ARKANSAS HISTORIC PRESERVATION PROGRAM

Get Down the Shovel and the Hoe:
Cotton and Rice Farm History and Architecture in the Arkansas Delta, 1900-1955

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INTRODUCTION

The agricultural character of Arkansas is one of the defining traits of the state. Farming has been a primary catalyst in the formation of cultural and social networks statewide, but nowhere is its impact on the land more apparent than in the Arkansas Delta. In contrast to the mountainous northwest, which until the last two or three decades had not experienced excessive development, the eastern region bears the orderly scars of centuries of farming. The soil of eastern Arkansas that once lay beneath thick stands of hardwoods, prairie grasses and wetlands has been exposed and altered through the introduction of levees, channeling, timber clearing, crop rows and precise leveling - leaving a distinctive "table top" relieved by the forests and loess heights of Crowley's Ridge, in the northeast.

Arkansas encompasses several disparate geographic regions, which are then further categorized as Highland and Lowland areas. The Lowland area encompasses the Gulf Coastal Plain and the Mississippi Alluvial Plain. The Alluvial Plain envelops the eastern third of the state and is referred to as "the Arkansas Delta" by residents, though the real Delta of the Mississippi River only touches on the southeastern tip of the state. There are further environmental divisions applied to the region that make it much more than just "the flat side." The swampy St. Francis Basin begins at Crowley's Ridge in the northeast and runs east to the Mississippi River, and north to Blytheville from Helena. Crowley's Ridge is a distinct rise of loessel soil covered in timber running south from the Missouri border to Helena. The White River Lowlands are found to the west of Crowley's Ridge, extending west to the Ozark Mountains and south to the Grand Prairie, which is another distinct sub-region of the Alluvial Plain. The Arkansas River Lowlands cover the area south from Little Rock into Louisiana.[1]

Numerous rivers altered naturally and through human intervention, surge through the profile of the Delta providing essential and turbulent marks on the history of the region, earning it the designation "a land created by rivers." This apt description lends clues to the fertile draw for aspiring farmers as the rivers were responsible for depositing alluvial sand, silt and clay on

the land, replacing sand left by a receding ocean. The resultant deep soil cover has a coarse to fine texture and the profile of the land is largely level with gentle ripples breaking the monotony.[2] The Delta soil is ideal for a variety of agricultural commodities but historically and presently, the region is symbolized by two important crops that thrive in the clay-based land: cotton and rice. Twentieth century agricultural bulletins noted that cotton crops would be at an optimum if planted in sandy loam with clay subsoil or in a red or chocolate clay loam, typical of the type found in the Arkansas Delta.[3] Those deposits of clay formed an impermeable layer in the Grand Prairie creating flooded fields and a limited infiltration level, perfect for the growth of rice.[4]

Though both staples have dominated the agricultural history of the Arkansas Delta, their stories are marked by distinct differences. Cotton, of course, had played a prominent part in the lives of Arkansas farmers for decades prior to the early twentieth century introduction of large-scale rice farming. When the market for cotton was good farmers prospered, leading to a total financial dependence on the cash provided by the plant. The lure of ready profits and changes in the land eventually contributed to a single-crop system that held farmers financially hostage as the market went though its numerous fluctuations. Other factors such as the sharecropping system and furnish merchants tied thousands to the crop in a desperate struggle to provide for their families. It took decades for mechanization to fully encompass the planting and cultivating processes of cotton since the very nature of the plant and its impact on the human aspect of the economy presented special problems, keeping the production of cotton a low-tech enterprise well into the twentieth century. The mire of poverty in which cotton producers had become entrenched during the Depression years inspired scores of politicians and their constituents to lobby and labor for organization and accountability in markets. Though many planters were initially resistant to the steps proposed by formal government programs, they eventually embraced education and financial aid after World War II, enabling them to mechanize, diversify or expand into other uses for cotton. Cotton in Arkansas did not become a truly "modern" agricultural enterprise until the mid-1950s.

Commercial production of rice began in Arkansas in 1896 with the planting of an experimental three-acre crop in Lonoke. Initial success in potential large-scale farming of rice was not achieved until 1904, making commercial rice culture a relative youngster next to Arkansas cotton. While cotton farmers saw the need for organization by the mid-nineteenth

century and several attempts were made at that time to systemize the industry, poverty and racism kept Southern cotton planters in a state of disarray. In contrast the early twentieth-century success of rice in the Grand Prairie provided an immediate impetus for the formation of growing associations, agricultural experiment stations and the organization of rice mills. Mechanization played a part in the growth of rice from 1904, with pump wells providing irrigation. Although power on early rice farms was provided by horses, mules or oxen, such sources were replaced within the decade by tractors and gasoline powered engines. Ongoing research and experimentation have made Arkansas rice one of the state's largest crops and a major export commodity.

The markets for cotton and rice were responsible for the organization of levels of society, the establishment of towns, formation of government programs, political agendas and transportation networks in Arkansas. Countless man-hours were expended in the perfecting, planting and harvesting of cotton and rice and in the invention of machines, chemicals and new markets to make their growth easier, faster, prolific and profitable.

City centers in most of the Delta are reached by linear roads that bisect acres of systematic fields bordered by a hatchwork pattern of small tracts of remnant woods and man-made levees and ditches for drainage and irrigation. These miles of tilled fields seem to grip population centers within a moat of soil, not allowing visitors and residents to forget the lure of the Delta. Mills, gins, elevators and driers symbolizing the tenacious grips of rice and cotton appear on the horizon, comparatively looming above the plain. Wooden or metal barns and sheds historically or currently devoted to the day-to-day operations of harvesting Arkansas's premier staples shimmer and pop in the summer heat. These agricultural buildings are yet another characteristic of the region that helps to relate the history of the dominant farming culture in eastern Arkansas. A Territorial tune that proclaimed:

Hang up the fiddle and the bow:

Get Down the shovel and the hoe![5]

aptly described the atmosphere that allowed the slow, sometimes painful history of cotton farming and the comparatively illustrious story of rice farming to become symbols of the Arkansas Delta.

COWLESS, SOWLESS AND HENLESS FARMS: COTTON IN THE ARKANSAS DELTA, 1900-1955

EARLY EVIDENCE AND SPREAD OF ARKANSAS COTTON INDUSTRY

It was not unrecognized that the soil of eastern Arkansas was productive prior to the French period in the state. In the sixteenth century it was noted by the Spanish de Soto expedition that the Indians at the village of Pacaha on the Mississippi River were growing corn.[6] Most early eighteenth century settlers to the area from Europe and the eastern states either failed or were not interested in large-scale farming and many took advantage of what have been termed "primary windfalls." Copious supplies of game and streams bursting with fish and waterfowl required no exertion on the part of hunters and gave the illusion that life would always be so.[7] Money making ventures revolving around hunting were hatched in the Delta but were deflated by distance to markets and the persistent problems of flooding, violent crime, Native Americans disturbed by the influx of non-natives and malaria-carrying mosquitoes, all of which impeded the progress of settlement.[8] The swamps of eastern Arkansas were bypassed by initial white settlers, many of whom came to the Territory via Missouri in the north and headed to the west along the Southwest Trail. Those who traveled south on the Mississippi River would be daunted on the Arkansas side by the lack of landings and acres of forests rooted in soggy pools. The devastation of disease that throve in such conditions caused many to seek higher and drier ground.[9]

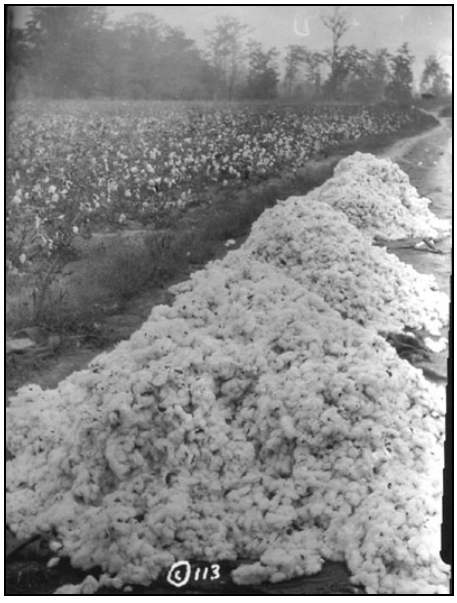
Even after the Louisiana Purchase very few migrants sought to institute large commercial farming concerns but continued to trap, trade and cultivate subsistence plots. Cotton used "for domestic purposes" was listed among the staples found in cultivation at Arkansas Post in 1805. Several people in the area were noted by nineteenth century entrepreneur John B. Treat as having planted cotton, but no gins had been constructed, which kept the growth of the industry in check for a few years.[10] By 1819 cotton was noted along the Arkansas River in southwest Arkansas by English botanist Thomas Nuttall, and in his opinion crops in Arkansas rivaled in quality those cotton plants found in Louisiana.[11]

Testimony regarding the increase in cotton farmers and cotton cultivation began to appear by the 1820s in newspaper and travel accounts of the state. An 1822 issue of the *Arkansas Gazette* made note of the tendency of Arkansans to "cultivate… large crops of cotton," and by 1825 the newspaper submitted that cotton was "the staple production of our Territory."[12] English

geologist George Featherstonhaugh wrote a mid-1830s study of Arkansas life that recorded the presence of several cotton plantations along the Arkansas River. His writings include an account of a day-long steamboat stop at Arkansas Post to load planter Frederick Notrebe's cotton, which was so abundant it would not fit aboard the boat in its entirety.[13]

The hold of cotton on the state was evidenced by political accommodation to agricultural interests. After Arkansas achieved statehood in 1836 the legislature created the ill-fated Real Estate Bank that catered specifically to planters. Collateral for state-backed bonds in the form of land, crops and improvements could be used to purchase shares in the bank. Branch offices were located in the main cotton-producing areas in the southern and eastern lowlands and by the next year the bank had accepted mortgages on 127,500 acres, all within thirteen cotton-rich lowland counties. The Real Estate Bank was liquidated in 1842 due to a series of mismanagement issues and the onset of a national depression, but eastern Arkansas continued to advance as the hub of cotton production for the state throughout the years prior to the Civil War.[14]

INSTITUTION OF THE COTTON PLANTOCRACY



The word *plantation* has evolved from its original definition as an "act of planting" to the modern designation of a large agricultural holding. Prior to the sixteenth century, "plantation" was broad enough to include a farm of any dimension, as in a personal subsistence garden or a grove of trees. The transitional meaning developed by the sixteenth century alluded to expansive holdings such as "a settlement in a new or conquered country."[15] Author Lewis Cecil Gray, defines plantations as a "capitalistic type of agricultural organization in which a considerable number of unfree laborers were employed under unified direction and control in the production of a staple crop." The number of slaves attributed to planter-level agriculturalists for the sake of categorization has often been fixed at twenty. While this could not be considered a definitive number, it most often indicated that a planter was engaged in the production of a large cash crop that required such a number of workers. Gray further breaks down plantations quantitatively as such: "Large

planters" held fifty or more slaves, "middle-class planters" might have held ten to fifty and "small planters" five to nine.[16] As slavery came to be replaced by the tenancy system, the word "plantation" transformed again to mean "a … farm having a labor force of five or more families."[17]

By the early nineteenth century, Arkansas settlers intent on assembling farms and plantations devoted to the cotton seed rather than concentrating on hunting and cultivating small garden plots began to occupy the eastern part of the state.[18] Planters who were previously established east of the Territory were able to use their accumulated wealth to locate cotton plantations in the territorial Delta because they could live elsewhere while their slaves exposed themselves to the unhealthy and dangerous job of preparing the land. In fact, if one lacked the means and the slaves the swamps would cause suffering and death for poor farmers and their families who attempted to work the land, beating out any ambition they may have possessed prior to settling in the Delta. Many such families were forced to abandon their efforts and begin anew in safer and drier regions.[19]

As the agricultural potential of the Delta lands became more widely known efforts to conquer the soil increased and obstructions to settlement were dealt with swiftly. Native Americans were an early impediment to the spread of cotton in Arkansas as they were settled on prime cotton-growing land. Territorial Secretary Robert Crittenden wrote to Secretary of War John C. Calhoun in 1823 that Quapaw Indians had laid claim to approximately two hundred and fifty miles south of the Arkansas River and as far north as Little Rock. This land was "… high, rich and immensely valuable." Crittenden pointed out that the staple crop in that region was cotton and that the river was accessible nine months out of twelve throughout the Quapaw claim.[20] The course of events regarding Indian land claims is well known and as was the norm in the early history of the United States and Arkansas anything of value to white settlement would soon be commandeered from Native Americans.

With Indian removal in the 1820s freeing up land in Arkansas, many eastern counties were settled by squatters who were knowledgeable of federal preemption laws allowing pioneers established on unsurveyed public domain to have first rights of purchase at the minimum price. However, title acquisition was soon out of the question for most because of a stalled economy; therefore, many original settlements in the southeast counties of Phillips, Chicot, Ashley and Bradley were created by squatters. Many among this group were considered lower-class and

were categorized as agricultural laborers, subsistence squatters and drifters. Haziness regarding the public domain of Arkansas encouraged not only the poor but the connected wealthy to seize land by forming a force of influence and power to often make outright illegal deals benefiting themselves through the underhanded acquisition of property.[21]

A third group consisting of middle-class men and women laid claim to much of lowland Arkansas soil, settling in the state with the intent of self-sufficiency rather than participation in production for an international market. They were categorized as yeomen, who were differentiated from the plantocracy by their aversion to participation in the planter practice of infrastructural domination for slave-produced cotton at the expense of varied commercial and industrial expansion. Yeomen-level farmers concentrated on "economic self-sufficiency" through the raising of an assortment of crops and livestock. Cotton and slavery on a small scale was not unknown on such farms but it usually provided only secondary profits.

The plantocracy of the New South (1880-1940) emerged from the seventeenth-century Chesapeake and South Carolina low country, extended south throughout the eighteenth century and reached the last migration boundaries of Texas and Arkansas by the nineteenth century. The new wave of planters in Arkansas was said by author Donald McNeilly to have been largely formed by the frontier. Varied backgrounds made up a class created from descendants of Old South (1600s-1865) planters, speculators, doctors, lawyers and former yeoman farmers attempting to elevate their station. Crude and unrefined, they were less educated and possessed fewer slaves and smaller landholdings than their Old South counterparts. Yet this group of agriculturalists was able to come together and dominate the governmental and economic functions of the state in order to establish themselves as raw ruling elite.[22]

Favorable environmental conditions and increased specialization fueled by international markets for cotton allowed the full flowering of planter society in eastern Arkansas by the 1850s. After the sixteenth-century introduction of Indian cotton to Britain, the demand began to outpace the supply and by 1800 British steam mills were begging for increased output. In the meantime the United States had become the world's major supplier of raw cotton, which allowed the young nation to step in and provide a never-ending supply of the fiber for British textile mills. The availability and ideal composition of land in Arkansas allowed the state to take its place among the leading providers of cotton.[23] Most of Arkansas was amenable to the raising of cotton because of the soil and climactic conditions but the Delta of Arkansas was the most prolific,

producing one and two bales per acre. This stood in contrast to the less fertile Prairie and Plains areas, which produced only a half-bale per acre and the northwestern region, whose thin soil did not attract large-scale planters.[24]

SIGNS OF GROWTH IN PLANTATION AGRICULTURE

In the years prior to the Civil War cotton became the number one staple for Arkansas. None of the other commodities raised in the state could achieve the returns of ginned cotton, which reached $16,165,292 for 367,363 bales by 1860. While a working plantation required production of livestock and other commodities to sustain the slave force and the family, cotton provided the ready money to support and enlarge the plantocracy's holdings. It was the belief of the majority of agriculturalists in the 1850s that cotton was the primary method of enriching themselves and at this time plantations began to outgrow general farming operations in terms of acreage, slaveholdings and importance placed on cotton in relation to other crops.[25]

From 1840 to 1860 agricultural specialization began a trend away from Arkansas lowland subsistence farming and toward the principal concentration on a single cash crop of cotton. A number of factors served as indicators that economic expansion was allowing cotton to come into its own as a staple. By 1860 increases in the lowland population raised the total number of inhabitants to a little over half that of the entire state; 87 percent of the state's slaves were located in the eastern counties; median eastern landholdings were larger than those in the highland counties; the number of cotton bales produced per one hundred persons in the state experienced a per capita increase of more than five times; the number of farmers considered planters (holding twenty or more slaves) grew to 12 percent of all slaveholders in the state and subsistence crops like corn and livestock decreased in overall production in comparison to the production rates of cotton.[26]

Evidence of an economic boom fueled by Arkansas agriculture can be further deduced from statistics that demonstrate the lucrative effects of farming on the overall economy by the 1860s. In 1860 the average value of Arkansas farms had reached $2,712, up from $859 in 1850. Per capita value of real estate increased $88 and personal property grew by $244 during that decade. Ninety-eight percent of the capital invested in the state was represented by land investments, farm implements and farm improvements. The white workforce engaged in

agricultural pursuits numbered 70 percent by 1860 and the overwhelming majority of black laborers were involved in agriculture as well.[27]

In the 1850s the population of slaves in Arkansas more than doubled and in some lowland counties the total of slaves reached a majority. Planters with large slaveholdings in the lowlands were increasing and those who owned twenty to fifty slaves soon reached 167 percent of the lowland population.[28] Delta plantations were the primary producers of cotton across the state and though the large slaveholding operations were not a majority among the farming units and usually owned less than half the land in the cotton-producing counties, the numbers of bales they generated bore out the fact that cotton was the dominant crop in the state.[29]

ESTABLISHMENT OF THE INDIVIDUAL COTTON PLANTATION

The importance of cotton to the economy of Arkansas gave rise to government programs implemented in the hopes of luring more settlers to the state and providing farmland for the state's favored flower. In 1850, 8.6 million acres of federal land was given to the Board of Swampland Commissioners, which sold it in order to raise money for levee and drainage projects. Another attractive enticement to settlement was the sale of land surrendered to the state for unpaid taxes. The Donation Act of 1840 provided each member of a family, including females, 160 free acres for payment of future taxes. Stipulations were that residents were to live on the land and make improvements.[30]

Chicot County planters gathered their forces in 1840 to push for a state law providing for a county levee commissioner who provided the plans for construction of a flood-protection system. Under the system local residents would provide the labor and taxes to fund the required work. In 1841 construction began on 110 miles of earthen levee along the Mississippi River in Chicot County. Slaves of planters who lived along the river erected levees on private land while tax assessments provided for contractors to build public levees. Such alterations to the wetlands of Arkansas cleared more acreage for agricultural purposes, buoyed the success of large planters and attracted other investors to the state, thus the establishment of substantial cotton plantations began.[31]

CLEARING

Cleared land was important to planters of large-scale operations for obvious reasons and improvement was the first arduous step toward establishing a plantation. Most planters would arrive with their slave force on newly acquired land in late winter or at the latest, early spring to begin clearing efforts. The first step was to fell large trees that could be used for other clearing tasks, then to remove underbrush by "grubbing out" with hoes and burning. Smaller trees and saplings that had lived in the shadow of old-growth trees were then cut down, cured and utilized for fuel. Any large trees that were left would be "girdled" by cutting through the bark with axes about thirty inches up from the ground to kill them. After a time the tree would die and be weakened enough to fall by itself or be more easily removed within a year. Arsenic could also be used to kill trees but by either method of removal stumps would remain in the ground to rot. [32]

After the burning of any remaining brush piles a fence would be erected around the field and the land would be prepared for plowing. Often a planter might rent previously cleared land in order to get a jump on the cotton crop and begin bringing in preliminary cash returns. Whatever crop was planted the first year would be considered payment for the costs of clearing the land and purchasing supplies for the slaves and the household.[33]

SEEDBED PREPARATION

Cotton is classified as a vegetable fiber or lint attached to the seeds of the various plants of the *Gossypium* genus. Initial cotton varieties in the Colonies were probably produced by crossing West Indian cotton with South American species and species that exhibited a short staple (length of fiber) and green seeds to which the fiber was firmly adhered. Other varieties, likely produced from West Indian cotton, generated a long staple and smooth, black seeds. In the seventeenth century cotton seed was imported from Cyprus and Smyrna, now Izmir, Turkey, while farmers in Louisiana conducted experiments with Nankeen and Siamese cotton in the late eighteenth century.[34]

The green-seed variety, also known as upland cotton, could be grown in a more widespread area than black-seed, or sea-island cotton, which only prospered on coastal islands of Georgia and South Carolina and certain lowlands. Green-seed did not bring in as much cash as black-seed but it could yield more per acre. When the eighteenth century invention of the cotton gin made the separation of short-staple lint easier and more profitable, it became the favored plant of the Cotton Belt until the early years of the nineteenth century when Mexican seed was introduced. The earlier varieties began to exhibit a shorter staple and the pods impeded picking because they did not open very wide. Black-seed cotton pickings per hand totaled only 30 to 40 pounds per day and green-seed 75 to 100 pounds. In contrast Mexican cotton produced wide-open bolls, which enabled pickers to produce 150 pounds, soon growing to several hundred pounds per picker per day.[35]

Cultivation and planting of cotton in the United States underwent an experimental phase in the years after the invention of the cotton gin. The earliest method was to raise the cotton plant in a garden within small patches and the same planting technique was uniformly applied to differing varieties. After 1800, planters gradually ascertained the proper planting process and came to embrace systems that were adapted to diverse varieties, which endured into the twentieth century.[36]

Seedbed preparation was the first essential step in cultivation practices on large plantations taking place in the late fall after the complete picking of the last year's harvest. Stalks remaining from the previous crop were cut or beaten down with clubs and were plowed under to provide humus. On some farms crop rotation involved the planting of winter legumes such as vetch, bur clover or cowpeas in the fall to furnish nitrogen and organic matter. When no cover crop was planted the ground would be broken during the period from January to March. [37]

Breaking the compacted land for planting would take place as early in the season as possible, and preferably when the ground was not wet. This process would involve a turning plow that would scrape the dirt with a moldboard, a curved board that turned over the earth cut by the plowshare and threw it in one direction, usually to the right. If the land needed leveling a *smudger* might be used. This implement was composed of two evenly spaced parallel logs secured by a pair of straps and hitched to oxen, mules or horses. The smudger could also break up dirt clods while flattening uneven fields. In preparation for planting, a *middle-busting* plow comprised of two folded wings that threw the dirt to each side would provide a furrow for

planting seed. The disk and harrow could also be used to throw up a planting bed, level the surface, insert previously spread seeds or fertilizer and cultivate small weeds. A tool similar to a plow called the *cotton scraper* would be used to sustain the v-shaped ridges produced by the middle-busting plow.[38]

Fertilization would precede the planting of seeds. Freshly plowed lands sometimes were not fertilized but other methods besides plowing under stalks were the use of barnyard manure and composts, swamp mud and sometimes lime. By the 1850s guano was coming into use and agricultural bulletins of the early twentieth century listed manure as the best fertilizer for cotton. Short stalks of cotton were composted in the field with manure, which facilitated rotting, returning organic matter to the earth. In areas composed of clay loam rock phosphate would be added to the compost. At this point a rounded block of wood fastened to a plow or a flat board pulled by horses over the furrows could be used to work in the fertilizer.[39]

PLANTING COTTON

The season for planting cotton spanned the first of March to the first of June but in Arkansas the bulk of planting took place between April 20 and May 10. It was recommended that the soil should be plowed to a minimum depth of six inches and a maximum depth of eight inches. Plowing in the fall was not to be followed by harrowing in areas composed of sticky clay soil, as was the case in the majority of the Delta, because the process would cause soils to run together and become too compact. Regional climactic conditions could dictate differing planting times but it usually commenced when the soil reached sufficient warmth for germination. *Bedding it up* or *hill and furrow* was a frequently used planting method in Arkansas, whereby two ridges were thrown together forming a low hill allowing air to circulate and water collected in the furrows to penetrate to the roots. By this technique four to six furrows at a varied distance would be thrown up toward the bed's center. Row width would differ according to predicted weather for the planting season because farmers wanted to enable the young plants to make the most of rainfall; thus they would be placed farther apart for dry weather and closer for a wet season. Ideally, one acre could efficiently contain half a bushel of cotton, which would prevent extreme thinning and would bring the bed to its full production.[40] Before mechanization furrows would keep mule-drawn plows on a straight line and prevent the animals from stepping on young

plants. However, this configuration remained in use even after tractors became prevalent in the mid-twentieth century.[41]

Early seed planting was sometimes done by *dibbling*, using a pointed, hand-held hoe called a *dibble* to make holes for the seed. This was very labor-intensive and time-consuming so most farmers only used this method for filling in holes in a crop or to plant a small garden. Prior to the Civil War planting would involve covering seed by kicking the dirt into the hole with the feet, a harrow, a hoe or a turning plow. The majority of planters used a press drill, also known as a seed drill. The development of this technology around the end of the Civil War allowed the use of horses or mules, thus speeding up the process. It also allowed farmers to plant seed at more uniform depths through the use of a series of runners, or drills that opened furrows prior to the dropping of the seed. A succession of metal discs or *presses* placed behind the runners would cut the sides of the previously opened trench and cover the seed. The uniformity of depth provided by the drill allowed seeds to germinate properly, preventing waste, making efficient use of soil moisture and producing larger yields.[42]

CULTIVATION

If the weather allowed, the young cotton plant would break the surface and take the form of a small, two-leaved flower resembling a hibiscus within a week or ten days. The first cultivation was termed *scratching around* and was undertaken as many times as required to keep weeds back until the cotton plant held enough leaves to throw shade. It was recommended that subsequent cultivations should be performed after rainfall to discourage weeds, break up the soil and circumvent evaporation.

Cultivation began in earnest about three weeks to a month after the planting of the seed. The first job, which needed to be completed by July, was to thin out or chop the stand of cotton with hoes to eliminate cotton-strangling weeds and crab and Johnson grass. Better yields would result if cotton was culled down to about one plant every eight to twelve inches. Plowing might take

place prior to chopping, during the operation or just after to loosen soil surface. Cultivation continued with six or eight plowings, each run being shallower than the last. Stand yields would be enhanced by regular cultivations as it prevented the depletion of plant food and moisture by weeds that could stifle the young cotton plants.[43]

The prominent method of cultivation in the eighteenth and nineteenth centuries was by hand with hoes. Animal-drawn implements attached to *Georgia stocks* – general-purpose frames for the attachment of differing equipment - came into use by the twentieth century for shallow cultivation. The level, loamy soil of Arkansas was suited for the scraper, skimmer and sweep - points and tines of different sizes and angles large enough to clean weeds. After scraping or throwing dirt to the cotton, a bull-tongue plow could be utilized for *barring off*, or digging ditches around rows to allow for drainage and to warm roots. By the middle of July the crop was ready to be *laid by* until the end of August, a period of rest for farmers and hands during which the stand was allowed to mature.[44]

After seven to ten weeks *squares*, which consist of a bud encased within three folded leaves, emerged. The square opened into a cotton bloom that lasted for three days, at which time it dropped off and a pod appeared. Within forty to seventy days a mature cotton boll presented and the next, most well-known step in the process was ready to commence.[45]

PICKING COTTON

Picking the crop in Arkansas usually began about the end of August and often continued until December. Cotton bolls do not open simultaneously; therefore cotton crops required at least three pickings, sometimes more. The bolls that appear first were referred to as the *bottom crop*; the next group, the *middle crop*; and the third was called the *top crop*. The best quality cotton came from the bottom and middle crops, while the top crop usually contained immature bolls, which was ginned separately so it would not degrade the market value of the entire stand. Historically, the process of picking was entirely done by hand and it remained so in some areas into the 1950s despite early repeated efforts to invent mechanized cotton pickers. The most familiar picture for many is that of pickers stooped in the field trailing large white cotton sacks behind them. Cotton sacks of heavy ducking came in varying lengths from three or four feet to twelve or fifteen-feet long by sixteen or eighteen-inches around. Sacks could be bought ready made or they could be sewn from ducking material. A strap attached to the open end of the sack

was slung around the neck to rest on the shoulder. Children would use the smallest sacks while faster, more proficient pickers used the larger ones.[46]

Cotton bolls were found in the center of the plant and usually about a foot from the ground. Open bolls were called burrs and were made up of five compartments, each containing a lock of cotton lint. Pickers would use both hands, by pulling the lock from the plant with their left hand and passing it to their right hand in order to drop it in the sack at their right hip. Cotton picking was a slow, long day's work, however labor would often be interrupted at noon to allow pickers and mules to rest for a couple of hours after which they would continue picking until dark. As bags were filled workers would empty the cotton into a sheet or basket placed among the rows. After emancipation, laborers and sharecroppers would present their bags to a weigher known as a *strawboss* in order to be paid. Harvested fiber could be stored in cotton pens - small, moveable buildings placed at the end of the rows - until it could be transferred to the gin. The picked cotton would be placed on scaffolds for drying, which would be facilitated by a hand that would turn the cotton with a rake. This action would also aid in removing trash. The cotton would be taken from the scaffolds to the gin house via wagons, which usually contained a bale of lint and almost half a ton of cotton seeds. Late summer would signal the beginning of the ginning season, which would continue into the winter or until all cotton had been processed and shipped. Larger plantations would have their own gin, which sometimes would offer their machinery to neighboring farmers for one-eighth or one-tenth of the proceeds.[47]

HISTORIC PLANTATION CAMPUSES

The twentieth and twenty-first century industrial manifestation of the cotton plantation is akin to the cluster of multiple buildings serving several functions grouped around the headquarters, or the home of the owner or overseer on early farms. Today's complexes contain central offices, surrounded by gins and seed and bale warehouses. The group of buildings that served the cotton planters in the nineteenth and early twentieth centuries has been described frequently as a campus. Old South-era farms would contain buildings that would be utilized for the day-to-day subsistence functions of those slaves and family members who resided there as

well as those dedicated to agricultural tasks. The system of sharecropping and farming co-operatives left impressions on the farming landscape as tenant housing replaced slave quarters, yet both systems tended to retain their traditional configuration, which has been described as *nucleated* in that they remained juxtaposed to the headquarters area. Tenant housing was more widespread but they were still within the boundaries of the owner's land.[48]

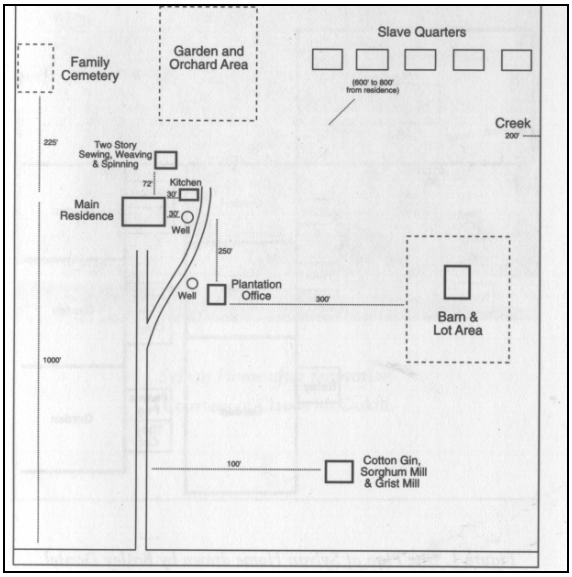
This pattern was a typical characteristic of larger cotton plantations found in the East. The complex would usually be concentrated around the main building from which management operated, whether it was the owner's home or the overseer's residence. In Arkansas the owner's dwelling could be a log house of one or two pens, a two-room, central-hall plan of brick or a substantial two-story home exhibiting the latest high-style architecture. Often, homes on such operations followed a progression from the modest, rustic dwellings of newly-settled slaveholding yeoman farmers and small planters to larger, vernacular or in fewer cases, high-style residences of established plantocracy.

Many plantations in the Cotton Belt of Arkansas were composed of simple, utilitarian structures that were discarded periodically as planters moved to fresh parcels during a new planting cycle. Some farmers might create an estate using the template of large, established plantations and distribute a collection of buildings along the same lines; however the result would commonly be unsophisticated in comparison. The memories of Harriet Bailey Bullock Daniel, daughter of Dallas County planter Charles Bullock, chronicle stylistic transformations in her father's antebellum homes and provides a map of the Bullock plantation campus in the vicinity of Tulip, Arkansas. Upon Charles Bullock's decision to settle in the state, he purchased two-thousand uncleared acres with a home described by his daughter as, "a small two-room log house, with stick chimneys and with wooden shutters for windows." Soon after the birth of Harriet the family moved several miles away to "a large two-room comfortable house, with a jump above, and a shed the length of the house at the back." The intent of this building was ultimately to serve as a weaving room, but it provided an interim home – referred to by Harriet as the "shack" - until Bullock constructed a two-story, six-room frame house with, "two wide halls, dressing-rooms and closets."[49]

A site plan of the "Old Bullock Home Place," provided a characteristic example of clustered antebellum farm operations featuring the Bullock house at the nucleus of the complex. The kitchen, well and weaving house each stood less than one hundred feet to the side and rear,

or northeast, of the main home. A garden and orchard area and the family burying ground were situated approximately two hundred fifty feet to the rear. A row of five slave quarters was erected east of the garden and about six hundred to eight hundred feet behind the house. The plantation office was placed to the southeast at a distance of two hundred fifty feet. The barn and lot area was three hundred feet east of the office and the cotton gin and sorghum and grist mills lay at the outermost, southern boundary of the farm.[50]

This orderly pattern had its roots in English manorial examples, which reached the United States by the end of the seventeenth century. Well-to-do planters in the East imported English architectural influences and spatial configurations drawn from the symmetrical dictates of the Georgian mode, which called for "the predictable order of a house's façade" to be transferred to the garden areas and, "as far as was reasonable, to the layout of the entire estate." Seventeenth-century books also imported English landscape tenets, transforming pioneer plantations into imitations of European baronial estates.



The arrangement of plantations has been presented as psychological mind-play on the part of planters. Factors such as limited access littered with *threshold devices* like gates, drives, forecourts, steps, terraces, porches, passageways and doors, were used to put visitors in their place and assert the importance of the owner. In several descriptions of Arkansas plantations the house was usually placed on a hill above the slave's quarters and outbuildings. Being short of substantial hills in the Arkansas Delta, homes like Colonel Terence Farrelly's Mound Grove in the vicinity of Arkansas Post were sometimes constructed on Indian mounds. (From a practical point of view, this could also serve the purpose of catching any breeze and aiding in run-off of rainwater).[51]

Old South cotton plantations have been likened to miniature towns because they contained a variety of buildings that served a wide spectrum of purposes from those that were utilized strictly in the production of the plantation staple and the maintenance of the draft animals who powered the farm machinery, to those buildings dedicated to production and

preservation of food items and storage. An observation of Southern farms by a Union officer recorded that, "They have a queer way of building on one thing after another, the great point being to have a separate shed or out-house for every purpose…" Architect Benjamin Latrobe offered that the juxtaposition of outbuildings to the main house were "as a litter of pigs their mother."[52]

The various buildings that were situated closest to the main house on a plantation composed *the yard*, which was considered a work area set aside for the execution of duties performed by slaves as requirement for upkeep of the headquarters. The extensive scale of work necessary to care for the planter's family often meant that many household duties were performed outside, thus space between buildings in the yard was not thought of as dead air between workbuildings, but as part of a communal work area that was utilized on a daily basis. Outbuildings serving various purposes could serve as boundaries between the planter's personal space and his fields. Numbers and dimensions of buildings would vary according to size and insularity of the plantation and in nineteenth-century Arkansas a common alignment would be rows of outbuildings parallel or perpendicular to the main house.[53]

The order exerted over the tumble of nature and its presentation to the community served to glorify the plantation principle. Few cotton plantations in Arkansas were likened to English estates, but the Anglo-Saxon *block plan* (buildings clustered together in a tight, gridlike formation) found in England was a common geometry among the Delta holdings of Old South Arkansas planters. This pattern, however, underwent a transformation after the Civil War with the institution of the tenant system.[54]

TURN-OF-THE-CENTURY CHANGES IN THE CAMPUS

As former slaves began to be utilized under tenure or rental arrangements, large plantations would be split into smaller units. While slave quarters were still extant on the plantation the newly freed sharecroppers would typically avoid them in favor of new, but often poorly constructed tenant houses placed further away from the main house. This movement altered the typical formation of the campus and has been attributed to the desire of the formerly enslaved tenants to escape the constant scrutiny of the planter and exercise their recent freedom. Another influence on this fragmentation was the need for tenants to be nearer to the fields in which they worked.[55] Tenant houses that were still in existence at the Dortch plantation in Scott,

Arkansas, when the district was listed on the National Register (03/21/79) reflected this change. A map of the district located housing to the north and east of the main house on two separate roads at distances ranging from less than a mile to approximately two miles, which was in contrast to the six hundred to eight hundred foot separation of slave's quarters on the Bullock campus mentioned previously.[56]

Other utilitarian structures on the plantation campus were relocated from their traditional spaces as well. Tenancy figured in these reorganizations but other factors like the re-emerging prominence of the railroads and an increasingly intricate agricultural infrastructure played a part also. The gin house, which was formerly an essential feature of the plantation, began to appear more often in central locations within communities. Known as *ginneries* or *custom gins*, by 1910 these facilities came to be linked with other commercial and industrial areas of farming like cotton buying, fertilizer production and cotton seed processing. With the decentralization of the cotton gin came government-controlled cotton storage warehouses and corporate cotton compresses in manufacturing and business centers of cotton towns and within the first decade of the twentieth century the gin was more commonly divorced from the plantation.[57]

The landowner did, however, retain individual control over certain aspects of the farming process, which was expressed in the placement of other farming structures on the plantation grounds. Equipment and mules were still stored in close proximity to the owner or manager's home so the use of these resources by sharecroppers could be monitored. Wagons used to transport cotton to the ginnery would be obtained from the main barn of the plantation and harvested cotton would be stockpiled in small cotton pens in the plantation's fields. Despite the disengagement of cotton processing buildings from individual farming concerns in the Delta there was still need for a variety of agricultural structures on the twentieth-century plantation.[58]

CHANGES IN COTTON GINNING AND CULTIVATION

The slow, grueling, physical act of cotton farming in early Arkansas characterized plantation life into the twentieth century and was one factor in the tendency of many farmers to become mired in a one-crop economy. Efforts at improved agricultural machinery sprang from the minds of farmers and inventors beginning in the mid-eighteenth century; however, cotton cultivation remained a relatively primitive practice performed by hand labor, mules and hoes up to the 1930s. Ginning and crushing aspects of the process of cotton farming advanced fairly early

with the late eighteenth-century invention of the saw gin, the 1885 invention of system ginning and the late 1880s use of steam engine power for cotton oil mills. Despite these improvements the continued need for hand labor remained concentrated in cultivating and harvesting. Small steps toward progress in other areas made the labor performed by the traditional worker a little easier and the yields more profitable, yet the production process of cotton did not appreciably change until technology and cultural and economic factors finally came together in the 1940s for the provision of a mechanized solution to cotton farming's problems.[59]

DELAYS IN MODERN MECHANIZATION OF COTTON CULTIVATION

Several issues have been cited as influences in the delay in mechanization of cotton farming. Institutional traditions such as the plantation system, slavery and the credit system kept the Cotton Belt trapped within a single-crop economy as the rest of the nation was making industrial and agricultural advances. Environmental factors also played a part in slowing progress. The geographic distribution of the Cotton Belt introduced a variety of problems for mechanization in the form of soil and climate diversity, varying terrain and differing genetic and fruiting characteristics of cotton. Farmers adhering to traditional cultural practices also prevented the timely spread of modernization.

The varying makeup of soil within the Cotton Belt meant that someone looking to mechanize cotton harvesting would have to take into account the plants and yields produced by different farming regions. As a partial result of differing soil characteristics plants could exhibit varying growth patterns. Across the Cotton Belt one could see plants variously characterized as low, scrubby bushes, tall plants with wide branches or plants with no leaves but stalks heavy with squares.

Engineers had success introducing and utilizing certain types of picking machines in areas where the soil could support such an exercise, such as the flat plains, however tests of spindle-type cotton pickers conducted in the Mississippi Delta proved that the "gumbo" and "buckshot" clay of the soil in the area could not withstand the five-ton machines when the ground was wet.

Cotton varieties in America produced plants with very distinct characteristics and yield levels. Cotton plants that contained leaves with hairy undersurfaces were desirable to farmers; however, they were not conducive to clean picking by machine. Smooth-leaf plants were introduced but yield results were poor. Mechanization had to await trial tests until such time as a cotton variety was achieved that could be cleanly picked and also exhibit prolific yields, proper staple length, spinning quality and resistance to disease. The fruiting personality of cotton also impeded mechanization due to the fact that bolls opened at differing rates. Picking could not be delayed as ripened cotton would be susceptible to injury from exposure, thus the reason for hand pickers entering the field up to five times in order to gather all the undamaged lint. Mechanical pickers would be expected to pick the earliest burrs without doing damage to the unopened ones still on the plant and eliminate green leaf trash to avoid staining the lint. Also vines and tall grasses could jam revolving parts of cotton pickers and if allowed to mix with lint, could prove complicated to remove.

Farmers introduced plant diversity that slowed mechanization through planting practices that were sometimes based less on scientific fact as they were on cultural practices transferred through migration or dissemination through local social networks. Changes in such practices were slow to reach the population and took some time to be recognized so farmers adhered to a great variety of beliefs as far as planting techniques. This would cause a delay in mechanization through the need for manufacturers to be assured of a mass market before they introduced a complex, costly machine in the Cotton Belt.[60]

THE IMPACT OF TENANCY ON MECHANIZATION

The repercussions of the Civil War intensified institutional and cultural faults in the South that allowed unrelenting poverty to play a part in the lack of mechanization. The South was so stunted economically by the war that despite a measure of post-war recovery, the region could not enter the Industrial Era. The supply of capital for future farmers in the South was also eliminated by the war and emancipation. After the end of the Civil War farm size in the South dropped and by 1900 the average acreage per farm in the Mississippi River Delta region encompassed less than 100 acres. Cotton production recovery did occur in Arkansas within a relatively short period but other factors such as declining per capita income and farm value still plagued the South.[61]

Though the Civil War brought an end to the traditional cotton plantation worker held in servitude, the cotton plant continued to endure and the need for a sufficient labor pool introduced a new dynamic to the history of the Delta in the form of tenancy. Agriculture was the backbone of Arkansas's economy from the early nineteenth century into the twentieth century and tenancy enabled it to maintain its position. After the Civil War, tenancy offered those poor Southerners that were unable to accrue enough capital to become planters or yeoman farmers a place on the agricultural ladder. The position they occupied, however was not a progressive one as many factors kept the tenant trapped in a harsh cycle from which he could not break free. By the turn of the century tenant houses had replaced slave's quarters on the plantation campus but their residents remained enslaved to the poverty of such a system.

Some historians believe that the Cotton South was inherently backward due to the tendency of many agricultural workers to only expend enough energy to provide a subsistence living. This tendency toward "preferred peasantry" was advanced as one reason income figures remained low. However, this does not take into account the psychological barriers of a life that seemed to consist of nothing but another year of hard work and debt, as well as environmental and dietary circumstances that contributed to medical conditions, such as malaria or pellagra, that could be taken for indolence. Illiteracy and the monotony of a single-minded existence also played a part in this apathy, which transferred to the community in low numbers of churches and under funded schools.

The crop lien and furnish merchant arrangements ensnared tenant families in another dead-end cycle. Accumulated debt owed to the furnish merchant for clothing and food purchased against future crops with exorbitant interest rates piled up and effectively stopped the ready rise of the farmer. The sharecropping system was the least efficient solution to the void left by emancipation as such workers were largely migratory and did not develop an allegiance to the land they worked. The soil was not preserved through the rotation of crops or investigation into scientific advances that would give a persistent yield because the tenant would soon be moving on to more fruitful land. For this reason sharecroppers also could not take on livestock to supplement their production, resulting in "cowless, sowless, and henless" farms that did not provide the family with nutritious diets or alternative financial resources.[62]

While tenancy was a major factor in Southern poverty and the delay in mechanization, it was only part of a larger problem, which was that there were simply too many agricultural

workers and not enough productive land. Planters who utilized sharecropping did their part to impede mechanization because they were saving money by hiring cheap, abundant labor so there was not a perceived need on their part to move to machinery. Farmers' relief organizations like the Grange and the Farmer's Union were formed by the late-nineteenth century but none reached a substantial measure of success at that time. Scientific information for the improvement of agriculture was made available by the 1880s through experiment station bulletins; however, such efforts continuing through the early twentieth century that preached diversification and scientific farming could not convert many Southern farmers who were loath to abandon their traditional methods.

With the coming of the Great Depression the struggle of Arkansas farmers came to a head under the collapse of cotton prices. Being the worst crisis in a line of such detrimental events, such as the cyclical undulations of the cotton market, boll weevil infestations and post-Civil War and WWI recoveries, economic events would not allow the South to bounce back without the help of the federal government. The Depression provided the impetus for President Franklin Roosevelt to institute his New Deal program of federal aid and opened the gates for programs designed to assist the farmer, many of which were abandoned after it became evident that such incentives were benefiting large landholders and crushing smaller farmers and sharecroppers through abuses of contract stipulations and non-distribution of federal benefit payments.[63]

In the early 1930s many croppers were displaced through evictions. In answer to the needs of increasingly destitute agricultural workers the Southern Tenant Farmer's Union organized strikes for increased wages and the Resettlement Administration attempted to relocate landless farmers and provide instruction in improved cultivation methods. Both organizations advocated and administered farming co-operatives. Co-ops were collections of single-family homes and farming plots on federal land. Community and co-operative services like equipment, gins, stores and schools were collectively owned by the residents and profits were divided among them. In most co-ops each individual plot was the responsibility of the farmer and the project was based on land division and redistribution. Among the three National Register listed projects in Arkansas – Plum Bayou, Lake Dick and the Dyess Colony - the Lake Dick co-op in Altheimer differed from the others in that the acreage devoted to the raising of crops was jointly worked and owned by all project residents and cash wages were paid for jobs performed by each man

under the co-operative work system. These projects did not make great inroads into the massive debt problems of the South's farmers but it did allow some to pay off federal loans for the purchase of their co-operative homes and establish themselves as property owners with income-producing land after such operations were liquidated.[64]

Despite the repeated efforts of the government to provide agricultural assistance, the overwhelming number of cotton farmers in the South by the late 1930s continued to struggle and modern farming methods through mechanization remained elusive. Several ongoing tribulations of the small farmer and tenant were outlined in a 1938 National Emergency Council report to President Roosevelt on the economic problems of the South. It was noted that the birth rate of the rural South was higher than any other region. In the 1920s planters would find such prolific reproduction a desirable trait in tenant families because they could use each and every member to pick cotton. In later years such numbers saturating the region could not be absorbed by a few industries and shrinking farms. Large planters who could afford to convert to machinery also put many men out of work. Unemployed farmers who moved to Southern industrial jobs were paid the lowest wages in the United States. They were considered unskilled and easily dispensable, so their positions were tenuous at best. Inadequate wages from seasonal agricultural work and part-time industrial work subsequently did not allow farmers to invest in their own land and equipment.

Small farmers who stuck to the single-crop market of cotton opened themselves up to the intrinsic risks of such a venture. Bankers and businessmen were linked to the farmers through those same risks, which meant that any financing would come with high interest rates because of the South's inability as a whole to accumulate its own capital. Local banks could not provide credit for all requests because the peak application period was in the spring and summer when deposits were smaller. To meet demand Southern banks turned to outside financiers, bringing loss of local control. Foreclosures as a result of the failure of farmers to pay mortgages would push many off their own land into indenture to another. With this indenture came the pattern of moving every few years, introducing more cost to the family. These patterns persisted throughout the 1930s and early-1940s despite federal assistance and educational programs regarding land improvement and mechanization. The situation would not change until WWII introduced avenues for the absorption of landless farmers in industry and diversification

opportunities for those who met the war's agricultural demands, which allowed mechanization to take root and proceed at an increasing rate.[65]

STEPS TOWARD TWENTIETH CENTURY MECHANIZATION

The recognition that labor problems needed to be resolved had begun early in the Cotton Belt's history. An 1820 planter in Louisiana who was faced with a labor shortage imported Brazilian monkeys with the intent of employing them in picking cotton. They did not work out as they were not efficient in the areas of production and cultivation so the planter was still faced with his original problem and cotton picking monkeys did not become a familiar sight in the fields of the South. The first recorded patent for a cotton picking machine was submitted in 1850. By the end of World War II over 1,800 patents were granted for harvesting and picking machinery. Such inventions fell into six categories: pneumatic - using vacuum suction or air blasts; threshing; chemical - achieved through a process of drying and powdering; electrical and static charges applied to the boll; stripping - through a combing action, and the ultimately successful spindle pickers.

Numerous inventions were proposed from 1850 to the mid-1940s but in many cases the human wrist proved more adaptable and productive than mechanical contrivances. Some proposed machines would have potentially produced drastic disruptions to the overall structure of the production process as well as posing a serious competitive threat during the Depression, which played a major part in the abandonment of many such efforts. Some patents achieved a modicum of success and many were used, despite their failure in the field, as influences for future designs.[66]

Several picker-type machines employing spindles, fingers, picket fence portions and prongs were constructed after 1850. Before the impact of the Depression, International Harvester performed between 1924 and 1930, the most extensive and costly experiments. Using previous patents as templates they tested seven machine types and hundreds of design changes. However, the first successful spindle picker is credited to brothers John and Mack Rust, who used the simple addition of moisture on vertical rows of rotating spindles, which efficiently grasped and twisted the cotton from the boll. Tests of the Rust machine conducted in 1931 set records by picking a bale of cotton in one day. Improvements were still necessary but the amount of cotton picked by the machine was forty to fifty times that produced by hand picking. This introduced a

social problem in the potential of the machine to displace labor, which the Rusts attempted to resolve.

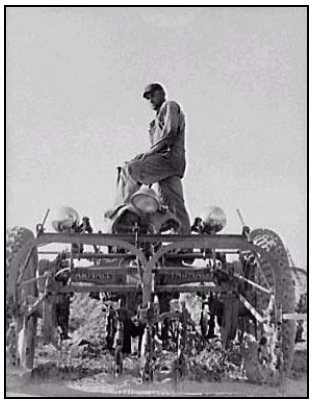
The Rust brothers feared that mass production by a manufacturer would wrest control from them and result in large-scale mechanized farming to the detriment of the small farmer. The brothers tried over several years to meet such concerns through capping prices, restricting marketing conditions through a lease arrangement contingent on other humanitarian concessions, and by making their machine extensively available to farming co-ops in the hopes of prohibiting individual ownership on a large scale. The lease plan was dropped in 1937 and the Rust brothers sold their two-row, self-propelled machines on the open market. Personal profits from sales went toward a foundation that provided assistance to displaced cotton farmers and encouraged co-operatives. The company endured many financing hardships and by the early 1940s their charter was revoked. John Rust formed an alliance with Jefferson County, Arkansas, farmers and businessmen in 1949 when he moved to Pine Bluff to perform additional experiments on an improved cotton picker in local fields. While there he went into business with Ben Pearson, Inc., and produced three new types of pickers.

By the 1940s implement manufacturers began to recover from the Depression and stepped up production of their own version of spindle-pickers and in 1942 International Harvester was ready to produce a commercial cotton picker. This innovation coupled with a farm labor shortage due to the war and the realized viability of mechanization inspired other manufacturers to develop their own products. Mechanical development was encouraged by commercial manufacturers and agricultural research organizations with a goal of regional adaptation. Annual cotton mechanization conferences held by the National Cotton Council of America were also held for problem-solving and the exchange of experiences.[67]

TRACTORS

A farm was considered totally mechanized if harvesters and pickers were used in conjunction with tractors. If a tractor was the only modern machine present then the operation would be described as partially mechanized because they were not used in every aspect of the cotton-growing process. In 1920 Arkansas had approximately 1,000 tractors; thirty years later the number had grown to 60,000.[68]

A 1923 study of 100 Arkansas farmers who used tractors on their farms found that they were used mainly for the preparation of seed beds, as that method was faster and less expensive than using horses. Part of the men surveyed purchased them in order to prevent wear on horses and men from heavy work; some used the tractors as power sources; some for commercial purposes and others as an investment. However, at that time all of the farmers surveyed stated that horses or mules were the best resources for certain chores such as hauling, road work, planting, seeding and cultivating. Mules were the first choice as draft animals after the Civil War. They were replaced in favor by horses in the 1930s and their numbers continued to decline, but even by 1950 when tractors were becoming more prevalent there were still over 100,000 mules on Arkansas farms. The call for increased power to provide pasture improvement and soil conservation overpowered farmers' reticence toward abandoning the traditional use of mules and tractors soon became a major force in the revision of Cotton Belt farming methods through land conversion and more efficient cropping patterns. [69]



CONTRIBUTING AREAS OF MODERNIZATION

Subsequent developments after the success of the cotton picker made it possible to totally mechanize the cotton-production process by addressing other areas of cotton farming that remained labor intensive; weeding, cultivation and planting. Three-row middle-breakers for seed-bed preparation, anhydrous ammonia as a nitrogren-providing fertilizer, uniform planting methods through the drilling, hill-drop and checkrow methods and improved cultivation through mechanical, thermal and chemical means were only a few of the areas that received attention during the 1940s.[70]

SYNTHETIC INSECTICIDES

The development of synthetic organic insecticides during WWII were among the most significant twentieth-century agricultural advancements because they made economic sense as they increased yield without raising set-up costs or considerably altering the application process. DDT, benzene hexachloride, chlorinated camphene and chlordane were considered modern alternatives to previously used poisons that could not successfully control all cotton pests. The

ideal application method for the new organic insecticides was as a liquid spray, but dusting had been prevalent since the realization that lead and calcium arsenate could deal more effectively with boll weevils in dust form. Switching to liquid sprays also initially required a significant alteration of application equipment. The increased weight of liquid mixtures and lack of water in the field for mixing delayed its widespread use.

Defoliants were used to replace the tedious step of waiting for frost to strip the leaves from cotton plants. Calcium cyanamide in chemical dust form was used beginning in 1949 to remove leaves that clogged machines, stained cotton and introduced grade-lowering trash. Defoliated cotton also opened faster in the boll and reduced lower branch rot as well as aiding in the elimination of boll weevils, aphids and leafworms. [71]

CROP DUSTING

The 1921 advent of crop dusting by airplane allowed the poisoning of large plots covering many acres within a reduced time. In 1916 poisoning of insects was accomplished by manual application of calcium arsenate, molasses and water to plants with a mop. The movement of horses through the fields also was used as an insecticide distributor when the farmer rested a pole tied out at either end with bags of poison on their backs. Other early methods included hand guns and saddle guns activated by a hand crank, mule-powered traction machines or power dusters pulled by gas engines or tractors. The first aerial crop duster was a WWI Curtiss JN-6H or "Jenny." The plane was equipped with a metal hopper on the fuselage, which successfully dumped lead arsenate onto a Dayton, Ohio field vexed with Catalpa Sphinx moths. Demonstrations of what crop dusting planes could do were common in the Mississippi-Arkansas-Louisiana Delta. In 1926 the Huff-Daland Dusters Company of Monroe, Louisiana presented "dusting by aeroplane" in Clarkedale, Arkansas. Exhibitions like these were heavily attended and were successful advertising ventures.

Crop dusting or "aerial application," became more refined in conjunction with more complex and efficient airplane design. Initially industry pilots and flagmen on the ground faced many dangers because of the early lightweight planes with weak frames. Pilots were required to fly very low in order to diminish "chemical drift," which placed them in the path of standpipes,

fence posts or utility wires. Flagmen in the field were used to signal to the pilot areas of the crop that still required dusting. Besides repeated exposure to chemicals these men were often clipped by the dusters.

After WWII surplus military planes provided crop-dusting pilots with more substantial craft. A favorite was the Boeing/Stearman Model 75 Kaydet two-seat biplane. These tough planes were altered by the addition of metal skins, forceful rotary engines and cockpit hoppers. Another frequently used military plane was the Piper J-3 Cub because its diminutive size allowed takeoff from short, dirt runways. By the mid-1940s the availability of surplus planes was dwindling so the civilian aviation industry entered the field with the development of planes designed specifically for crop dusting. The first agricultural plane was the 1958 Grumman "Ag-Cat." Piper used the template of the Cub series to develop the PA-25 Pawnee in 1957. This low-winged monoplane introduced such improvements as a 20-cubic-foot capacity hopper connected to a chemical spray distribution system, high seating position, improved seat restraints and strengthened cockpit structures for the protection of the pilot.[72]

AGRICULTURAL BUILDING TYPES

Very few antebellum farm buildings remain in the Delta. However, modern cotton farms of the Delta often retain dwindling examples of early-twentieth century structures related to the production of the crop. Community gins and warehouses mark the locations of once busy industrial sectors in many small Delta towns, now largely hollow and forgotten. These remnants of early cotton farm operations are rarely composed of complete collections of resources. The influences of mechanization and computerization can be seen in changes in purpose as well as additions and alterations of size, but their agricultural character remains evident no matter what century they were constructed in. Many historic cotton structures have been moved or have been converted to modern uses, so the story they tell regarding the farming process may require extensive investigation.

COTTON GINS

The cotton gin was considered among the most important of structures found on plantations and later within community gin complexes. Besides being instrumental in the financial status of the farmer, it served as a social center for the local population. Delta

plantations and towns with an agricultural base were seldom without the cotton gin as these structures influenced the amount of cotton taken to market and the final price received for the crop. “Gin” - which is an abbreviation of the eighteenth-century designation, “cotton engine” - refers specifically to the machinery that separates the seed from the cotton lint. Another term for the gin was “gin stand”; however, the building that housed the equipment also came to be known as a gin, gin plant or gin house. “Ginning” was a description of the procedure of seed removal and the turning out of a finished bale.

Cotton lint required separation from the seeds for spinning into thread and weaving into cloth. Originally it was done by hand, which could take an entire day for the completion of one pound of seed-free cotton. An early ginning device of manually turned rollers and stones from India was improved upon with the addition of crank handles attached to two wooden rollers on a wooden mount. This was progress as far as the comfort level of the operator was concerned, but it still only resulted in approximately five pounds of lint per day. Roller gins also did not sufficiently separate the seeds from short staple or green-seed cotton.[73]

Eighteenth-century advances in roller gins were not enough to satisfy the demands of the British mills and the rollers sometimes crimped the fibers and broke up the seeds, staining the lint. The invention of the spike gin by Eli Whitney in 1796 improved the process through a faster and cleaner method utilizing cotton-grabbing wires within a wooden cylinder. As the seeds separated from the lint they would be deposited into a hopper. Problems with loose wire spikes causing injuries and time-consuming repairs as well as the slow process of emptying seeds from the hopper led to the use of circular saws in gins that passed over the cylinder tearing the lint from the seed. The circular saw method endured in the ginning process and continues to be used in a computerized version today.[74]

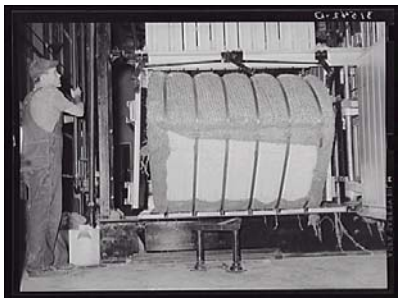
Cotton needed to be cleared of organic trash prior to ginning. This task was completed by hand as the earliest gin stands only separated seeds. By the nineteenth century the ginning process remained much as it was in Eli Whitney’s time. Gin stands driven by belts were powered by two teams of draft animals attached to sweeps - levers attached to a horizontal drive wheel by the animal’s yokes. Animals were a regular source of power for gins by the end of the nineteenth

century, though experiments with water and steam had been attempted by that time. In the early twentieth century steam was in regular use and diesel engines powered by fuel, water and oil were common by the 1930s.[75]

Hand-feeding of cotton in gins was replaced in the 1880s by *telescope* suction pipes that pulled seed cotton from wagons by air stream into a separator, variously referred to as *vacuum box*, *blow box* or *cotton dropper*. The telescope configuration using suction persisted through the mid-1950s until a hydraulic form of control largely replaced the *suck man* who manipulated the telescope. The separator, placed above the gin stand, contained a screen panel flanked on the back by a suction fan and at the front, a pipe. Cotton from the telescope would be drawn from the wagon, through the separator and into a distributor trough by the pipe. The use of feeders above the gin stands receiving an incessant flow of cotton allowed an increase in the numbers of stands. Lint would be conveyed through the stands to a common line flue, which carried the cotton to a condenser, which would separate the cotton from the flow of air by a screen drum forming a batt. Chimney stacks on the roof would blow away dust and other particles. This basic process known as *system ginning* invented by gin owner Robert Munger in the late nineteenth century, has carried on into the twenty-first century with subsequent hydraulic, electrical and computerized modernizations for the handling of bulk quantities.[76]

COMPRESSES

The screw press for the compression of cotton bales became a frequent addition to the gin complex by the early 1830s, providing more efficient ways to package and ship cotton. The town of Pine Bluff, Arkansas, constructed a compress in 1884, which was one of the earliest facilities in the state. The long bags of cotton previously used for shipping were unwieldy for oxcarts and mules on overland trips, delaying the farmer's profits, so the press introduced uniformity in the size of the bales, making shipping easier and faster, enabling ship captains to transport more bales per vessel and allowing more efficient utilization of warehouse floor space. Screw presses were separate from the gin house but built close to the lint room so that clean cotton could be transferred by basket to the press. Horses or mules yoked to two "buzzard wings" – steeply angled beams affixed at the apex of a large oak screw – would



activate the press by walking in a circle, which would lower the screw and pressing block into a wooden bale box, compressing the cotton. By the 1850s an indoor baling press with iron screw was invented.

A windlass would be used to tie out the bagged bales with six or eight ropes, which was the common method of securing cotton bales before 1840 when iron hoops and straps came into use, though rope continued to be used through the turn of the century. By 1845 these compacted bales could be made smaller by half through hydraulic compresses, located near shipping facilities and warehouses. In the 1880s bale presses consisting of double boxes on turntables were located inside the gin with the stands. A slanted chute from a condenser would fill an empty box with cotton while the adjacent full box compressed a bale with a screw. By the 1920s hydraulic rams were replacing the screw for bale pressing and the use of upacking compresses with the hydraulic ram placed in a pit became common. Compress warehouses located in areas central to factoring and shipping amenities could also be used for storage.[77]

COTTONSEED CRUSHERS

Initially underappreciated and considered to be a dispensable byproduct of the nineteenth-century cotton industry, cottonseed came into its own as a financial boon to New South cotton farmers by 1890. Cottonseed had been utilized for medicine in the West Indies, in the formation of oil and cattle feed and for lamp oil in the eighteenth century. Before large-scale commercial uses for cottonseed oil became feasible during Reconstruction, seed accrued around gins would be fenced off, burned or dumped into adjacent streams. The collection of massive amounts of seed became troublesome in that it produced a foul odor, which it was feared would cause sickness. Some gins were situated on stream banks for the express purpose of dumping seed, which prompted Southern states to pass legislation invoking a fine for distributing cottonseed into a stream used for potable water or fishing. This ruling also disallowed excessive accretion of seed within a distance of half a mile of a city or village.[78]

In the late colonial and early national periods, the accumulation of excess seed was the impetus for the development of a new industry revolving around the extraction of oil from cottonseed. The knowledge that oil could be produced from cottonseed coupled with the increasing supplies of seed resulting from mechanization of spinning and weaving, spurred businessmen and farmers to lay the groundwork for the economic benefits of the crushing

industry. Upland cottonseed retained its oil-absorbing fibers and fuzz even after ginning, which was a hurdle to the growth of the industry since the short staple cotton was the favored variety in the Cotton Belt. Animal powered hullers were developed in the late 1820s, which allowed the removal of lint-covered hulls or "linters" from the kernel of the cottonseed through the use of friction. The hulled kernels would be crushed with a series of millstones, and then pulverized in a mortar with an animal-or water-powered pestle until oil was extracted.[79]

The number of oil mills in the United States fell after the early-nineteenth century start up of the cottonseed industry was interrupted by the Civil War. By 1879 with the aid of renewed transportation routes, cottonseed processing began to pick up. Four basic products were formed in crushing mills: crude oil, seed residue in the form of cottonseed cake, hulls and linters. Original interest in the product centered on its use as an illuminant, but by World War I production areas shifted to using the oil as a low-cost replacement for soap oils and edible fats. In addition to these goods the four basics were applied to the manufacture of paint, fertilizer, mixed animal feeds, rayon and nylon. Out of this expansion came a shift in location as oil mills began to be built closer to rural cotton gins rather than in manufacturing centers with river access.[80]

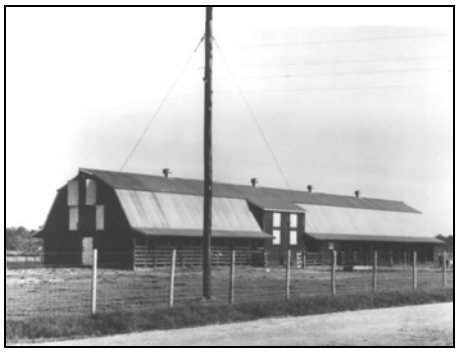
After 1855 hull-burning steam engines and later coal, provided power for the majority of cottonseed-oil mills. In the early-twentieth century electric and diesel motors were used in some areas of the mills. Delinting through the use of fine saws minimized the loss of oil through absorption by hulls that retained lint. The hulling process was enhanced in order to prevent the wasteful crushing of damp, undeveloped seed with the mid-nineteenth-century introduction of cutting or cracking techniques and knife hullers, but a pneumatic method ultimately reduced man-hours in the 1930s.[81]

The meat or kernel of the seed and hulls would be separated by a series of screens as hulls went into storage. Kernels were crushed into thin flakes for cooking in steam-heated kettles, which made it more liquid for removal of oil. At the correct temperature the meal could be formed and pressed into cakes. Originally the cakes were poured into porous bags and pressed between boards or mats for the expulsion of oil. By the late-nineteenth century steam-powered and hydraulic presses were in use and by 1905 oil expellers using rotating screws within a cone were developed. Expellers applied high pressure to extrude large flakes of meat and oil but this method suffered an initial decline in popularity because of problems with metal fatigue,

production of inferior oil and meal, set-up difficulties and increased labor costs, so their use declined. However, by the 1950s improved screw presses became more common along with chemical solvent extraction techniques.[82]

BARNS

Barns were utilized on the plantation into the mid-twentieth century and are still among the structures found on modern agricultural operations. They could also be found in gin complexes, though in dwindling numbers as mechanization replaced animal power in the mid-twentieth century. The well-ordered planter might have specific buildings with designated purposes, such as gearsheds, toolsheds or woodsheds but many farmers simply referred to each structure as a "barn." It has been stated that barns of large proportions were not as numerous as small, specialized structures in the Deep South, which suggests that plantation inventories listing barns would not always be the commonly–held perception of the stately gambrel-or gable-roofed species. Sometimes the front porch of a plantation home served as a catch-all for those livestock, tools and accessories that would normally be secreted away in a building dedicated to that purpose. An 1830s observation of a plantation home of the Cotton Belt noted that horses were seen grazing in the vicinity of the planter's piazza, which itself displayed "strewed saddles, whips, horse blankets, and motley paraphernalia with which planters love to lumber their galleries."[83]



Many early farmers in the Cotton Belt felt that the general mildness of the weather in the South eliminated the need to shelter their produce and livestock. Horses would sometimes be located in plots of land on the farmstead that had been allowed to "turn" after the soil was worn out. Cows were often brought in from the pasture in the morning, corralled, milked outside - rather than inside a barn - and then released. When cover was provided for animals and feed the most rudimentary type of barn consisting of a small single-crib configuration would frequently suffice.

As transportation networks like the railroad and improved roads became more common in previously isolated areas of the state, ethnic influences could dictate the variety of barn types

found in the South, as would likely the types of building materials found in the area. Local experience regarding the best type of agricultural building could be colored by stylistic preferences brought from without the region or adaptations of historic architectural precedents. By the early nineteenth century the U.S. Department of Agriculture began releasing annual reports offering guidance on farming life. One such report released in 1867 was titled *Barn Buildings, Notes Regarding Construction*. USDA agricultural bulletins of the early twentieth century also provided plans and building material suggestions for farm buildings used for differing purposes. This introduced some uniformity but they were still adapted through the years for size and storage concerns, resulting in a variety of styles through the 1950s. These characteristics express the fact that the design of agricultural buildings for the most part were not influenced by any particular factor and even within the state of Arkansas there were a great range of barn types.[84]

THE VARIETY OF AGRICULTURE BUILDINGS

A sizable group of disparate structures would share the plantation with the most prominent and recognizable buildings. Prior to mechanization, draft animals would have assumed a high degree of importance in the day-to-day operations of the cotton farm. Separate stables for horses and mules would be provided. As some farms held up to one hundred mules, shelter for them could be substantial. Mules also had outdoor mule lots, or fenced-in areas containing shade trees adjacent to the barn that would be used for mid-day cooling periods. Hay barns, granaries and silos would be near the animal barns for storage of feed and bedding. Self-sufficient plantations would also have blacksmith shops, tack rooms and equipment sheds for storage of bridles and care of draft animal equipment and various farming implements. Cotton-seed warehouses can sometimes be found on plantation land next to gins or their sites, but most examples are found in community centers at the location of ginneries. Cotton pens for the storage of picked cotton would be placed in the fields, but they could be dragged to different areas on runners applied to the building.

Carriage, automobile and wagon sheds would be placed close to the main house for the commuting convenience of the family and for storage of wagons filled with harvested cotton. As mechanization became more common farm buildings would include large, one-story, open structures termed *pole barns* to shelter tractors and mechanical pickers, though for many years

animal and mechanical power would share a place of prominence. Small buildings for the planter's office would be used for the day-to-day business of the farm and financial transactions related to the tenants. Crop dusting planes would be housed in small hangars by the fields next to their short runways or in municipal hangars.[85]

Various employees on the plantation were provided with housing in the area of the headquarters. The farm manager or straw boss that scanned the entire plantation for the implementation of smooth day-to-day operations was considered the second-in-command on the plantation. If married, he would be provided with a manager's house on the headquarter grounds, usually close to the periphery of the cotton field. A riding boss would serve under the farm manager and provide field supervision. Larger plantations would employ multiple riding bosses who would split up administration of scattered fields. These men would be provided with a house on the headquarters close to the main operations. Managers of the commissary would also reside on the headquarters as well as bookkeepers, woodworkers, blacksmiths and mule hostlers. Tenant housing displayed the influence of the sharecropping system in their placement near the fields that families worked, rather than within sighting distance of the main house as slave quarters had been.[86]

By the mid-1950s cultural, economic, social, financial and technological factors had struck a combination that lifted cotton farming out of the past. Many of the early agricultural buildings and complexes had been lost due to the onset of *neoplantations* and mechanized farm equipment. Neoplantations were characterized by the disappearance of scattered tenant homes through destruction to allow unimpeded progress of modern machinery in the fields and construction of new homes for wage laborers, once again placed close to the headquarters. With the demise of sharecropping the furnish system could not survive, which led to the destruction of commissaries. Smaller gins were also razed or converted in favor of technologically modern gin plants.[87]

Interest in preserving the story of the agricultural personality of the Arkansas Delta has resulted in the moving of many extant buildings to other locations as museum exhibits. Others are used as storage facilities until such time as they can be replaced by nondescript corrugated steel structures or upon their final surrender to old age or high winds. Family farm concerns often join in partnerships with other Delta families to organize the modern corporate equivalent of the community cotton gin. Such complexes are usually highly computerized metal versions of

the early vertical board buildings with tall smokestacks. Despite such mechanized changes in these concerns the people who produce and process the cotton today still feel a very human emotional tie to the demands of that plant once referred to as the "king" - just as Arkansans of the nineteenth and twentieth centuries did. The financial rewards or abuses endured at the hands of the crop reveal themselves in the persona of the community, the conversations heard at the local gin and the want of traditional farm families to remain tied to the land. As modern cotton farmer Moreland White of Osceola remarked on the tenacious desire for cotton land, "If I didn't want it, they'd have somebody lined up to take it next year."[88]

PROFITABLE ENOUGH:
RICE IN THE ARKANSAS DELTA, 1900-1955

INTRODUCTION

Rice occupied a place of prominence in Arkansas agriculture on a par with cotton. Its early twentieth century introduction as a commercial crop came decidedly late in comparison, but the resultant economic benefits have made the state a leading provider in the global market to this day. The nexus of rice production in Arkansas is known as the Grand Prairie, which is made up of a triad of counties including Arkansas, Prairie and Lonoke in the south-central section of the Arkansas Delta. Rice is also a primary crop in several contiguous counties mainly clustered around Crowley's Ridge and the counties north of the Grand Prairie and west of the Ridge. Chicot, in the extreme southeast corner of the state is the southern-most county that produces rice.[89]

The Grand Prairie is also known as the Grand Prairie Terrace and is considered the highest and most level terrace of the Arkansas Delta. In the nineteenth century the terrace demonstrated little variety in landscape features but produced an abundance of natural grasses in contrast to the profusion of tree cover found in other areas of the Delta. The thick layers of clay beneath the terrace prevented rainwater from penetrating far from the surface so trees grew sluggishly but grasses could thrive. Frequent natural and man-made wildfires ensured that the Prairie maintained its treeless character. Up to the late nineteenth century introduction of rice in the Prairie, early settlers to the state thought of the area as the least profitable land and best suited for grazing of scrub cattle, horses and mules or for hay production.[90]

By 1896 the makeup of the soil in the Grand Prairie came to be considered the perfect host for rice cultivation. It has been described as a "silt loam of stiff blue clay with an impervious layer 4 to 6 inches under the surface." The clay layer was what made the soil so hospitable to rice. Referred to as *hard pan* or *low pan*, its characteristics were that it slowed the percolation of water within the top twelve inches, which allowed the retention of moisture for the rice roots. It also resisted disruption by the average plow and it could be used to create strong levees, which would provide water-filled pools for the submersion of rice plant roots.[91]

CONTRASTING CROPS

Rice, like cotton, came to occupy a noteworthy position in the history of Arkansas agriculture. The differences surrounding their cultivation are many but the social and cultural effects of the growth of both did much to shape the state and each continues to influence Arkansas's agricultural industry in the twenty first century. Rice on smaller farms could be largely cultivated by a single person until harvest time, thus the environment of a rice farm is vastly different from cotton farms in that the extensive plantation campus did not take shape. The structural remnants of early twentieth century rice culture in Arkansas today are mainly commercial in the form of warehouses, elevators, driers and bins. The arrow straight highways of the Grand Prairie are still lined with several examples of twentieth century rural farmhouses in various states of disrepair. Few outbuildings associated with the planter homes remain but the houses are a part of the farming landscape, embraced by the curves of the levees.

The tenancy system of rice did not exact such a toll on sharecroppers as had cotton. Many sharecroppers were able to turn a profit allowing them to buy equipment and retain some disposable income. Most were able to pay for supplies with cash so the furnish merchant system did not have such a notorious reputation under the rice tenancy system. At a time when the Southern Tenant Farmers Union was fighting a losing battle against cotton plantation owners for sharecropper's rights under the tenure system, rice tenants with written leases were in a position to hire lawyers when disputes over their rights arose.[92]

The story of rice in Arkansas is mostly chronicled in technological forums, unlike every area of cotton farming, which are recorded in memoirs, fiction and film as well as technical bulletins. The culture surrounding rice did not exact such an emotional and labor intensive toll, making accounts of its tale seem less romantic and more industrial. In contrast to the trials of Arkansas cotton growers, rice farmers seemed to have had a relatively easy time becoming established and making a profit as individuals. The organization of rice farmers and the acceptance of government intervention by the industry allowed for recovery efforts during crisis periods that were geared to the individual who worked the land, whether they owned it or farmed it for the landowner.

Within ten years of the documented origin of commercial rice farming in Arkansas the crop had become largely mechanized through the use of tractors while cotton farmers still clung out of necessity to the draft animal. The level of labor required to coerce and harvest cotton from

the land was much more rigorous than that expended on rice, save for harvest time. The increased use of machinery by rice farmers gave their land more value per acre, allowing them to retain more capital than cotton farmers during periods of low agricultural land prices.[93]

Cotton farming left very few hours in the day for the twentieth century farmer to spend with his family other than that they shared working in the fields, nor could they spend time or precious funds on general maintenance of associated farm buildings. Progressive mechanized farming methods linked to rice allowed for the upkeep of the farm and frequently freed up other family members to take part in social activities and community organizations. Children were able to go to school rather than toil in the fields and wives could join clubs or attend vacation camps in Arkansas that catered specifically to farm women.[94]

Rice farmers, like cotton farmers, initially engaged in inefficient agricultural practices as a result of single-crop production on their land. However, by the mid-1920s agricultural researchers began to advocate rotation of crops and raising of livestock. Rice farmers were less resistant to change than cotton farmers and such diversification was embraced on rice land. Rice Branch Experiment Stations implemented by the 1920s in the Arkansas Delta were charged with the dissemination of technical information, chief of which was variegation. The Arkansas Rice Growers' Co-operative Association began promoting a soybean marketing cooperative in 1955 and the characteristic use of land by rice farmers of the Delta was described by the Arkansas Rice Promotion Association thusly: "He uses the other acreage for such crops as cotton and soybeans, and plants the rice on a given field only every third year."[95]

The history of cotton farming in comparison to that of rice farming in Arkansas is vastly different; so much so that it seems at times as though one is speaking of another country regarding the cultural and economic phenomena of each. The industries existed side by side and both survived through fluctuating markets to become symbolic of the Arkansas Delta in positive ways.

RICE IN SEVENTEENTH CENTURY AMERICA

Attempts to grow rice in Virginia began in 1647; however, these efforts did not lead farmers to believe at that time that rice could become a major industry in America. Experiments in rice cultivation did persist and evidence on the historic establishment of the plant in America was offered by Lewis Cecil Gray. The *Calendar of State Papers, America and West Indies,*

1677-1680 contained a note that the Proprietors of colonial South Carolina were in the process of attaining rice seed for the area, and a 1691 petition commented on a list of new "comodityes" that the Colony was enthusiastic about, which included rice. Also, in that year a patent for an engine used for rice husking was granted by the assembly and four years later an assembly act listed rice as a product that could be extended as imbursement for quitrents (rent paid by a freeman). Gray offers the year 1695 as a significant date for the possible implementation of industrial rice production in earnest as the lower house of the South Carolina assembly recognized that rice was being produced in enough quantity by 1698 to require a petition for the revocation of the English duty on rice. Exports of rice from the Colony in significant quantities were noted by a collector in 1700 and the plant was listed as number two in Carolina exports by 1706, obtaining first place in 1708.[96]

A popular romantic story of the establishment of American rice has also been attributed to a late seventeenth century happenstance meeting between a stranded ship captain and a South Carolina resident (whose identity changes according to the source), which resulted in the gift of a bag of rice seed from Madagascar. The immediate wild success of the rice plant in the region supposedly led to Charleston achieving status as the hub of the eighteenth-and nineteenth-century rice industry.[97] Gray found this version to be idealistic but does offer an eyewitness account from that period stating in 1696 a ship from Madagascar did introduce rice of "a much fairer and larger Kind" than that currently being grown. The witness identifies the new seed as "larger, and brighter, of a greater increase, and will grow both in wet and tolerable dry land," in comparison to the previous seed type, which the witness stated, "requires to grow wholly in water." So that incident may have been the providential starting point of advanced commercial rice production in the colonies with the introduction of better quality seed.[98]

DISBURSEMENT OF THE RICE CROP

Before the Revolutionary War the rice industry was prevalent within inland, fresh water swamp lands of the lower eastern colonies, but by 1758 tide swamp lands were seeing the introduction of the crop and by the close of the war Georgia had become a prime producer. Early nineteenth-century growth of the industry occurred in southeast and northeast South Carolina and advanced along the Cape Fear River into North Carolina.[99]

The Civil War compromised the eastern rice growing areas with the destruction of dikes and emancipation of the predominant labor force. Mississippi River planters stepped into the void and adopted the rice-planting methods of the East. Southwest Louisiana became a major rice center in the 1880s when Midwestern wheat farmers were driven from their lands to the Gulf Coast by negative economic, entymological and climatic forces. Farmers were also drawn to the area by land promotion campaigns disseminated by the railroads that targeted the Midwest. After a fitful start and many failed farms due to improper crop choices, the newcomers began to notice the success of Louisiana Cajun rice farmers. Former wheat farmers adopted the Cajun planting methods and easily introduced their farming equipment to the cultivation of rice since it, like wheat, was a grain. The soil of the southwestern Louisiana prairies served as a willing host to a wildly successful cash crop and within ten years the area served as a technologically advanced center for the growth of rice.[100]

RICE IN ARKANSAS

Accounts of subsistence crops of rice raised in swampy areas of Arkansas had been recorded prior to the advent of commercial growth in the Grand Prairie. Accounts of the French occupants of Arkansas in 1721 recorded that new settlers could pay for slaves with notes reimbursable in installments of rice or tobacco. The use of Arkansas rice in exchange for various commodities was noted in other early eighteenth-century evidence as well. Thomas Nuttall's observations of Arkansas included the presence of small amounts of rice in 1819 and reports of the census bureau in the early nineteenth century submitted that surplus rice marketed from Arkansas totaled several thousand pounds. Captain Robertson of the steamer *Sallie* told of several farmers along the Arkansas River raising rice in 1844 and in that year, rice was included in cargo from Van Buren on the side-wheeler *Cherokee Belle.*[101]

William H. Fuller, the father of rice growing in Arkansas, digging his last well in 1915, nineteen years [illegible] raising his first crop.

The early twentieth century was the commencement of recognition by a few individuals that the Arkansas soil and climate was similar enough to that of Louisiana that the state could

become a mass producer of the crop. An initial late nineteenth century effort by Carlisle, Arkansas, farmer W.H. Fuller to establish rice in Lonoke County using his observations of a crop in Louisiana, did not provide the results desired. Realizing that the environment in the state should have produced the same level of yields, Fuller spent four years immersing himself in a study of the Southwest Louisiana rice industry in order to obtain the same results at home. In his absence his brother-in-law, John Morris, experimented with rice in the Carlisle area. Upon his return to Arkansas in 1904 Fuller persuaded some Lonoke County businessmen to give him $1,000 if he were able to successfully cultivate seventy acres of rice and turn out thirty-five bushels per acre, which he accomplished in that year. Fuller considered this crop the advent of the commercial rice industry in Arkansas.[102]

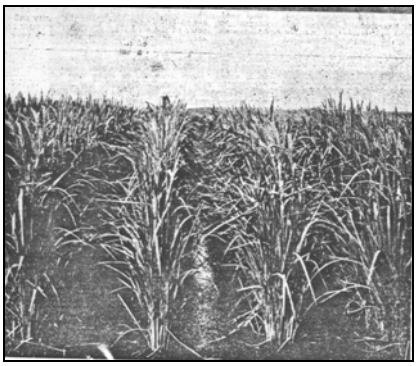
The Morris family claimed to be the true arbiter of successful rice growth on the Grand Prairie as they stated that they had brought to maturity an entire twenty-acre stand of rice planted in 1903. From the examples of the Morris and Fuller farms, other Lonoke County farmers gained confidence and by 1905 four hundred fifty acres of rice had been planted in the area. Political recognition of the suitability of Arkansas soil for rice came with the turn-of-the century organization of an agricultural experiment station devoted to observation of the rice culture in Lonoke County. Fiscal shortages led to the termination of the station in 1910; however, it was re-authorized by the General Assembly in 1923 and work was begun anew in 1926. The new station located between Stuttgart and Almyra continued in its initial purpose, which was to further agricultural research and experimentation, but it also examined modern alternatives to traditional fertilization, guidance in grass and weed control and development of new rice strains.[103]

SPREADING THE WORD OF ARKANSAS RICE

The magic combination of Arkansas's climate and soil seemed to provide profitable results in a timely manner for most who tried rice farming. The common yield for farmers in the years immediately after Fuller's 1904 crop was fifty-five to sixty bushels to the acre and total acreage in rice had reached 28,000 by 1909. Accounts on the amazing spread of rice culture in Arkansas contained estimates of a rise to 55,000 acres within the next year. Most early failures were attributed to inexpensive wells and pumps that deprived rice plants of the required water. However, once these problems were resolved A.A. Kaiser stated in *The Rice Journal and Southern Farmer* that those with 160 acres in rice had "a perfect mint." Prior to 1909, land prices

in the rice counties of Arkansas, Prairie and Lonoke, stood at about $1 an acre but when the fertile properties of the Prairie became known the price rose to from $60 to $100 an acre. [104]

The enthusiasm of local farmers who had discovered the earnings to be obtained were responsible in large measure for the increase in Delta acreage devoted to rice but once the railroads and newspapers began distributing positive publicity about the region and offering land for sale, the area was flooded with hopeful farmers. Editorials in the *Rice Journal* declared that "Although there are now thousands of acres devoted to rice production, the prairies seem exhaustless and many thousands of acres are simple (sic) awaiting working." George Sibley offered in the *Rice Journal* that "everybody is satisfied that the industry is profitable enough. Those not getting full crops knowing and saying that it was their own fault, not on account of any failure of the land, water or climate, all of which were good."[105]



The Southwest Trail, published by Rock Island Lines, claimed that their periodical was produced to further agricultural development of a "southwestern empire," which included Arkansas. It was provided free of charge to farmers and any who might be interested in settling in the region. In the early twentieth century the publication featured several articles regarding the miraculous yields of Arkansas farmers and the ease with which they became rice barons. Farming failures were easily accounted for and advice for the relatively simple correction of these malfunctions – usually attributed to water sources - was offered. Local and statewide newspapers in Arkansas spread the word about the Grand Prairie and the *Arkansas Gazette* credited the area as being "one of the richest agricultural sections of the state." If one was worried about the neighbors *The Rice Journal* assured potential Arkansans that "the rice belt citizen is a wideawake up-to-date, hustling, public-spirited American." Real estate agents joined the fray by serving as sponsors for excursion trains that would escort potential buyers free of charge to the Prairie to peruse the available land. The success of these efforts was evident by the numbers of newcomers lured from the Midwest who brought with them adequate capital to acquire inexpensive agricultural plots. Lonoke County land was purchased by men "from the far east and north," including Frank S. Ganong, associated with the *Boston Herald* who was said to have obtained several tracts in the county for himself and other eastern investors.[106]

THE LABOR FORCE

These men who arrived in the state to work the rice fields differed in several ways from the workforce in Arkansas's cotton sections. Firstly, slavery was never a factor in commercial rice production within Arkansas. G.W. Fagan, a Stuttgart rice farmer, remarked in the early twentieth century that the tenancy system in the Grand Prairie lacked the brutality of cotton sharecropping. At the turn of the century many farmers were able to set up independent operations with a minimal workforce until harvest time, when crews would be required for the threshing procedure. Hired teams provided labor at harvest time and neighbors would often work together. With the increased use of mechanized harvesting during World War II the work force was reduced by an average of fourteen men and labor input per acre fell by eight hours; however, there was still plenty for wagehands to do on a rice farm. It was noted by Stuttgart rice farmer, J.M. Spicer that the rice section would be supplied with "droves" of workers imported from cotton areas after they had completed the picking process in the cotton fields.[107]

Many newcomers to the Grand Prairie viewed sharecropping as just a step toward achieving landownership, a temporary situation. Many of these sharecroppers were able to transcend their beginnings and become planters but by 1920 a large number were driven completely out of farming or they reverted once again to tenancy due to a crash in rice prices. By the 1940s small family farms were being absorbed and replaced by large farms, many up to 1,000 acres. Twenty years before, five hundred-acre farms were considered unusual.[108]

Very little has been written about tenancy or other forms of labor on Arkansas rice farms. It was not a topic that Works Progress Administration writers explored. Perhaps due to the lack of drama connected with the relatively well-off rice tenants the documentation is decidedly lacking in comparison to that written about cotton tenancy.[109]

CHARACTERISTICS OF RICE

The scientific name for rice – a member of the grass family - is *oryza sativa*. Early rice shoots are similar to oats and wheat, but they exhibit thinner leaves and stalks. Multiple shoots topped with grain displaying tasseled heads rise from a single seed forming a substantial cluster of stems at a height of three to four feet. Varieties of rice were limited in the early twentieth century but there were three categories under which they were classified. The *long grain* category, which had a length of four to five times longer than its width, was light and fluffy and

separated when cooked. Honduras was a long grain rice that had been grown in the U.S. since 1890 and it was the most popular variety available in the early years of Arkansas rice cultivation. *Short grain* and *medium grain* categories exhibited short, fat grains that clung together when cooked and were moist and tender. Japan was a short grain variety introduced by American agriculturalist Seaman A. Knapp in 1902. Blue Rose, a medium grain variety engineered in 1909, addressed the problems of low yield eventually experienced by those who raised Japan and Honduras rice exclusively. Other medium grain varieties such as Early Prolific, Lady Wright and Edith displaced Honduras as the primary grain by 1920. The number of rice varieties continued to grow through the years and by the mid-1970s there were a total of 7,000 known varieties.[110]

SHAPING THE LAND

The early rice crops of Arkansas were planted using the same power sources as cotton, which was usually a team of horses or mules, a few rudimentary implements and the strong backs of the farmers. The relatively level, treeless area of the Grand Prairie did not require clearing so the first step in cultivating the crop was preparation of the land to receive the rice seed. After World War II the bottomland forests surrounding Crowley's Ridge to the northeast were drained and depleted by the self-propelled tree saw and bulldozers, providing more acreage for rice. These newly opened areas proved to be amenable to rice because the soil contained few species of weed seeds that would provide competition for the new crop. [111]

The dense composition of the soil in the Grand Prairie dictated the use of a sod bottom plow, which would lay the sod over in a smooth movement. Most often, farm implements powered by draft animals required the use of a team of four, often referred to as a *four-up*. Gang plows fitted with several blades that made parallel furrows would be an ordinary sight in rice fields but the weight of the plow would be considerable even for a team of horses or mules, so the amount of land that would be plowed within a day usually stood at three or four acres. Plowing would begin in the early fall and continue through the winter.[112]

Around early June seedbeds would be made ready for inserting the rice seed after a period of land preparation. Early twentieth century seedbed construction would usually be accomplished with eight-foot, single-disk harrows pulled behind a four-up, plows or tractors to reduce sod furrows to small hunks. Drag harrows consisting of staggered bars of curved teeth could be pulled behind the disk harrows to further break down the clods of soil and complete the

leveling process. Due to the stress on the team and the farmer from the constant, weighty drag of the equipment and the heat of the season, seven acres would usually be the safe maximum for a day's work creating seedbeds in the field.[113]

PLANTING THE SEED

The seed drill had been invented in the early eighteenth century but some farmers simply sowed rice seed through broadcasting by hand. If this was not done properly the rice would not germinate, or if it developed on the surface the exposed seedlings could be killed by frost, blown away or eaten by birds. In the absence of harrows to cover the seeds with soil, some early farmers would use large, leafy tree branches. By the time the Grand Prairie had become an important commercial rice center, the equipment of Midwestern immigrants made the rice farmer's task easier and seed planting more efficient.[114]

The grain drill was such an implement imported from the Midwest in the early twentieth century. Powered by four animals, the turning wheels of the sixteen-hole drill would provide power to transfer seed into tubes from a hopper and then into trenches previously opened by a series of disks. The trenches would then be filled in by round trace chains or spike-toothed drags that were positioned behind the disk openers. The drill provided farmers with larger yields because it insured the formation of uniform trenches, which would provide the proper amount of moisture from the soil and reduce waste of seed through early or late germination. Small, animal-powered drills were utilized into the 1930s but soon steam and gasoline tractors influenced a change to larger, more technologically sophisticated drills that would cover larger tracts within a day's time.[115]

After World War II surplus military airplanes were put to use on a large scale in agricultural applications. The most well known was the use of planes for crop dusting, however, as early as 1938 J.O. Dockery of Stuttgart had begun experimenting with air seeding in a straight wing Waco plane on a local farm. Dockery's experiments were the first use of air seeding outside of California as he planted by air in various soil conditions and investigated several types of dispersion systems to facilitate even distribution. Seeding by air on wet fields in the Grand Prairie was not as prevalent as it was in Pine Bluff and other eastern

areas of the state that contained buckshot clay so the grain drill remained the most popular and less expensive seeding method in the Prairie for the time being. After World War II new chemicals were released for use by civilians and fertilization of the rice fields in the Prairie began. After the fields were flooded farmers could not fertilize so airplanes were used to distribute pellets by air. Dockery was also instrumental in the invention of a fan shaped spreader with vanes that applied fertilizer evenly on fields.[116]

LEVELING

Since rice is a semiaquatic plant it required maintenance in a flooded environment during all or part of the growing season in order to curtail competition from weeds and to provide higher yields. Early irrigation of rice involved laying off fields without consideration of land contours or the need for level land, a practice that resulted in saturated valleys that were incapable of being drained. Land used for rice growth was more efficient if it was level with a gentle slope leading to drainage channels. Leveling the land did not become a standard procedure in rice planting until the late 1920s. The process would involve eradication of ridges and filling in sloughs and hollows so that the tracts would drain quicker during the growing season and at harvest time, and seedbed preparation could begin earlier. It also allowed the maintenance of a uniform depth of water in levees, which would help control weeds. It was easier to construct straight levees on graded fields, which diminished the total of productive rice land lost since hilly tracts required more levees in closer proximity to each other than those on level land and it reduced costs of tillage and harvest.[117]

Floats, developed in the late 1920s were the first implements used in land leveling. The earliest floats were composed of two eight-or ten-inch wooden runners and cross pieces or *blades,* fashioned from two-by-six boards. A later, more efficient float patented by a Stuttgart rice farmer consisted of alternating diagonal blades, which provided a lateral transfer of the soil and a forward movement at the same time.[118]

PUMPING

Most flooding in the Prairie would be provided by pumping from rivers, lakes, bayous and wells. In 1915 half of the Arkansas rice acreage would be irrigated by pumps from wells, which were owned by individual farmers. Irrigation companies or other individuals supplied the

rest with water from large canals through a rental arrangement with rice farmers. Large pumping plants would commonly consist of one or sometimes more, pumps driven by engines fueled with petroleum, gasoline or kerosene. Pumps in the Prairie would provide 7 1/2 gallons or 1 cubic foot of water per minute for each acre under irrigation.[119]

Canals that transported water to the fields were constructed from two parallel levees spaced about fifty to two hundred feet apart. Pumping the water from these canals could be the most expensive venture in a rice field as there were costs that varied depending on the height to which the water was pumped, the amount of water pumped and the cost of petroleum and wages for plant attendants. Farmers would save money by forming a large co-operative plant that could service several fields. Wells could allow irrigation in areas that were not considered cultivable to rice by retrieving water from underground sand and gravel beds. The cost of increased lift made pumping from wells a little more expensive except in periods of heavy rainfall, so farmers introduced alternative methods of irrigation to offset the costs of pumping. Cost-saving techniques included planting rice in low areas, allowing rainwater to pour in from elevated land; collecting rainwater in reservoirs on high ground for controlled release; or redirecting water from dammed streams or ditches to their fields. Other ploys would involve extending levees outside of the field to deflect water and planting rice on characteristically marshy land.[120]

BUILDING LEVEES

Field levees were the central apparatus in the regulation of water depth in the field. The required uniform depth in each paddy was dependent on the proper location of levees and their quality of construction. By 1915 surveyors or farmers knowledgeable in the use of an engineer's level would be employed in determining the exact location of levees to prevent uneven flooding and added expense. A rodman in the field would make certain that the placement of levees would be on lines of equal elevation and he would be followed through the field by a team and plow in order to mark the position of the levee at the moment it was located. It was recommended that a gradual curve, rather than short turns or crooked furrows be followed. Levees made sharp turns only on the occasion of extremely uneven land and only in certain circumstances did they intersect.[121]

The dense, wet soil of the Grand Prairie in winter provided for compact construction, diminishing seepage and prevention of levee wash-out, so this was thought to be the best season

to build new field levees and to re-construct old ones. The procedure began with the plowing of an eight-inch trench of exposed clay flanked by deposited dirt approximately five feet from the periphery of the field. Earth would be cast back into the trench and horses would be ridden on the levee to puddle it. Three or four furrows to either side of this trench would be plowed and a *push*, also known as a *crowder*, would be employed to pile the dirt from the furrows into the proper height and width. A push, pulled by a team of eight mules, came in several sizes for varied levee height and was composed of two boards on edge in the form of an "A" with graduated horizontal braces in the center. The longer side of the push would slide along the furrow while the short side would "crowd" the earth to the levee. An interchangeable lever or *guide stick* appended to the long side of the push and supported on the shorter, "earth" side at a horizontal angle controlled the amount of earth moved and stabilized the push. Around World War I a steel ditching implement called the *Martin Ditcher* began to be used for levee building and by 1928 *levee pullers* that would pull, rather than push, earth to the levee came into use.[122]

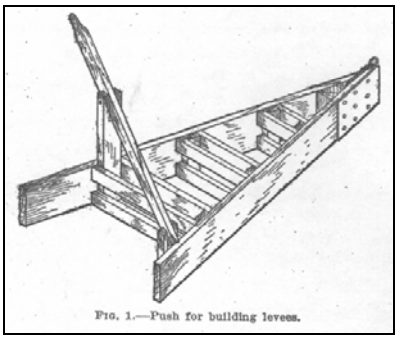


FIG. 1.—Push for building levees.

The sides of the levees were constructed with gentle slopes in order to allow farm equipment and teams to traverse them. Every year the levees were destroyed during preparation and seeding procedures but the marks on the land remained to indicate their proper location and they could be re-shaped with graders. The irrigation process, which began between June 10th and 20th, would commence at the main water source by pumping to lateral canals, then to field ditches and ultimately into the paddy. In the early twentieth century, water flow to successively lower levees was controlled by the use of a board or sack set into the dirt. Sometimes a space was simply cut into the levee; however, this was not efficient in the case of an unexpected rain storm. Improved wooden gates equipped with sliding shutters were developed later for regulation of water flow. By the mid-twentieth century metal levee gates or levee control boxes containing adjustable panels were in use.[123]

WATER MANAGEMENT

In the earliest years of rice growing in Arkansas the fields would be kept continuously flooded from the moment the plants reached a height of four or five inches to the point the heads

turned down, which signaled harvest time. Over time the result of this uninterrupted flooding proved to be detrimental to the crop as it lowered the yield and blighted the head. Early twentieth century trials by the Arkansas Agricultural Experiment Station determined that water cover helped maintain an even temperature in the day and night air and reduced scum, weeds and insects but it was better for the plant if the field was periodically flooded and drained up to a deadline of ten to fourteen days prior to harvest time, a total of seventy to one hundred days. The pumping of fresh water every ten days was imperative as stagnant water could kill the rice plant.

Just after the seed was planted the field would receive a *sprout* flooding to facilitate germination. The water would be drained at the appearance of one-third inch white sprouts to prevent rot. When the leaves of the rice plant emerged a *point* flooding would be applied that would force the rice to grow faster than invasive weeds and grass and subsequently kill the intruders. When the rice reached a height of six inches the water cover was lowered for thirteen to thirty days and then subjected to dry growth for forty to fifty days. During this period the field would be cultivated by plow and hoed to remove weeds, grass and red rice - a separate species that reduced the market value of white rice. A *harvest* flood would be introduced at the point that the plants began to joint and would remain up until just before harvesting. By the 1950s farmers would drain the fields in the middle of the growth period in order to apply nitrogen fertilizer. Ensuing flooding would transport the fertilizer to the roots of the rice as the water entered the soil.[124]

HARVESTING

The dry period of the rice fields prior to harvesting in the fall was essential as the soil needed to be able to sustain the heavy binding equipment so draining would be instigated by cutting into levees with shovels or in later years, removing or upending the levee gates. Differing weather conditions and soil types would dictate the draining deadline for different rice farmers, but the proper period was usually when the fully headed rice turned down, which was normally two to three weeks prior to harvest time. Cutting rice at this time made the grain tough, preventing breakage during milling.[125]

The earliest method of cutting would be with the sickle or cradle, however, by the time Arkansas became a commercial rice-producing state, farm machinery had advanced enough that team-drawn reapers, also known as *binders*, were commonly used. As tractors became more

common on Arkansas farms they would replace animals as a power source in the field. The binder's driving wheel would be rotated by a *bull wheel* attached to a sprocket chain, which in turn would drive a sickle and reel. By 1910 gasoline engines replaced the bull wheel. The power source for the binder would provide rotation of the reel, which would bend the stalks of rice toward the sickle, cutting the plant six to twelve inches from the ground. The rice would then be transported by a canvas cloth to a gear driven knotter for tying into a bundle or sheaf. Bundles would be deposited onto a bundle carrier, which placed them in the field to be picked up by workers who would assemble them into a tipi shape known as a *shock.* This formation would allow unripened grain to dry and rainwater to run off. [126]

W.G. Vincenheller, director of the Arkansas Agricultural Experiment Station in 1906, recommended that the ground be dry for shocking and that the bundles should be braced against each other in order to prevent damage from rain. He advocated that the shock should be longest on the east and west sides and it should be capped with bundles headfirst to the north away from the sun. The heads needed shelter from rain and sun so they were left in the shock about three or four weeks until the straw was cured and the kernel became hard and dry enough to endure the milling process.[127]

THRESHING

Prior to the implementation of combines, the progression of the crop from the field to the rice mill would involve custom threshing of the shocked rice under either a *ring* arrangement, influenced by the threshing rings of the Midwest, or the use of an *independent crew* operation. Most rice farms in the state were too small to justify individual ownership of a thresher and the larger machines were too expensive, so farmers would co-operatively gather their equipment and labor for the formation of a threshing crew or ring to work in conjunction with a machine crew. The independent crew operation would involve a machine owner and a complete team who would work for the farmer at a cost per bushel. Under these first come, first served arrangements some farmers were delayed so long in getting their crop threshed that the weather often turned, resulting in increased cost to the farmer and production of poor quality rice. The solution was the formation of partnerships through which farmers bought their own machines and hired operators until they gained enough knowledge to do it themselves.[128]

Transport of the shocked rice from the field to the thresher necessitated a crew of bundle haulers who loaded about eight to ten wagons with bundles to be threshed. In soft, boggy conditions, sleds equipped with a *basket rack* or bundle cart would be used to avoid getting bogged as the team crossed levees. Tractor-powered bundle carts were developed later that tipped forward as they were filled and were kept balanced by a drop hitch to the tractor. Around World War II a twelve-by-nine foot *buck-rake* attached to a row-crop tractor came into use, which allowed the threshing of eight hundred bushels a day. The buck-rake enabled operators to collect up to six shocks per load and deposit them upright for feeding to the thresher, thus saving money and cutting down on the amount of required labor.[129]

Steam engines were the dominant power source for threshing until World War I and were still found on some rice farms up to the 1930s when they were largely replaced by the more dependable internal combustion engine. The farmer or steam engineer would install their threshing rig near the rice field and belt the engine to the machine. Laborers hired to haul

bundles would load shocks from the field onto wagons to be transported to the thresher where men positioned on the wagons would toss bundles into the thresher cylinder in order to separate the rice from the stalks. The rice would then be directed to the bottom of the thresher and to an elevator, which carried the rice to a "Y" shaped bagger spout, from which it blew into a burlap bag called a *tow sack* that held one hundred eighty pounds of grain. The discarded straw would be subjected to a constant battering as it traversed the thresher in order to ensure that all the rice was removed. The straw would finally run through a fan housing, which impelled the straw into a blower to be deposited into a stack, which would be used for feed, mulching, beds for livestock or it was burned.[130]

The rice bagging process would require a labor force of three. Two men were designated sack draggers and they were charged with affixing and removing full bags from the bagger spout on the thresher. Each man would shake and settle the bags in order to fill them to their capacity of four bushels then drag them to the sack sewer. The sewer would shape the bag yet again then sew it together making sure to leave *ears,* extra material at each corner for grasping. The sack sewer was required to be very proficient at his job because he needed to maintain a rate of one

sack per minute and execute tightly drawn, close stitches to prevent leakage of rice out of the seams or ears.[131]

RICE COMBINING

Methods and machines for harvesting rice went through several transformations with the ultimate goal of reducing labor costs and eliminating some of the myriad threshing procedures. Other issues that were addressed through ongoing modernization of rice harvesting were the eradication of potential weather damage to the rice, loss to hungry blackbirds and ducks, reduction of shattered rice and more efficient drying of grain. Efforts to address these needs began soon after the early twentieth century introduction of commercial rice farming in Arkansas and subsequent unsuccessful experiments were made in the 1920s. To ensure premium rice, cutting of the grain took place when the moisture content was at a much higher level than that considered safe for storing. Thus, the rice needed to be artificially dried before storage, which required increased financial output of the planter and added to the harvesting time. Because of those factors most farmers stayed with the traditional binder in the field and new harvesting machines did not become prevalent until after 1940. By the mid-1950s binders and threshers were almost wholly replaced throughout the state.[132]

Farm labor shortages and growing demand for rice in the 1940s led to the increased use of self-propelled combines, which had previously been used effectively on Midwestern grain crops. Under combine usage the farmer was able to cut and thresh at the same time. Tractor-pulled grain carts would be situated beside the combine on solid ground to receive the rice, then a power-driven augur would propel the rice from the cart to a truck. The crew requirements for combining rice were a man on the combine, another on a tractor and grain cart, which transported the harvested grain to two more men and two trucks that ultimately hauled the rice to the drier. Arkansas had limited drying capacity so most trucks encountered long lines at the few commercial driers in existence by the late-1940s. Arkansas rice planters also used tractor-drawn combines, which utilized fifty percent more labor per acre than self-propelled combines but used less than one-third the labor of the binding method, demonstrating the benefits of such an advance in the field.[133]

DRYING

Under the combine method of harvesting the step of curing, or drying rice in shocks was eliminated. When wet rice was stored longer than 24 hours the farmer ran the risk of heat damage resulting in dark brown kernels that lessened the quality and price of milled rice, so the process of artificial drying was introduced. Commercial drying in Arkansas was implemented in 1944 and by 1946 driers were situated throughout the rice sections of the Arkansas Delta. Individually owned driers were most common in 1946 but corporate driers handled the most rice in that year, while farmer-owned co-operative driers organized by the Arkansas Rice Growers Co-operative were second.[134]

After the rice was weighed in the grain carts or trucks to determine payment of the farmer using the services of the drier, the rice would be unloaded. The front wheels of rice trucks would be driven onto a frame that elevated, allowing the rice to filter out the back of the truck bed via gravity into a hopper. From the hopper the rice made its way by gravity or by a conveyer screw to elevating equipment, which transported it to the *head house* at the top of the elevator in buckets attached to a continuous belt. Once at the top it would be propelled to one of three locations: to the cleaning equipment, the drier receiving bin, or to storage bins.[135]

Some rice would be cleaned by the planters before shipping in order to remove straw and mud but most often it would be cleaned at the drier to ensure adequate market value and to make the drying process easier and more efficient by removing the danger of straw clogging the bin spouts. Machines such as the Monitor, Scalperator and the Millerator utilized air separation, suction and roughing screens to remove weed seeds, dust and unthreshed heads. Bins called *receiving* or *garner bins* positioned above the drier equipment served as a receiving point and temporary storage for grain prior to drying. [136]

There were several types, designs and categories of rice driers in use by the mid-1940s but the columnar type using gravity, screw-type conveyors and heated air was the most common. Berico and Hess driers were examples of continuous flow, columnar types, both of which operated by moving parallel columns of rice downward through drier equipment as they were subjected to forced heated air from outside the columns (Berico type), and from within the

columns (Hess type). Bin driers were another type often used on in-farm operations. Under the bin drying method rice typically used for seed would be dried inside round, metal storage bins using unheated air.[137]

STORAGE FACILITIES

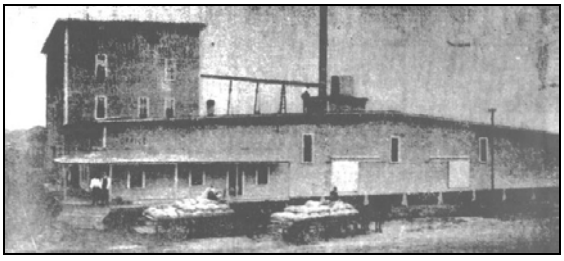
When the threshing operation was performed by crews the rough rice would be stored in bags at commercial warehouses or in private, planter warehouses until it was sold; a method that became problematic to farmers because of rodent damage and the cost of bags and labor. Due to the once-a-year harvesting of rice and high moisture content, the grain had to be stored under ideal environmental conditions prior to milling in order to assure a stable product. The first bulk storage of rough rice in Arkansas was located at the Standard Milling Company in Stuttgart in 1917; however, these initial facilities did not address the concerns of moisture levels, turning intervals and effects of weather. By the mid-1940s the operation of commercial drying occurred soon after harvesting but all other processing operations were spread out over the year requiring the proper storage facility. The USDA reported that rice storage bins could be composed of any material that would provide a dry, cool, pest-free space with aeration and stirring capabilities for long-term storage. By 1946 storage bins at commercial driers containing hopper bottoms for grain removal were composed of concrete blocks secured with steel rods. A survey of Arkansas rice farms in that year recorded the presence of wooden receiving bins and galvanized steel bins over wood frames in addition to the concrete structures. Such facilities in Arkansas were referred to alternately as elevators or driers. Lynn Staton, former chief engineer of Riceland Foods and a Stuttgart resident, stated that both names were used to refer to any tall, rice processing building.[138]

MILLING

In the early years of rice production in Arkansas the market for planters was made up of inconsistent buyers from Louisiana and Texas. By 1907 some leading businessmen and farmers organized the Stuttgart Rice Mill Company and had enjoyed a profit of $16,000 in that same year. The expansion of rice production in the Prairie by 1909 had reached such proportions that there was a need for more mill capacity so a second facility called Mill B was constructed across

the street from the original in Stuttgart. Beginning in the early 1900s new mills were built in substantial numbers across the rice sections of the Arkansas Delta.[139]

The main function of the milling process was to remove the husk and bran layers from rough rice straight from the field to achieve the desired end product, which was the starchy endosperm destined for consumption. The earliest method of obtaining husked rice was a hand process borrowed from the Native Americans, which consisted of grinding kernels on a hollow log with a pestle made from a hardwood stick. Pecker mills and cog mills powered by animals and water mills – also known as Lucas Mills - came in use in the eighteenth century. As mills became more mechanized a pounding procedure used to remove the second cuticle known as the *bran* was replaced with a huller or scourer, and polishers that removed the third cuticle were implemented by the late nineteenth century. Arkansas mills began to use rubber rollers rather than hewn millstones and composition stones to loosen rice husks by the late 1940s.[140]



The milling of rice took place in stages beginning with cleaning using coarse screens to separate the paddy rice or rough rice from material that was bigger than the grain, such as straw, stones and mud lumps. Fine screens were used to eliminate small weed seeds, sand, dirt and other materials smaller than the rice. The grain was husked by a *sheller*, which tore the hulls from the kernels, loosening them by sending the paddy into two spinning rubber rollers rotating at differing speeds in order to slacken the hull. Then the rice was sent to the *aspirator*, which completely removed the hulls by using sieves to retain the light weight husk, or ventilation to blow the husk off with wind currents. A *paddy separator* would segregate shelled grain, or brown rice from unshelled grain that did not lose its hulls on the first pass, through the use of an inclined metal sheet that separated the lighter, shelled rice and sent the paddy back to the sheller for a second pass. A *pearler* would perform the actual milling operation of separating the bran from the kernel, giving it a white color by a three step, rubbing process using abrasive stones, coarse screens, metal rollers and water polishing.[141]

ORGANIZATION

The varied procedures in rice cultivation caused differences in business interests among farming groups. Rice growers and millers very quickly became involved in organizations that offered them protection from the vagaries of commercial agricultural production and from each other. Such organizations had a hand in the shaping of the farming landscape in rice sections of Arkansas as they were responsible for the large industrial centers that bloomed as a result of improved marketing efficiency and growing demand. Soon after the implementation of Arkansas's rice industry, American rice prices began falling. As problems with overinflated crop estimates on the part of millers and other internal disputes between industry players persisted, planters formed the Rice Growers' Association of Arkansas to protect and inform industry providers in 1909.[142]

Millers were faced with record amounts of grain from the southern rice belt in the early years of the twentieth century, introducing difficulty in their ability to sell the crop, but farmers felt that prices were kept unreasonably depressed by the millers' "bear" estimates, as a result the Southern Rice Growers' Association was formed by planters in Texas, Louisiana and Arkansas to organize for better prices in 1910.[143]

The position of the millers and the farmers had been aided by the 1917 declaration of war, which enabled America to become a key supplier of rice for Allied armies and the military, causing prices to double. By 1920 Arkansas growers enthusiastically met their full agricultural potential and had raised record amounts of rice only to face a severe drop in prices. The crash resulted in driving many farmers from their land that year and the state lost 6,000 rice farming operations. The decline in profits was blamed on the farmers for producing so much rice in the first place while the planters felt the mills were responsible because they were not receiving a fair price for their crop. At the same time the millers pointed to the public for their lack of interest in buying rice. In the boom years during World War I the price of rice for the consumer had risen commensurate with the higher prices paid to the farmer, which translated to increased prices in the stores, leading to decreased public demand.[144]

The Arkansas Rice Growers' Co-operative Association was formed in 1921 as a result of producer's uncertainty about their future earnings. The incorporators of the association formed a non-stock co-operative that required every farmer who brought in rough rice to sign a membership agreement. The Association would mill the rice and sell it through brokers and

agents. The Association initially leased mills but by the mid-1920s they had purchased operations in Stuttgart, Wheatley and Dewitt. After a 1929 restructuring to the benefit of the farmers the Association began a successful future, which has endured to the present under the legal name Riceland Foods.[145]

EXTOLLING THE VIRTUES

In addition to the squabbles among factions, farmers contended with the fact that rice had not been a traditional part of Arkansans' diets and with the continuing disputes and fluctuations in pricing, it was recognized that the industry needed to join forces for a more vibrant marketing strategy. In 1910 rice analyst S. Locke Breaux suggested that the planters meet the millers halfway by boosting sales of domestic rice through improved advertising and distribution. By the 1920s this tactic was sorely needed and the industry was up to the task. The *Carlisle Independent* of October 7, 1920, reported that the Southern Rice Growers' Association was going to donate finances toward a national rice advertising crusade. The article stated that, "the campaign is designed to influence the American people to become a rice consuming nation…This will be accomplished by educating American women to the value of rice as a healthful, delicious and economical food." It was described as "the greatest campaign for the promotion of an article of food that was ever launched in America."[146]

The Arkansas Delta participated in the challenge wholeheartedly. Local newspapers printed a series of articles that encouraged Arkansans to eat more rice. The *Daily Arkansawyer* of Pine Bluff reported on rice drives whereby forces of saleswomen would canvas neighborhoods to take orders of rice through Pine Bluff retailers. The slogan of rice week in Stuttgart was "Eat rice, talk rice, serve rice, order rice." The Inn Café in Stuttgart took this admonition to heart and offered free rice to its patrons.[147]

The Depression did not aid the push to popularize rice in Arkansas or the nation, but World War II brought an increase in price and acreage as Asian rice industries were adversely affected by the conflict. This crisis for Asian producers translated into renewed vitality and higher prices for American rice farmers. The industry stabilized due to governmental intervention and the revamped Agricultural Adjustment Administration (AAA) allotment system. Unlike AAA payments for cotton, this system of allotments for uncultivated land directly

benefited the rice producer rather than the landowner. Life for the rice farmer remained steady from World War II through the twentieth and twenty first centuries.[148]

INDUSTRY GROWTH

The 1940s and the 1950s saw tremendous growth within the rice industry. The groundwork for such expansion had been laid by the re-authorized Rice Branch Experiment Station of the College of Agriculture of the University of Arkansas beginning in 1926. The station, located between Almyra and Stuttgart, set up on a 160-acre rice farm and construction began on a research laboratory and administrative offices in 1929. Initial work at the experiment station involved a study of crop rotation benefits and examination of factors like seeding, weed control, pests, disease and fertilizer. The station also developed new rice varieties through the 1930s.[149]

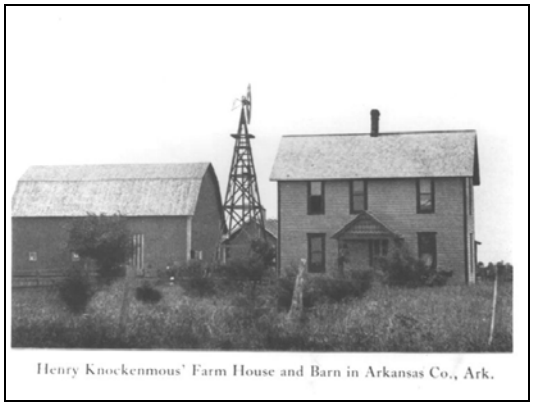
Riceland Foods in Stuttgart (then known as Arkansas Rice Growers' Co-operative Association) collaborated with the experiment station and was itself instrumental in the development of new byproducts and manufacturing processes. The company implemented modern rice dryer capabilities in the mid-1940s under the direction of the experiment station's former assistant director, L.C. Carter, and it was at the forefront of adopting electrically powered equipment in their mills. Experiments on quick-cooking rice, extraction of oil, a more lucrative market for broken grain and study of a parboiling process emerged from research at Riceland in the 1940s.[150]

The company also formed a construction department in 1946. The bulk of the work performed by this department involved constructing steel storage tanks and it was an early advocate of the *slip-form* method used on cement grain storage elevators. This technique involved a movable form that slid up allowing fresh cement to be poured over hardened cement, resulting in the familiar circular shape of the Delta's grain elevators.[151]

THE ARCHITECTURAL CHARACTER OF RICE PLANTATIONS

Much of the historic landscape of individual rice farms in Arkansas was dominated by paddies and irrigation networks. The structural resources associated with rice farming were largely constructed in town centers and these operations took on monolithic proportions as they grew to encompass facilities for rice byproducts and increased production from the state's ever-

larger, corporate farming operations after the 1920s. Remaining examples of twentieth century housing for rice farmers in the rural sections of the Grand Prairie mainly consists of Foursquares, L-plan homes, restrained Queen Annes or I-houses. Decorative concessions were kept to a minimum with the occasional application of gingerbread trim. Many rice farmers in the Delta were from Germanic backgrounds, which were reflected in their efficient and thrifty lifestyles. Though planters received profitable returns from their crop, finances were devoted to the farm or used to purchase expensive machinery rather than in the construction of high-style mansions. Some fashionable homes were built in city centers but even these did not reflect the opulence that some of the wealthiest cotton barons expressed on the headquarters of their plantations. No resources pertaining to rice tenant housing have surfaced at this time, but the Grand Prairie landscape is dotted throughout with small, wooden or rolled asphalt bungalows that appear to date anywhere from the turn of the century to the 1950s. Similar to cotton sharecropping shacks, some of these buildings are doubtless representative of the rice tenancy system. [152]



Henry Knockenmous' Farm House and Barn in Arkansas Co., Ark.

The rice industry hit Arkansas at the turn of the century with a no-nonsense attitude. The history of rice farming in the state is epitomized by organization, mechanization, scientific research, and for the most part, positive economic benefits. Arkansas has become a national and international leader in the production of rice and the circulation of groundbreaking technological and informational innovations in rice production. The optimism that was expressed by trailblazing rice farmer, W.H. Fuller in 1904 endured through the ups and downs associated with all areas of Arkansas agriculture through the 1950s. Bill Reed, spokesman for Riceland Foods, Inc. evinced that same confidence when he stated of Arkansas's 2003 harvest, "I'd say the crop looks pretty good."[153]

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ARKANSAS HISTORIC PRESERVATION PROGRAM

Get Down the Shovel and the Hoe:
Cotton and Rice Farm History and Architecture in the Arkansas Delta, 1900-1955

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