The Machine in the Rice Field: A Spatial Analysis of Mechanized Rice Processing Infrastructure along the Cooper River, 1780 - 1830

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THE MACHINE IN THE RICE FIELD: A SPATIAL ANALYSIS OF MECHANIZED RICE PROCESSING INFRASTRUCTURE ALONG THE COOPER RIVER, 1780 – 1830

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
Historic Preservation

by
Jacob B. Hockenberry
May 2024

Accepted by:
Dr. Carter Hudgins, Committee Chair
Dr. Richard Porcher
Dr. Hayden R. Smith
Dr. Kendy Altizer
ABSTRACT

This thesis examines the spatial and physical characteristics of mechanized rice processing infrastructure along the Cooper River in South Carolina’s Lowcountry between 1780 and 1830. Historic rice plantation plats and modern geospatial data provided new information regarding the location of rice processing machines in relation to other plantation landscape features. This research analyzed seven rice plantations that contained these machines. Each plantation plat was georeferenced using ArcGIS Pro to support a detailed spatial analysis of these processing sites. While literature has extensively detailed the social, economic, environmental and enslaved aspects of rice culture in the Lowcountry, little research has specifically focused on processing machines on rice plantations.

The establishment of processing infrastructure was dependent on the topography and hydrology of the Lowcountry. This research concludes that mechanized processing machines were located within 1,000 feet from the Cooper River or a major tributary at an elevation between two and eight feet. These areas were characteristic of tidal marsh deposits, clayey sand and clay facies, and alluvium soil deposits formed during the late Pleistocene and Holocene geologic periods. The reliance on riverine transportation during the period of study further oriented these processing machines towards the extensive network of navigable waterways which traversed the Lowcountry. Moreover, the dependence on slave labor encouraged the establishment of enslaved settlements to be closer to sites of mechanized processing compared to the primary dwelling house.
DEDICATION

To my family and friends for their continuous support of my academic endeavors.
ACKNOWLEDGMENTS

I would like to extend my sincerest thanks to my committee Carter Hudgins, Richard Porcher, Hayden Smith, and Kendy Altizer. This thesis would not have been possible without their support, guidance and expertise. I would especially like to thank my committee chair, Carter Hudgins, for his continued encouragement and insight. I would also like to thank Hayden Smith for his valuable feedback and discussions. Finally, I would also like to give special thanks to Richard Porcher for sharing his enthusiasm and expertise for the history of rice culture in the Lowcountry.

Thank you to my family: Poppal and Grammy, Mom and Brian, Pap and Gram, Dad and Marla, and Uncle Tim. Thank you for sparking my interest in history and your unwavering support in my study of it. Without your continuous love, guidance, and encouragement I would not be who I am today. Thank you to my girlfriend, Mackenzie. Your love, patience and support will never cease to amaze me. I love you all.

Finally, thank you to those in the cohort who have made these past two years of graduate school something to remember. I will cherish the memories and friendships that I have made here in Charleston.
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CHAPTER ONE
INTRODUCTION

As the spires and smoke of Charleston cast silhouettes in the early morning hours of a summer day in 1841, John Irving set out up the Cooper River. His departure from the city wharves via steamboat was not for business, but observation. During this excursion, Irving would sketch the landscape he passed, capturing as he did life on the rice plantations that lined the Cooper River. These sketches, occasionally published in the *Charleston Courier*, were eventually compiled in *A Day on Cooper River*, published in November 1842. Irving’s book, advertised as “a very beautiful and graphic account of the different plantations, &c. on Cooper River, with many incidents, anecdotes and biographical sketches, &c. connected with them and their various proprietors,” provides a glimpse into Antebellum life on the river.¹ As his steamboat ventured north and the city’s silhouette faded, the built landscape transitioned from urban to agricultural. Thick marshes with backdrops of lofty cedar and pine trees flanked the river. Further upstream these marshlands gave way to a cultivated landscape.

Provisional crops, timber, cotton, rice and indigo were among the many crops Lowcountry planters established on their estates along the Cooper River. When Irving passed what he termed “fine crops,” rice was nearing the end of its growing season. The late August harvest that would soon commence was a “very interesting period to the hopes of the husbandman.”² Before rice could be exported to transatlantic markets, it first

¹ “New and Delightful Book,” *Charleston Courier* (Charleston, South Carolina), November 17, 1842: [3].
had to be processed. Preindustrial methods of rice refinement involved laborious tasks completed manually by the enslaved. Planters sought to refine these methods to alleviate the physical labor demanded of their slaves. Industrious modifications resulted in the adaptation of machines for threshing and pounding out rice. Mechanized threshing barns and pounding mills characterized industrial Antebellum rice processing. This infrastructure was common on the Lowcountry’s agricultural landscape by the time Irving made his excursion in 1841.

Today, the fragments of industrialized rice cultivation which shaped South Carolina’s agricultural landscape are strewn throughout the Lowcountry. Since the collapse of the industry, former rice plantations have been subdivided, developed into residential communities and industrial facilities, and transformed into ecological or hunting preserves. Nature has overtaken abandoned rice fields, dikes, and irrigation canals once at the heart of commercial rice agriculture. Consequently, the mechanized infrastructure once integral to the preparation of rice for market has been destroyed by

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5 State Historic Preservation Office, “Rice Fields and Section 106 SHPO Guidance for Federal Agencies and Applicants” (South Carolina Department of Archives and History, 2011), 2; DuPont de Nemours, Inc., an American chemical company, operates their Cooper River Plant on the property that was originally Dean Hall Plantation; A residential community is located in the area that once comprised Pimlico and Mepshew plantations. For more on how hunting and leisure transformed the Lowcountry see, Julia Brock and Daniel Vivian, eds., *Leisure, Plantations, and the Making of a New South: The Sporting Plantations of the South Carolina Lowcountry and Red Hills Region, 1900-1940* (Lanham: Lexington Books/Fortress Academic, 2015); Robert B. Cuthbert and Stephen G. Hoffius, eds., *Northern Money, Southern Land: The Lowcountry Plantation Sketches of Chlotilde R. Martin* (Columbia: University of South Carolina Press, 2009).
both time and nature. The location of this infrastructure and its context to the broader rice plantation landscape is the focus of this study.

**Rice Cultivation and Market Preparation**

Rice cultivation in South Carolina began as early as the 1690s, a decade after the English established Charles Town at Oyster Point. Inland swamps, savannahs and marshes were utilized in these early years for rice growing. Quickly realizing the profitability of this crop and reinforced by successful harvest yields, colonists promoted the commercial production of rice, entrenching rice culture in the Lowcountry. By the mid-eighteenth century, planters recognized that tidal forces could be harnessed to irrigate rice fields, setting in motion a “long period of experimentation… to develop tidal rice culture.” The introduction of rice transformed the landscape of the Lowcountry as slaves worked to convert cypress swamps into an extensive engineered network of rice fields, canals, dikes, and trunks. A unique system of labor that developed in the Lowcountry was employed. The task system, characterized by a daily “tasks,” defined South Carolina’s rice plantation labor system. By the mid-eighteenth century, a standard

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8 Edelson, *Plantation Enterprise in Colonial South Carolina*, 82-86. Edelson argues that the task system formed the basis of the Lowcountry plantation labor force due to the customs that had been established when South Carolina was first settled in the late seventeenth century. Prior to the colony being dominated by plantation economies, it was a slave society in which slaves provided for themselves. As demands accelerated plantation market economies, planters adopted the custom of enabling slaves “secure life’s necessities.” (Edelson, *Plantation Enterprise in Colonial South Carolina*, 86)
daily task of a quarter of an acre was impressed on slave for field related work including planting, hoeing, and harvesting.\textsuperscript{9} Slavery played a crucial role in Lowcountry rice culture. The enslaved not only provided the labor necessary to work the rice fields, but they imparted the agricultural expertise needed to grow it.\textsuperscript{10} The process of getting the valuable crop from the fields to market involved three steps, harvesting, threshing, and milling, all completed by enslaved labor.

\textit{Harvesting}

The initial step in processing rice was the summer’s harvest. Inundated fields of nearly ripened rice crops were drained by enslaved workers in late August to early September. This task involved opening trunks embedded in the banks of rice fields, releasing water from the last flood of the growing season known as the harvest flow.\textsuperscript{11} These trunks acted as “the conduit to direct water into and out of rice fields.” Archaeological evidence has documented three distinct types of trunks that were used in Lowcountry; lift-gate, swing-gate, and lever-gate trunks.\textsuperscript{12} Once drained, the fields were

\begin{footnotesize}


\textsuperscript{11} Charles Joyner, \textit{Down by the Riverside}, 47; Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 105.

\textsuperscript{12} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 42.
\end{footnotesize}
left to dry out for up to ten days before the harvest began to prevent slaves from toiling in the muddy quagmire of the rice fields, although this was not always the case.\textsuperscript{13}

The physical process of harvesting rice involved cutting off the grain bearing portion of the crop with a sickle. A sickle or “rice hook” was the primary method of harvesting rice throughout much of the Antebellum period in South Carolina. This was a slow and tedious process as it involved grasping the rice stalk with one hand and wielding the sickle with the other. Additional implements used during this period included the cradle scythe. Machines for harvesting rice were introduced postbellum and used extensively in Louisiana, Texas and Arkansas. While these various methods of harvesting were experimented with in the Lowcountry, none replaced the rice hook due to issues concerning inadequate cutting, financial burden, unstable soil, and maneuverability of harvesting machines.\textsuperscript{14} Harvesting rice was arduous work for the enslaved. This was exacerbated by the humid and swampy conditions of the rice fields further intensified by the heat of the late Carolina summer.

\textsuperscript{13} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 105-106; Charles Joyner, \textit{Down by the Riverside}, 47.

\textsuperscript{14} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 106-108.
Figure 1: Scenes of Rice Culture published in Harper's Weekly, January 5, 1867. Harvesting with a rice hook is depicted on the right center scene. (Harper's Weekly, January 5, 1867)

Once cut, the rice was left to dry on the “generous stubble” left behind, ensuring that the grain was not in contact with water. After at least a day passed, the rice was tied in large sheaves and transported to the threshing yard. Rice was either transported manually by “carts or on the heads of female workers” or on rice flats navigated through the system of canals which comprised the plantation. Once to the threshing yard, the rice stalks was stacked and cured in ricks. This curing process “matured and hardened” the rice through the exothermal fermentation of the stalks. The rice would be monitored daily to prevent it from getting mowburnt which is the result of excess heat damaging the rice.

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grain. Allowing the rice to fully mature was “important to prepare rice for threshing and milling.”

**Threshing**

After the rice was harvested and cured, the second step of processing began. This involved removing the grain from the stalks through the process of threshing. Throughout the Antebellum period, threshing evolved from manually beating the rice out of the stalks to using mechanized machines. However, the adoption of such technologies on Lowcountry plantations differed dramatically as economic and social means influenced where and when threshing machines were integrated.

Before mechanized machinery, threshing rice was an “onerous and slow” multi-stage process. First, rice sheaves were manually beaten to remove the grains from the stalk. The “primary threshing implement” used at this stage for most of the Antebellum period was the flail. This tool consisted of three parts: a long handle (staff), a small piece of rawhide (swivel), and a short piece of wood (swingle or bob). Porcher and Judd provide a good visual description of how this tool was utilized; “a worker held the staff and whirled the swingle in a circular motion over his or her heads, bringing it down with force on the sheaves and dislodging the rice from them.” Once the stalks of rice were beat, they would then be shaken to remove any additional rice grains. What remained was rice and chaff, chaff being the inedible hulls that envelop the rice grain. Threshing was either done in a large threshing yard or in a threshing barn.

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To remove this chaff, the rice then had to be winnowed. Early methods of winnowing included using a fanner basket, winnowing platform or winnowing house. A winnowing house being an enclosed version of a winnowing platform. In principle, these methods relied on a natural source of wind to blow away the lighter chaff, leaving the heavier rice grain behind. By the mid-eighteenth century this reliance on a natural source of wind was replaced by a mechanical one. In 1754, Joseph Kogar introduced the wind fan which effectively “replaced the winnowing barn for cleaning rice.” Other wind fan designs were introduced in the following decades leading into the early nineteenth century. These modifications and improvements to wind fan designs were eventually

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19 A winnowing house was a large structure, raised roughly fifteen feet above the ground with an exterior access stair. Rice, temporarily stored here, would be dropped through a grated opening in the center of the structure during times of strong wind. The heavier rice grains would be collected below the opening while the lighter chaff was blown away by the wind, effectively separating the rice and chaff. (Porcher and Judd, *The Market Preparation of Carolina Rice*, 116.)
implemented in threshing machines introduced in the latter part of the Antebellum period. Further demands by planters to adequately prepare rice for milling led to the adoption of the rolling screen. Rolling screens were used to further clean the rice by removing “heavier particles, such as defective rice and sand, that were not removed by wind fans.” This development was first documented around 1782 – 1783 at the tail end of the American Revolution.

Over the course of the next four decades, manual means of threshing rice dominated the Lowcountry. The agricultural productivity of plantations during this period placed strained these more traditional hand methods of threshing rice. A lack of mechanical methods to thresh higher rice yields stymied efficient processing for market export. Experiments and modifications to existing threshing technology for other cereal grains ensued in search of a reliable solution that could be applied to rice culture. However, none gained any widespread adoption from Lowcountry planters. By the 1820s, increased yields of rice crops outpaced the rudimentary method of threshing rice with a flail. Accordingly, planters demand for an efficient threshing machine ensued.

Their pleas were resolved in 1829 when Calvin Emmons, of New York, introduced a rice thresher capable of threshing up to 700 bushels a day. Emmons design utilized iron beaters that were attached to a cylinder which, when rotated, “combed” the

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21 Porcher and Judd, *The Market Preparation of Carolina Rice*, 121; For additional information on rolling screens, see the “Threshing” chapter in *The Market Preparation of Carolina Rice*.
rice from the stalk which was supplied by a feeder tray. Further modifications to
Emmons’ machine included replacing the iron elements of his original machine with steel
to better withstand wear. His design “revolutionized rice threshing,” providing a
foundation for later machines.\textsuperscript{24} By the early 1830s, machines had accounted for every
step of the threshing process once completed manually. Beaters had replaced the flail,
wind fans had replaced fanner baskets and the winnowing house, and the newest addition,
rakes, replaced shaking the straw of remaining rice grains.\textsuperscript{25} Various elements of
Emmons’ original design were further enhanced by enterprising inventors like William
Emmons, Ludlow, William Mathewes, and Jehiel Butts leading up to the Civil War.\textsuperscript{26}

The flail remained the dominant implement used on rice plantations for threshing.
Mechanized threshing machines did not become common on Lowcountry rice plantations
until after 1830. However, mechanical innovations to improve cleaning threshed rice
including the wind fan and rolling screens would have been available to planters along
the Cooper River during the early Antebellum period. The final step in preparing rice for
market involved cleaning and polishing the rice grain through the process of milling.
Unlike threshing, machines to mill rice developed throughout the eighteenth century and
became widely available to planters by the end of the century. Therefore, mention of
mechanized processing infrastructure in this thesis largely refer to the machines
implemented to complete this step.

\textsuperscript{24} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 127.
\textsuperscript{25} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 132.
\textsuperscript{26} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 128-137. For further information on the
evolution of threshing machinery, see the “Threshing” chapter in \textit{The Market Preparation of Carolina Rice}. 
Milling

The final step to processing rice for market is milling. This process separates the inedible portions of the threshed rice: the hull, bran and germ, from the edible rice grain. Milling naturally occurred between September, when the rice crop is harvested, and April, when the new season’s crop is planted. The mechanization of milling occurred prior to that of threshing. Like threshing however, innovation stemmed from an increased volume of rice yields that could not be processed between September and April by traditional methods. The increasing yields reflect the widespread success and adoption of tidal rice culture over inland rice culture following the American Revolution. Consequently, these improved yields impeded traditional milling techniques creating a choke point in market refinement. The need for mechanical milling equipment to satisfy the needs of prosperous Lowcountry planters who were more than willing to industrialize emerged in the late 1700s.\textsuperscript{27}

The primary method of milling rice in colonial South Carolina was with a mortar and pestle. This physically demanding process involved using a pestle to pound rough rice that was placed inside of the pestle. This action of “pounding” the rice generated “friction [between the grains of rice] that removed the hull and the outer layers of bran.”\textsuperscript{28} The root of this method can be traced back to Africa where it was traditionally used by women to “prepare all African cereals,” including rice.\textsuperscript{29} Judith Carney’s thesis of agricultural diffusion across the Middle Passage is exemplified in the adoption of this

\textsuperscript{27} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 153, 64; Chaplin, \textit{An Anxious Pursuit}, 232, 251.
\textsuperscript{28} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 157-158.
\textsuperscript{29} Carney, \textit{Black Rice}, 74.
milling technique. By 1698, rice was being milled in South Carolina using a mortar and pestle. A combination of increased crop yields associated with its commercial production, varying quality of “pounded” rice, and the grueling labor required of slaves forced mechanized techniques of milling to be explored.31

Prominent politician John Drayton (1766 – 1822) described three kinds of rice mills – pecker, cog, and water – that were used in South Carolina during the eighteenth century.32 John Lucas, grandson of Jonathan Lucas I, supplemented these three mill types to include a spring mill.33 In the mid-eighteenth century, the three mill types described by Drayton were used in conjunction with a wooden (rotary quern) mill. These wooden mills were constructed of two circular pieces of wood, a runner and a bed, and were typically of pine. The runner, slightly raised off the bed, would be rotated manually. The outer hulls of the rice fed between these two elements would be ground off when the runner was rotated. The wooden mill was an important component of the early milling process and used as late as the 1790s.34 The mill types noted by Drayton and Lucas would then be used to remove the “more tenacious bran.”35 Each of these mills incorporated the operation of the mortar and pestle into its design, differing only in the methods the pestle were operated and the source of power. While the spring mill was likely powered by hand, being that it is “the most simple,” the pecker, and cog mills harnessed animals like

30 Carney, Black Rice, 84.
32 John Drayton, A View of South Carolina: As Respects her Natural and Civil Concerns (Charleston: W.P. Young, 1802), 121.
33 Porcher and Judd, The Market Preparation of Carolina Rice, 162.
34 Porcher and Judd, The Market Preparation of Carolina Rice, 166-169.
35 Porcher and Judd, The Market Preparation of Carolina Rice, 166.
oxen, mules, or horses to power the mill.\textsuperscript{36} The pecker and cog mills operated on the simple principle of mechanically raising a stationary pestle and allowing it to fall into a mortar located beneath it. This action would generate enough friction to remove the hull and bran.\textsuperscript{37} This separate two-step process required the rice to first pass through the wooden (rotary quern) mill to remove the hull before the pestle mill removed the bran.

Water mills, as the name implies, were powered by sources of water available throughout the Lowcountry. The use of water powered mills paralleled the use of pecker, cog and spring mills, along with the traditional method of mortar and pestle. In 1744, a water-powered rice mill was recorded in the journal of William Stephens in Chatham County, Georgia.\textsuperscript{38} Although in Georgia, this early piece of evidence supports the use of water-powered rice processing infrastructure in the Lowcountry by the mid-eighteenth century. These mills were fed by a number of water sources which changed and evolved over the course of the Antebellum period. Earlier mills relied on more natural flowing sources like small streams. By the mid-eighteenth century, reservoirs constructed to flood inland rice fields were utilized as a power source for these mills. The shift to tidal rice culture at the end of the eighteenth century also shifted the source of power for rice mills. Tidal waters impounded on rice fields served as the power source for mills, being strategically released through a mill race driving the waterwheel.\textsuperscript{39}

\textsuperscript{36} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 170; Drayton, \textit{A View of South Carolina}, 121.

\textsuperscript{37} For a more detailed discussion on the operation of the pecker, cog, and drum mill see: Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 171-177.

\textsuperscript{38} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 186.

\textsuperscript{39} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 188-189.
The topography of the South Carolina Lowcountry made the operation of these mills unique. Because of the naturally low lying areas in which rice processing infrastructure was built, all water-powered rice mills were driven using undershot waterwheels.\textsuperscript{40} These rice mills were typically two or three story structures with a gable roof. The foundation and lower story of the mill were typically brick while the upper stories were wood. Dimensionally, they would have been “approximately thirty feet wide by forty feet long.” They would have been situated adjacent to a canal which served as a millrace for the structure, supplying the mill with water. The construction of these millraces was crucial to the performance and longevity of the rice mills. Gates were constructed in the millrace to control the flow of water engaging the waterwheel. A common waterwheel measured twenty-two feet in diameter and fourteen feet wide.\textsuperscript{41}

In 1787, the water-power rice mill was revolutionized by skilled millwright Jonathan Lucas I (1754 – 1821). Lucas, a descendant of millwrights, ingeniously unified the once two-step process of milling rice into one. His incorporation of millstones and modifications to existing water mill designs established a basis for subsequent mill designs. These millstones cleaned the rice better than wooden (rotary quern) mills and reduced the overall damage to the rice grain.\textsuperscript{42} An engraving of his “Water Rice Machine” is depicted in Drayton’s book \textit{A View of South Carolina: As Respects her Natural and Civil Concerns}. Later improvements made by Lucas to his rice mill sought to further automate the process of milling through the inclusion of elevators, rolling

\textsuperscript{40} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 192.
\textsuperscript{41} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 194-197.
\textsuperscript{42} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 202-204.
screens, and brushes. Elevators moved the rice grain to different milling components, rolling screens improved the separation of the rice grain from debris, and brushes polished, or remove the inner layers of bran, before the rice was sent to market. Water-powered rice mills were the most common form of processing infrastructure used during this research’s period of study and reflects planter’s demand for more efficient methods of processing.

Figure 3: Engraving of Jonathan Lucas I’s "Water Rice Machine" in A View of South Carolina (Library of Congress)

Industrial development of steam engines during the eighteenth and nineteenth centuries led to the last major shift in Antebellum rice processing, the transition to steam

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power. The transition to steam power introduced additional components to the rice processing landscape in the form of engines, boilers, and chimneys. By 1825, steam-driven engines were gradually installed on Lowcountry rice plantations making processing “independent of the tides.”\textsuperscript{44} Boilers, and their adjoining furnaces, were used to generate steam which was transferred through a series of pipes and check valves.\textsuperscript{45} The chimney served two purposes. The first being to create a draft to pull oxygen into the furnace to feed the fire underneath the boiler which generated steam for the engine. The second purpose was to expel smoke, cinders and gases from the fire through the flue.\textsuperscript{46}

While Jonathan Lucas applied steam in 1817 to his rice mill in Charleston, steam engines were not widely adopted until the 1830s.\textsuperscript{47} However, the combination of high cost associated with installing and maintaining these steam engines, and moreover mills, excluded smaller plantations from adopting such machines.\textsuperscript{48} These barriers to entry reserved the adoption of steam engines to toll mills on larger plantation and commercial mills which developed in Charleston during the late Antebellum period.\textsuperscript{49}

Industrialization is typically portrayed as overlooking the Antebellum South, a largely agrarian society evoking characteristics of Jeffersonian Democracy. An examination of the Lowcountry rice industry and the mechanization of rice processing offers a different perspective. In Charleston specifically, industry was well established by 1860 having

\textsuperscript{44} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 232.
\textsuperscript{45} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 245.
\textsuperscript{46} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 251.
\textsuperscript{47} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 224, 232, 278.
\textsuperscript{48} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 224, 276.
boasted railroad manufacturers, iron foundries, and lumber, cotton and rice mills.\textsuperscript{50} While industrialization permeated the rice industry through mills, Chaplin indicates that this was a “selective importation” of “industrial capitalism.” While steps to process rice became mechanized, other aspects of Lowcountry rice culture “remained strikingly backward and reflected the region's continued reliance on enslaved human labor.”\textsuperscript{51} Slaves continued the work of planting and harvesting rice by hand, manually threshing it with flails when machines were unavailable, and constructing and maintaining rice field irrigation networks.\textsuperscript{52}

Like threshing machines, the emergence and widespread implementation of steam-powered rice mills originates at the end of the period of study examined in this research. Therefore, there is a focus on water-powered rice mills. However, remnants of various steam-powered infrastructure on rice plantations along the Cooper River examined demonstrate the ability of these plantations to adopt more industrial methods of rice processing. Plantations discussed in this research that adapted their original water-powered rice mills to steam include Middleburg, Comingtee, Mepkin, and Cedar Hill.

\textit{Slavery and Rice Milling}

The introduction of milling technologies transformed labor requirements traditionally needed to pound rice by hand. Water powered machines during the late


\textsuperscript{51} Chaplin, \textit{An Anxious Pursuit}, 261.

\textsuperscript{52} For further discussion on slavery on Lowcountry rice plantations see, Wood, \textit{Black Majority}; Joyner, \textit{Down by the Riverside}; Chaplin, \textit{An Anxious Pursuit}; Carney, \textit{Black Rice}. 
eighteenth century were able to produce between 2,100 and 4,240 pounds of clean rice per day. Mills operating at these high volumes were able to replace the tasks of a large number of slaves. The adoption of rice mill machinery meant that “few slaves needed to tend the water mills,” eliminating the arduous task of manually pounding rice by a large number of slaves. This shift in agricultural processing contributed to the dynamic change of the plantation task system through labor hierarchies.

The development of “specialized jobs” on Lowcountry plantations such as “trunk minders” or mill “operators” elevated the status of slaves that held these positions. The “valuable” skills of slaves as “millwrights, engineers… [and] mill hands” was mentioned in the public auction notice for Dean Hall Plantation on the Cooper River in December 1856. Joyner notes that these types of skilled occupations were typically held by slaves of more advanced age in part due to their “enhanced knowledge and diminished physical capacity.” Teenage boys also worked as mill hands as supported by a contemporary source. In February 1818, an advertisement posted in the Charleston Courier sought to hire “six negro boys, from 12 to 16 years of age, to attend in a Rice Mill.” While Carney’s claim and this source differ on age of mill workers, it does reinforce that mechanized rice processing through water, and eventually steam, driven mills demanded less labor.

55 “Sales at Auction,” Charleston Courier (Charleston, South Carolina), December 8, 1856: [3].
56 Charles Joyner, *Down by the Riverside*, 63.
57 “Pine Logs and Staves, Wanted,” Charleston Courier (Charleston, South Carolina), February 17, 1818: [4].
Cultivating rice was just one component of a larger process in turning this agricultural crop into a marketable commodity. Processing the rice grain was the other major step. Until the late eighteenth century, the work of threshing, winnowing and polishing the rice grain had been done entirely by hand. It was not until the late eighteenth century that milling technology was applied to processing rice in the Lowcountry. Such technological development required less labor to be completed by hand leading to an increase in cultivation productivity.\textsuperscript{58} While different methods of milling was utilized following the Revolution, it was Jonathan Lucas’s water powered rice mill that “revolutionized the market preparation of Carolina rice.” Lucas’s adaptation of previous milling methods as well as his own modifications made his mill design “standard of the industry” and “set a course of technical innovation that led to extensive mechanization of milling in the 1800s.”\textsuperscript{59}

\textbf{Focus of Study}

Research on rice agriculture in South Carolina has primarily focused on the economic, environmental, social, and political aspects of Lowcountry rice culture and the significant role that slaves had in cultivating, harvesting, processing, and shipping the cereal grain. Remarkably, few sources have discussed the technological component of rice processing in the Lowcountry. The exception, Richard Porcher and William Judd’s \textit{The Market Preparation of Carolina Rice: An Illustrated History of Innovations in the Lowcountry Rice Kingdom}, examines the development of rice processing over the


\textsuperscript{59} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 202, 204.
duration of the industry. While *Market Preparation of Carolina Rice* is exceptional at visualizing and describing the technological innovations of the rice industry, it lacks a comprehensive discussion of where these mechanized processing sites would have been located in relation to the broader plantation, and moreover, riverine landscape. The questions this thesis addresses are as follows: what was the spatial relationship between mechanized processing sites and other plantation features, particularly the planter’s dwelling house and dwellings of the enslaved? What was the topographic relationship between mechanized processing sites and their source of power? Did different modes of transportation influence where these processing sites were situated? More broadly, this research examines post-Revolutionary industrialization of Lowcountry rice plantations through the proliferation of mechanical rice processing infrastructure.

*Establishment of Study Area*

While rice cultivation occurred along the coastline of South Carolina and northern Georgia, this research focused on rice plantations along the Cooper River. This study area was chosen for a number of reasons. First, the existence of the Cooper River Historic District (CRHD) provided a foundation from which further research could begin. Placed on the National Register of Historic Places (NRHP) in 2003, the CRHD is designated as a “remarkably intact historic and cultural landscape.” This 30,020 acre region reflects agricultural activity along the river which “played a vital role in the successful production of rice.”60 Additionally, a substantial number of contributing historic resources associated

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with rice processing reinforced the selection of the study area. These resources include a rice mill chimney and steam engine at Cedar Hill Plantation, a chimney and steam engine at Middleburg plantation, and rice mill remains at Comingtee Plantation. Despite the identification of these important resources, efforts to preserve these ruins from further degradation have not been greatly espoused. This poses great concern as these valuable resources impart the district with historic integrity; without them, the historic value is undermined.

The second reason this area of study was selected stems out of personal interest of the Stoke’s Rice Mill located on Comingtee Plantation. The remaining structural fragments of this mill incited personal curiosity to understand the significance of this mill and how it reached its current state. Growing up in rural Pennsylvania where historic flour and grist mills are still part of the landscape, the lack of mills, albeit rice mills, in the Lowcountry further stressed this interest. Finally, disregarding the reasons of an established historic district and personal inquiry, this area was selected due to a lack of literature regarding rice agriculture and rice milling in this region. Literature regarding rice plantations along the Santee, Ashepo, Combahee and Edisto rivers elsewhere in the Lowcountry have been published by the state’s Department of Archives and History.61 Yet, little research has been dedicated solely to rice cultivation on the Cooper River.

The hydrology of the Cooper River further defines this area of study. The Cooper River is an example of a black-water river. The headwaters of these rivers, located in the

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coastal plains, contain a low volume of freshwater discharge. This allows salt to intrude up to twenty-five miles inland compared to brown-water rivers where saltwater is confined to the mouth of the estuary. Black-water rivers have vertically homogenous estuaries in which fresh and saltwater mix creating brackish tidal marshes that characterize the lower portions of these rivers. These areas are unsuitable for rice agriculture due to the damaging effects of saltwater on the crop. This restricted rice cultivation to plantations further upstream. For the purpose of this research, the area of study is limited to plantations located along the east and west branches of the Cooper River north of their confluence.

This thesis is broken down into six chapters. Chapter two provides a discussion of the scholarly literature that bears on the antebellum rice industry and how that is seated in the broader context of South Carolina’s agricultural history. Chapter three presents the methodology employed to address the questions raised in this thesis. Chapter four presents evidence supporting the mechanization of the rice plantations examined along the Cooper River. Chapter five provides a spatial analysis of mechanized rice processing infrastructure located on seven rice plantations. Finally, Chapter six builds on this analysis by presenting the findings and proposing a generalized spatial model that can be applied to future research.

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CHAPTER TWO
LITERATURE REVIEW

The scholarly literature on rice culture in the Lowcountry is both temporally and geographically extensive. Leading works from scholars like Peter Coclanis, Judith Carney, Richard Dwight Porcher Jr., William Robert Judd, Daniel Littlefield, James Tuten, and Hayden Smith explore the unique place of rice culture in the Lowcountry’s agricultural landscape.\(^6^3\) Their work addresses broader categorical themes from which to explore this topic. This literature examines rice agriculture by evaluating its economic conditions, social and political considerations, technological innovations, enslaved experiences, and environmental implications. One area that has been insufficiently explored is industrialized rice production. Ernest M. Lander Jr. addressed this topic in the mid-twentieth century but confined his study to industrial mill complexes located within the city of Charleston.\(^6^4\) More recent work by Porcher and Judd have addressed this topic by utilizing extant processing infrastructure on former rice plantations to understand the structural and technological evolutions of rice refinement. Overall, scholars have largely neglected processing infrastructure in the rural periphery.

Concentrated in mosquito and alligator infested tidal swamps, remotely situated, and out of public view, these remnant features are obscured from the public. Such

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\(^6^3\) Coclanis, The Shadow of a Dream; Carney, Black Rice; Porcher and Judd, The Market Preparation of Carolina Rice; Littlefield, Rice and Slaves; Tuten, Lowcountry Time and Tide; Smith, Carolina’s Golden Fields.

conditions contribute to a lack of historical investigation on the topic of industrial rice production on Lowcountry plantations. Despite this, the extant features have much to contribute to a more comprehensive history of Lowcountry rice culture. By examining the academic literature of Lowcountry rice agriculture, it is evident that research on rural plantation processing infrastructure has either been inadequately studied or ignored. This is especially true for plantations along the Cooper River. Research to address this void on mechanical rice processing infrastructure can foster insight into social and environmental dynamics of these locations, reinforce their significance to rice culture, and aid in contemporary efforts to preserve them.

**South Carolina Agricultural History**

From its outset, agriculture played a fundamental role in the development of South Carolina. Walter Edgar’s monumental *South Carolina: A History* asserts that “[t]he proprietors wanted to create… an agricultural experimental station” in the colony to export “exotic product(s)” that would fetch high values in England. Furthermore, the success of supplemental provision crops was necessary to support future colony inhabitants.\(^65\) The success of early colonization in South Carolina rested solely on the productivity of the regions land and waterways. The study of the state’s agricultural history is vast and complex. Various agrarian industries transformed the landscape and thus form the foundation of this literature. The commercial industries that define South

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Carolina’s early agricultural history include cattle raising, rice, indigo, cotton, tobacco and timber.\(^{66}\)

Evidenced thus far, the focus of this research centers on the Lowcountry’s rice culture, contributing to its dense literature portfolio through a spatial examination of mechanized processing infrastructure. More specifically, this research focuses on the geographic area along the east and west branches of the Cooper River in present-day Berkeley County, South Carolina. By emphasizing this region in particular, rice cultivation and refinement is better understood within the context of Charleston during the Antebellum period.

**Rice Agricultural History**

Over the course of the twentieth century, historians and geographers alike have placed rice agriculture at the center of their research. Many of these works place the geographic region of their study on the Lowcountry of Georgia and South Carolina, while others have looked at rice production of the southwest in Louisiana, Arkansas and Texas. Temporally, previous literature examines rice from its initial introduction to North America in the late seventeenth century through the mid-twentieth century.

Notwithstanding the geographic region, this literature broadly delineates the research of

rice culture into areas concerning its economic drivers, social and political implications, technological adoptions, enslaved experiences, and environmental influence. One area that has been inadvertently neglected is the investigation of processing infrastructure used in the industrial preparation of rice for commercial market. Extensive literary research has yielded few sources that discuss these structures at length. Those that do glance over aspects concerning their situation on the plantation landscape.

In his extensive work detailing the economic expansion and decline of the Lowcountry, Peter Coclanis weaves rice, along with other agricultural commodities, into his narrative. He concludes that the homogenous economic structure built up around the “external demand” for rice inevitably led to the decline of the economy when these demands “faltered.” Additional works by Coclanis include his evaluation of post-emancipation inland rice production by both white and black agriculturalists. Another study which examines how the Lowcountry economy and social circumstances were shaped by technical innovations of rice agriculture is Ellen Shlasko’s 1997 dissertation, “Carolina Gold: Economic and Social Change on a South Carolina Rice Plantation.” In addition to economic perspectives, rice cultivation has also been examined through the lens of social and enslaved perspectives in multiple works by Judith A. Carney.

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69 Ellen Shlasko, “Carolina Gold: Economic and Social Change on a South Carolina Rice Plantation” (Phd. diss., Yale University, 1997).
As mentioned earlier, Porcher and Judd’s *The Market Preparation of Carolina Rice* provides an excellent foundation on which to explore agricultural innovation in regard to rice cultivation. Joyce E. Chaplin’s *An Anxious Pursuit: Agricultural Innovation and Modernity in the Lower South, 1730-1815* is another study which entwines intellectual history with technological developments in the American South. Her research is broken down into two parts, one which examines the intellectual influences of the Enlightenment on southern planters and another which analyzes how agricultural industries like rice, indigo, and cotton reflected these ideas.\(^71\)

The experiences of the enslaved on rice plantations is another significant aspect of literature that has been well populated. Prominent literature on this subject includes research by William Dusinberre and Charles Joyner.\(^72\) Both of these works focus on the social dynamics of slavery from the perspective of the enslaved and overseers in order to deepen the understanding of the physical and emotional anguish of this, as historian Kenneth M. Stampp coined, ‘peculiar institution.’ Understanding the mobility of the enslaved on rice plantation is the focus of Lisa Briggitte Gore Randle’s dissertation “East Branch of the Cooper River, 1780-1820: Panopticism and Mobility.” Her work is pertinent to understanding a correlation between rice processing infrastructure and enslaved settlements.\(^73\)

\(^{71}\) Chaplin, *An Anxious Pursuit*.

\(^{72}\) Dusinberre, *Them Dark Days*; Charles Joyner, *Down by the Riverside*.

One discussion that permeates this literature is the role that African slaves had in the origin and propagation of rice culture in the Lowcountry. The primary contention in this discussion is the “conflicting evidence and the lack of primary documents” to support a definitive answer. Various theories have emerged on the origin of rice culture. Early interpretations touted European agency to “triumph over nature” and entrenched the discussion of rice culture’s origin to innovative planters.

More contemporary arguments favor the idea that African slaves were responsible for the development of rice agriculture in South Carolina. In his pathbreaking book Black Majority, historian Peter Wood was one of the first to recognize the congruence between the success of rice agriculture in the Lowcountry and the importation of African slaves. David Littlefield advances this idea further in Rice and Slaves: Ethnicity and the Slave Trade in Colonial South Carolina noting that Europeans recognized that African slaves “possessed the technical knowledge to produce [rice],” thus forming a strong connection between South Carolina and the West African coast. Judith Carney reinforced this theory through her geographic investigation between “culture, technology, and environment” between the Lowcountry and West Africa, suggesting “agrarian diffusion” across the Middle Passage.

Landscape along the East Branch of the Cooper River, Berkeley County, South Carolina, 1783-1820,” (master’s thesis: University of South Carolina, 2009).

75 Edelson, Plantation Enterprise in Colonial South Carolina, 55; see also Duncan Clinch Heyward, Seed from Madagascar (Chapel Hill: University of North Carolina Press, 1937); David Doar, Rice and Rice Planting in the South Carolina Low Country, Contributions from the Charleston Museum, 8 (Charleston, SC: The Charleston Museum, 1936).
76 Wood, Black Majority, 36-62.
77 Littlefield, Rice and Slaves, 113.
78 Carney, Black Rice, 81.
Further resources that discuss how slavery as an institution, and the slave trade shaped the Lowcountry is David C. Littlefield’s *Rice and Slaves*. In order to understand the system of labor implemented on Lowcountry rice plantations, Leigh Ann Pruneau’s dissertation examines the task system and how it influenced notions of slave autonomy and gender in Georgia and South Carolina. Her research reveals that slaves, to some extent, had the ability to control how long they labored due to a lack of uniformity across rice plantations on labor tasks. Additional general literature on rice agricultural history includes works by James M. Clifton, Henry C. Dethloff, David Doar, William B. Lees, Kenneth Morgan, and James Tuten.

**Buildings in Agricultural History**

One of the most “underutilized primary sources” in the study of agricultural history is the structures themselves. Buildings used to support agrarian industry operations can indirectly give insight to agricultural historians about how these structures were used and adapted to changing economic or technological climates. In 2014, Sally McMurray published “Buildings as Sources for US Agricultural History,” an essay that posits the idea that agricultural buildings can be an extremely valuable resource to

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historians despite the interpretation challenges that exist. She suggests that buildings can be used in conjunction with primary documentary evidence to reinforce written records and even reinterpret existing understandings of agricultural history.82

One challenge McMurray identifies is that it is difficult for historians unfamiliar with architectural investigations to recognize changes or sequencing that a structure may have undergone. Changes in building material, saw marks in wood, nail types, and construction technique can indicate building evolution which align with agricultural development. By understanding these nuances, agricultural historians are better able to corroborate the physical environment with archival sources to strengthen historical narratives. Additionally, McMurray presents that the “uneven survival” of particular structures is an issue that persists in using the built environment to inform agricultural history.83 This issue is pertinent to the discussion of rice processing infrastructure on the Lowcountry landscape as many of these structure have been lost. Rice milling infrastructure falls particularly in line with this as many had little use following the collapse of the industry in the early twentieth century. With their original purpose voided these rice mills were abandoned and left to ruin.

Documentary and physical evidence of rice culture support Porcher and Judd’s *The Market Preparation of Carolina Rice* which thoroughly expound the mechanical development of preparing rice for market. Porcher states in the preface that by “examining the ruins of barns and mills and other artifacts… along with the scant written

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material in public and private archives, we have been able to diagram the implements and machines that prepared rice for market, to demonstrate how they operated, and to depict the buildings that housed these machines.”

The exceptional research completed for a study of this caliber reinforces the potential of the argument forwarded by McMurray. The fieldwork conducted by Porcher and Judd primarily consisted of surveying remnant features to interpret how they operated over one hundred and fifty years ago. While this research will not revisit this aspect, it does examine the situation of these machines on Charleston’s peripheral rice plantation landscape along the Cooper River.

**GIS and Maps for Historic Data**

Maps have been used for centuries to spatially visualize landscapes and orient individuals to the world around them. While physical maps have been used by historians for decades, recent innovations have enabled digital maps and mapping to become tools that scholars can employ in their research. The development of geographical information systems (GIS) in the latter part of the twentieth century has allowed scholars from various humanitarian and social science disciplines to spatially interact with data that was formally impossible. GIS can be defined as a “computer-based system to aid in the collection, maintenance, storage, analysis, output, and distribution of spatial data and information.”

Given the nature of this thesis, GIS is the most suitable tool to visualize and manage the collected data. Over the recent decades, the application of digital tools, including GIS, to the study of social sciences and the humanities have helped to

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transform research and data organization in these respective fields. GIS allows researchers to link “locations and their attributes so that they can be displayed in maps and analyzed” by criteria like location, proximity, dispersal, social, economic or physical characteristics. Its application to historical scholarship and, moreover, historic preservation has transformed how these disciplines manage and interpret spatial data regarding historic structures and landscapes.

Published works by various scholars from the fields of archeology, history, cultural resource management, historic preservation, and landscape archeology have centered the use of GIS at the forefront of their studies. The application of GIS to historical research in the late twentieth century has since produced its own subdiscipline known as historical GIS (hGIS). This field of study employs GIS as a “form of database” that contains attribute data derived from historical records that can be spatially visualized. Its acceptance as a tool has been reinforced by its analytical capabilities to “integrate data from a number of different sources,” and identify and describe patterns that may have evaded researchers previously. The use of hGIS in this research of rice processing infrastructure along the Cooper River is significant to identify sites of production, serve as a database for historic plat information, and obtain spatial distance and elevation data.

Recent works of literature that applies GIS to historical research include Mason Waugh’s “The Cloistered Infrastructure of the Ohio & Erie Canal.” Waugh uses GIS to

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86 See Anne Kelly Knowles, ed., Past Time, Past Place: GIS for History (Redlands: ESRI Press, 2002) for a further discussion on the application of GIS technology to the study of history.
87 Knowles, Past Time, Past Place, xiv.
determine potential archeological locations of ancillary structures associated with the Ohio & Erie Canal. He does this by georeferencing plat maps created in the early 1900s by Ohio’s Canal Commission. Using these georeferenced plats, he identifies that culverts have a unique potential to be a “considerable” contributing resource to the canal’s National Register of Historic Places listing in Scioto County, Ohio. The application of hGIS in his research lead to the proposed expansion of contributing resources for this National Register listing. Waugh provides a foundational approach to georeferencing historic plats accurately that serves as a basis for data extraction and analysis. His active cognizance to ensure that plats are accurately georeferenced additionally serves as a standard in this thesis.89

Historic GIS has also been used to identify battlefield features in a major Southern seaport during the Revolutionary War. Lisa Marie Gardiner’s thesis entitled “Defending a Nation: Synthesizing Geographic Information System Analysis and Ground Penetrating Radar to Locate Battlefield Features Associated with the 1780 Siege of Charleston” clearly emphasizes the importance that GIS can have in historical research. Gardiner utilizes modern data including light detection and ranging (LiDAR) and ground penetrating radar (GPR) along with historic maps to establish survey areas to locate Revolutionary War defensive features on the Charleston peninsula. The basis for the GPR surveys she conducted were distilled from georeferenced historic maps created during the siege in the early 1780s.

Her findings indicate that half of the identified survey areas “provided compelling evidence” of siege related features. While this research applied hGIS as a step in the overall methodology, it nevertheless discounts its application. This study reinforces the idea that historic maps can be combined with modern geospatial technology in order to locate historic features with relative accuracy. Similar data is applied in this thesis to support georeferencing historic plats and provide additional data that is analyzed. The conclusions drawn from her thesis can be applied to rice processing infrastructure as the locations derived from historic plantation plats hold validity.

While GIS has its inherent benefits in the use of historical data, scholars have recognized its limitations. More specifically, historical documents created to depict spatial relations of landscape features are not entirely accurate. This issue is recognized in Harco Willems et al. in “The Analysis of Historical Maps as an Avenue to the Interpretation of Pre-Industrial Irrigation Practices in Egypt.” Willems et al. identify that previous research rejected the idea of incorporating GIS into their study due to the infeasibility of georeferencing various portions of the *Carte de l'Égypte*. The authors disprove this assumption by recognizing that “transformation errors” associated with the georeferencing procedure will occur and accepted an error calculation (root mean square error) of 200 meters. By doing this, they were able to evaluate the success of these maps

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to “reconstruct the preindustrial Egyptian irrigation landscape” of the eighteenth century.\footnote{Harco Willems et al., “The Analysis of Historical Maps as an Avenue to the Interpretation of Pre-Industrial Irrigation Practices in Egypt,” in \textit{The Nile: Natural and Cultural Landscape in Egypt} (Bielefeld, Germany: Transcript Verlag, 2017), 267-268, 334.}

Gregory and Ell identify further limitations of GIS to the application of historical research. They note how “historical sources are often incomplete, inaccurate or ambiguous.” More so an issue of the sources themselves, these conditions can contribute to analytical restrictions when evaluating spatial data.\footnote{Ian N. Gregory and Paul S. Ell, \textit{Historical GIS: Technologies, Methodologies, and Scholarship}, Cambridge Studies in Historical Geography (Cambridge: Cambridge University Press, 2007), 17.} This research is cognizant of this particular issue in order to avoid inaccurate interpretation and assumptions of rice plantation complexes along the Cooper River. By recognizing the potential benefits and limitations of GIS, this research seeks to balance these variables to develop a sound methodological approach and execution.

**Conclusion**

The history of rice agriculture in the Lowcountry is extensive and complex. Scholarly works by Coclanis, Shlasko, Littlefield, and Carney have developed an arguably deep understanding on the impact that rice had to the economy and enslaved life in the Lowcountry. Despite the efforts of previous scholars, material and environmental aspects of rice culture has not received the same attention. The consideration of processing infrastructure and its situation on rice plantations falls within this deficient area of literature. Pulling together information from sources covering various areas of rice culture and applying GIS concepts to derive spatial information from historic maps
this research fills this void. Such endeavor enhances South Carolina’s agricultural history through a deeper understanding of spatial and environmental conditions of mechanized processing infrastructure along the Cooper River during the Antebellum period.
CHAPTER THREE

METHODOLOGY

Historical GIS (hGIS)

Geographic information systems (GIS) first emerged as a tool for geographers in the late 1980s. Despite being controversial in regard to its application to geography, GIS introduced a digital technology capable of quantitative analysis that was previously unattainable using physical maps. The ability of GIS to “query, manipulate, visualize, and analyze” features on Earth’s surface makes it a powerful tool for researchers across multiple humanitarian disciplines.\(^{93}\) The application of this technology to historical scholarship has enabled new research to leverage this geospatial tool to spatially analyze historical data and visualize it. Since the late-twentieth century, a subdiscipline of history, known as historical GIS (hGIS), has emerged which centers its analytical framework around using GIS to address new question and reexamine old.\(^{94}\)

Historical GIS capitalizes on geography’s traditional “study of spatial differentiation,” and history’s “study of temporal differentiation” to “study patterns of

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\(^{94}\) See Anne Kelly Knowles, *Past Time, Past Place* for a further discussion on the application of GIS technology to the study of history.
change over space and time.”\textsuperscript{95} In principle, historical GIS is the product of linking qualitative or quantitative data to spatial locations.\textsuperscript{96} The nature of this thesis lends GIS to be a useful tool to answer questions of where Antebellum rice processing infrastructure was located and its relationship other plantation features. Two recent works of historical literature discussed in the previous chapter employ hGIS as a foundational method of analysis.\textsuperscript{97} These works recognize the value that historic maps have as primary sources and apply them to strengthen their research.

**Data Collection**

This section discusses how historic plats and modern geospatial data were obtained, organized, managed, and extracted. An examination of the limitations pertinent to using maps and plats as primary sources is also addressed here. The scope of acquiring historic plats and modern geospatial data is confined to the geographic extent of this research which stretches north of the confluence of both east and west branches of the Cooper River. (see Figure 4) Acquiring historic rice plantations plats in this region with mechanized rice processing infrastructure clearly depicted was integral to this research.

\textsuperscript{95} Anne Kelley Knowles, *Past Time, Past Place*, xii.
\textsuperscript{96} Anne Kelly Knowles, “Introduction,” *Social Science History* 24, no. 3 (Autumn 2000): 452; Gregory and Healey, “Historical GIS,” 639.
\textsuperscript{97} Waugh, “The Cloistered Infrastructure of the Ohio & Erie Canal”; Lisa Marie Gardiner, “Defending a Nation.”
Figure 4: Locator Map of Survey Area in relation to Charleston. (Map by author)

*Historic Plat Data Collection*

The method of historic plat collection was initially based on current knowledge of extant rice processing features. Field surveys conducted by Richard Porcher and William Judd to “document ruins of threshing barns, mills, and floodgates” for *The Market Preparation of Carolina Rice*, served as the preliminary basis of this knowledge. Their work on various plantations are recorded in Appendix I of the book.\(^{98}\) The appendix contains rice plantations within the area of study examined in this research and served as an initial list to begin collecting historic plats. Contributing resources to the Cooper River

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Historic District further enhanced this primary list. This historic district is important to consider because many of the “structures… and archaeological remains of settlements, machines, [and] barns” remain intact. The endurance of these resources is fundamental to maintaining the integrity of the historic district, thereby reinforcing the significance of this research. The inventoried properties within the historic district include large plantation tracts that contain various contributing elements. Plantations with associated rice processing resources, such as steam engines, rice mill ruins and chimneys, were appended to the initial list derived from Porcher and Judd.

Using this list as a basis, archival research began. This research included accessing online digital archives and searching for plats or plans of individual plantations. Supplemental information, discussed later in this chapter, regarding each plantation was then derived from the plats. Plats used for this research were obtained from various libraries and institutions in Charleston and South Carolina. Archived plats were either in a physical medium or digitally available. The Charleston County Register of Deeds Office, particularly the McCrady Plat collection, proved incredibly valuable as many of the historic plats used in this research are cataloged there. The repository at the South Carolina Historical Society (SCHS) in Charleston was another valuable resource for locating additional plats. Plats archived at the SCHS were digitized through camera photography. This allowed the plats to be georeferenced. High quality scans of the plats archived in the McCrady Collection were digitally available and obtained.

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99 Online archives included the South Carolina Historical Society Online Catalog, University of South Carolina Digital Collections, and the South Carolina Department of History and Archives Online Records.
During the collection process, it was noted that the identification of rice processing sites on some plats were absent. While several plats distinctly marked these machines others did not, despite the fact that mechanized rice processing was present on these plantations at the time of their creation. Plantations which lacked adequate notations of processing sites were eliminated from the analysis to avoid any presumptuous determinations on where these sites were actually located. The inclusion of historic plantations plats where these machines and barns are denoted is crucial as it reinforces the knowledge of processing infrastructure that permeated this fluvial region during the late-eighteenth and nineteenth century.

Furthermore, comments on two plantations used for analysis should be noted. The plat of Cedar Hill and Cherry Hill Plantation, produced in 1906, is outside of the period of study for this research and fails to depict a processing structure. However, physical remnants of a rice chimney on this plantation, visible on aerial imagery, enabled this site to be identified. Moreover, a plat of Middleburg Plantation was unable to be obtained and therefore could not be georeferenced. A landscape report on the gardens at Middleburg depicts the plat but fails to properly cite where it was obtained from. Consulting the images of the plat contained in this report, information about the plantation and plat were derived. A composite map of rice plantations, including Middleburg, created in 1987 by Leland G. Ferguson and David W. Babson was used to supplement information for Middleburg.100 Extant remains at Middleburg also enabled this site to be identified. These

were the only two rice plantations in this research which the location of processing infrastructure had to be bolstered using additional sources to accurately identify.

In total, five historic plantation plats identified the presence of mechanized processing infrastructure. The range of dates for these plats is between 1786 and 1827.\textsuperscript{101} The early plats label these sites using “barn” and “machine house” in conjunction with one another. Late-eighteenth century plats use “machine” to indicate these processing sites, where “mill” is used in the latest plat. While they are all different, the plats contain basic information about both the physical landscape and the period in which it was produced. Some feature ornamental elements around the title and map summary while others are more simple in design. The map summary provides key details on the location of the plantation depicted, the owner, the acreage of the plantation, the surveyor, and when the survey was completed. All plats contain an “explanation” or content table where landscape features are noted, and land use is described and calculated in acreage (see Figure 5). Some plats are artistically rendered whereas others are more rudimentary. The renderings are used to represent different land uses. These plats are the product of cadastral surveys which employ metes and bounds to delineate property boundaries. Overall, the plats provide significant detail on the landscape and land use of late-eighteenth and early-nineteenth century rice plantations along the Cooper River.

\textsuperscript{101} The plat of Dean Hall Plantation is archived as circa 1835, however the survey from which the plat is based on occurred in 1827.
Modern Geospatial Data Collection

The reliance on modern aerial imagery and geospatial data for this thesis required this data to be easily obtainable, comprehensive, and high quality. Modern geospatial data utilized for this thesis was acquired through the National Oceanic and Atmospheric Administration (NOAA). NOAA’s Data Access Viewer hosted by the Office for Coastal Management enables users to define areas of interest from which to download elevation (LiDAR), imagery, and land cover data. For the purpose of this thesis, aerial imagery and
elevation data were obtained. The elevation data, contained within a raster dataset known as a digital elevation model (DEM), was derived from a remote sensing technique known as light detection and ranging (LiDAR).

The specific aerial imagery dataset that was used was 2021 USDA NAIP 4-Band 8 Bit Imagery: South Carolina. This dataset was projected using South Carolina’s State Plane Coordinate System (SPCS) based off the North American Datum of 1983 (NAD83). This SPCS was selected because it is ideal to “minimize distortion [including area, direction, distance and shape] in each zone.”\textsuperscript{102} These qualities were ideal to offer the most accurate spatial information and imagery. When applied to ArcGIS Pro the aerial imagery consisted of small raster image quadrants that did not interact as one cohesive layer. To resolve this, a new raster layer was created by using the “Mosaic to New Raster” geoprocessing tool within ArcGIS Pro.

To further enhance the identification of historic landscape features, elevation data was also retrieved from NOAA. The specific DEM acquired was the 2017 SC DNR Lidar DEM: Coastal Counties (Berkeley, Charleston and Williamsburg), SC. This dataset was projected using the same SPCS as the aerial imagery to ensure both datasets aligned accurately. The value of using elevation data in this thesis is that it provides a detailed view of surface features not visible in aerial imagery. This enables historic rice cultivation infrastructure, like canals and dikes, to be discerned amidst vegetation coverage.

The topography of the Lowcountry is a reflection of its underlying geology. Geologic formations, developed between the lower Oligocene and Holocene geologic periods, influence the topographic and environmental conditions of the landscape. In conjunction with elevation, this thesis also examines the geologic formations underlying mechanized processing infrastructure on rice plantations along the Cooper River. The information needed for this analysis was obtained from the U.S. Geologic Survey (USGS). A map entitled *Surficial Geologic Map of the Charleston Region, Berkeley, Charleston, Colleton, Dorchester, and Georgetown Counties, South Carolina* provides the necessary geologic data needed to develop a thorough analysis.103

Data Extraction

The process of extracting information from historic plats began by creating a spreadsheet to store and manage the data. Within this spreadsheet, the following information was recorded for each plat: plantation name, date of plat, surveyor, plantation owner, plantation acreage, acreage of rice land, parish, notated structures, power and water source, river access and type, road access and associated river system. This spreadsheet initially served as a database to organize and gather information that could then be qualitatively analyzed. Once point features were created for each mechanized processing site, this spreadsheet served as attribute data for each individual site.

Next, the digitized historic plats were georeferenced. This process was completed using ArcGIS Pro, a GIS software developed by ESRI. This software enables users to

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conduct various kinds of spatial analysis, data manipulation and visualization.

Georeferencing is the process of transforming and assigning a real world geographic location to vector or raster data. This approach allows features denoted on the historic plantation plats to be assigned real world spatial coordinates. Georeferencing the historic plats was completed manually. Each plat was thoroughly examined together with the corresponding modern landscape to strategically identify similar control points in which to link the two. The DEM aided tremendously in this task as physical landscape features not visible in aerial imagery were able to be discerned. For each plat, an average of six to ten control points were selected. These control points consist of road intersections and directional changes in rice canals. (see Figure 6) A similarity polynomial geographic transformation was applied to all the plats. This type of transformation preserves the shape of the original plat image by not distorting it which is important to accurately determine the location of rice processing infrastructure.¹⁰⁴

Despite control points being strategically selected to accurately georeference each historic plats, errors are unavoidable. These errors include distortion and residual error. Distortion occurs when attempting to superimpose a flat map onto Earth’s “complexly curved” surface. This causes the flat map to be compressed or stretched to properly align with Earth’s surface.¹⁰⁵ The residual error is a calculation for each control point based on the transformation of the source control point location and the destination control point location. Principally, the control point selected to georeference the historic plat, in this

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¹⁰⁵ Bolstad, GIS Fundamentals, 117.
case rice processing infrastructure, will not be positioned exactly on the control point specified on the modern landscape due to transformation errors. For each plat, the root mean square (RSM) error is calculated using the residual errors to determine the quality of the transformation. Ideally, the closer the RMS error is to zero the more accurate the transformation is. The RMS error of the five plats that were georeferenced were between 39 and 162 feet which indicate a fairly high level of accuracy.

Figure 6: Visual of the residual error when georeferencing the plat of Hagan Plantation. The source control point is shown in red and the destination control point is shown in green. (Map by author)

Once the plats were accurately georeferenced, vector point data was created for each of the processing sites. This point data was contained in a point feature class in

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ArcGIS Pro. The points were centered on the machine house or mill depicted in the plats. Ground truthing efforts at Comingtee Plantation captured accurate coordinates of the processing infrastructure which was used. This is the only processing site which accurate spatial coordinates were obtained. Other processing sites were determined using the historic plats. Ground truthing of the other sites should be completed in future research.

Individual points were labeled with the plantation name which was used to connect the spreadsheet that contained additional information garnered from the plats. The creation of this point data served as the basis for spatial analysis.

**Data Analysis**

Once all historic plats had been georeferenced, point features created, and supplemental information joined, analysis could begin. The data analysis section of this research largely consists of quantitative distance and elevation measurements and qualitative characteristic information. Seven rice plantations serve as the dataset for analysis. The components that are examined include plantation acreage, cultivated rice land acreage, elevation of processing sites, distance from the processing sites to the primary dwelling house and enslaved buildings, the proximity of processing sites to the Cooper River and the condition of its access, and the proximity of processing sites to public roadways.

Distance measurements were obtained using the “Measure Distance” tool in ArcGIS Pro. Such measurements were taken from point features on each plantation to various features of interest on corresponding plats. These included the enslaved settlement, primary dwelling house, the Cooper River, and public roadways. The unit of
measurement for these distances is in feet. The distances were recorded in the spreadsheet and rounded to the nearest multiple of five in order to provide whole numbers for analysis. Elevation data was extracted for each point feature using the “Add Surface Information” geoprocessing tool. This tool extracts the elevation data (z value) contained in the DEM to the x and y coordinate location of the processing sites. The unit of measurement for the elevation output is also in feet. This data was also recorded in the spreadsheet; however, it was not rounded. The data in this spreadsheet was then manually manipulated to group data and observe trends. A discussion of this analysis is presented in Chapter Five.
CHAPTER FOUR
MECHANIZATION OF THE COOPER RIVER

The compilation of historic rice plantations plats along the east and west branches of the Cooper River unveils an interesting spatial and temporal distribution of mechanized rice processing sites. Using the list of plantations derived from Market Preparation of Carolina Rice, the Cooper River Historic District National Register nomination form, additional primary source material, and known physical remnants, a total of nine plantations were identified as having mechanized rice processing infrastructure by 1830. The following plantations that are examined are Lewisfield Plantation, Comingtee Plantation, Middleburg Plantation, Limerick Plantation, Hagan Plantation, Pimlico Plantation, Mepkin Plantation, Dean Hall Plantation, and Cedar Hill (Blessing) Plantation. While these plats do not necessarily establish when these machines were constructed on each plantation, their presence indicates that a form of mechanized rice processing was present by the date of the plat. They are examined chronologically by the date of the plat for each plantation. The purpose of this chapter is to present information derived from historic rice plantation plats and supplementary primary source evidence supporting the mechanization of these rice plantations along Cooper River during the Antebellum period.

Research also suggests that additional rice plantations along the Cooper River may have adopted elements of mechanized rice processing during this period of study. Unfortunately, extensive archival research yielded no historic plats of these plantations. A brief discussion of the findings is presented to support the argument that mechanized
rice processing occurred on these plantations. The plantations which evidence is presented are Bossis Plantation, Farmfield Plantation, Buck Hall, and Chachan Plantation. Further research is necessary to better understand the circumstances at these rice plantation and to verify this hypothesis.

**Sites of Mechanized Rice Processing**

*Lewisfield Plantation*

In March 1786, Joseph Purcell surveyed Lewisfield Plantation belonging to Keating Simons. Lewisfield, originally part of Fairlawn Barony, was purchased by Sedgwick Lewis in September 1767. The property that Lewis obtained was situated north of Exeter Plantation and known as “Little Landing.” In 1774, Sarah Lewis, Sedgwick’s daughter, married Keating Simons who received Lewisfield as part of her dowry. By 1785, Simons had established himself along the Cooper River at Little Landing. Purcell’s detailed survey of Lewisfield from 1786 is significant as it contains the earliest evidence of mechanized rice processing along Cooper River compared to all the other plantation plats that were analyzed. Located on the upper reaches of the wester branch of the river, Lewisfield contains a total of 903 acres. Of this, 135.5 acres were employed as tidal rice fields situated on the banks of the river. Purcell’s illustration depicts two

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108 *State Gazette of South-Carolina* (Charleston, South Carolina), July 11, 1785: [1].
adjacent structures notated as a “Barn, Machine house” approximately 900 feet from Cooper River.¹⁰⁹

What makes this mechanized processing site interesting is that no connection between the machine and the plantation’s larger network of irrigation canals existed at the time of the survey. These canals were a vital component of early mechanized processing sites supplying water which was used to power the mill. The absence of such component at Lewisfield begs the question of how the machine was powered. It can rationally be forwarded that the machine at Lewisfield was likely driven by animals. In 1802, John Drayton’s description of the pecker and cog mills indicate the use of animals to beat out and polish the rice. These mills were typically used in conjunction with a wooden mill which first removed the outer hulls. Once these had been removed, they were milled using either of the mills that Drayton described.¹¹⁰ This postulated method of power source of the machine at Lewisfield was unable to be reinforced by primary sources. However, it is worth considering given the lack of connection between the machine house and the engineered canal network at Lewisfield in 1786. Regardless, a tidal rice mill was established at Lewisfield by 1835 as noted in an advertisement for the property in January of that year.¹¹¹

¹⁰⁹ Joseph Purcell, A Plan of Lewis_Field Plantation Belonging to Keating Simons Esquite Containing in the Whole Nine Hundred and Three Acres Situated on the West Side of the Western Branch of Cooper River in St. John’s Parish, Charleston District, and State of South Carolina, John McCrady Plat Collection, 1556 (Charleston, S.C.: Charleston County Register Mesne Conveyance, March 1786).
¹¹⁰ Drayton, A View of South Carolina, 120-121; Porcher and Judd, The Market Preparation of Carolina Rice, 166-167.
¹¹¹ “Estate Sale,” Charleston Courier (Charleston, South Carolina), January 22, 1835: [1].
Commingtee Plantation

Two months after Joseph Purcell surveyed Lewisfield Plantation he was back out along the Cooper River, this time at Commingtee Plantation. In May of that year, Purcell surveyed the lands belonging to Elias Ball Jr. (1709-1786) located near the “T of Cooper River.” During the early decades of the eighteenth century Ball Jr.’s father, Elias “Red Cap” Ball (1676-1751), expanded Commingtee to 1,096 acres, of which rice fields consisted of 101 acres. Like at Lewisfield, a “Barn and Machine house” is identified at Commingtee along the banks of the western branch of Cooper River. The rice processing complex at Commingtee consisted of a barn and “brick pounding-mill” constructed around 1784 by the Elias Ball III (1752-1810).

This plantation is unique in that it is divided into two sections, Commingtee and Stokes. Though the latter is not explicitly depicted on Purcell’s 1786 plat, Stokes may be the area Purcell notated as “New Settlement.” Regardless, the origins or this settlement are unclear. The rice pounding mill is located in the Stoke settlement, hence why modern reference to this processing site is the Stoke Rice Mill. The mill was originally powered by tidal floodwater reserved in a mill pond adjacent to the structure. Because the water supply was dependent on tidal influence, the mill operated “according to the

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112 At the time of Purcell’s survey, Ball Jr. owned the property. Following his death in August 1786, his son Elias Ball III (1752-1810) inherited Commingtee. (Edward Ball, Slaves in the Family (New York: Farrar, Straus and Giroux: 2014), 244.
114 Deas, Recollections of the Ball Family, 11, 15.
115 Deas, Recollections of the Ball Family, 10.
116 Porcher and Judd, Market Preparation of Carolina Rice, 197, 316.
A millrace was situated on the north side of the Stoke rice mill. This millrace directed water to an undershot waterwheel from the mill pond located north of the structure. In 1802, John Ball Jr. took possession of Comingtee Plantation following his studies at Harvard and remained here until his death in 1834. The mill at Comingtee is denoted as “Ball’s Mill” in Henry Ravenel’s plat of Dean Hall from 1827. Sometime around 1840, Keating S. Ball, the son of John Ball Jr. inherited Comingtee Plantation. It was during his tenure of the plantation that he “put up” a “large steam threshing-mill” in the late 1850s or early 1860s.

A spatial investigation of the Stoke rice mill has posed some questions regarding its original location and construction dates. The Stoke rice mill was the only mechanized rice processing site in this research that was accurately located using ground truthing. On-site investigation of this site included capturing coordinate data on the south façade of the brick mill. This data was then projected into ArcGIS and a feature point was created from which measurements of other landscape components could be gathered. Once the 1786 plat of Comingtee Plantation was georeferenced, it was discovered that the processing site depicted on the plat did not align with the located point. The depicted processing site, which included a “barn and machine house” are roughly 800 feet southwest of the physical remnants of Stoke rice mill. While errors in transformation do occur when overlaying historic plats to the modern landscape, the discrepancy observed between the 1786 depiction of the processing site and the physical remnants do raise some questions.

117 Deas, Recollections of the Ball Family, 15.
119 Deas, Recollections of the Ball Family, 20,15.
about the development of rice processing at Comingtee Plantation during the Antebellum period.

Figure 7: Remains of Stoke Rice Mill, Western Branch of Cooper River. (Image by author)

In her *Recollections* published in 1909, Anne Simons Deas suggests that the old brick pounding mill, understood to be the one that Elias Ball built circa 1784, was operated as late as the early 1850s.\(^{120}\) She goes on to note that fifty years prior to when she published her account Keating S. Ball had “put up” a steam threshing mill. This would put the introduction of steam power at Comingtee around 1859. However, does Deas account suggest that another mill was built by Keating Ball or was the “old brick pounding mill” converted to steam power? The construction of a new mill does not seem

\(^{120}\) Deas, *Recollections of the Ball Family*, 15.
likely as the extant mill features a millrace; a feature that would be redundant in a steam driven mill. Physical evidence at the extant mill does suggest that it was modified to be steam driven.\textsuperscript{121} Additional question can be raised such as, are there potentially two generations of mechanized processing sites at Comingtee and why is the “barn and machine house” in the 1786 depiction located so distant from the extant site? The answers to these questions may simply be a matter of an inaccurate depiction of the plantation in 1786 and transformation errors in georeferencing the historic plat. However, the discrepancy in locations previously mentioned is considerable and worth of further investigation. Such investigation into the development of rice processing at Comingtee will hopefully bear fruitful answers.

\textit{Middleburg Plantation}

The plat of Middleburg Plantation was prepared by Joseph Purcell in 1786. At the time that this plat was created, Middleburg was owned by Benjamin Simons III. Upon his death in 1789, his daughter Sarah Lydia Simons inherited “Middleburg proper containing the settlement and the larger part of the [tidal] water front” along Cooper River.\textsuperscript{122} In July 1799, Sarah Lydia married Jonathan Lucas Jr., son of millwright Jonathan Lucas I (1754 – 1821) who revolutionized rice processing.\textsuperscript{123} It was on this plantation in 1801 that Jonathan Lucas I built the first water-powered toll mill along the eastern branch of

\textsuperscript{121} Porcher and Judd, \textit{Market Preparation of Carolina Rice}, 233.
\textsuperscript{123} “Marriage and Death Notices from the City Gazette,” \textit{South Carolina Historical and Genealogical Magazine} 25, no. 4 (October 1924): 181; Porcher and Judd, \textit{Market Preparation of Carolina Rice}, 202-204.
Cooper River. 124 This mill serviced smaller rice plantations along the Cooper River and its hinterlands who did not have the economic resources available to construct one. 125

Along with operating during the fall and winter, traditionally when rice milling occurred, the toll mill at Middleburg also operated during the “summer season.” In 1804 the “reputation of this mill [at Middleburg] and the manner in which it is conducted are so universally known and approved of, that nothing need further be said of it.” 126 The mill continued to be an important site throughout the Antebellum period for both commerce and leisure. Middleburg mill was a point of interest for steam ship excursions up the Cooper River, allowing passengers to admire and experience this critical piece of rice culture. 127 Once steam engines were adopted to the mechanized processing of rice by 1825, it is likely that the tidal water mill at Middleburg was converted to steam. 128 This development is visible through the extant remnant of the rice processing site at Middleburg. The mill’s brick foundation, steam engine, cylindrical boiler, and chimney are all that remain of this once prominent Lowcountry rice mill. 129

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124 “A Lucas Memorandum,” South Carolina Historical Magazine 69, no. 3 (July 1968): 193; Irving, A Day on Cooper River, 66.
125 Porcher and Judd, Market Preparation of Carolina Rice, 316
126 “Rice, on Toll,” City Gazette (Charleston, South Carolina), May 18, 1804: [4].
127 “For Fair Lawn, Cooper River,” Charleston Courier (Charleston, South Carolina), September 5, 1843: [3]; “Mr. Webster's visit up Cooper River,” Charleston Courier (Charleston, South Carolina), May 13, 1847: [2].
129 Porcher and Judd, Market Preparation of Carolina Rice, 192, 234, 243, 257.
Limerick Plantation

The earliest plat of Limerick Plantation is a 1786 plat prepared by Joseph Purcell based on a survey from March 1706. Unfortunately, this specific plat was unable to be located. Despite this, two contemporary plats were identified and able to supplement for the loss of Purcell’s plat. The first contemporary plat is from 1788 and is possibly a copy of Purcell’s original plat completed just two years prior. The second plat is from 1797 and was prepared by John Hardwick. Limerick is located at the eastern extent of the study area at the headwaters of the easter branch of Cooper River where Gough Creek and

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Huger Creek converge. In 1797, Limerick contained 4,704 acres a majority of which was forested high lands and uncultivated swamp. Of the cultivated lands, 337 acres were reserved for rice fields. Evidence of mechanized rice processing at Limerick is depicted in Hardwick’s plat. A grouping of structures connected to Kensington Creek via a canal is identified as a “Machine.”

Ownership of Limerick throughout these three iterations of plats remained the same, belonging to the estate of Elias Ball III (1752-1810) His father, Elias Ball Jr. (1709-1786) acquired the plantation from Daniel Huger III in 1764. Elias Ball III inherited Limerick and Comingtee following the death of his father, Elias Ball Jr. in 1786.131 It was at Limerick that Elias Ball III established his permanent residents around 1785 and remained there until his death in 1810. From here, Ball III managed Limerick, along with his other various rice plantations including Comingtee. Rice production at Limerick expanded in the two decades following the American Revolution. By 1797, twelve upland rice fields constituted 74% of all rice fields at Limerick.132 The advancements in rice processing during this period was not overlooked by Elias Ball III. A comparison between the plats from 1788 and 1797 reveals an interesting development in rice processing which occurred at Limerick.

In Hardwick’s 1797 plat, the cluster of buildings noted as machine are located adjacent to upland rice fields. This same location in the 1788 plat is void of any indication of structures, let alone a machine used to process rice. Letters written between

Elias Ball III of Limerick and his cousin Elias Ball of England indicate that the workings for a rice mill had begun by the end of 1787. In November of that year, Elias Ball of England wrote “Your iron works for rice mill will be ready for shipping in a short time and shall be sent out by first opportunity from Bristol.” A water powered mill was constructed at Limerick between 1793 and 1795 by Jonathan Lucas. Three critical pieces of evidence can be used to support this relative date of construction. The first being “a memorandum of mill timber… which specified the lumber required for the construction of the 60 foot long mill building and barn.” The second and third being receipts “for parts and erecting pounding mill” and the installation of rolling screens. 133 This evidence reinforces that the machine that John Hardwick depicts during his survey in June 1797 was the water powered mill constructed by Lucas.

133 Lees, “The Historical Development of Limerick Plantation,” 54; Ball, Slaves in the Family, 259.
The machine at Limerick is located roughly a mile north of the confluence between Kensington Creek, present day Gough Creek, and the easter branch of Cooper River. In Hardwick’s plat, a canal is shown connecting the mill to the lower section of the creek. This suggests that a connection between the machine and the Cooper River existed via this canal. Tidal forces were not sufficient enough to power this machine given its situation above tidal influence.\textsuperscript{134} Rather, inland reservoirs located north of the machine were the main power source for this particular processing site.\textsuperscript{135} An engineered network of canals, ditches, and inland rice fields supplied water to the machine, ensuring that it could be operated without regard to tidal forces, unlike many other plantations.

\textsuperscript{134} Lees, “The Historical Development of Limerick Plantation,” 54.
\textsuperscript{135} Lees, “Limerick - Old and in the Way, 142.
Hagan Plantation was originally part the estate of John Huger consisting of 4,965 acres located between the main branch of Cooper River and French Quarter Creek in St. Thomas Parish. In his last will dated October 12, 1803, Huger divided his land holdings into three separate plantations among his sons Daniel, John, and Alfred. The smallest of the three tracts containing 1,386 acres, Moreland Farm, was granted to Huger’s third son Alfred. His second son John received Akinfield totaling 1,723 acres. Daniel, John Huger’s first born son, inherited Hagan Plantation totaling 1,856 acres. A plat of this survey and division, completed in 1798 by a “J. P.”, most likely Joseph Purcell given his extensive activity during this period, provides a glimpse into the plantation landscape of all three of these tracts.\(^{136}\)

Hagan Plantation, the largest of the three tracts, contains evidence of mechanized rice processing that Akinfield and Moreland do not. This plantation is located along the eastern branch of Cooper River bounded to the east by French Quarter Creek. The 1,856 acre plantation contains 565 acres of low land rice fields and swamp. In this 1798 survey of Hagan, two distinct structures identified as a “Barn” and a “Machine” are situated 1,430 feet south of French Quarter Creek. While the artistic rendering of this plat is not as detailed as that of Lewisfield, Comingtee, or Limerick, it does provide essential information regarding mechanized rice production at Hagan Plantation around the turn of the eighteenth century. These structures are independent of one another which suggests

that the barn may have been used for storage and threshing the rice before it was sent to
the mill for final processing.

Figure 10: Barn and Machine situated south of French Quarter Creek depicted in 1798 plat of Hagan Plantation. (Map by author)

The machine itself is located at the terminus of a canal and adjacent to another
which is perpendicular to the one leading up to the machine. In addition to these
structures a cluster of three buildings are situated 205 feet from the machine and barn.
While these structures are not defined on the 1798 plat, it can be postulated that these
could be enslaved millwright or mill worker houses. This hypothesis can be supported by
the shift in labor requirements for processing rice in the late eighteenth century prompted
by the increased mechanization of the industry.\textsuperscript{137} With the responsibilities of operating

\textsuperscript{137} Edelson, \textit{Plantation Enterprise in Colonial South Carolina}, 110.
the machine at Hagan reduced to a handful, it is likely that the cluster of three buildings are for enslaved mill workers.

*Pimlico Plantation*

In 1810, John Ball inherited Pimlico, Mepshew, and Kecklico Plantations following the death of his brother Elias Ball III.\(^{138}\) Elias purchased Pimlico and Kecklico around 1802 as a sale advertisement for a “tide swamp plantation, situate on the west branch of Cooper river, called Pimlico” was listed in the *City Gazette* in January of that year.\(^{139}\) Completing the final resurveys of the lands recently acquired by John Ball in May 1810, surveyor John Diamond, produced a detailed plat of Pimlico, Mepshew and Kecklico plantations. Ball’s estate totaled 2,248 acres, roughly 198 acres of which were tidal rice fields located along the Cooper River.\(^{140}\) Despite the detailed rendering of this plat, Diamond neglected to annotate the various plantation structures. This makes accurately identifying the rice processing site at Pimlico more challenging and presumptuous.

By the time Elias Ball III purchased Pimlico in the early nineteenth century, a processing machine was already located on the property. An advertisement for Pimlico published in 1786 indicates that the “machine” established on the plantation required only


\(^{139}\) “For Sale,” *City Gazette* (Charleston, South Carolina), January 22, 1802: [1]; Ball, *Slaves in the Family*, 260.

“some small repairs to be put in working condition.”\textsuperscript{141} In January 1794, “a new barn and machine, an overseer’s and negro houses” were situated on the “valuable plantation.”\textsuperscript{142} Rice cultivation prospered at Pimlico after Ball acquired the plantation. In December 1805, Ball advertised 2,000 bushels of “yellow seed rice” for sale at Pimlico. This advertisement indicates that rice grain not sold by March of the following year would then be “sent to mill.” Pimlico employed both inland and tidal rice cultivation methods as the seed rice that Ball advertised was successfully “raised on inland swamp, which has not been planted for a number of years.”\textsuperscript{143}

The mechanization of rice processing at Pimlico extends into the early 1840s. Inspired by the successful attachment of a threshing machine to the rice mill at Bossis Plantation in March 1842, Elias Octavious Ball, son of John Ball, had one subsequently installed at Pimlico.\textsuperscript{144} The machine at Bossis, “built for a moderate sum of $300,” was designed by William Ferrel, a machinist from New York state, and could thresh “fifty bushels of rice per hour.” The machine that Elias O. Ball had constructed at Pimlico, while comparable in size, differed from that at Bossis. Rather than being mounted to the pestles of the rice mill, the threshing machine at Pimlico was “attached to the water wheel shaft of the rice mill.”\textsuperscript{145} This indicates two important details of the mechanized rice

\textsuperscript{141} “For Private Sale,” \textit{Charleston Morning Post} (Charleston, South Carolina), August 8, 1786: [3]; This plantation listed for sale is understood to be Pimlico based off a comparison in the cited advertisement and one from January 22, 1802 (cited earlier). Both the 1786 and 1802 advertisement list the plantation as having 160 acres ideal for rice cultivation and being located near Strawberry Ferry. This evidence concludes that the tracts of land for sale are the same, providing further details on the condition of the machine located at Pimlico.

\textsuperscript{142} “Public Auction,” \textit{City Gazette} (Charleston, South Carolina), January 27, 1794: [3].

\textsuperscript{143} “Yellow Seed Rice,” \textit{City Gazette} (Charleston, South Carolina), December 17, 1805: [1].

\textsuperscript{144} “Public Notice,” \textit{Charleston Courier} (Charleston, South Carolina), April 4, 1842: [3]; Irving, \textit{A Day on Cooper River}, 71.

\textsuperscript{145} Irving, \textit{A Day on Cooper River}, 71.
processing site at Pimlico. The first being that the mill and threshing machine was water
powered as late as the 1840s. The second being that the threshing machine could be
operated independently of the mill by not being attached to the pestle shaft.

_Mepkin Plantation_

In 1762, Henry Laurens (1724-1792) purchased 3,100 acres along the western
branch of Cooper River known as Mepkin. Compared to his other plantations located in
South Carolina and Georgia which specialized in rice production, Mepkin represented a
plantation of diverse agricultural economy. Along with rice, other commercial
agricultural products which were produced at Mepkin include provisional crops, indigo,
and firewood. This diversification of commodities allowed Laurens to adapt his
plantation to shifting commercial markets.  

Laurens was heavily invested in the
commercial rice industry and sought improvements to its processing for market. Laurens
made efforts to procure a rice pounding machine based on a design by Robert Deans for
Mepkin while in England just prior to the outbreak of the American Revolution. Whether
this machine was constructed at Mepkin is unknown.  

In 1784, after an extensive
career in politics, Laurens retired to Mepkin Plantation which was nearly destroyed
during the Revolution.

146 Edelson, _Plantation Enterprise in Colonial South Carolina_, 203-213.
147 Porcher and Judd, _Market Preparation of Carolina Rice_, 165-166.
148 Porcher and Judd, _Market Preparation of Carolina Rice_, 23; Edelson, _Plantation Enterprise in Colonial
South Carolina_, 251-252.
Following the death of Henry Laurens in December 1792, his sole heir, Henry Laurens Jr. subsequently inherited his father’s estate at Mepkin. Henry Laurens Jr. continued his father’s commercial enterprise in rice cultivation at Mepkin. An early design of Lucas’s rice machine likely existed at Mepkin prior to Henry Laurens’s death. In 1794, Jonathan Lucas made improvements to this tidal rice mill which effectively automated Laurens’s tidal mill. However, in a letter addressed to Lucas from November 1796, Laurens requests that Lucas join him at Mepkin to discuss matters “without which… the intended new mill cannot well be begun upon.” This suggests that the mill which Lucas constructed was not complete until the later part of the 1790s. Notwithstanding, Laurens had established a toll mill at Mepkin by 1803. The toll mill appears to have continued operation throughout the first three decades of the nineteenth century, having undergone a “complete repair” in November 1826.

Two contemporary pieces of artwork done by Charles Fraser help to visualize the various components of rice processing present at Mepkin. The first piece is his May 1805 watercolor entitled “Mepkin.” The focus of this painting is the grand main house situated in the foreground. However, a winnowing house is visible in the background of this painting. The next piece is a pencil sketch entitled “Rice Mill at Mepkin.”

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149 “Died,” City Gazette (Charleston, South Carolina), December 11, 1792: [2]; Edelson, Plantation Enterprise in Colonial South Carolina, 252.
151 Henry Laurens, “Correspondence 1,” November 20, 1796, South Carolina Historical Society, Lowcountry Digital Library.
152 “The Subscriber’s Mills,” Charleston Courier (Charleston, South Carolina), November 14, 1803: [4].
153 “Mepkin Mill,” Charleston Courier (Charleston, South Carolina), November 4, 1826: [1]; “Mepkin Mill,” City Gazette (Charleston, South Carolina), March 8, 1815: [2].
Unfortunately, the medium of this piece makes it difficult to make out distinct features of the mill. The structure itself is depicted as a gabled structure with a gabled ell. The mill is raised on a brick foundation. The foundation, like that at Comingtee and Middleburg, likely served as the inner wall to the millrace.\footnote{Charles Fraser, “Rice Mill at Mepkin,” Lowcountry Digital Library, Gibbes Museum of Art, 1800-1809.}

![Figure 11: Charles Fraser’s sketch of the rice mill at Mepkin Plantation from 1800 (Charles Fraser, “Rice Mill at Mepkin,” Lowcountry Digital Library, Gibbes Museum of Art, 1800-1809.)](image)

\textit{Dean Hall Plantation}

The plat of Dean Hall Plantation on the western branch of Cooper River is the last plat produced within the examined period of study. This plat is archived as circa 1835. However, the plat itself indicates that the physical landscape features depicted are based on a survey made in March 1827 by Henry Ravenel. At the time of Ravenel's survey, the

\footnote{Charles Fraser, “Rice Mill at Mepkin,” Lowcountry Digital Library, Gibbes Museum of Art, 1800-1809.}
property belonged to William A. Carson. John B. Irving’s description of Dean Hall notes that it resembles “a well ordered village more than that of a single plantation” highlighting the scrupulous condition of Carson’s estate. Of the 2,600 acres of land that makes up Dean Hall Plantation approximately 504.25 acres were used to cultivate rice. This land featured a mix of tidal swamp rice fields located along the banks of Cooper River and inland rice fields supplied by various reservoirs on the property.

It is common to see late eighteenth and early nineteenth century references to mechanized rice processing features as “machines.” Henry Ravenel’s plat differs from this trend by using the word “mill” to describe the rice processing site at Dean Hall. Additionally, the mill is depicted as a single structure, unlike others along Cooper River which depict at least two structures labeled barn and machine. His choice to use this term and depiction may reflect a more accurate representation of the processing infrastructure that William Carson employed at Dean Hall. By 1830, the development of threshing machines and their implementation on rice plantations make it feasible that the threshing machine and pounding mill were contained within one structure. Like at Pimlico and Bossis Plantation, the power source for the threshing machine at Dean Hall was likely connected to the primary power source of the mill. Upon his inspection of the plantation in 1842, Irving observed that the “mill and thrashing machine” to be “in complete order.”

156 Irving, A Day on Cooper River, 8.
157 Henry Ravenel, Plan of Dean Hall Plantations Situated on Cooper River in the Parish of Saint Johns Berkley, 32/139 (South Carolina Historical Society, March 1827).
158 Porcher and Judd, Market Preparation of Carolina Rice, 132.
159 Irving, A Day on Cooper River, 8.
The rice mill is situated approximately 90 yards south of Cooper River adjacent to a perpendicular intersection of two canal which both connect to the river. Its location and proximity to rice cultivation infrastructure suggest that this was a tidal driven water mill at the time the plantation was surveyed. The introduction of steam engines to the process of rice milling around 1825 makes it unlikely that one would have been implemented at Dean Hall in 1827. However by 1856, Dean Hall was equipped with “one of the best steam rice pounding mills, steam thrasher… worthy the attention of any one wishing to engage in the profitable business of rice milling.”160 In relation to the enslaved settlement at Dean Hall, the rice mill is located roughly 750 yards away to the southeast.

160 “Rice, Cotton and Provision Lands, and 200 Negros, on Cooper River,” Charleston Courier (Charleston, South Carolina), December 8, 1856: [3].
Cedar Hill (Blessing) Plantation

The 1906 plat of Cherry and Cedar Hill Plantation owned by Simons-Mayrant Co. provides little information regarding any elements of mechanized rice processing at Cedar Hill during the Antebellum period. This is due to it being a century removed from the period in question and the lack of necessity to include it in the plat. However, the physical remnants of a rice chimney and supplementary historical investigation of the plantation itself generates a valuable understanding of the mechanized rice processing established at Cedar Hill. In the nomination form for the Cooper River Historic District, the remnant feature at Cedar Hill Plantation are incorrectly attributed to Cherry Hill Plantation. A variety of different primary sources depict Cedar Hill along Cooper River adjacent to Blessing Plantation while Cherry Hill is depicted inland along French Quarter Creek south of Cooper River.\(^\text{161}\) Within this thesis, Cedar Hill Plantation and Blessing Plantation are referred to jointly as Cedar Hill (Blessing) due to their significant connection during the early Antebellum period.

The original tracts of land that contained Blessing, Cedar Hill and Cherry Hill Plantations was acquired by John Deas by 1780.\(^\text{162}\) In November 1784, John Deas listed the sale of Blessing Plantation in the *South Carolina State Gazette and Daily Advertiser*. In it, Deas notes that a “machine-house” is situated on the property, the earliest reference


\(^{162}\) Smith, “The Baronies of South Carolina: Quenby and the Eastern Branch of Cooper River,” 25.
to mechanization at Blessing Plantation. In 1789, the Blessing and Cedar Hill were conveyed to Archibald Broun by John Deas’s son, John Deas Jr. These two plantations were separated by a public causeway and road leading to Bonneau’s Ferry on the eastern branch of Cooper River depicted in a survey of Blessing Plantation from April 1786. This separation seemed to be more figurative than physical. By 1796, Henry Lauren’s son, Henry Jr. possessed both Blessing and Cedar Hill after these tracts had been conveyed to him and his father by Broun.

Henry Lauren’s’s venture in the rice industry, which began at Mepkin Plantation three decades prior, expanded once his son acquired Blessing and Cedar Hill. In March 1805, Laurens Jr. sought business at his toll mill on the eastern branch of Cooper River, in the vicinity of where the remnants are at Cedar Hill Plantation. Reference to this mill as “Blessing Mill” reinforces the strong, or rather complex connection between Cedar Hill and Blessing plantations. Early nineteenth century connection of this mill with Blessing Plantation, but modern remnants associated with Cedar Hill Plantation illustrates the complex boundary delineation changes that have occurred over the last two centuries.

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163 “To be Sold,” South-Carolina Gazette and General Advertiser (Charleston, South Carolina), November 30, 1784: [1].
165 Plantation of Tract of Land Named the Blessing, John McCrady Plat Collection, 5327 (Charleston, S.C.: Charleston County Register Mesne Conveyance, April 1786).
167 “The Subscriber,” Charleston Courier (Charleston, South Carolina), April 24, 1805: [3].
Laurens Jr.’s “Blessing Mill” seems to have been established by at least 1803, if not earlier. In November 1803, Henry Laurens’s mills “on the Western and Eastern Branches of Cooper River, are both ready to receive RICE on Toll (sic).” The mill on the western branch of Cooper River being the one built by Jonathan Lucas at Mepkin Plantation in the 1790s. Given Laurens Jr.’s status as a rice planter, and his connection to Jonathan Lucas, it is likely that the “Blessing Mill” was a water powered mill. The mechanized components of this mill such as a thresher or pounding pestles is unknown. To a certain extent, it is likely that the mill was outfitted with the latest mechanical designs given the financial disposal of Laurens Jr.

Cedar Hill and Blessing plantations eventually fell out of the Laurens family between 1820 and 1860. While the exact acreage of tidal rice swamps that was cultivated during the period when Laurens operated his mill is not exactly known, in

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168 “The Subscriber’s Mills,” Charleston Courier (Charleston, South Carolina), November 14, 1803: [4].
early 1831, it contained nearly one hundred and fifty eight acres.\textsuperscript{170} By the end of that decade, additional features associated with rice processing were located at Cedar Hall including a winnowing house.\textsuperscript{171} The presence of this structure by the late 1830s, given the development of threshing machines and the inclusion of wind fans in their design, signifies that rice processing at Cedar Hall was to an extent still done manually. While a component of threshing may have been completed manually, the sale of the “entire machinery of a rice mill” in February 1837 suggests that milling rice was at least in part mechanized.\textsuperscript{172} The remnants of the rice chimney and steam engine extant at Cedar Hill support the further industrialization of rice processing at the plantation as steam power was introduced to the rice industry by the 1820s.

**Additional Rice Processing Sites**

Throughout the process of researching the development of mechanized rice processing along the Cooper River, references to additional mechanized rice processing sites on other plantations were uncovered. The reason that these are contained within this section is in part due to the nature of information available. Many of the plantations in this section have sparse information in regard to their location, prominence, and operation. Additionally, the lack, or absence thereof, of contemporary plats of these plantations makes accurately determining the location of these processing sites nearly impossibly. That being said, the omission of compiled information from this thesis would be a detriment to future scholars interested in the topics pertaining to this research. While

\textsuperscript{170}“Under Decree in Chancery,” *Charleston Courier* (Charleston, South Carolina), February 16, 1831: [3].
\textsuperscript{171}“At Private Sale,” *Charleston Courier* (Charleston, South Carolina), January 2, 1837: [4].
\textsuperscript{172}“By John Y. Stock,” *Charleston Courier* (Charleston, South Carolina), February 2, 1837: [3].
this is certainly not all the information regarding each plantation, it is a start from which future research can begin to explore. The plantations discussed in this section include Bossis Plantation, Farmfield Plantation, Buck Hall Plantation, Chachan Plantation.

**Bossis Plantation**

Bossis is the first plantation where evidence was uncovered that suggests the presence of a mechanized rice processing machine. Bossis is located approximately five miles upstream of the “T” on the easter branch of Cooper River. During the eighteenth century it was connected to adjacent plantations Richmond and Farmfield. Throughout the nineteenth century, Bossis was owned by the Harleston family.173 In April 1842, Olney Harleston issued a public notice in the *Charleston Courier* to Mr. William Ferrel certifying his successful application of a threshing machine to his water-driven rice mill at Bossis.174 Mr. Ferrel was “a machinist and man of science” from Troy, New York where he conducted business at an iron foundry.175 The thresher that Ferrel installed in March 1842 was capable of threshing between thirty and fifty bushels of rice per house producing rice “as clean as when done by the flails, clear of foot stalk, and without hulling it.”176 If driven by a steam engine, the amount of rice that could be threshed in a day would be nearly “five hundred bushels.”177 The threshing machine was installed at Bossis for $300.178 Those in attendance who witnessed the operation of Ferrel’s thresher

174 “Public Notice,” *Charleston Courier* (Charleston, South Carolina), April 4, 1842: [3].
175 Irving, *A Day on Cooper River*, 71.
176 Irving, *A Day on Cooper River*, 71; “Public Notice,” *Charleston Courier* (Charleston, South Carolina), April 4, 1842: [3].
177 “To Rice Planters,” *Charleston Courier* (Charleston, South Carolina), April 5, 1842: [3].
at Bossis include Olney Harleston, W. Ball, Kenting S. Ball, John C. Ball, Nicholas Harleston, John Harleston, Thomas Corbett, Jr.\footnote{179}

The rice mill at Bossis Plantation was a tidally driven. The drawback of this mill being powered by tidal waters is that its operation was dependent on the ebb and flow of the tides. The mechanical thresher Ferrel installed was attached to the pestle shaft of this mill.\footnote{180} This shaft was essential for milling rice as it lifted the large pestles used to pound out the rice placed in the mortar below each pestle. Energy produced from water passing through the mill race under the water wheel powered the drive wheel located on the interior of the structure. The pestle shaft was mechanically connected to the drive wheel through a spur wheel. Despite being fully mechanized by the mid-nineteenth century, rice milling machines still retained the traditional elements of the mortar and pestle.\footnote{181}

\textit{Farmfield Plantation}

Adjoining Bossis Plantation is Farmfield Plantation, another site of mechanized rice processing along the easter branch of Cooper River. Farmfield is located south of Bossis and directly across from Middleburg Plantation and Pompion Hill Chapel. Like Bossis, the tract of land known as Farmfield was owned by the Harleston family during the eighteenth and nineteenth century.\footnote{182} In 1801, Farmfield was owned by Col. John Harleston’s daughter Jane who married Thomas Corbett.\footnote{183} Evidence to support that a

\footnote{179} “Public Notice,” \textit{Charleston Courier} (Charleston, South Carolina), April 4, 1842: [3].
\footnote{180} “To Rice Planters,” \textit{Charleston Courier} (Charleston, South Carolina), April 5, 1842: [3].
\footnote{181} Porcher and Judd, \textit{Market Preparation of Carolina Rice}, 201,160.
\footnote{182} Chandler et al., “Cooper River Historic District,” 7-24-25; Irving, \textit{A Day on Cooper River}, 56-57.
\footnote{183} Irving, \textit{A Day on Cooper River}, 57; “The St. John's Post,” \textit{Charleston Courier} (Charleston, South Carolina), January 24, 1851: [2].
mechanized rice processing machine was located at Farmfield is a circa 1900 image that depicts a rice mill. The arrangement of the primary structure, its additions, a chimney, and a detached structure provide some indication of the type of machine that was located here.

This image depicts what is understood to be a steam driven threshing mill/barn similar to that at Chicora Wood Plantation in Georgetown County, South Carolina. It is unknown when a steam engine was installed at Farmfield, if at all. Based on the emergence of steam driven rice mills around the 1830s and the lack of additional evidence to support mechanized rice processing at Farmfield, it is likely that this threshing barn was constructed outside this research’s period of study. The primary gable-end structure is the threshing barn which contained the components of the threshing machine. The model of threshing machine installed at Farmfield in unknown. Located on the gable end of the threshing barn is an addition with a shed roof. This addition is likely the engine room based on its proximity to the brick chimney. The chimney is located a short distance from the engine room and detached from the structures entirely. On the second level of the threshing barn, a horizontal projection extents to a secondary structure located on the eave side of the threshing barn. This projection is most likely a conveyor which moved the threshed rough rice from the threshing barn to the secondary structure. The secondary structure is likely a storage barn where rough rice was kept before it was
sold or sent to mill. This structure is elevated on a brick pier foundation reinforcing its purpose as a storage barn as it would protect the valuable grain from vermin or water.\textsuperscript{184}

\begin{center}
\includegraphics[width=\textwidth]{figure14.jpg}
\end{center}

Figure 14: Rice mill at Farmfield Plantation c. 1900 (Courtesy of The Charleston Museum, Charleston, South Carolina)

\textit{Buck Hall}

Buck Hall Plantation is located six and a half miles upstream from the “T” on the western branch of Cooper River. It is situated directly across the river from Mulberry Plantation between Washington Plantation and Chachan Plantation.\textsuperscript{185} In the eighteenth century, Buck Hall was the property of Col. Alexander Moultrie and contained “200

\textsuperscript{184} This interpretation of the image of the mill at Farmfield is based on the general understanding of mechanized rice processing and the detailed description of Chicora Wood Plantation in Porcher and Judd,\textit{Market Preparation of Carolina Rice}, 138-142.

\textsuperscript{185} Samuel Gaillard Stoney,\textit{ Map Showing the Plantations Along the Cooper River as They Were in 1842}.
acres of some of the best tide swamp on that river.” Improvement to the plantation and its infrastructure likely didn’t take place during the 1790s as the property was advertised for sale for much of the decade. Hary Grant acquired the plantation in 1793 from Moultrie and proceeded to list it for lease or purchase. By 1798 the property entered sheriff’s sale where it was sold as the property of Samuel Gourdine, “at the suit of Hary Grant.” It is unknown whether Samuel Gourdine (also spelled Gourdin) purchased Buck Hall. However, he is listed at Buck Hall to as a member of the St. John’s Post in 1801. The St. John’s Post was an organized group of planters who facilitated the communication between Charleston and its hinterlands of St. John’s Parish. Additionally, in 1810 the Vestry of St. John’s Parish advertised a fifteen year lease of the lands situated between Samuel Gourdin of Buck Hall and Mrs. Edwards of Washington Plantation which supports that Gourdin likely obtained the property at the beginning of the nineteenth century.

Buck Hall was advertised again in November 1829 by a B. Gaillard. In its description, there is no mention of improvements made to the property that suggest mechanized rice processing had been implemented at Buck Hall. Throughout the 1830s and 1840s shipping reports suggest that Buck Hall was producing rice as shipments of

186 “To be Sold,” City Gazette (Charleston, South Carolina), March 4, 1793: [3].
187 “Summer Residence,” City Gazette (Charleston, South Carolina), May 16, 1793: [3].
188 “Sheriff’s Sale,” City Gazette (Charleston, South Carolina), September 17, 1798: [4].
189 “The St. John’s Post,” Charleston Courier (Charleston, South Carolina), January 24, 1851: [2].
190 “Glebe Land, in St. John’s Parish, at Auction.” City Gazette (Charleston, South Carolina), November 24, 1810: [4].
191 “Valuable Estate on Cooper River,” Charleston Courier (Charleston, South Carolina), November 18, 1829: [5].
rough rice entered Charleston’s port on a frequent basis.\textsuperscript{192} Rice processing became mechanized at Buck Hall at some point before 1849. A sale advertisement for Buck Hall in January of that year notes that “on the premises is a… steam rice thresher and a rice mill.”\textsuperscript{193} Additional evidence to support the implementation of mechanized rice processing at Buck Hall either does not exist or was not discovered during research. As this evidence falls outside of the study period for this thesis, further research would aid in revealing the extent of mechanized rice processing at Buck Hall. The lack of defined ownership between 1790 and 1830 contributed to the lack of rice production and therefore need for mechanized methods of processing rice at Buck Hall.

\textit{Chachan Plantation}

The evidence supporting mechanized rice processing at Chachan Plantation is compelling and sheds new insight into the toll milling landscape along Cooper River during the Antebellum period. Unfortunately, no contemporary plat of Chachan were located and much of the information regarding this plantation was developed through newspaper research. Chachan is situated directly across from Lewisfield Plantation between Buck Hall and Willow Grove plantations on the western branch of the Cooper River. In March 1793 Alexander Moultrie sought to liquidate his property at Buck Hall and Chachan, publishing a notice of its availability in the \textit{State Gazette of South Carolina}.

\textsuperscript{192} These two sources were selected to represent the period when shipping reports related to Buck Hall appeared in Charleston newspapers. Numerous reports exist between 1832 and 1848 which support that Buck Hall was actively producing rice during this period. “Marine News,” \textit{Southern Patriot} (Charleston, South Carolina), January 21, 1832: [3]; “Shipping News.” \textit{Charleston Courier} (Charleston, South Carolina), November 29, 1848: [3].

\textsuperscript{193} “Valuable Tide Swamp Rice Land,” \textit{Charleston Courier} (Charleston, South Carolina), January 8, 1849: [3].
Carolina. By this time, tidal rice swamps consisted of nearly 300 acres. The property also contained the necessary cultivation infrastructure to support the commercial production of rice highlighted by a “canal in which a large schooner may come up within four hundred yards of the barn.”194 This barn was likely a threshing or storage barn where rice was kept until it could be sold or milled. Moultrie’s plantation was subsequently “seized and taken in execution and mortgage” that same month.195

By early 1794, Theodore Gaillard came under ownership of Chachan Plantation containing a total of 700 acre, of which 300 acres were tide swamp.196 At some point between 1794 and 1798 a rice pounding mill was constructed at Chachan as supported by an advertisement published in the City Gazette. This advertisement indicates Mr. Gaillard’s Mill was established to receive and pound rice on toll.197 It is not specifically stated in this advertisement that Gaillard’s mill is at Chachan, rather this connection must be established through the culmination of other primary sources. In January 1800, Theodore Gaillard Jr. advertised that his father’s mill, located at “a very convenient situation on Cooper river, will pound out upon toll at 7 per cent a quantity of Rice.”198 This “situation” noted by Gaillard Jr. was roughly five miles above Strawberry Ferry.199 In February 1805, Theodore Gaillard advertised a pair of mill stones and 500 bushes of “gold seed” rice for which he had “no further use.” It was indicated in this same advertisement that Gaillard had sold Chachan Plantation which was “five miles above

194 “To Be Sold,” State Gazette of South-Carolina (Charleston, South Carolina), March 4, 1793: [3].
195 “Sheriff’s Sales,” City Gazette (Charleston, South Carolina), March 18, 1793: [3].
196 “For Sale,” City Gazette (Charleston, South Carolina), January 15, 1794: [3].
197 “Toll Rice,” City Gazette (Charleston, South Carolina), February 13, 1798: [3].
198 “A Rice Mill,” City Gazette (Charleston, South Carolina), January 7, 1800: [3].
199 “Toll Rice,” City Gazette (Charleston, South Carolina), February 13, 1798: [3].
Strawberry Ferry.⁵²⁰⁰ There is no further reference to Gaillard’s mill throughout the rest of the Antebellum period leading to the understanding that it lost its significance as a toll mill; perhaps due to the establishment of the toll mill at Middleburg.

The corroboration of these two pieces of evidence reinforce that a rice toll mill was established at Chachan Plantation in 1798.⁵²¹ This forwards a substantial new understanding of the establishment of toll mills along the Cooper River during the Antebellum period. It has been traditionally claimed that the first rice toll mill established in South Carolina was at Middleburg Plantation in 1801. However, this new evidence

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²⁰⁰ “For Sale,” Carolina Gazette (Charleston, South Carolina), February 22, 1805: [3].
²⁰¹ Modern spatial measurement does confirm that Chachan Plantation is roughly located five miles above Strawberry Ferry.
indicates that Chachan Plantation was actually the first rice toll mill established along Cooper River. While short lived, the evidence of a toll mill at Chachan furthers scholarly understanding of that plantation and the role it held in the broader context of toll milling along Cooper River. Further investigation of this plantation and rice processing site may assist in painting a clearer picture of this Antebellum landscape.

Conclusion

This chapter has presented evidence on the development of mechanized rice processing along the Cooper River for all nine of the plantations. It also provides evidence for plantations not included in this study due to a lack of information about rice processing on contemporary plats. Finally, this chapter had forwarded evidence which would expand the current knowledge of known rice processing sites along Cooper River. This chapter serves as a synopsis of the mechanization of rice processing infrastructure along the Cooper River during the Antebellum period.
CHAPTER FIVE

ANALYSIS

An analysis of eight different elements provide valuable insight into the spatial characteristics of mechanized processing machines implemented on rice plantations along the Cooper River. The categories examined include the acreage of plantation, acreage of land dedicated to rice cultivation, the elevation of the processing machines, the distance from the machines to the primary dwelling house and enslaved buildings, the proximity of the machines to the Cooper River and access condition, and the proximity of machines to public roadways. The previous chapter investigated a total of nine plantations along the Cooper River where processing machines were employed in the refinement of rice for market. This chapter examines seven specific plantations where the locations of these machines are distinctly annotated on historic plats or where remanent features are accurately known. The plantations examined in this chapter include Lewisfield Plantation, Comingtee Plantation, Limerick Plantation, Hagan Plantation, Dean Hall Plantation, Cedar Hill (Blessing) Plantation, and Middleburg Plantation. Mepkin and Pimlico Plantations drop from this study because it was not possible to locate the mechanized processing infrastructure on these plantations. Historic plats, georeferenced using ArcGIS Pro, provide accurate distance measurements while topographic and geologic data deepen this spatial analysis. Using both historic and geospatial information,

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202 The plat for Cedar Hill Plantation produced in 1906 does not have relevant information regarding the overall plantation acreage, acreage dedicated specifically to rice cultivation, primary dwelling house and enslavement dwellings. For this reason, it is excluded from the calculations for these categories. However, the remnants of a brick chimney and steam engine enable the analysis of the remaining categories to include Cedar Hill Plantation. These remnant features at Cedar Hill are attributed to Cherry Hill Plantation in the Cooper River Historic District.
an assessment of landscape characteristics on Lowcountry rice plantations is presented in this chapter.

**Analysis**

The first category of analysis is the size of rice plantations measured in acres. Plantations along the Cooper River that implemented mechanized rice processing ranged between 903 and 4,965 acres. The varying range in acreage allow these plantations to be divided into three classifications: small-scale plantations, medium-scale plantations, and large-scale plantations. The small-scale plantations include Lewisfield and Comingtee consisting of 903 and 1,096 acres respectively. The medium-scale plantations include Hagan, Middleburg, and Dean Hall consisting of 1,856, 2,592 and 2,600 acres respectively. The large-scale plantations include Limerick consisting of 4,704 acres. The extensive range in acreage of these plantations highlight that rice was not the only agricultural commodity produced on these plantations. Timber, indigo, cotton, and provisional crops were also cultivated on rice plantations to diversify market incomes. On average, rice only accounted for 14% of the land usage on the plantations examined. The average size of rice plantations along the Cooper River that implemented rice processing machines was 2,292 acres.

The second category of analysis is the number of acres used for rice cultivation on each plantation. The range of cultivated acreage on Cooper River rice plantations was between 101 acres and 565 acres. The overall acreage of rice plantations did not necessarily correlate to the amount of land devoted to rice cultivation. For example, two of the medium-scale plantations, Dean Hall and Hagan, had the highest number of acres
under rice cultivation at 504 and 565 acres respectively. Plantations which had the lowest number of acres under rice cultivation included two small-scale plantations and one medium-scale plantations. Those being Comingtee, Middleburg, and Lewisfield with 101, 191, and 222 acres respectively.203 Comingtee and Lewisfield are categorized as small-scale plantations while Middleburg is categorized as a medium-scale plantation. Limerick is unique in that it is both a large-scale plantation and above average in rice land acreage with 337 acres dedicated to rice cultivation.

The widespread shift to tidal rice culture beginning in the latter decades of the eighteenth century sought to capitalize on specific “topographical and hydrological conditions” of the Lowcountry.204 Swamp and marshlands located along rivers, once viewed as “wasteland,” became commercially profitable through rice cultivation.205 Environmental conditions of topography and water drainage restricted the production capacity and size of inland rice plantations. Inland planters produced an average of “ten bushels an acre less” than tidal rice planters.206 Additionally, tidal rice culture expanded the amount of rice fields that could be cultivated on these plantations.207 While this enabled more rice to be produced, it strained traditional processing capabilities. This limitation demanded more intensive means to process rice for market. Therefore, the proliferation of mechanized processing infrastructure on Lowcountry plantations can be

203 At least for Middleburg, the limited number of rice field acreage may reflect the role it had as a toll mill in the early nineteenth century.
attributed to the increase in production capabilities of tidal rice cultivation. This increase is reflected along Cooper River as the average acreage under rice cultivation on plantations that implemented mechanized rice processing was 320 acres.

The third category of analysis relates to the elevation at which machines were constructed. Elevation data extracted from the digital elevation model (DEM) for each rice processing machine or mill depicted on historic plats provides fascinating insight into the topography of these sites. The data reveals that the location of all rice processing sites do not exceed ten feet in elevation. (See Appendix B) Plantations where the rice processing machines are lowest in elevation are Hagan, Comingtee, and Middleburg at roughly 2.4, 3.2, and 4.6 feet respectively. The machine sites located above five feet in elevation include those at Limerick, Dean Hall, and Cedar Hill (Blessing) being roughly 6.2, 7.7, and 8.3 feet respectively. The machine at Lewisfield is an outlier of this data as
it is situated at an elevation of 10.2 feet. The elevation of this machine house and the lack of water source, discussed later in this section, may provide supporting evidence that the processing site at Lewisfield was not water powered.

A correlation exists between topographic elevations and the underlying geologic formations of these processing sites. The soils where processing machines are lowest in elevation consist of “tidal marsh deposits” and “clayey sand and clay facies.” These soil types are indicated as Qht and Qsbc on the geologic map. (See Appendix C) The tidal marsh deposits were formed during the Holocene geologic period, while the clayey sand and clay facies are a component of the Siver Bluff terrace formed during the late Pleistocene geologic period. These soil deposits, specifically the clayey sand and clay facies “occur only at elevations below 10 ft.” The soil composition of processing sites above five feet include the clayey sand and clay facies of the Silver Bluff terrace and the Wando Formation formed during the late Pleistocene geologic period along with alluvium soils formed during the Holocene geologic period. These soil types are indicated as Qsbc Qwc and Qal on the geologic map. (See Appendix C) These relatively young geologic deposits are lower in elevation compared to geologic deposits of older formations. The construction of processing machines on these younger geologic

\[208\text{ Weems et al., Surficial Geologic Map of the Charleston Region.}\]
formations reinforce the low topographic conditions which characterized these processing sites.

Figure 17: Geologic formations underlying the mill at Comingtee Plantation (Figure by author)

Topography was fundamental in the operation of water driven processing machines throughout the Lowcountry. Mechanized processing infrastructure was typically established between two and eight feet in elevation on clay-based soils formed within the last 130,000 years. The topographic characteristic of these soils, being less than ten feet in elevation, was critical to the operation of these sites. Appendix B contains localized elevation maps of each of the rice plantations to illustrate the terrain of where
these processing sites were established while Appendix C illustrates the underlying geology.

The fourth category of analysis is the distance of processing infrastructure to the primary dwelling house. Mechanized processing sites are located between 1,090 and 2,945 feet (0.21 and 0.56 miles) from the primary dwelling house. Plantations where processing infrastructure is closest to the primary residence are Middleburg, Dean Hall and Lewisfield at 1,090, 1,360, and 1,475 feet (0.21, 0.26, and 0.28 miles) respectively. It does not appear that time and development in rice culture played a determining factor in the location of mechanized processing infrastructure. Dean Hall’s mill, which is depicted in the 1827 survey of the plantation, is located a similar distance away from the primary residence as Lewisfield’s “barn and machine house” depicted in the 1786 plat of that plantation.

Plantations in which the processing infrastructure is located a moderate distance from the primary residence include Comingtee and Limerick at 2,395 and 2,945 feet (0.45 and 0.56 miles) respectively.\(^{209}\) The location of the “barn and machine” at Hagan Plantation proved to be an outlier of this data being roughly 6,605 feet (1.25 miles) from the primary dwelling house. The configuration of rice fields and settlement at Hagan accounts for this separation between the processing machine and primary dwelling house. Overall, rice processing infrastructure along the Cooper River is located on average 2,645 feet (0.50 miles) from the primary dwelling house.

\(^{209}\) The term “moderate distance” is defined in the context of this research as approximately half a mile in distance.
The fifth category of analysis is the distance of processing infrastructure to enslaved settlement structures. Lewisfield and Hagan are outliers in this analysis as rice processing infrastructure is respectively located 310 and 5,410 feet (0.06 and 1.02 miles) from enslaved dwellings. The discussion in the previous chapter hypothesized that three structures in close proximity to the “barn and machine” at Hagan were occupied by skilled millwrights and laborers. This hypothesis was not used to determine the distance between processing machine and enslaved settlement. Rather, the enslaved settlement notated on the 1798 plat of Hagan was utilized. The processing site at Middleburg is the median of this data being located 1,085 feet (0.21 miles) from the enslaved dwellings. Processing infrastructure on the remaining plantations including Comingtee, Dean Hall, and Limerick, are located 2,085, 2,265, and 2,945 feet (0.39, 0.43, and 0.56 miles) respectively from enslaved settlement dwellings.

<table>
<thead>
<tr>
<th>Plantation Name</th>
<th>Plat Date</th>
<th>Distance to Primary Dwelling (feet)</th>
<th>Distance to Enslaved Settlement (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comingtee</td>
<td>1786</td>
<td>2,395</td>
<td>2,085</td>
</tr>
<tr>
<td>Middleburg</td>
<td>1786</td>
<td>1,090</td>
<td>1,085</td>
</tr>
<tr>
<td>Lewisfield</td>
<td>1786</td>
<td>1,475</td>
<td>310</td>
</tr>
<tr>
<td>Limerick</td>
<td>1797</td>
<td>2,945</td>
<td>2,945</td>
</tr>
<tr>
<td>Hagan</td>
<td>1798</td>
<td>6,605</td>
<td>5,410</td>
</tr>
<tr>
<td>Cedar Hill (Blessing)</td>
<td>1803</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Dean Hall</td>
<td>1827</td>
<td>1,360</td>
<td>2,265</td>
</tr>
</tbody>
</table>

Figure 18: Chart comparing distances of processing infrastructure to primary dwelling and enslaved settlement (Chart by author)

Comparing aggregate distance data of the previous two categories reveals that enslaved settlements were situated roughly 300 feet closer to processing infrastructure. This spatial construction underpins the emphasis of commercial agricultural production
carried out by the enslaved. The task system’s orientation towards the laborious work associated with processing infrastructure and agricultural lands is reinforced through this spatial arrangement. Additionally, the proximity of the enslaved dwellings to the primary dwelling alludes to planter’s perception of surveillance and power over the enslaved. The placement of enslaved dwellings, as Stewart concludes, was more so reinforced by a sense of “orderliness” rather than that of surveillance. Moreover the “threat” of surveillance was “the true manifestation of a control mechanism in the physical environment.” By retaining enslaved settlements near the primary dwelling, planters were able to impose a sense of control over the enslaved.

Moreover, the establishment of settlements, for both white overseers and black slaves was inherently connected to topography and underlying geologic formations. The primary and enslaved dwellings at Comingtee, Middleburg, Limerick, Hagan, Cedar Hill (Blessing), and Dean Hall are located on clayey sand and clay facies formed during the middle Pleistocene roughly 200,000 years ago. This soil types is indicated as Qtc on the geologic map. (See Figure 19) These soil deposits are components of the Ten Mile Hill Formation and situated at “elevations between 25 and 40 ft.” The establishment of settlements on these geologic formation is reflected through the topography which ranges between twenty-four and thirty feet in elevation. Lewisfield is the only settlement which

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211 Weems et al., Surficial Geologic Map of the Charleston Region.
is established over the clayey sand and clay facies of the Wando Formation formed in the late Pleistocene between 70,000 and 130,000 years ago.

Figure 19: Geologic formations underlying Hagan Plantation overlaid with the plat from 1798. The soil type underlying the settlement is labeled Qtc on the geologic map. (Figure by author)

The sixth and seventh categories of analysis are concerned with the location of processing infrastructure and access relative to the Cooper River. Since a majority of the machines installed on these rice plantations before 1800 were driven by tidal waters, proximity to the Cooper River was essential for their operation. One may expect to see processing infrastructure situated directly on the river, similar to mills constructed in the upstate to process flour and corn. Analysis suggests this premise is incorrect. Processing
infrastructure could not be constructed directly on the Cooper River primarily due to tidal influences making the river flow in two directions. Other types of mills used to process flour and corn elsewhere in the state were established along streams or rivers as the water flowed in only one direction. Like these mills in the upstate, the gearing mechanisms of rice processing infrastructure was designed to operate in one direction and reversing this operation would cause considerable damage to the machinery.\textsuperscript{212} The ebb and flow of Lowcountry waterways made the establishment of rice processing mills directly along the Cooper River unrealistic.

Instead, processing infrastructure harnessed tidal water in the sense that rice fields acted as large reservoirs that strategically drained water through the mill race. Fresh water, compounded on adjacent rice fields by rising tides, was subsequently released when tides receded providing the necessary force to drive the undershot water wheel. Water confined in these fields produced a water head of four to five feet at low tide.\textsuperscript{213} Adjacent rice fields situated at roughly one to three feet in elevation, placed this water head between five and eight feet in elevation. As noted earlier, the elevation of processing infrastructure was roughly two and eight feet. The correlation in elevation between the water head and the processing machine underpins the functional operation of these sites. The topographic conditions, influenced by the underlying geology, made the establishment of processing infrastructure at these locations viable.

\textsuperscript{212} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 200.
\textsuperscript{213} Porcher and Judd, \textit{The Market Preparation of Carolina Rice}, 189.
Stoke’s rice mill at Comingtee Plantation is the only processing site examined that is directly situated on the banks of the Cooper River. However, a mill race along the north side of the structure indicates that it was driven by impounded tidal water from an adjoining rice field. Processing sites examined on the remaining plantations range between 310 and 5,745 feet from the Cooper River. Rice processing infrastructure located within 1,000 feet from Cooper River those at Dean Hall, Middleburg and Lewisfield Plantations measuring 310, 860, and 900 feet respectively.

Figure 20: Mill race of Stoke's rice mill on Comingtee Plantation. This site is currently part of Bonneau Ferry Wildlife Management Area owned by the South Carolina Department of Natural Resources (SCDNR). (Image by author)

Plantations where processing infrastructure is located between 2,000 and 6,000 feet from the Cooper River include those at Cedar Hill (Blessing), Hagan, and Limerick measuring 2,240, 3,260, and 5,745 feet respectively. This separation is due to tidal rice
fields comprising much of the riverfront, forcing these machines to be situated more inland. This is primarily true for both Hagan and Cedar Hill (Blessing) Plantation. At Hagan, rice fields buffer the land adjacent to the Cooper River and French Quarter Creek. The topography and underlying geology of the landscape further influenced the establishment of this processing site 1,500 feet southwest of French Quarter Creek. (see Figure 19) The processing machine at Cedar Hill (Blessing) also reflects this topographic and land use trend being situated 2,200 feet from the Cooper River buffered by tidal rice fields. The processing site at Limerick is removed from the Cooper River because of its situation amongst reservoir fed inland rice fields as opposed to tidal rice fields. The machine at Limerick, being “above the influence of the tides,” was powered by water from these inland reservoirs.\textsuperscript{214} Overall, the average distance of processing machines on rice plantations to the Cooper River is 1,909 feet.

All processing infrastructure, except that at Comingtee, had indirect access to the Cooper River. These sites employed the engineered network of canals on Lowcountry rice plantations to access the Cooper River. Lewisfield Plantation proved an exception as it lacks a canal leading to the “barn and machine house” in the plat from 1786. Nonetheless, these canals not only channeled tidal freshwater onto rice fields, but also provided a mode of transportation. Canals leading directly to processing infrastructure facilitated a connection between these seats of market preparation with both domestic and trans-Atlantic markets.

\textsuperscript{214} Lees, “The Historical Development of Limerick Plantation,” 54.
The final category of analysis examines the location of mechanized rice processing relative to public roads. Improvements in infrastructure across the Lowcountry during the colonial period, including public roads and ferries, allowed remote areas along the Cooper River to become “integrated more completely into the market economy” of Charleston. These improvements also expanded the geographic area where rice could be produced. The significance of these early road networks and their role in Antebellum rice culture should not be ignored. The varying distances between rice processing infrastructure and public roads depicted in contemporary plats is broken down into three groups for closer examination.

The first group consists of Cedar Hill (Blessing), Middleburg, and Limerick measuring 1,060, 2,500 and 3,210 feet (.20, .47, and .61 miles) respectively from the nearest public road. The second group consists of Comingtee and Lewisfield measuring 6,270 and 8,150 feet (1.19 and 1.54 miles) respectively from the nearest public road. The last group consists of Dean Hall and Hagan measuring 10,355 and 15,355 feet (1.96 and 2.9 miles) respectively from the nearest public road. The proximity of Middleburg’s processing infrastructure to the public road likely supported its operation as a toll mill in the early nineteenth century. The mechanized processing site at Cedar Hill (Blessing) is unique in that it is located near the inland landing site of Bonneau’s Ferry which connects to the public road, which is present day Cainhoy Road. The disconnected nature of Dean

215 Peter A. Coclanis, “Rice Prices in the 1720s and the Evolution of the South Carolina Economy,” *Journal of Southern History* 48, no. 4 (November 1982): 541; This network of public roads also enabled plantations along the Upper Santee River to transport their marketable goods down the western branch of Cooper River to Charleston. See Edelson, *Plantation Enterprise in Colonial South Carolina*, 133.
Hall and Hagan to ground transportation places greater emphasis on water transportation for the export of processed rice from these plantations.

Figure 21: Proximity of machine from barony and public roads at Limerick Plantation (Map by author)

Summary

By the end of the eighteenth century, the embrace of tidal rice culture placed a significant emphasis on lands situated along primary waterways across the South Carolina Lowcountry. The development of rice fields along the Cooper River followed this pattern. A network of tidal rice plantations developed along the eastern and western branches of the river supported by a network of interior roads, ferries, and navigable waterways. While the size of these rice plantations varied, the average contained roughly 2,292 acres of land, utilizing 320 acres for rice cultivation. Development of mechanical
methods to process increasing rice yields quickly followed. This is reflected by the proliferation of at least seven processing machines along the Cooper River landscape at Comingt ee, Middleburg, Lewisfield, Limerick, Hagan, Mepkin, and Pimlico Plantations by 1800.\textsuperscript{216} The situation of these processing machines was determined by elevation, topography and underlying geology. Furthermore, the dominant mode of transportation during the Antebellum period reinforced the situation of these sites closer to navigable waterways.

\textsuperscript{216}The latter two plantations were not examined in this analysis but evidence to support the mechanization of these plantations by 1800 is presented in Chapter Four.
Figure 22: Network of interior roads, ferry crossings, and waterways depicted in John Wilson’s 1822 Map of South Carolina (Library of Congress)

The operation of these mechanized processing machines fell on the work of a limited number of skilled enslaved workers. Their role in operating and servicing these important components of Lowcountry rice culture is reflected in the proximity of their dwelling houses to these machines. From the rice plantations examined here, the average distance from the enslaved dwellings to processing machines is roughly 2,350 feet (.44 miles). Compared to the primary dwelling house, typically located 2,645 feet (.50 miles) from the machines, enslaved settlements are located closer to rice fields and areas where rice processing occurred. This emphasizes a labor connection between slaves and the
cultivation of rice and its processing for market. Edelson claims that the “rice regime… resettled them [slaves] away from white residences, near the fields or around the pounding barns.” Research suggests that enslaved settlements remained located near primary “white residences,” but were oriented towards rice processing machines and agricultural lands, refining Edelson’s assertion.

A heavy reliance was placed on the engineered hydrologic landscape of Lowcountry rice plantations. Canals were used to connect five of the seven mechanized processing sites to the Cooper River. The function of canals, both as a water control method and means of transporting rice to market is highlighted along the Cooper River. This latter function reinforces the primary dependence of water transportation compared to ground transportation throughout the Antebellum period.

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217 Daniel Littlefield notes that “a positive emphasis on slaves from rice-growing regions” of African existed among South Carolinians during the eighteenth century (Littlefield, Rice and Slaves, 113). The connection between slaves and the cultivation of rice is of a broader debate on the African influence of rice culture in South Carolina. See Wood, Black Majority for a more detailed discussion.

218 Edelson, Plantation Enterprise in Colonial South Carolina, 88.

219 The processing infrastructure at Cominette and Lewisfield are removed from this the mill at Cominette was situated directly on its banks and the machine at Lewisfield lacked a canal leading to the river.
CHAPTER SIX
CONCLUSION

The commercialization of rice cultivation in the early eighteenth century transformed the Lowcountry landscape. Initially reserved to inland methods of cultivation, tidal swamp lands adjoining primary waterways were harnessed for rice cultivation by the mid-eighteenth century. These natural environs were transformed into geometric patterns of dikes, canals, and fields by the enslaved at the direction of planters. This emphasis on tidal swamplands, once viewed by colonists as “unproductive wastes” who instead favored “higher and drier land,” dramatically increased the value and demand of these areas. Prior to the American Revolution, manual methods of processing largely characterized the preparation of rice for market. While animal and water driven machines did exist, planting and cultivation methods limited the rice yields that required processing. The American Revolution disrupted the colonial rice trade and destroyed Lowcountry plantations. Planters returning to their rice enterprises began rebuilding, shifting their focus on tidal rice cultivation which had already demonstrated its economic profitability prior to the war.

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224 Porcher and Judd, *The Market Preparation of Carolina Rice*, 64.
The shift to tidal rice cultivation increased productivity of Lowcountry rice plantations through improved crop yields. Consequently, the quantity of rice that required processing for market exceeded traditional hand methods of processing. Planters responded by developing more efficient, mechanized mills and replaced traditional hand milling methods. As the technology and machinery to process rice developed, so did the demand for the quality of rice that was sent to market. Planters that were not able to produce quality “clean rice” were “beaten out of the market.” This shift to industrial methods of rice refinement was crucial for planters to maintain the commercial enterprises they had established by the end of the eighteenth century. Their ability to process quality rice for market was contingent on the establishment of mechanized rice processing infrastructure. Through geospatial and topographic analysis, this research demonstrates elevation, topography and underlying geology of the Lowcountry determined where mechanized processing infrastructure was established.

**Findings**

As Smith notes in *Carolina’s Golden Fields*, topography played a major role in the development of areas for rice cultivation. This topography, and moreover underlying geologic formations, was fundamental in determining where mechanized rice processing infrastructure was and could be established. The geologic formations which fostered the establishment of processing infrastructure included tidal marsh deposits, clayey sand and...

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clay facies, and alluvium soils formed during the late Pleistocene and Holocene geologic periods. These deposits, defining geological features of the Lowcountry, underlay the region’s expanding tidal rice fields. The topographic conditions of the Lowcountry’s rice growing region offered a link between an ability to command water and the introduction of mechanized rice processing.

By the 1780s, water was the primary source of power for many of the processing sites in the Lowcountry. The agricultural requirement of water for rice cultivation made harnessing its power fairly straightforward. Reservoirs originally utilized for inundating inland rice fields were adapted to power the mills which processed the grain. Tidal rice culture made the control of water even easier. Freshwater captured in rice fields during rising tides was strategically released through the mill race when the tide ebbed, engaging the mill’s waterwheel. Plantations that had inadequate topographic conditions were limited in the ability to harness water and therefore implement mechanized processing infrastructure.

Research reveals that processing infrastructure located along the Cooper River was situated either at or below the elevation of the water source used to power the machine. The elevation of processing sites was found to be below ten feet in elevation with the exception of Lewisfield Plantation. Further reinforcing this connection is that all processing machines were located adjacent to rice fields which are roughly one to three

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229 Porcher and Judd, *The Market Preparation of Carolina Rice*, 188.
feet in elevation. In short, mechanized processing infrastructure was established between two and eight feet in elevation and within 300 feet of rice fields.\textsuperscript{230}

Topography also influenced the establishment of the broader plantation landscape, particularly in regard to settlement. Rice plantation throughout the Lowcountry were described as being “well diversified with swamp and high lands.” Such composition allowed these plantations to participate in both domestic and export economies. Furthermore, these high lands served as “places of human habitation.” In these areas, white planters and black slaves organized settlements comprising of a primary dwelling house, enslaved dwellings, provisional grounds, stables, carriage houses, barns and workshops.\textsuperscript{231}

These topographic and compositional characteristics are observed on the rice plantations along the Cooper River. The soils underlying plantation settlements typically consist of clayey sand and clay facies formed during the middle Pleistocene period. Moreover, these soil formations characterize areas of higher elevation. Because rice processing infrastructure was located in more remote low lying areas, they are separated from the planter and enslaved dwellings. Primary and enslaved dwellings on rice plantations along the Cooper River are situated between 250 and 1,200 feet from one another. This is comparable to Stewart’s findings in her work on plantation surveillance...

\textsuperscript{230} This distance was determined by applying the “Buffer” geoprocessing tool in ArcGIS Pro to the documented sites of rice processing. A comparative analysis between this buffer and contemporary plats confirmed that rice fields were located within this prescribed distance.

\textsuperscript{231} Edelson, \textit{Plantation Enterprise in Colonial South Carolina}, 114; Stables and carriage houses were added to this list of settlement composition based on depictions in the plat of Lewisfield Plantation from 1786.
in the A.C.E. Basin. She concluded that distance from the primary dwelling house and enslaved dwellings was between 50 and 1,000 feet.\textsuperscript{232}

Despite the close proximity of the primary and enslaved dwellings on higher ground, enslaved dwellings on rice plantations along the Cooper River were established closer to rice fields and, to an extent, the mechanized processing sites. This supports Edelson assertion that enslaved dwellings were “often next to the pounding barns,” or near the “fields in which they worked.”\textsuperscript{233} Enslaved settlements on four rice plantations are spatially closer to the processing infrastructure compared to the primary dwelling house. These plantations include Comingtee, Lewisfield, Hagan, and Middleburg. On average, enslaved settlements were located 2,350 feet (.44 miles) from processing machines compared to the primary dwelling house which were located 2,645 feet (.50 miles) from these machines. The reduced labor force required to operate a mechanized rice processing machine may help explain why there is a lack of settlement closer to these processing sites. With a majority of the plantation labor required in the cultivation and maintenance of rice fields, the placement of enslaved dwellings near them took precedent.

Transporting rice from these processing sites in the rural hinterlands to markets in Charleston where it could be sold and exported was essential for Lowcountry planters. This research reveals that processing infrastructure was suited towards riverine modes of transportation compared to terrestrial. A transportation link between the processing

\textsuperscript{232} Stewart, “Plantations, Planning & Patterns,” 87.
\textsuperscript{233} Edelson, \textit{Plantation Enterprise in Colonial South Carolina}, 115.
infrastructure and the Cooper River created through canals is present on five out of the seven rice plantations that were examined. On these plantations, mechanized processing infrastructure situated adjacent to canals connect these sites to the Cooper River or its tributaries. The geographic conditions of the Lowcountry with its extensive network of navigable waterways made the environment seemingly “designed by nature for commercial agriculture.”234 As such, the development of colonial transportation networks favored these waterways. As Coclanis notes, “the transportation system of the low country was designed primarily to facilitate connections between seats of production in the interior and coastal ports.”235 Therefore, the establishment of rice processing infrastructure near the riverine waterways of the Lowcountry, specifically the Cooper River, was pertinent.

The network of public roads established by the mid-eighteenth century was primarily used to connect distant plantations with the primary vein of river transport, the Cooper River. Additionally, these roads aided in the settlement of inland plantations, development of communities, and inter-plantation connections.236 Access to the Cooper River, which all rice plantations in this research possessed, negated the need for rice to be transported to Charleston via this overland network. The dissociation of mechanized rice processing sites to public roads supports this. While mechanized processing infrastructure was typically situated less than a quarter of a mile (.18 miles) from either the Cooper

234 Edelson, Plantation Enterprise in Colonial South Carolina, 130.
235 Coclanis, The Shadow of a Dream, 147.
236 Edelson, Plantation Enterprise in Colonial South Carolina, 133; George D. Terry, “‘Champaign Country’: A Social History of an Eighteenth Century Lowcountry Parish in South Carolina, St. Johns Berkeley County,” (Phd. diss.: University of South Carolina, 1981), 180.
River or one of its tributaries, this same infrastructure was situated roughly half a mile (.47 miles) from public roads. This spatial relationship reinforces the importance of the Lowcountry’s river systems and its function in underpinning the economic activity of the rice industry during the Antebellum period.

Examining this topic more broadly, this research’s focus is centered on rice culture in the Lowcountry following the American Revolution. During this period, a transition occurs where manual means of processing rice is superseded by more mechanical methods. The information presented in Chapter Four supports this notion that rice plantations along the Cooper River industrialized between 1780 and 1830. While the transition throughout this period of study is gradual, the early 1780s is identified to be a pivot point from which extensive industrialization occurs in the rice industry. Industrialization is further bolstered by the agricultural development of tidal rice cultivation. This view of Lowcountry rice plantations place it within the broader context of the Industrial Revolution that was beginning to take shape in the United States during this period. The prolific development of mechanical processing machines during the late eighteenth-century demonstrate that the industrial ideals of the North had not passed over the rice planters of the agrarian South.

**Model for Rice Plantations**

The dynamic history of rice production in the Lowcountry during the eighteenth and nineteenth centuries is often overlooked. Since the collapse of the industry in the early twentieth century, the landscape along the Cooper River, once characterized by a complex network of rice fields and irrigation canals, has been transformed into residential
communities, industrial facilities or wildlife preserves. Nature has since reclaimed its territory, concealing elements arduously constructed by the hands of the enslaved. Such elements include locales of market processing that fundamentally supported the propagation of commercial rice agriculture. Identifying and documenting these locations of mechanized rice processing is vital because of the information it can provide to expand the understanding of rice culture during the Antebellum period. From this, efforts to interpret and preserve these significant locales of South Carolina’s agricultural history can be taken.

A generalized spatial model can be developed for other rice plantations across the Lowcountry using the information garnered from this research. Information regarding the location of all mechanized rice processing infrastructure implemented on Cooper River rice plantations is incomplete. The potential for additional mechanized processing infrastructure presented in Chapter Four is ideal to apply this model. Using such model, areas suitable for the establishment of processing infrastructure can be identified. Through this, archeological and physical investigations can be conducted more accurately. This model relies on elevation, fluvial and historic transportation infrastructure data to delineate areas characteristic of mechanized processing placement.

The spatial element driving this model is the distance from major rivers and its tributaries. Processing sites were located within 6,000 feet of the Cooper River. However, this did not account for sites that were situated on its major tributaries, specifically French Quarter Creek and Kensington Creek, which is today Gough Creek). With these distances considered, mechanized processing sites were typically within 2,500 feet of
major transportation waterways. Elevation of the terrain should next be considered. Processing infrastructure was situated below ten feet in elevation. By further restricting the area previously identified below this elevation, it eliminates extents not topographically suited to support mechanized rice processing infrastructure. The final element that should be factored into this model is the proximity of processing sites to historic public roads. This data will need to be created. While the general path of historic roadways make up a substantial portion of today’s modern transportation infrastructure, others have been abandoned. Using a combination of historic maps and elevation data, historic public roadways can be visualized. Processing infrastructure, as revealed in this research, was located a minimum of 1,000 feet from public roads. This information can be used to exclude areas within this range. While the situation of mechanized processing infrastructure was not contingent on its connection to overland transportation routes, it may aid to further delineate areas that were best suited for processing site establishment based on topographical and hydrological characteristics.

Further Research

While this research has sought to identify and define the physical characteristics of rice processing infrastructure established along the Cooper River, additional research on this subject remains. One initial question raised in this research was: why were significant sites of market processing abandoned and their significance to South Carolina’s agricultural history not adequately studied? This question stems partly out of the comparison between these remnant sites and ruins of churches across the Lowcountry, like Biggins Church near Moncks Corner and Sheldon Church in Beaufort
County, South Carolina. Examining the conditions which resulted in the degradation of these processing sites may help shed light on historical memory and the rice industry in South Carolina.

Another avenue of research is to continue the exploration of additional mechanized rice processing locations presented in Chapter Four. While the information presented on these sites is merely superficial, further physical and archival investigation of each rice plantation is required. Such research is valuable as it will contribute to the collective understanding of rice processing along the Cooper River. A more detailed investigation regarding rice cultivation and means to process rice for market on all the plantations examined would yield insightful information. This research was unattainable given the limited scope and time requirement of this thesis.

More specific research into the data presented in this thesis is also a potential avenue for future research. Of particular significance is a deeper analysis of the arrangement of the plantation landscape including the primary dwelling, enslaved quarters, processing infrastructure, and other ancillary out-buildings. Questions directed towards the establishment of enslaved settlements near or distanced from processing infrastructure and how that reflects planter’s perception of spatial layouts, efficiency, mobility and power dynamics may offer deeper insight into organization on Lowcountry rice plantations.

**Conclusion**

Rice plantations characterized the landscape of the Cooper River during the Antebellum period. The Lowcountry’s topographic and hydrologic characteristics created
an ideal environment for the propagation of tidal rice culture. By the late eighteenth century, planters reaped the benefits of increasing rice yields facilitated by tidal irrigation. However, antiquated processing methods unable to effectively refine this valuable export commodity restricted its market preparation. The industrious agency of planters, inventors, and millwrights developed machinery capable of meeting the new demands of planters in order to export rice to transatlantic markets. The adoption of such machinery designed to leverage the abundant sources of water along Cooper River rice plantations is evident from 1780 – 1830. The establishment of these machines transformed Lowcountry rice culture and served as the precursor to more industrialized rice mills established in Charleston later in the Antebellum period.

The study of rice culture in the Lowcountry is a major component of South Carolina’s broader agricultural history. Previous research which focused on social, economic, and environmental components of rice culture have overlooked the more industrial aspects of its history. Porcher and Judd’s foundational work has provided a springboard from which additional research can develop. The intersection of rice culture, industry, and the built environment provide scholars an opportunity to advance a more complete view of rice culture history and how it shaped the Lowcountry.
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Appendix A

Historic Rice Plantation Plats
Figure 23: Joseph Purcell, A Plan of Lewis_Field Plantation Belonging to Keating Simons Esquire Containing in the Whole Nine Hundred and Three Acres Situated on the West Side of the Western Branch of Cooper River in St. John’s Parish, Charleston District, and State of South Carolina, John McCrady Plat Collection, 1556 (Charleston, S.C.: Charleston County Register Mesne Conveyance, March 1786).
Figure 24: Joseph Purcell, A Plan of Coming_Tee Plantation Situated on the North Side of the T of Cooper River, in St. John’s Parish, Charleston District, and State of South Carolina, Book D, Page 185 (Charleston, S.C.: Charleston County Register Mesne Conveyance, May 1786).
Figure 25: John Hardwick, Plan of Limerick, a Plantation Belonging to Elias Ball, Esqr. Situated on the Head Branch of the Eastern Branch, of Cooper River, in St. John’s, St. James & St. Stephen’s Parishes, Charleston District, & State of So. Carolina, John McCrady Plat Collection, 1541 (Charleston, S.C.: Charleston County Register Mesne Conveyance. June 1797).
Figure 26: J P, Plan of a Body of Land Divided into Three Plantations on Tracts Named the Hegan, Akinfield, and Moreland Farm Situated on the East Side of Cooper River, in the Parish of St. Thomas, Charleston District & Containing in the Whole 4,610 Acres, John McCrady Plat Collection, 1710 (Charleston, S.C.: Charleston County Register Mesne Conveyance, 1798).
Figure 27: Henry Ravenel, *Plan of Dean Hall Plantations Situated on Cooper River in the Parish of Saint Johns Berkley*, 32/139 (South Carolina Historical Society, March 1827).
Figure 28: Simons & Mayrant, *Plat of Cherry & Cedar Hill St. Thomas Parish South Carolina*, 32-88-03 (South Carolina Historical Society, 1906).
Appendix B

Digital Elevation Model of Analyzed Plantations
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Figure 48: Historic plat of Limerick Plantation overlaid on modern aerial. (Map by author)
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Geologic Map
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**Plats and Maps**

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Miscellaneous Plats and Maps


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