benjamin Mazyck and a portion of the study track.

All of the authors agree that the most significant limitation of this system was its vulnerability to freshets or seasonal floods. Sudden large quantities of water would destroy the upper dam or flood over it. This, in turn, would either flood crops, washing them away, or bury them under silt. Just as importantly, heavy rainfall would raise the level of streams, making it impossible to gravity drain fields. Nearly as severe was the inability of most reserves to capture enough water to protect against severe droughts.

There is little useful historical information on significant eighteenth century floods and most accounts are similar to the October 1773 letter from James Laurens to his brother, Henry Laurens:

> We have had such tides these two days past as to Cover all Mr. Gadsden's dams & that part of your Near the high Land by which means your tennents are greatly out of Concet with their Situation, as their Gardens, Stables, &ca. are all under Water

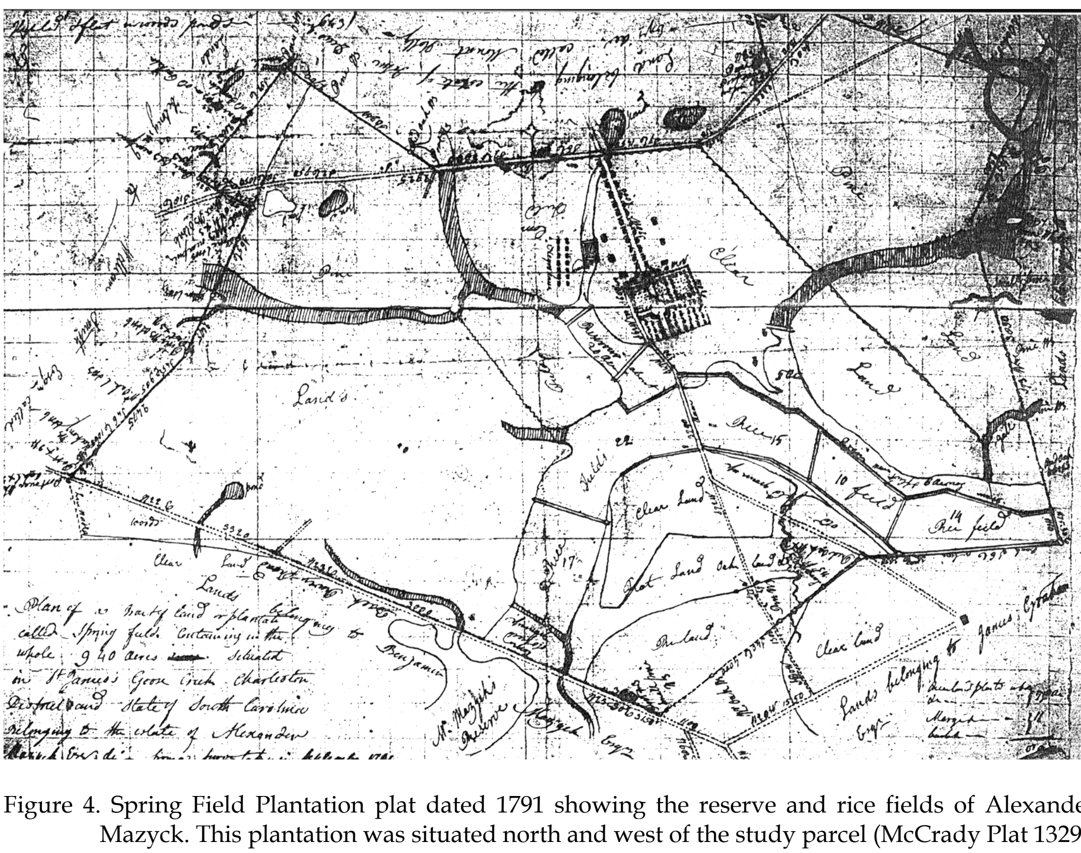

Figure 4. Spring Field Plantation plat dated 1791 showing the reserve and rice fields of Alexander Mazyck. This plantation was situated north and west of the study parcel (McCrady Plat 1329).

(Rogers et al. 1981:126).

Floods were common and all watersheds seem to have been equally vulnerable. For example the "great rains" during the summer of 1766 that did much damage to roads, bridges, and rice fields as reported in the August 4, 1766 *South Carolina Gazette*. Chaplin also reports several brief accounts where rice was reported to have been "rotten" by the freshet flooding and another case where all the fields were "under Water" (Chaplin 1993:230). Information, however, is limited and it is difficult to draw any conclusions about what steps, besides constant maintenance, planters might have taken to protect themselves.

Likewise droughts were part of the Carolina landscape, although here there is scholarly research suggesting significant eighteenth century droughts in 1746 and 1765, with far more frequent periods of reduced rainfall in 1738, 1747-1750, 1753-1758, 1762-1764, 1772-1774, 1778, and 1798-1799 (Cook et al. 1999; Karl and Koscielny 1982). In fact Henry Laurens comments in one letter, "Burning droughts, devastating Tempests, destructive Rice Birds, & worthless Overseers, Should always be held in view at the Commencement of a Rice Crop" (Rogers et al. 1981:404) – implying that some factors (such as the weather) were always variables over which the rice planter had no control.

To these issues Porcher adds a third limiting factor – the limited availability of suitable inland swamps (Porcher 1987:5). In spite of these constraints, swamp cultivation continued through most of the eighteenth century and, in some locations such as Goose Creek, well into the nineteenth century.

Eighteenth Century Tidal Cultivation

Porcher suggests a beginning date of around 1738 for tidal cultivation, although it took another 50 years for the transfer to be completed (Clifton 1981:275; Gray 1958:I:281). The 1738 date used by Porcher may come from a *South Carolina Gazette* (January 19, 1739) notice that offered two tracts of land for sale: "each contains as much River Swamp, as will make two Fields for 20 Negroes, which is over flow'd with fresh water, every high tide, and of consequence not subject to the Droughts." Chaplin, too, finds evidence that planters realized the potential of tidal flooding by the 1730s (Chaplin 1993:232) citing a 1741 *South Carolina Gazette* advertisement for 1,400 acres on the Combahee River "in a good tide's way."

An important difference with the introduction of tidal rice was increased output per hand. Inundation of the fields controlled both insects and weeds – allowing each African slave to work more acres. In 1748, with interior swamp cultivation, the output per hand was reported to have been about 2,200 pounds or about 49 bushels of rough rice. One hand would work between 1 and 3 acres of rice, in addition to provision crops. By 1791, the average rice acreage per hand had increased to between 5 and 6, plus provision crops (Clifton 1981:277; Gray 1958:I:283-284; Whitten 1982:15).

Although management of the crop would be less labor-intensive, creation of the fields required more labor and capital than inland fields, and their maintenance took more still and attention (Chaplin 1993:232, 235). Despite the resumption of importation of African slaves in the late 1740s, the vagaries of international markets during the 1740s and 1750s restricted the planters' ability to embark on the large-scale improvements that would be required to put new rice fiends into production.

The process of tidal cultivation (described by one planters as a "huge hydraulic machine") has been outlined on so many occasions it scarcely needs repetition (see, for example, Hilliard 1975 or for a primary account, Butler 1786). While the system is often explained (as it is by Hillard) as "ingenious," it is important to remember that virtually all of the technology had already been developed for inland swamp rice cultivation and the process of the adaptation to tidal culture took place over at least 40 years. While we don't intend to ignore the technological adaptations, it is important to understand tidal cultivation in an evolutionary context – with the gradual development through years of experimentation and use of existing technology. A simple synopsis is offered by Carney:

> First slaves constructed levees, or rice banks, around rectangular-shaped plots on the mudflats. The rice field was embanked at sufficient height to prevent tidal spillover, with banks often reaching six feet in height. Earth removed in the process resulted in an adjacent canal, while openings in the rice bank admitted the inflow of tidal water onto the field. The next step involved dividing the area into quarter sections (of ten to thirty acres), with river water delivered through secondary ditches. This elaborate system of water control enabled the adjustment of land units to labor demands and allowed slaves to sow rice directly along the floodplain. Sluices built into the embankment and field sections operated as valves for flooding and drainage. When opened at high tide, the tide flooded the field. Closed at low tide, the water remained on the crop. Opened again on the ebb tide, excess water was drained away from the plot. (Carney 2001:92).

Carney (2001:94-96) also explains the gradual evolution from plug trunks – hollowed out cypress logs with a plug in one end to control flow – to hanging flood gates still seen today as water control devices in coastal impoundments.

Planters were aware of the potential of tidal rice fields, and relatively high prices during the 1760s encouraged some to expand into the new agricultural technology. But "in the lowcountry's maturing plantation economy, agricultural experiments saw fruition only when a crisis jeopardized existing agricultural activities (Chaplin 1993:19). The War of Jenkin's Ear (1739-1742) stimulated South Carolina's adoption of indigo planting, and the non-importation resolutions of the early 1770s (Americans refused to buy British cloth) encouraged home production of woolen and cotton – led by the planter elite, this political reaction laid the foundation for the post-war cotton boom (Chaplin 1993:212-214).

Whitten suggests that by the late eighteenth century, rice planters were experiencing problems with weed and insect control, as well as soil exhaustion – and these problems spurred the adoption of tidal cultivation techniques (Whitten 1982:8-9; this same view is repeated by Bagwell 2000:86). Alternatively, Chaplin (1993) suggests that it was the crisis of the American Revolution that turned ambitious rice planters away from their moderately successful inland fields to vast new uncleared tidal tracts.

Regardless, the years of war took their toll on established rice plantations. Many slaves were commandeered by the Army or lost to the British; with the enlistment of their overseers or masters, others could not be made to work. Rice fields damaged by weather or human action were not repaired. On many plantations, the neglect continued even after 1783, with planters distracted by the loss of funds, labor, and their British connections (Chaplin 1993:235).

The wealthiest planters recovered first: unlike poorer farmers, they had slaves against which to borrow money. Chaplin explains,

> Amounts of both land and slaves increased in the upper ranks. In the meantime, falling

> levels of wealth in the population as a whole indicated that the coastline no longer offered economic opportunities to as many of its free inhabitants as it had before the war. . . . Only those already in the planter class (or the rare well-heeled immigrant) could afford to expand production (Chaplin 1993:237-238).

According to Chaplin,

> The 1780s formed a watershed in the development of tidal planting. Innovators had earlier built up a crucial reserve of knowledge about techniques of exploiting tidal lands; a larger group of planters now had the incentive to use these techniques (Chaplin 1993:236).

Planters returned to rice, and they finally committed themselves to tidal fields. Their choice was between rebuilding inland plantations, where the limits of profitability were known, or building new plantations, where the possibilities appeared boundless. Capital and slaves resources were thus directed to the construction of tidal rice field systems.

The South Carolina Agricultural Society was established in 1785, its founding members including Thomas Heyward, whose family were pioneers in tidal rice cultivation, and Thomas and Charles Cotesworth Pinckney, who focused on milling as well as cultivation. The new organization replaced the colonial reliance on Britain's Royal Society of Arts (Chaplin 1993:140). Rather than simply making efforts to improve crop yield, as was the tendency among later antebellum planters, the innovative planters not only improved existing cultivation but introduced new crops, developed new mechanisms, and significantly adapted old methods for growing new staples (Chaplin 1993:10). An example might be the introduction of a new rice variety:

> The *Gold Seed Rice* (the ordinary crop Rice most highly esteemed, and therefore universally cultivated), an oblong grain 3/8ths of an inch in length, slightly flattened on two sides, of a deep yellow or golden color, awn short; when the husk and inner-coat are removed, the grain presents a beautiful pearly-white appearance – and ellipsoid in figure, and somewhat translucent. This Rice has been introduced into the Winyaw and Waccamaw region since the Revolution. It was planted by Col. Mayham on Santee in 1785 (Allston 1846:323).

These activities, however, were not unique to the South Carolina Agricultural Society. The Medical Society of South Carolina, founded in 1789, while focused on medical issues, broadened its scope to include communal needs, as well as topographical and climatological recordation (Shaffer 1991:219-221).

Planters continued to seek European technology, particularly for controlling water and for cleaning grain. They obtained English water pumps, and "particularly valued Dutch expertise in using hydraulic power and in draining and flooding land" (Chaplin 1993:142-143). This appreciation of European technology was probably behind the names given to Heyward plantations in St. Bartholomew's Parish, which included Amsterdam, Rotterdam, Antwerp, Hamburg, and Copenhagen. South Carolina rice planters compared cultivation methods from Sumatra and China to Egypt, Italy, and Spain, threshing machines from Scotland and Sicily, pumps and waterwheels from Holland and Venice (Chaplin 1993:147-150).

By the 1790s, tidal fields had come to represent South Carolina rice planting. The seats of the wealthiest planters were along Goose Creek, the Cooper, Edisto, Combahee, Santee, and Waccamaw rivers. While inland swamps had produced between 600 and 1,000 pounds of rice per acre, by the 1790s tidal rice on a postwar tidal planters could make 1,200 t0 1,500 pounds – a slave could make five times as much rice on a postwar tidal estate as on a pre-Revolutionary inland plantation, averaging between 3,000 and 3,600 pounds per worker. Coastal land values also rose, with improved tidal swamp selling for two to three times as much as inland swamp – increasingly restricting the opportunities to the already wealth (Chaplin 1993:247).

There were social impacts with each of these expansions – from dry to swamp and from swamp to tidal. In particular Chaplin notes that each required more infusions of labor, which required more investment of capital in human flesh. This demand created, and then maintained, the black majority along the coast. The working conditions, which also deteriorated with each expansion, also created a greater tendency for slaves to run-off, persistently eroding whites' authority over their property. Further authority was given up with the use of the task system, which allowed slaves, once their tasks were performed, to have their own time. And with the task system came an increasing tendency for slaves to question the fairness and equality of the tasks assigned, causing yet further erosion of white power (Chaplin 1993:230-231, 234). Even as the system expanded, became more productive, and created greater wealth, the seeds of its own destruction were already being sown. There are almost certainly multiple causes – beyond the end of slavery – for the demise of rice cultivation in South Carolina. There are indications of increasing competition from a variety of locations, over-planting, erosion of field levels, exodus of mill engineers, less interest in the quality of rice breeding, and – in general – a lessened detail to all levels of quality from seed to finished rice (Glenn Roberts, personal communication 2003). Consequently, the fall of the rice kingdom was a result of many factors in the postbellum.

Continuity of Upland Rice Cultivation

While the manner in which most rice was grown gradually evolved from dry to wet , upland rice cultivation was still practiced into the nineteenth century (Clowse 1971:126) – and not simply as a provision crop on small yeoman farms. Volunteer rice – the so-called "red rice" – was endemic to water culture. The combination of conditions promoted not only its growth, but also its survival from season to season. The problem is clearly documented by a letter from James Laurens to his brother Henry Laurens in December 1773, "I rec'd 50 barrels Rice from Mepkin last Saturday, so much red in it that I had much trouble to find a Purchaser" (Rogers et al. 1981:204).

Upland dry rice cultivation, however, dramatically reduced the amount of volunteer rice – it was simply not able to survive the harsher conditions. As a result, these upland planters maintained the condition of the seed, supplying the low country planters. As Whitten observes, "the high price of seed rice compensated for the extra labor of hand weeding that wet culture avoided" (Whitten 1982:11). Gray (1958:I:283) also comments on the premium that piedmont (or upland) rice commanded over "Carolina rice." James Laurens, in 1773, wrote about his efforts at even this late date to plant upland rice (Rogers et al. 1981:48).

Continuity of Inland Swamp Rice Cultivation

Despite the promise of new tidal fields after the Revolution, many planters continued to use reservoirs, either as their only source of water or along with tidal irrigation. Developments in tidal irrigation probably helped improve methods of reservoir irrigation as well; some plantation "old fields" continued to produce. Tidal irrigation did not immediately or entirely replace other forms of rice cultivation (Chaplin 1993:243).

Inland rice cultivation continued until after the Civil War, but may have become increasingly confined to production for the home table. George Washington Oswald produced 33,730 pounds of rice on Ravenwood Plantation (Chessey Creek, St. Bartholomews Parish) in 1849 (National Register nomination). However, David Gavin's slaves were still planting small amounts of rice in the Indian Field Swamp (St. George's, Dorchester, Parish) in 1862, much of it for their own consumption (David Gavin Diary, South Carolina Historical Society). Vernon provided considerable detail concerning the planting of small parcels of inland swamp rice by African Americans in the Mars Bluff, Florence County area into the early twentieth century (Vernon 1993).

Some inland plantations probably fell out of production during a generational change – a father may have continued to plant as he had always done, but if the son was already established on his own land by the time he inherited, he may not have turned back to the "old fields." However, whether for sentimental reasons, a sense of denial, or the reluctance to admit that systems created through immense labor were not longer particularly valuable, sellers of inland plantations extolled the merits of their abandoned fields.

In late 1840 (*South Carolina Courier*, December 29, 1840), Charleston factor Theodore Gaillard offered for sale a plantation in St. Paul's Parish, 2455 acres made of several tracts. The McQueen's Place "has on it a good rice barn, and an excellent pounding machine, to work by water, and when in order is calculated to pound from eight to ten barrels per day." The large plantation had "about 400 acres of excellent rice land, immediately below three extensive reservoirs, which if put in order, will water 200 acres of rice, without the aid of rain. . . ." How long McQueen's Place had been inactive is unstated, but both the pounding mill and reservoirs were out of order.

Mount Pleasant Plantation, 1900 acres in St. Paul's Parish "about 25 miles from Charleston on the Parkers Ferry Road" was offered for auction in March 1854. The prime cotton and provision land was partly cleared, and "a part of this tract is a large body of wooded rice swamp, but which could be easily cleared, and rendered very valuable; it is supplied with an abundance of inland fresh water" (*South Carolina Courier*, March 1, 1854). It must have taken years of neglect for Mount Pleasant's rice swamp to have grown up in woodland, yet the hope remained that some optimist would take a chance on clearing and planting it.

Advertisements for tidal field plantations took an entirely different tone:

> a plantation at Wiltown containing 470 acres of land, 206 of which is Tide Land, situated on the best pitch of the tide, and alike exempt from freshets or salts. This plantation is unquestionably one of the best on Pon Pon [Edisto] River, and believed to be inferior to none of its size in the State. The solid clay, with a rich black mould on the surface, with dams, ditches, trunks etc. all in the best order. The barn is located on the brink of the channel, and vessels load and discharge their freight with the greatest facility. A point of land contiguous to the barn affords an admirable site for a mill . . . (*South Carolina Mercury* December 12, 1829).

The terms for the sale of Navarino Plantation (Prince George's, Winyah, Parish) – "now in the highest state of cultivation, containing about 150 acres of prime rice land, plants measurement, at a good pitch of tide" – were explicit: the land was to be "delivered when the crop is got out" (*South Carolina Courier* December 21, 1840).

By contrast, when Woodford Plantation (St. Andrew's Parish) was advertised in 1856, the inland fields were mentioned almost as an aside:

> 780 acres, about 235 acres are cleared and are good cotton and provision land. There are also about 65 acres of old rice land cleared. The balance is well-wooded with oak, hickory, etc.; Church Creek, upon which the tract bounds, is navigable up to the settlement (*South Carolina Courier*, December 2, 1856).

<u>Development of Rice Processing</u>

Regardless of how rice was grown, the processing was generally the same, with changes only as different technology (some successful, some not so useful) was promoted.

Whitten comments that the labor and expense of rice processing were the earliest – and perhaps most significant – obstacles to the crop's development (Whitten 1982:13). Once in the barnyard, the rice still needed to be separated from the straw, cleaned of the husk, separated from the bran, polished (which removed the pellicle or film), cleaned, and then adequately packed for shipment. All of this work was so time consuming that the planter would spend months processing his rice, not getting the finished rice to vessels for shipment until late fall or winter. Most of the export trade was then conducted in the winter and spring months (Clowse 1971:129-130). Unfortunately, many planters sought to shorten the cycle by reducing the quality of their efforts, resulting in mercantile observations such as:

> I request you to attend to the cleaning and packing the Rice. The quality of both the Grain & the Barrels from your Side was much complained of the present year (Rogers et al. 1981:575)

> Our Planters are to blame for not cleaning their Rice better than they generally do. The poor people here [in England] have not time or will not be at the trouble to wash it So carefully as we do in America & they are disgusted by the chaff, gravel, & other mixtures found in it (Rogers et al. 1981:578).

Perhaps most revealing was the observation by Henry Laurens:

> Our Coopers, our Negroes, our very bodies almost in these warm & plentiful Countries are vexatiously careless & often occasion me long Walks & loud Talks. But the Sailors are as careless & some what more ungovernable than the other folk & if I don't mistake you'll find some deficiency this time also (Rogers et al. 1978: 427).

Harvesting occurred from early September to early October when the crop would be cut with sickles and stacked in the drained fields to dry. When dry, the cut rice straw was bound in bundles or sheaves and carried to the stack or barn, either on the heads of slaves or on "flats" built to navigate the canals in the rice fields. There the rice would await further processing.

Threshing, or separating the grains from their stock (culm) or the straw, was the first step. While treading (by either slaves or animals) was initially used, during much of the Colonial period the most common approach was to place the bundles on the ground with heads outward. Slaves would then walk down the rows of bundles swinging a flail to beat off the heads of rice, yielding rough rice (Clowse 1971:129; Gray 1958:I:281; Whitten 1982:12-13). Machine threshing did not come into general use until the middle of the nineteenth century (Whitten 1982:13). Threshing, however, was the easiest step, since the rice easily separates once dry. More complex – and more labor intensive – were the following steps of removing the chaff and polishing the rice.

The next step, milling, removed the indigestible hulls from the grain. Then the inner "skin" or bran would be removed, resulting in a white color. As mentioned earlier, the removal of the bran and germ also resulted in rice less likely to spoil during the long transatlantic voyage. The undesired hulls and chaff were separated from the grain by winnowing.

The earliest technique, known as "pounding," used a wooden mortar and pestle. Carney notes that this is a misnomer since the goal was to obtain whole, not broken or pulverized, grains. To achieve this required a skilled tapping and rolling motion (Carney 2001:125; Clowse 1971:129). It is perhaps because of this that period accounts explain a skilled worker produce 95% unbroken, whole grain, while a less skilled, "careless," or fatigued worker could easily shatter half of the rice (Clowse 1971:129).

The success of the pounding was of crucial importance to the planter since broken rice sold at significantly reduced prices. Carolina planters generally graded the poundings as "rice," or "whole rice," "middlings," or partially broken grains, and "small rice," or small broken grains. There would usually also be some percentage of rice flour. Separated by sieves, the rice would be put up in barrels for market, the middlings would often be used by the planter's family or sold on the local market, and the small rice would be used by the slaves (Carney 2001:126-127).

To further complicate the process, pounding unfolded in two distinct operations. During the first pounding the hull or husk is removed, representing a relatively easy step. The second stage is polishing the rice. This was more difficult and involved detaching the bran (which was responsible for the grain's brown or red color) without breakage.

The great labor involved in pounding was early recognized not only as limiting the profitability of rice, but also as seriously fatiguing the slaves. Planters looked for ways to mechanize, during the 1730s price boom, and again during the 1740s when the labor saved could be put to indigo. Planters tried animal power, but the postwar tidal plantations produced so much that not even horse-power could keep up (Chaplin 1993:251-253). Chaplin quotes Peter Manigault who, in 1794 warned his overseer, "if the Rice made at Goose-Creek is not yet beat out, I wd. Wish to have it sold in the rough, to save Labour to the Negroes" (Chaplin 1993:252).

Much effort was expended in attempting to develop machines to pound the rice – allowing faster and, most importantly, more precise, milling. Clifton notes that between 1691 and 1768 the South Carolina Assembly granted eight patents for various rice threshing or polishing machines. While none lived up to the expectations, it is telling that virtually all of them were developed when rice prices were below normal – inspiring efforts (and creating market) to cut costs (Clifton1981:278).

Porcher provides an intriguing view of the various inventions. He notes that one of the first (from 1691) was Peter Guerrard's "Pendulum Engine," that was reported to "much better, and in lesse time and labour, huske rice" (Porcher 1987:10). The device appears to have been a relatively simple fulcrum device. He notes that he has found nothing in the literature to suggest that the invention was either successful or spurred further innovations.

Peter Villepontoux introduced a rice pounding machine in 1732 and obtained a patent in 1736. The details of this machine are no better known, but he suggests that it was a "cog" machine. A very similar device was developed by George Veitch in 1768. This machine attracted much attention and, during trials, was reported to have pounded at least 580 pounds of rice in just over 2 hours. The judges felt that six horses could beat out 600 barrels of rice in a season. Ultimately the Assembly awarded Veitch £2,500 for his invention, apparently with much urging from Henry Laurens (Rogers et al. 1976:576). Laurens, only months later, was sorry for his support:

> I am afraid that it will not answer our expectations & therefore I am going now immediately to erect one upon the *best old plan* at Broughton Island. . . . A few Gentlemen upon whose judgement & veracity I could depend gave the House the strongest assurances of the usefulness of the New Machine but it seems now that the Inventor or improver deceived them in some material points which escaped their notice (Rogers et al. 1976:706).

Gray (1958:I:282) notes that there were yet other inventions. In 1733 Francis Garcia was encouraged to produce a machine for "the more expeditious beating or pounding of rice." In the same year another act was passed by the Assembly encouraging Charles Lowndes in a similar endeavor. In 1743 the Assembly offered encouragement to John Timmons for his machine to clean rice. Additional notices were published in 1755 and again in 1756.

After pounding the rice would be winnowed to remove the lighter trash from the heavier grain. During much of the Colonial period this winnowing process involved placing the hand-milled rice in circular and shallow straw baskets about two-feet in diameter. During a breeze the grains and hulls were rotated inside the basket and tossed in the air – the lighter chaff is carried off by the wind, while the heavier rice falls back into the basket, known on the plantation as the fanner basket (Carney 2001:113).

Later the winnowing was expanded to dropping the pounded rice from buildings elevated on stilts – allowing the wind to remove the trash and the rice to be collected off hard packed clay floors below. By the middle of the eighteenth century the hand or animal-turned wind fan was introduced and Whitten (1982:13) reports that wind fans were in general use by 1761.

By 1802 Drayton's *A View of South Carolina* described three "types" of rice machines still found in use in the state. The included the "pecker," "cog," and "water" mills. The pecker mill is likely the fulcrum device developed by Guerrard in 1691. The cog mill was described by Drayton as working "upright pestles driven by animal power." Porcher believes that these are the Villeponteaux and Veitch mills. The final type, or water mill, is illustrated by Drayton (Figure 5), who notes that it was developed by Jonathan Lucas at Peachtree Plantation on the Santee River in 1787. With this device the process of removing the hull and bran are done in separate steps. First millstones are used to grind off the hull, then mortars and pestles are used to pound off the bran. The cog machine was incorporated with mill stones added as a separate step (Porcher 1987:11).

Other modifications, such as threshing machines and steam engines are all nineteenth century innovations (Porcher 1987:13-16).

In spite of all these efforts, a few comments by Henry Laurens suggests that processing continued to be a challenge. In 1766 he commented some "workmen" in the Wambaw areas had been spoken to about

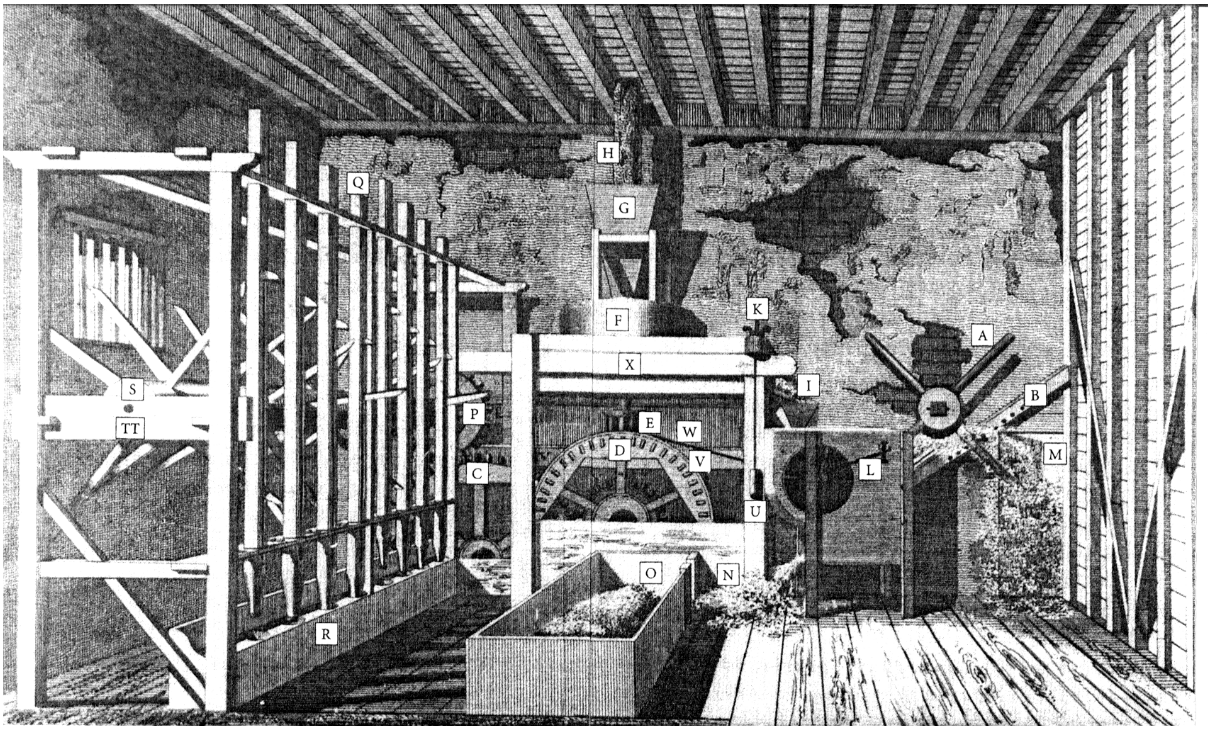

Figure 5. "An Inside View of a Water Rice Machine as Used in South Carolina," from John Drayton's 1802 *A View of South –Carolina*. *A*. The Windlass for raising the Flood Gate. *B* Holes for a Pin by which the Windlass & Flood Gate are secured. *C.* The main driving Cog Wheel fixed on the Water wheel shaft. *D.* A large Wheel, revolving on the same Axle with the small Wheel Y. *E*. A Small Lanthorn Wheel impelled by the large Cog Wheel D. *F*. Mill Stones. *G.* Hopper. *H*. Funnel; thro' which the rough Rice falls from the Loft. *I.* Funnel from the Mill Stones discharging into the Wind-fan Hopper. *L.* A Strap, worked by a Crank for moving a riddle within the Fan. *M.* Hulls or Chaff passing thro' the Door. *N.* The Hulled rice, discharging from the Wind-Fan into the Bin. *O.P*. A Cog Wheel, Moving the Axle S. *Q.* The Pestles. *R.* The Mortars. *TT*. Two movable Beams, supporting the Axle S. *U.* End of the Cross Beam, into which the Screw K. plays, and also supports the long moveable Beam VV. on which the upper Mill Stone rests, raised at pleasure by Screw K. *W.* A Band, which works the Pulley of the Wind-Fan. *X.* A long cross beam, connecting the Beating & Grinding Parts.

building "a Machine for pounding Rice" (Rogers et al. 1976:106). Regardless, it seems that mechanical rice processing was remarkably unsuccessful until the last quarter of the eighteenth century. In 1772, Henry Laurens insisted:

> For cleaning Rice . . . no Grinding will answer the purpose. Rice is ground first for the *Mortar* by a *Wooden* Mill & the *softest* kind of *Pine* is chosen for that service. The husk is ground off very clean, but nothing less than the Pestle will take off the Inside Coat, & shew the neat whiteness of the Grain (Rogers et al. 1980:409).

Yet the next year he reports that the carpenter, Sam, had come to his Mepkin rice plantation and built a "New Woodpecker Machine which McCullough writes me exceeds all Expectation % Pounds 5 barrels Rice per Day with ease" (Rogers et al. 1981:204).

The Economy of Rice

Before considering the legislation affecting rice, or the affects of rice on the Carolina economy, it is perhaps useful to briefly consider how rice – a relatively unimpressive grain – became a viable trade commodity. Rice had little economic importance in medieval Europe and was largely confined to Spain and Italy where it was primarily consumed by Catholics during the Lenten season. What was present was grown locally and was generally used by the poorer classes. While plentiful in the Orient, its weight and the long journey did not encourage its trade except to the very wealthy.

With the collapse of State power in India and the influx of European colonialism in the eighteenth century, curried meats, vegetables, and rice gained much wider acceptance among Europeans (especially the British). At first the dishes were found only on the tables of the wealthy, where it was considered elegant. Gradually Dutch plantation owners introduced Indonesian rice meals to Amsterdam. Rijsttafel (Rice Table) was soon the favorite culinary tradition of the Netherlands. The Rice Table was an elaborate meal of Indonesian dishes developed during the Dutch colonial era. It included rice and foods to accompany it: curried meats, fish, chicken, vegetables, fruits, relishes, pickles, sauces, condiments, nuts, and eggs. The dinner would be served with a plate of rice with the side dishes chosen to achieve a balance of salty, spicy, sweet, and sour accompaniments. A rijsttafel of 40 dishes was not uncommon, the meal sometimes taking three to four hours to consume (FitzGibbon 1976, Herbst 2001). The combination of these events opened the market for rice in Europe.

Gray notes that in the first years of the Restoration, several decades before rice was planted in Carolina, the English import duty on the grain was fixed at £1 6s. 8d. per hundredweight containing 112 pounds, or nearly 3-pense sterling a pound. By 1663 all European goods bound for the Colonies, even on English-built ships, had to be transshipped through England, guaranteeing to the British, rather than colonial, merchants control over the colonial import business (Dethloff 1982:235). In 1692 the duty was increased by adding a 5% ad valorem rate on top of the specific duty. And in 1710 the act was made "perpetual" (Gray 1958:I:284). In 1704 rice was placed on the list of goods and commodities that had to be exported from the colonies to only England (Dethloff 1982:233).

Table 2.
Some Typical Costs of Establishing a Plantation in Carolina, 1775 (adapted from Carman 1939:285)

	£	S
1,000 acres of land (1/3 good swamp land and remainder upland	575	0
Buildings	142	15
Two good Negro mechanics	142	15
Two old Negroes to care for stock	57	0
26 field slaves (1/3 women)	927	10
Two house servants	69	5
Stock (including 80 oxen and cows, and eight horses)	88	16
Plantation tools, carts, and plows	21	8
TOTAL	2,024	9

Dethloff suggests that, in spite of the bad press the various navigation acts have received from historians, the acts generally supported colonial business practices through the first two thirds of the eighteenth century. He notes that they allowed colonists favorable access to European markets, stimulated rapid growth of marine industries, contributed to an increased supply of manufactured European goods and services, provided credit for colonial trade, and ensured protection for the trade from the Royal Navy (Dethloff 1982:235).

At first South Carolinians exported rice directly to Portugal and the West Indies (Dethloff 1982:235). The Colonists were not only outraged at the duty, but also at the additional shipping time and charges that were added to rice by this needless stop in England. Most particularly it made it very difficult to get rice to the European countries that demanded it for Lent.

It took England until 1730 to relax the Navigation Act, allowing Carolina to export her rice directly to any part of Europe south of Cape Finisterre, which is the northwest tip of Spain's Atlantic coast (although a duty still had to be paid and the rice had to be shipped in English vessels and those vessels had to stop in England on their way back to America).

Although the relaxation of trade restrictions was a boost to rice planters, its impact has been overstated according to Gray (1958:I:286), who notes that the legislation did not open the area north of Cape Finisterre – an area that included Holland and Germany (the French were not great rice eaters in the eighteenth century according to Root (1980:414) . As an example of the limited impact, Gray notes that of the 20,458 hundredweight of rice shipped from Carolina between 1713 and 1717, only 2,478 hundredweight (or only 12%) went to countries south of Cape Finisterre, thus avoiding the additional shipping time and duties. In the period between 1730 and 1739, more than 74% of Carolina rice went to Holland, Hamburg, Bremen, Sweden, and Denmark – all north of the Cape Finisterre line and therefore requiring transportation through England. In 1767/8 the percentage had not radically changed, with only 22.6% of the total exports going to countries south the Cape Finisterre line.

In 1767 colonial rice was placed on the "free list" between May 4 and December 1, 1767 – a practice that was continued until May 1, 1773. There was, however, a re-exportation duty of 6 pence a pound was added.

Table 3.
South Carolina Rice Prices, 1722-1775, shillings per hundredweight (adapted from Coclanis 1989:Table 3-29).

Year	Price	Year	Price
1722	5.17	1750	8.98
1723	6.01	1751	6.53
1724	6.16	1752	7.93
1725	5.62	1753	9.55
1726	6.57	1754	6.20
1727	8.03	1755	5.82
1728	6.62	1756	4.83
1729	6.38	1757	4.82
1730	6.29	1758	6.16
1731	5.32	1759	9.40
1732	6.02	1760	7.35
1733	5.72	1761	5.51
1735	8.64	1762	4.76
1736	8.26	1763	6.31
1737	8.89	1764	6.01
1738	9.60	1765	6.36
1739	5.47	1766	8.13
1740	4.71	1767	8.01
1741	7.45	1768	9.26
1742	6.39	1769	8.62
1743	4.91	1770	6.76
1744	4.23	1771	7.28
1745	2.29	1772	12.03
1746	2.24	1773	9.04
1747	4.43	1774	7.37
1748	6.44	1775	6.59
1749	8.28		

In addition to the duties, there were yet other charges. Henry Laurens explained these to a client:

> Rice at 35/ will cost you here with the charges 6/ Sterling per 112, freight to a market 4/9, Insurance to cover your Interest & Premium at 20 per Cent 1/9½, half subsidy & charges at

Cowes 11½d, total 13/6 Sterling
per Ct. (Hamer et al. 1970:489).

To these shipping and commission charges, of course, must also be applied the initial capital investment to establish a rice plantation. Those costs are estimated by Carman (1939:285) and reproduced here in Table 2. The most significant cost, throughout the Colonial period, was the purchase of African American slaves, especially during those periods when the flow of human flesh was restricted. Yet even land was an escalating commodity. Whitten explains that rice land was doubling in value every three to four years by 1748 (Whitten 1982:16). An alternative means of acquiring both land and slaves, however, was inheritance or marriage and it is difficult to determine if direct or indirect acquisition was the most important route.

Coclanis (1989) provides us with another view of the economics of rice and its importance in the rise, and demise, of the low country's economy. While the arguments are complex and worthy of greater attention by those focused on economic history, we may summarize the proposition relatively simply. There is no question that rice production grew steadily in the Colonial period, added by technological innovations. Coclanis reminds us that rice yields increased from about 1,000 pounds per acre during the first quarter of the eighteenth century to at least 1,500 pounds per acre during the last quarter (Coclanis 1989:97). He also reveals that the price of rice increased more over time than the prices of goods imported into South Carolina from England (Coclanis 1989:106-107). Thus, while there were clearly dips in the price of rice (see Table 3), overall the trend increased and, more importantly, the trend of rice prices was higher than the trend in import prices. He concludes that despite tremendous mortality, market forces in the low country during the eighteenth century "lead to aggregate expansion and intensive growth, increasing social stability, and the accumulations of vast wealth" (Coclanis 1989:110). The mean total wealth per white inhabitant (generically, personal wealth) grew steadily, from £146.68 Sterling between 1722-26 to £303.62 between 1757-62 (Coclanis 1989:89).

In spite of this, the low country economy collapsed -- Coclanis remarks that, "the forces responsible for the area's earlier dynamism had been routed" by the end of the nineteenth century and "the dark victory of economic stagnation [was] virtually complete" (Coclanis 1989:111). He looks carefully at the estimates of wealth and points out that while Carolinians, especially rice planters, were exceedingly wealthy, much of their wealth was tied up in human flesh. When mean nonhuman wealth per capita is examined, "the low country had trailed both New England and the Middle Colonies even in 1774, the distance separating the low country and these other areas, which in 1774 had been short, by 1860 had greatly increased" (Coclanis 1989:125). In other words, when slaves were taken from the equations, the per capita wealth of Carolina declined precipitously and the situation was probably even worse than this would indicate when we consider that by all accounts the cost of living in the South was far higher than elsewhere in the Country during the nineteenth century.

The low country's economic rise was based entirely on its specialization in the production of a few plantation staples with slave labor. During the eighteenth century that proved to be highly profitable, but by the nineteenth century the system began to fail. Coclanis explains this collapse by pointing out that rice was never "vital" to the West. He notes that, "in comparison with sugar, cotton, and tobacco, which have been described with some accuracy in the literature as mighty, kingly, and holy commodities respectively, rice was but a humble footman or sexton, lacking even a hint of sovereignty in the marketplace" (Coclanis 1989:133). Rice was really never more than a cheap dietary supplement or complement intended to feed the poor, soldiers, orphans, and slaves. It was not an indispensable product and, as the nineteenth century moved forward, there was increasing competition from Bengal and Java in the East Indies and from Louisiana, Arkansas, and Texas here at home. Another historian, R.C. Nash, has similarly pointed out, "Rice . . . was an inferior good, a *substitute* for other small grains" (Nash 1992:682).

Coclanis (1989:141) calculates that the annual net rates of return on investment for rice ranged from about 12.5% in 1710 to an astonishing 26.7% in 1768. By the nineteenth century, however, the figures were consistently at 1% or less and most often in the negative range. In 1859 the rate of return was an astonishing –28.3%. Rice was simply no longer worth the effort to plant – in spite of the puffery of its later apologists.

Relatively little attention, however, has been directed to why South Carolina's economy grew and declined so precipitously with rice. Shepherd and Walton (1972) in *Shipping, Maritime Trade, and the Economic Growth of Colonial North America* focused on the cost of transport and claimed that increased efficiency and gains in productivity in distribution were largely responsible for Colonial economic growth. Russell Menard (1988) suggested a three-stage model of economic growth, with rapid growth prior to 1740, stagnation during the 1740s, and slow expansion after 1750 (the result of the end of the wars between 1739 and 1748 and diversification into indigo). R.C. Nash (1992) advanced the idea that European demand played a pivotal role in the growth of South Carolina's rice industry. Coclanis (1989), already discussed in some detail, believes the rapid Colonial growth was the result of a variety of factors, including specialization, greater demands on slaves for labor, relative increase in factor inputs (such as land, labor and capital), productivity changes from better technology, the growth of domestic credit sources, and improving terms of trade.

Recently Hardy (2001) attempted to test these various models. He converted the value of rice exports into constant pounds sterling (see Figure 6) revealing that the rice industry went through three distinct phases. During the period from 1722 to 1738 (roughly corresponding to Menard's first phase) the industry grew at a steady, rapid rate, with the value of rice exports increasing at an average rate of £7,046 per year – a striking compound growth rate of 13.9% per year.

In the second period, from 1739 to 1763, the value of rice exports stagnated. Hardy attributes this to two periods of war sandwiching an uneasy peace. During this period average growth fell to only £1,719 per year or an annual compound rate of only 1.3%.

In the third and final period, from 1764 to 1774, the value of rice exports expanded at a variable, but generally rapid, rate. The average rate of growth was £9.099 per year, or a compound rate of more than 3.6% per year.

Hardy found that while the first period of growth, from 1722 to 1738, could be explained by changes in the organization of trade and shipping (as advanced by Shepherd and Walton), the second period could not be explained by their model. Rather, it appears that factors internal to South Carolina (such as specialization and increased demands on slaves), coupled with increasing market demand in Europe and the West Indies for a cheap grain, lead to the growth after 1764.

While we have thus far focused on how the economics of rice affected the planter, there is another significant partner in the process. Nash (2001) points out that unlike sugar and tobacco planters, rice planters rarely marketed their own crops in Britain using the commission system. Not only were overseas markets fragmented for rice, but the high cost of shipment relative to the value of rice required a knowledge of freight and commodity markets that most planters either did not possess or chose not to learn. In addition, Nash (2001:77) notes that there were few variations in rice quality, so planters had only very limited opportunities to earn premium prices for their crops. As a result, rice planters largely marketed their crops in America rather than Europe and early on the central market became Charleston.

By about 1700 a large, professional merchant community had already emerged from the migrants reaching Caroling. In particular many were Huguenots. Van Rumbeke (2001:32-35) notes that merchants formed the second largest group coming to Carolina, accounting for about 25% of those whose occupants could be identified. He notes that they were either local merchants, largely from Aunis, maritime ports, and La Rochelle in France, that mixed mercantile activity with agriculture or "especially at [the] turn of the eighteenth century, factors for large London-based companies" (Van Ruymbeke 2001:34).

Until the 1720s, the Charleston merchants usually acted as factors or agents for British merchants from whom they received consignments of dry goods. The rice planters, who were their most important clients, usually contracted to make future payments for their purchases in "merchantable" rice when their crops were harvested. The Charleston merchant-factors would then remit the rice to their British agents, usually in ships provided by the British firms.

By the 1720s – which corresponds with the rapid growth of rice – there was a fundamental change in business practices. Rice planters began to sell their rice on the open market, receiving payment in cash, which they then used to discharge their debts to the merchants for various supplies. Nash notes that this suited both parties. The planters could, if they wished, withhold the sale of rice, in an attempt to manipulate the market to obtain better prices. The Charleston merchants found that they could trade more flexibly if they were able to purchase rice on the open market, rather than through a contract that anticipated future deliveries. Since one cost of shipping was how long a vessel was in port, by having rice on hand, the merchants were able to move ships more quickly in and out of port, reducing their costs. This new "class" of Charleston merchants may be called "export merchants."

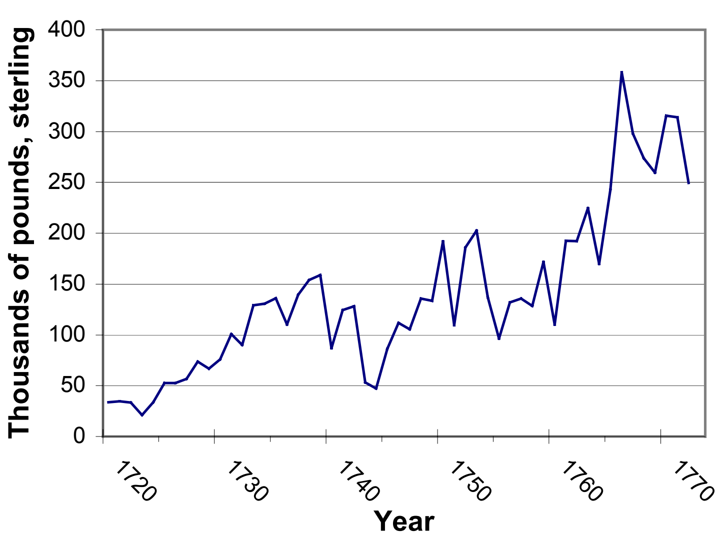

Figure 6. Value of South Carolina rice exports (constant £ sterling, 1860 = 100). (Adapted from Hardy 2001:Figure 5.1).

During King George's War (1739-1748) the basic method of marketing rice changed once again. The rice market collapsed (as previously discussed) and the value of rice reached disastrous lows. Many rice planters ceased selling rice themselves and, instead, retained "rice factors" to sell the rice on commission to the Charleston export merchants. This new class of merchants came either from the ranks of existing Charleston merchants or from planters or sons of planters who moved to Charleston and used their rural connections to launch themselves into business (Nash 2001:79).

The factors invariably owned or leased wharfs and warehouses on Charleston's East Bay Street. The planters would send their rice to these locations, either in their own boats or in boats owned by the rice factors.

Nash notes that this change soon lead to friction as the interests of various parties were often very different. For example, the rice factors, whose interests coincided with those of the planters, wanted high rice prices and low freight rates. In contrast, the export merchants wanted low rice prices and, since they also handled the shipping, high freight rates. The rice factors seem to have been very successful in forming cartels to keep up the price of rice and push down freight rates. Nash (2001:80) notes that the factors would advise their clients to "stop their boats," or halt shipments to Charleston, driving up the price of rice. As ships empty stacked up in the harbor, the freight rate also dropped. Nash observes, "the general effect of the country [rice] factors' manipulations was to push up the price of rice in Charleston rather than in Europe, thus eating into the profit margin of the Charleston export merchants and their British correspondents" (Nash 2001:80).

<u>The Impact of Rice on African Americans</u>

Peter Wood's classic *Black Majority* provides the only detailed examination of the growth of South Carolina's African population (Wood 1974). Supplemented with Daniel Littlefield's (1981) *Rice and Slaves* and Philip Curtin's (1969) *The Atlantic Slave Trade*, we can begin to obtain a better idea of the impact rice played on the importation of Africans into the Carolina colony.

Wood observes that the future of slavery in Carolina established early and by conditions elsewhere in the British realm. In particular, the Proprietors realized that Barbados could provide seasoned settlers from a very short distance at a very minimal cost – allowing an early, and substantial, return on their investment. The ranks of the Barbadian emigrants consisted of small landholders who had been squeezed from their holdings, bound-servants who found no land available when their terms expired, and political exiles who fled to the island after the English restoration. Eventually the Proprietors even made a concession to the Barbadian settlers, allowing black adults (virtually all of whom were slaves) a status in the headright system equal to that of free white women and children. This was a major victory for the settlers since their major holdings were in slaves – and the net result was a significant increase in the number of slaves to be transported into Carolina from the Barbados early on. Wood notes that well over 40% of the enslaved Africans reaching the British mainland colonies arrived in a single port – Charleston (Wood 1974:xiv).

Figure 7 shows the population trends for Carolina during the early Colonial period. In particular it reveals that the white population remained slightly larger than the enslaved African population until about 1709 – around the time that there was increased attention to rice production and an increased need for African slaves. We also see a dip in the importation of slaves in 1715-1716 as a result of the Yemassee War. After this point, however, the slave population increases dramatically, with the white population never able to keep up. Wood also uses the available data from 1720 and 1740 to calculate the annual rate of black population increase for the two decades in excess of the number of immigrants (ignoring departures and those escaping). He finds that a population that had been increasing at a rate of 5.6% per year before 1720 appears afterward to have been *decreasing* at a rate of 1.1% per year over the next 20 years. It is tempting to suggest that much of this decrease can be attributed directly to the labor associated with rice cultivation (see also Morgan 2001).

Perhaps the most detailed account of the affect of rice planting on the enslaved comes from Dusinberre's (1996) examination of Gowrie, a river swamp rice plantation on the

Savannah River. While the study incorporates only the nineteenth century, the general conclusions are likely relevant to earlier rice plantations. In fact, Dusinberre (1996:80) notes that similar accounts are unavailable for the eighteenth century, where there is only one reasonably complete record of mortality rates – and it goes back only to 1786 (see Steckel 1979). Yet he suggests that the eighteenth century rates were likely much worse – taking into consideration that they reflect a period prior to the "reform" movement of the 1820s.

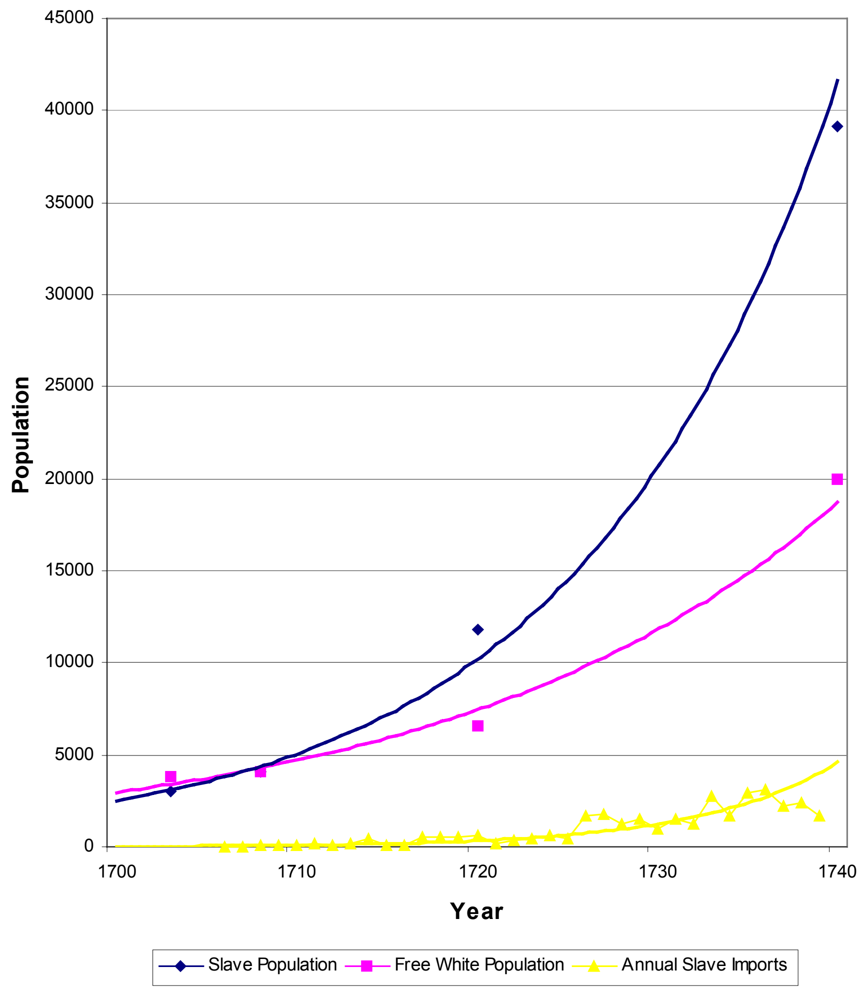

Figure 7. Population trends in Colonial South Carolina, 1700-1740 (adapted from Wood 1974:Table 4).

Dusinberre (1996 :51) notes a horrific child mortality rate of 90% at Gowrie– although this does not take into account stillbirths or mis-carriages. He suggests a more conservative estimate of at least 55% for general use, suggesting that two-third of all children born on swamp rice plantations would die before their sixteenth birthday (Dusinberre 1996:80, 412, 416). Wood also explains,

> the drive to secure profits or remove debts by increasing the production of a plantation economy created a willingness to buy Negroes on credit, a callousness toward the conditions of resident slaves, and a general sense of the expendability of black labor. All these tendencies worsened the prospects for natural population growth among slaves and simultaneously heightened the demand for slave imports. A vicious circle was thereby established in which it appeared advantageous to stress the importation of "salt-water" slaves rather than the survival

Table 4.
Population Figures for South Carolina by Parish, 1720 (Adapted from Wood 1974:Table 2).

Parish	A. Taxable Acres	B. Taxpayers	C. Slaves	D. Estimated Free Population (B x 5)	E. Estimated Total Population (C + D)	F. Estimated % Slaves (E/C)	G. Taxable Acres Per Person (A/E)
St. Helena	51,817	30	42	150	192	22	270
St. Bartholomew's	30,559	47	144	235	379	38	80
St. George's	47,457	68	536	340	876	61	54
St. Paul's	187,976	201	1,634	1,005	2,639	62	71
St. Andrew's	197,168.75	210	2,493	1,050	3,543	70	56
St. James Goose Creek	153,267.50	107	2,027	535	2,562	79	60
St. Philip's (Charleston)	64,265	283	1,390	1,415	2,805	50	23
St. John's Berkeley	181,375	97	1,439	485	1,924	75	94
St. Thomas & St. Dennis	74,580	113	942	565	1,507	63	50
Christ Church	57,580	107	637	535	1,172	54	49
St. James Santee	117,274	42	584	210	794	74	148

of those at hand" (Wood 1974:152).

Not all scholars, of course, agree with Wood. Some, such as Chaplin suggest that after mid-eighteenth century planters realized, "a reproducing slave force served their interests better" and that by the 1750s "slaves lived longer . . . and raised children" (Chaplin 1993:54-55). There is some support for this view, with even Wood acknowledging that by the 1760s birthrates were rising (1974:142-166). Menard, however, has critiqued Wood's figures and posits less increase and more slave imports as responsible for seeming rise in number of African Americans (Menard 1995).

Figure 7 does not reveal where these African American slaves eventually resided. In 1720 the interim governor, James Moore, forwarded to England "An Exact account of the Number of Inhabitants who pay Tax in the Settlement of South Carolina for the yeare 1720 with the Number of Acres and Number of Slaves in each parish." Wood (1974:146-147) expands the information, providing a closer look at the parishes making up South Carolina during the early colonial period (see Table 4).

While we find that the slave population of St. Andrew's Parish exceeded St. James Goose Creek (2493 to 2027), the Goose Creek parish was 79% black, compared to only70% in St. Andrew's. The study tract, largely focused on inland swamp rice cultivation was dominated by African American slaves.

Recently Carney (2001) has made a strong argument that Africans transferred an entire "knowledge system" concerning rice – everything from production to consumption – and "slaves from West Africa's rice region tutored planters in growing the crop (Carney 2001:81). Yet much of this thesis has been presented before by Wood and Littlefield. Wood, for example, observes that it was the slave, not the European, who was familiar with rice planting, noting that the most significant rice region,

> Was the "Windward Coast," the area upwind or westward from the major Gold Coast trading station of Elmina in present-day Ghana. Though most of the slaving era a central part of this broad stretch was designated as the Grain Coast, and a portion of this in turn was sometimes labeled more explicitly as the Rice Coast (Wood 1974:59).

He concludes that it seems likely African slaves "succeeded in nurturing rice where their masters had failed" (Wood 1974:62).

The argument is made even more strongly by Littlefield, who first attempts to decipher the ethnicity of slaves brought into South Carolina. Noting that Carolina planters had clear preferences. In general the preference was for Africans from Gambia and the Gold Coast with a decided bias against those from Calabar (or Ibo or "Bite") slaves from the Niger Delta. Those from the Windward Coast and Angola were somewhere in between (Littlefield 1981:9; see also Curtin 1969:157). In spite of these supposed preferences, Table 5 reveals that the most commonly imported slaves were from Angola.

Nevertheless, Littlefield (1981:21) notes that in one year alone – 1764 – of the five ships that came into the Gambia region, three arrived in South Carolina in 1765. He further argues that planters placed a positive value on slaves from rice growing regions, especially Upper Guinea, Senegambia and the Windward Coast (Littlefield 1981:75-78). Combined, these three regions contributed nearly 43% of the African slaves brought to Carolina during the eighteenth century (see Table 5).

Littlefield acknowledges the earlier contribution of Wood and observes that the theory is easier to advance than to prove, with Wood having taken the concept about as far as possible, given the lack of substantive data, especially information concerning slave imports during the crucial first two decades of the eighteenth century (Littlefield 1981:103). He does, however, point out the implausibility of Europeans having the knowledge base to develop rice cultivation (see also Hess 1992: 10-11), pointing out that Chinese cultivation techniques were drastically different than those of early Carolina (while commenting that there are many similarities between Carolina and Africa).

What is missing, however, are examinations of rice growing in Spain (where rice was introduced in the eighth century by the Moors) and Italy (where it was introduced from Spain by the fourteenth century) (see Root 1980:414). France can be ignored since there was no successful rice cultivation there until the very early twentieth century (Hess 1992:14; Root 1980:414). Were the techniques in these two areas similar to those used in Carolina? And were there mechanisms to transfer that knowledge successfully to the English colonists?

But what explains the large proportion of Angolas (where rice cultivation was not historically significant) being imported, if there was a positive value placed on slaves from Gambia? Littlefield offers only that it was easier to secure large numbers of slaves from Angola

Table 5.
Slaves Imported into South Carolina by Origin, 1733-1807 (adapted from Curtin 1969:Table 45).

Coastal Region of Origin	%
Senegambia	19.5
Sierra Leone	6.8
Windward Coast	16.3
Gold Coast	13.3
Bight of Benin	1.6
Bight of Biafra	2.1
Angola	39.6
Mozambique-Madagascar	0.7

than from Gambia. At the same time he reminds us:

> Curtin's estimates indicate that South Carolina received a larger percentage of Gambia and Windward Coast slaves than was characteristic of the English slave trade as a whole, and this can be said to have been a matter of preference. The high percentage of Angolas can be assigned to a combination of acceptability and availability (Littlefield 1981:113).

Carney, a geographer with extensive African experience, provides considerable background information on the rice heartland – which extends north to the Niger River and east to Lake Chad, encompassing all of the areas exploited for slaving. The centers, however, ranged from the Gambia River southward into Sierra Leone, essentially identical to the three regions previously discussed. She suggests, however, that the proportion of slaves brought into Carolina from these three regions grew over time – from 12% in the 1730s to 54% from 1749 to 1765 and then to 64% between 1769 and 1774 (Carney 2001:89). While this certainly suggests that they were favored because of their knowledge base, it still does not prove that they were selected in order to teach the English how to cultivate rice. And this is a stumbling block that Carney is never able to get over.

Carney's critics – such as Philip Morgan – contend that she fails to provide critical evidence. He notes, for example, that when rice production was supposedly most in need of outside assistance – during the period up to 1730 – the Upper Guinea Coast was not a major supplier of slaves, so that only about one in eight slaves was from a rice growing area. He goes on to remind us that it wasn't until the third quarter of the eighteenth century that Africans from rice growing areas became a majority of these imported (Morgan 2002). By this time rice cultivation techniques were well established and it seems that the African contribution would be minimal.

It appears that we have come a full circle back to the admonishments of Littlefield – there doesn't seem to be adequate data to *prove* that African slaves were more than skilled laborers recruited to assist with a system that already had been developed. Nevertheless, there seems to be little doubt that enslaved Africans and rice cultivation were inexorably tied together in Carolina.

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