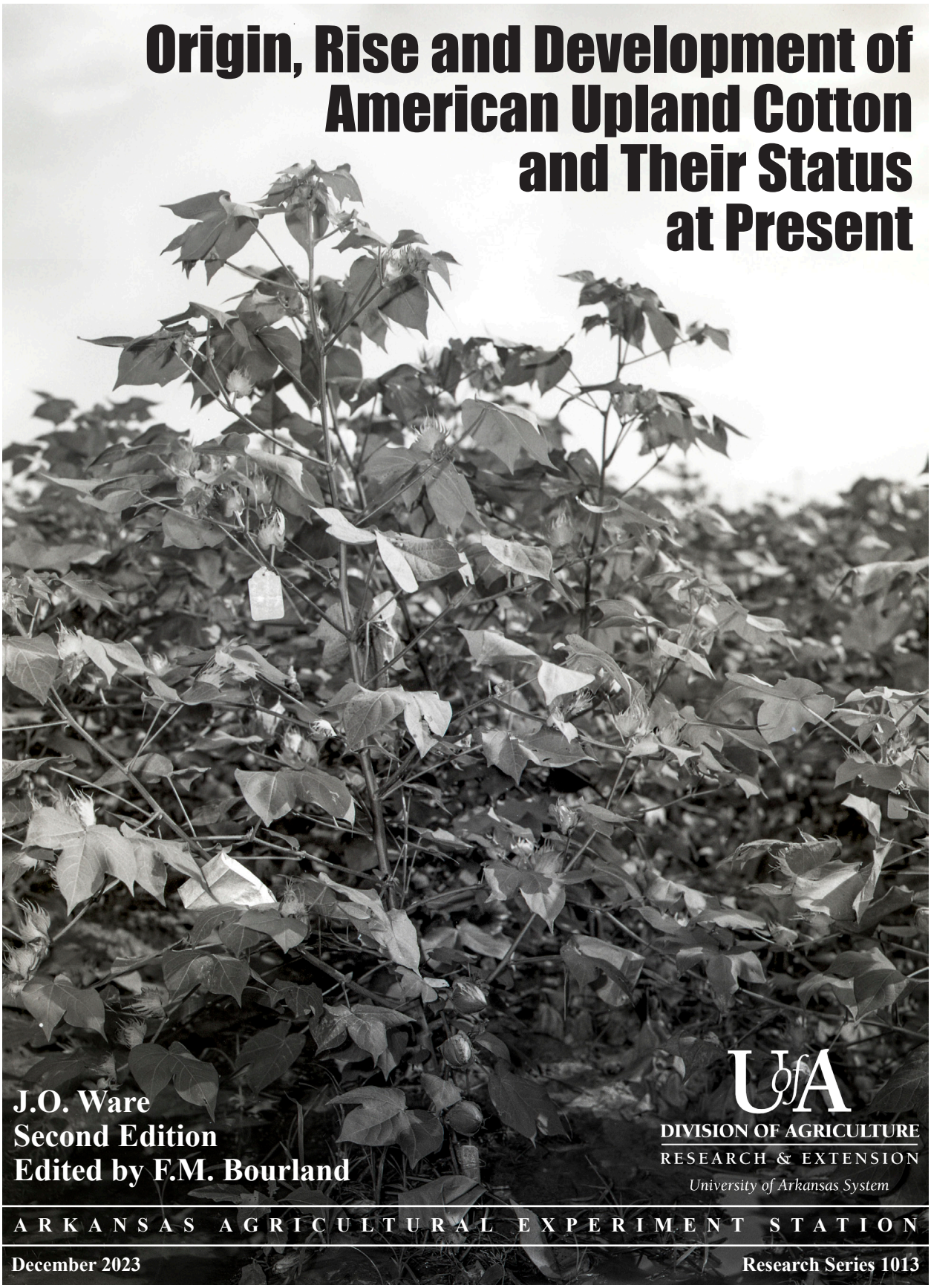
Origin, Rise and Development of American Upland Cotton and Their Status at Present



J.O. Ware
Second Edition
Edited by F.M. Bourland

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Cover Photo: Photo of cotton plant in Dr. Ware's breeding nursery at the University of Arkansas, likely taken in the 1930s in Fayetteville. Note the paper bags used for self-pollinating and the string tags for labeling crossed bolls.

Layout, technical editing, and cover design by Gail Halleck

Arkansas Agricultural Experiment Station (AAES), University of Arkansas System Division of Agriculture, Fayetteville. Deacue Fields, Vice President for Agriculture. Jean-François Meullenet, AAES Director and Senior Associate Vice-President for Agriculture–Research. WWW/CC2023.

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Second Edition

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Preface

J.O. Ware pictured examining cotton plants in a field.

As chronicled by Bourland (2018, 2019), Jacob O. Ware (1888–1977) was an early leader in U.S. cotton breeding, and contributed significantly to the U.S. and Arkansas cotton industries. Dr. Ware bred cotton at the University of Arkansas (UA) from 1920 until 1934, and released many varieties including 'Arkansas Rowden 40,' which was estimated to have occupied 50% of Arkansas's cotton acreage in the mid-1930s (over 1 mil acres) and spread to adjacent states. In 1934, he became the senior USDA cotton agronomist at Beltsville, Maryland. He returned to UA in 1950 with a joint UA and USDA appointment and retired in 1958.

Dr. Ware's obituary (Northwest Arkansas Times, March 19, 1977) states that, "He established a national system of cotton variety testing … and assisted in the development of superior varieties to meet needs of cotton communities across the cotton belt." It further noted that, "He was recipient in 1963 of the "Man of the Year" award from the Southern Seedsmen's Association and his research in cotton genetics won him membership in the National Academy of Science and honor societies of the profession. He is the author of many technical papers, two textbooks, and numerous popular articles on cotton, and was recognized internationally as one of the foremost cotton authorities of his time." Additionally, his obituary indicated that, "In 1951, he made possible the establishment of the Ben J. Altheimer Chair of Cotton Research, the first Chair in the division of agriculture at the University." (Funds from this Chair were used to cover costs associated with this re-publication.)

Besides his achievements in variety development, Dr. Ware made significant advances in variety testing, trait evaluation (inheritance and relationship studies), and became an early leader of U.S. cotton breeding. He wrote extensive reviews on the history of cotton breeding in the U.S. culminating with this 1952 extensive review of the origin and development of American Upland cotton varieties. This second edition of Origin, Rise and Development of American Upland Cotton and Their Status at Present is being republished as a digital publication to preserve Dr. Ware's exhaustive work. The original publication has always been difficult to cite, and has now become almost extinct. In recent years, secretarial staff in the UA Department of Crop, Soil and Environmental Sciences established a digital copy of the publication. My editing of the digital copy primarily included correcting typographical errors (by comparison to original hard copy) and editing some long sentences to make them easier to read and understand. I found one paragraph in which I felt that a "can" should have been "cannot" (page 26). Before making that change, I sent the paragraph to three cotton breeder colleagues to confirm my opinion. Otherwise, I was careful not to make edits that might change the intent of his original text.

This book can be divided into four major areas: 1) History of cotton prior to any cotton breeding efforts (pages 7 to 10), 2) Cotton variety development before the boll weevil entered the U.S. in 1893 (pages 10 to 40), 3) Cotton variety development after the boll weevil was introduced (pages 40 to 56), and 4) Lint properties and production statistics associated with U.S. cotton varieties (pages 56 to 76). Other than the first section, much of Dr. Ware's information was derived from personal communication and is not readily available in other publications. This book provides a unique and important reference book for cotton breeders/geneticists, but also for anyone interested in cotton production or plant breeding.

Ware (1952), a companion publication to this book, focuses on cotton varieties planted in Arkansas by providing additional background information on these varieties (history and production shifts), a novel key to identify the varieties, and results from Arkansas variety tests conducted in 1946–1950.

The boll weevil era, which began in the early 1900s (as noted by Ware), ended in the U.S. with the Boll Weevil Eradication Program in the 1990s. Ware chronicled breeding efforts in the first half of the boll weevil era. While developing improved lines in the second half of the boll weevil era, public and private cotton breeding focused on improving genetic resistance to insect and disease pests and gaining a better understanding of inheritance and interrelationships of traits. During this time, the Plant Variety Protection (PVP) act was passed in 1970. This act stimulated efforts in variety development by allowing breeders to protect their lines. Boll weevil eradication (and the end of the boll weevil era) in the U.S. was accompanied by the advent of transgenic cotton varieties, which provided heightened resistance to certain insect pests and enhanced weed control by providing tolerance to several herbicides. Thus, Ware's pre-boll weevil and boll weevil eras have now been followed by a post-boll weevil (or transgenic) era.

Fred Bourland, 2023
Professor and Altheimer Chair for Cotton Research and Development

References

Bourland, F.M. 2018. History of cotton breeding and genetics at the University of Arkansas. J. Cotton Sci. 22:171-182.
Bourland, F.M. 2019. Jacob Osborne Ware, an early cotton breeding giant. J. Cotton Sci. 23:239-245.
Ware, J.O. 1952. Origin and performance of principal cotton varieties in Arkansas. June 1952. 66 pp. Arkansas Agricultural Experiment Station Bul. 527.

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Acknowledgments

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Introduction

American Upland cotton (*Gossypium hirsutum*) is a Dixie product. Although the stocks of the species were brought from elsewhere, new types (through series of adaptational changes) formed this distinctive group—the final characteristics of which are a product of the Cotton Belt of the United States. These biological processes were considerably aided by man and the steps of development possibly were about as follows: (a) natural selection took place in the earlier introductions, (b) seed were saved from the more choice stocks, (c) series of subsequent introductions were obtained from the better sources, (d) these were acclimatized and the superior ones kept, (e) as the colonists spread or moved westward new ecological situations affected the direction in adaptation and varietal differences occurred, (f) the source of seed also had effects on varietal differences, (g) later in the time scale, selection breeding began and brought more pressure on varietal differentiation, and (h) finally, modern breeding took over and we now have the varieties and strains that exist today and the generally high level of responses maintained in most of them.

From time to time during this period and out of this series of developments, stocks have gone out, or back, to most of the other cotton growing countries, where similar evolutionary processes (though shorter in span and less rugged in change) have re established the stocks and other special types of Upland cotton.

First Great Impetus

The rise and development of American Upland cotton received its main emphasis in a rather unique setting of coordinated movements, that gathered their forces in the latter part of the 18th century. This culmination was the invention of factory machinery for manufacturing cotton textiles in England, the invention in the United States of the sawgin to separate the fuzzy seed of Upland from the lint, and the new and suddenly enlarged supply of Upland cotton developed in the southern states. The rise of American Upland cotton from the standpoint of history was much later than that of some of the other cultivated species in other cotton growing areas of the world. However, when this cotton did come on the scene commercially, the supply was not only greater but the product was much more suitable than any other kind for general factory use.

Origin and Development

The present Cotton Belt, when Europeans first came, contained no cotton except some *Gossypium punctatum* forms possibly in southern Florida, along parts of the coast of the Gulf of Mexico, southwestern Texas, New Mexico and California. It is more definite, however, that Hopi or Moqui cotton of *punctatum* stock did occur in Arizona. Lewton[1] classified this cotton as *Gossypium hopi* but Hutchinson et al.[2] think that it is a form of *punctatum*, a subspecies of *G. hirsutum.* Though present for a long time in the southwest, neither Hopi nor the forms mentioned as possibly occurring further eastward, appeared to enter the later Upland complex.

The white people coming to a country, where self-sufficiency was paramount, required some sort of textiles for clothing and other uses. Since the South was a warm country that was not very suitable for flax, hemp or wool production, and was a place of need of cool summer clothing and quickly-produced cheap clothing, the new settlers sought cotton for making or mixing in their textiles. In many cases, however, flax was possibly used for warp in weaving and wool may have been used as weft or mixed with cotton for this filler when winter clothing was made. The settlers were already familiar with such usage of cotton in the old countries, and it was natural for them to obtain seed of the cotton plant for planting in the New World from the countries from which their raw cotton had previously come to Europe.

The cottons known to European trade before the discovery of America were those of the Mediterranean area—the Levant, Spain, Sicily and North Africa—and of India, Siam and China. Columbus and other early explorers (knowing of this trade in cotton and of the growing of the plant in these Old World countries) on arrival recognized the same sort of industry and thought they were in India, and had reached that country by a sea route directly westward. Hence, the first islands discovered were called the "West Indies." The industry was being practiced in about the same manner as had been reported for Old India and was widespread on the islands (West Indies) and in many places on the tropical mainland (America). Specimens of the textiles and doubtless cotton seed were carried back and made much of among the home people. These seed no doubt were planted in various Old World cotton areas particularly around the Mediterranean and became presumably a part of the stocks later carried to the new colonies of North America.

The earliest cottons brought to this country were from the Levant. Some of this seed probably was returned New World stocks, but at least portions of it were of the Asiatic species *G. herbaceum*, the common cotton of the Near East and Central Asia at that time. In connection with the early settlement of Louisiana (which at the time included Alabama, the general Mississippi Valley and Texas), white Siam cotton and Chinese Nankeen were brought in. These cottons doubtless were of the other Asiatic species *G. arboreum*. The next step was the introduction of New World cottons from the West Indies and also to some extent from eastern Mexico, and Central America, Pernambuco (in Brazil) and Peru. Cotton culture was taken up earlier by white people in these (Latin American) countries, due to earlier European colonization and the advantage of having already adapted or endemic stocks. These tropical

cottons did not in many cases thrive in our higher latitude and under our summer day length because of their perennial habit or photoperiodic requirement. However, annual forms or near annual forms, apparently of the *G. hirsutum* species (which doubtless had been originally collected from the east coast mainland of Mexico and Central America) fruited under our length of day condition and matured some bolls before winter frosts set in. Although these stocks may not have been much adapted at first, eventually they (and those of the same kind that may have been returned from the Mediterranean area) supplanted the Asiatic species of prior introductions. Therefore became the regular early American Upland cotton of the colonial period and thereafter until Mexican highland stocks began to supersede them.

Colored lint represented in the Chinese Nankeen such as first introduced into Louisiana (spreading in that French or Spanish territory and likewise into English colonies eastward) persisted doubtless for some time in small plantings where natural color of lint was desired in making certain homespun and pattern weaves. Moreover, it is likely that this kind was also finally replaced at a somewhat later date by imported Mexican or Central American colored varieties brought in along with the white ones. The Mexican colored cottons remained as relics in a few primitive American communities until recently. Some of these are still maintained in experimental gardens. Possibly, some of the present colored stocks also have arisen as mutations from white stock.

Early White Uplands of Two Kinds

The early and generally established white *G. hirsutum* was of two types: The naked or black seed (with fuzzy tip) and the fuzzy green seed (Hammond[3]). The former could be better handled in hand ginning or by the crude type (churcka) roller gin that was introduced from the Levant or India into some areas, particularly near the coast. The seeds of this type of cotton were loose in the lint and consequently slipped out more easily either by hand manipulation or when run between the rollers. The green seed kind was more productive, but the seeds were tight in the lint and, therefore, very difficult to remove with the hands or even with the roller gin. However, this problem was overcome by the use of the bow to the extent that the less productive naked seed form gradually dropped out of existence in areas where the roller gin had come into use. In the bowing process, the tight seed cotton was repeatedly beaten with the bow and the bow string allowed after each stroke to momentarily vibrate in the mass. This operation loosened the lint to the extent that it was much more easily removed from the seeds by the gin rollers or even by hand. (Bowed cotton was a trade name that persisted in Georgia long after the process had been discontinued as a result of the invention of the saw gin).

Origin of Upland Name

The immediate coastal areas of the colonies, being interested mostly in other enterprises like tobacco, rice and indigo production, did not take up cotton culture as a home industry very much. Their commercial industries provided purchasing power to obtain textiles from the mother countries or raw cotton from Smyrna, the Barbadoes or Pernambuco for the slaves to make their clothing. Sea Island, *Gossypium barbadense*, that became an important commercial crop in coastal areas of South Carolina and Georgia, did not develop until after the Revolutionary War when rice and indigo lost much of their export value. Successful Sea Island stock was not introduced until about 1787. Spread of this cotton to the interior in southern Georgia and northern Florida was considerably later.

In the back or upper country (interior) of the Carolinas and Georgia, the colonists by necessity had to be completely self-sufficient. They had little transportation outlet and consequently not much to sell. In this upland country (and where wool and flax production could not provide for all textile uses), the short, tight, green seed cotton (and to some extent the naked seed and colored lint forms) sufficed in adaptation, and thus, supplied the textile shortage and consequently became known as "Upland cotton." This name later on was used in contrast with "low land" or "Sea Island" when the Sea Island cotton came into culture.

First Commercial Use in This Country

Not a great deal of the upper country was occupied by white people until after the close of the French and Indian War in about 1760 when the Pennsylvania Dutch, Tidewater people, and new European immigrants rapidly spread over these upcountry regions. Cotton culture likewise spread among these new colonists, but did not become a commercial crop of any consequence until the outbreak of the Revolutionary War when textile supplies for the coastal areas were cut off from England and raw cotton from all outside countries was greatly curtailed. Cotton textiles were so badly needed to clothe the soldiers, as well as the people in general, that cotton culture not only expanded in the old local areas but spread to the coastal eras of Maryland, Delaware and New Jersey and also to eastern Pennsylvania. Roller gins were set up in Philadelphia, and consequently this city became a market for seed cotton and a center of distribution of lint to those who could spin and weave it into cloth. After the Revolution, Philadelphia continued as a seed cotton market until the saw gin was established in the South and New York became an export market of the sawginned lint.

The Factory System of Manufacture

In the meantime, the factory system for manufacture of cotton textiles had been established in England. This development, like that of the origin and rise of American Upland cotton in the southern states, had a long period of growth even much longer than the latter.

The art of growing and conversion of cotton was brought into and established in Spain in the 10th century by the Moors and in Italy during the 11th and 12th centuries by the Crusaders. Although English soldiers participated in the Crusades, they apparently did not return any converted cottons to their homeland. Crawford[4] states that cotton was first used in England in the 13th century for candle wicks and trimmings of doublets, but that importation of cotton goods was not common until the 14th century. The countries of northwestern Europe being much removed from cotton-growing areas, the art of conversion only gradually spread from southern Europe to those areas. The movement was from Italy to south Germany and to Flanders or the Netherlands. Cotton manufacturing (hand) began in England in the latter part of the 16th and early parts of the 17th centuries coincident with the coming of Flemish refugees from the Netherlands. These refugees were cotton textile workers. In about 1621, approximately 40,000 pieces of mixed cotton and linen fabrics were being produced annually and, according to Hanby,[5] cotton manufacturing was firmly established in England by 1641. However, due to crude and clumsy implements (little improved over those of 2,000 years earlier in India), fine yarns and those of strength and fineness could not be produced. These yarns were loose and flimsy and, therefore, to make them strong they had to be heavy and coarse. For this reason, all warp yarns had to be made of linen.

It was not until after 1771 when Richard Arkwright completed the first cotton mill, including his famous spinning frame driven by water power at Cromford, England, that cotton could be spun into yarns strong and firm enough for use as warp. After this advancement in textile improvement, "allcotton" fabrics were produced for the first time in Europe. The rate of processing was greatly speeded up and cotton goods became much cheaper due to greater production and to no further need of the more expensive linen yarn for warp. Arkwright's spinning frame was a combination of Wyatt's spinning rollers, Hargreaves spinning jenny and other improved devices of the time that he found useful to incorporate. Richard Arkwright has been considered the father of the factory system of cotton textile manufacture in England. One of his mechanics and associates, Samuel Slater came to America and built the first successful spinning mill at Pawtucket, Rhode Island, in 1793. Slater became the father of the cotton textile industry in this country. Shortly following Arkwright's first cotton factory, Samuel Compton in 1779 invented the "spinning mule," which was a machine capable of spinning cotton into fine yarn. The mule consequently gave the British manufacturers final control over the difficult art of fine cotton spinning and made England the world's dominant figure in this industry. It was possible to spin fine yarns strong enough to weave into the lighter grades of cotton fabric, suitable for the best calicoes. Machinery in England, therefore, took over the work of the fine hand arts of India that had profitably existed for thousands of years in Dacca and other parts of India and had given textile romance to the East.

Early Supply to England

As the manufacturing age in England arose, additional supplies of raw cotton besides those of the Mediterranean area and India were sought in the New World. At first, the new supply was obtained in the West Indies and to some extent in Brazil and Peru. Finally, these supplies became inadequate, and after the Revolutionary War, regular trade in cotton was begun with the United States (some few small scattering lots had been shipped to England prior to the Revolution). Commercial supply in this country had been small due to the difficulty of linting the tight, fuzzy seed Upland. However, after the invention of the saw gin in 1793 by Eli Whitney, it was possible to soon meet the English demand.

An annual average of 100 bales of 400 pounds each were shipped to England from 1786 to 1790; 166,310 bales from 1816 to 1820; 1,297,230 bales from 1846 to 1850; and 2,589,070 bales from 1876 to 1880. From 1786 to 1790, American cotton made up only 1/636 of England's total cotton imports, while 60 years later, 1846 to 1850, American cotton supplied 4/5 of England's cotton needs.

Sea Island shipments doubtless were included in these lots. Although relatively small in amount to that of Upland, Sea Island all went to the fine spinners of England until similar spinning was developed on the continent and in this country. Sea Island cotton gradually grew to quite an industry in coastal South Carolina and Georgia and finally in some more interior parts of southern Georgia and north Florida as production in the West Indies, which included much long and fine cotton, declined. Also, after the Revolutionary War, rice and indigo cultures lost much of their importance. This decline brought about more need for a substitute crop in coastal South Carolina and Georgia. Sea Island cotton became the substitute. The American Sea Island was the finest known in the world at the time and this long fine lint was used for the manufacture of thread, laces and other fine yarn goods. Since this was a limited trade, Sea Island growing never became a wide spread enterprise and one that competed with the main cotton growing industry, using the Upland species. The Upland, to the merchants collecting and handling it and to the English spinners, soon became known as "American Upland."

As the American spinning industry developed, more and more of the Upland, as well as of the Sea Island, was used domestically. After fine spinning arose in this country, im-

portation of Egyptian cotton in competition with Sea Island began. Later on, particularly after the War Between the States, American fine spinners became interested in Upland long staple and gave impetus to the growth of this type in the Mississippi Valley.

Decline of Green Seed Upland

The green seed Upland, previously indicated as of coastal Mexico or Central American origin, sufficed in the early days of new lands and slave labor, but did not appear to have the yield, the lint percentage, the size of boll, the disease resistance, the storm resistance nor the length of fiber that was found later to occur in the grayish white seed stocks from the drier highlands of Mexico. According to Hammond,[3] the introduction of this new Upland stock, begun in the early decades of the 19th century, was said to be of as great further impetus to the American cotton industry as the saw gin was to the culture of the green seed type.

Some green seed stock or derivatives, however, persisted, particularly in the eastern end of the Cotton Belt for a long time even extending into the earlier part of this century. The practice of the use of commercial fertilizer, begun about 1850, tended to detract growers from varieties as of first interest in production. The response in cotton yield on old lands thought to have been already worn out, brought about by this commercial plant food, tended to offset dissatisfaction with the green seed varieties, that would have otherwise arisen earlier. These varieties were early and prolific and therefore quite responsive to quick acting nutrients.

The peoples of the southern colonies, though not all of the same nationality, were homogenous in interest and will to get ahead by pioneering and hard work. Descendants of the earlier settlers of the eastern colonies moved westward as new territory was opened to them and, by sheer force of number, dominated the sparsely settled original French and Spanish provinces of Louisiana and Texas. Kindred relations and common economic interests, all the way across the Cotton Belt, stimulated exchange of crop seeds and, therefore, as far as cotton was concerned in the earlier period, tendencies toward adaptational developments of distinct types in given areas was largely counteracted. Green seed stocks were carried and sent westward and newly acquired Mexican highland stocks carried back or sent eastward.

According to Dabney,[6] cotton was the great pioneer crop of the new southwestern states (of United States at that time). The center of production moved faster than that of any other crop and more rapid than the center of population itself. By 1839, Mississippi was producing almost 1/4 of the entire crop of the country. According to Gabbard and Rea,[7] cotton growing on a commercial scale was introduced in Texas by American colonists led by Stephen F. Austin who settled on the banks of the lower Brazos River in 1821. In 1826, Austin stated "Our cotton is of superior quality and produces very well, the average height of cotton on the bottom land is 9 to 12 feet and yields generally 2,500 to 3,000 pounds to the acre." In 1833, two thousand bales of 450 pounds to the bale were ginned in each of the Departments of Brazos and Nacogdoches, Texas.

Formation of Types

In the earlier period when cotton was solely a home industry, the people (as far as records show) were not very variety or type conscious. The plantings were thought of merely as "cotton." However, after the big westward movement took place and cotton growing became more of a commercial enterprise, growers doubtless began to note, to greater extent, differences in yield and in relative popularity of particular products with buyers. Such distinctions would lead to giving more attention to the special variety to plant and the best source of seed. The best adapted stock for the particular area where the crop was to be grown would also be another consideration. As the growers moved westward, such questions as these would arise: Were certain stocks of the green seed kind, from the east, better? Were the Mexican kinds, that were beginning to come into the country, more satisfactory? Were mixtures of two or more kinds still better or was it desirable to make special selections of the stalks that showed best response in their fields?

Separate stocks from foreign sources or from different places in this country showed certain differences in response and in appearance and were given names. Local selections from imported stocks exhibited special characteristics and were also given names. As such stocks were cultivated longer in the same area, especially if continuously selected for some special attribute, they showed still more individuality. On the other hand, no distinct patterns of real botanical differentiation of subspecies or of species level ever occurred. Categories of this rank are not likely to arise in the course of only a century among contiguous areas and where seed exchange continued. The varieties and type groups of American Upland are thought, and spoken of, as agricultural varieties and types in contrast to that which would be expected in a regular taxonomic classification made strictly from the botanical standpoint. These agricultural types and varieties from the early beginning of development, as discussed above, gradually arose and became more and more distinct until the early part of this century—when measures put forth to combat the boll weevil obliterated some of the types and their varieties and greatly modified the rest.

Fortunately for the record, Duggar[8] and Tyler[9] made studies of the American Upland varieties at the time of their height in differentiation and just before the onrush of the boll weevil caused a new or much modified series of varieties to be substituted. Duggar[8] collected and grew under observation at Auburn, Alabama, varieties representing all types of the Cotton Belt. The first collection was made and grown in 1899 and, thereafter, 60 to 100 varieties were re-collected for each of the years during the period of 1902 to 1906

inclusive. Tyler,[9] by use of the questionnaire method, surveyed the Cotton Belt in 1907 and obtained the names of 612 varieties and synonyms. This survey was followed up by travel to verify many of the reports. Experiment stations and many of the growers were visited and their records or stocks studied.

Duggar[8] found that there were eight general types, seven being rather distinct. The eighth group was more or less a catchall for nondescripts that could not be placed elsewhere. This group was referred to as intermediate or miscellaneous. Tyler[9] added an additional group, or that is, separated the big boll division into two types. The nine groups are as follows: Eastern Big Boll or Truitt type, Semicluster or Peerless type, Cluster or Dickson type, Rio Grande or Peterkin type, Early or King type, Long Limb or Petit Gulf type, Upland Long Staple or Allen type, Intermediate or Miscellaneous type, and Western Big Boll or Stormproof type.

Mexican Highland Stocks

When Cortez invaded Mexico in 1619, he found the natives making extensive use of cotton for clothing and in their other textile arts. They had neither wool nor silk and did not use flax, although they possessed that plant. It has been estimated that prior to this conquest, the annual production of Mexico was about 200,000 bales. However, under Spanish rule, cultivation declined—but some stocks remained in culture and others were carried to the West Indies, the Mediterranean area and to many other parts of the world. The Upland forms grown by the Mexicans on the highlands, such as Cortez found, were likely to have been annuals or near annuals and doubtless possessed growth habit more suitable for the American Cotton Belt than was the case with the lowland and island forms further south.

About the first recorded importation and distribution of Mexican highland stocks of Upland in this country was made by Walter Burling, who brought this seed from Mexico City to Natchez, Mississippi, in 1806. Later, some of this stock was transferred to South Carolina about 1816 and eventually became the parents of a large number of good varieties of that part of the Cotton Belt. Another of the earliest records of Mexican importation is that of a stock designated as the Hollingshead cotton, which was said to be of Mexican origin and grown to considerable extent in the Carolinas about 1818. Petit Gulf, a stock of Mexican origin, became very prominent in Mississippi and spread to other parts of the Cotton Belt during the period of 1830 to 1850. H.W. Vick of Vicksburg, Mississippi, made many shipments of this stock for a number of years from a port (just below Vicksburg on the Mississippi River) known as Petit Gulf. The stock took its name from the shipping point. In about 1848-1849, large quantities of Petit Gulf were shipped by Vick to Georgia and Alabama, where it was widely grown and later served as parent material of subsequent varieties. This stock was characterized by large, longlimbed, longjointed plants, ovate bolls of medium size, lint percentage of 30 to 32 and staple length of 7/8 to 1 inch. The plants were late and not very prolific. This type was maintained throughout the century, but possessed sufficient variation for other types such as cluster and semicluster to be originated from it. Duggar[8] designated Petit Gulf as the type example of his longlimbed type.

Mexican Burr was another old Mexican stock that produced bolls in clusters and also was the source of later cluster varieties. A variety known as Sugar Loaf (not the eastern variety known for its earliness) derived from Mexican stocks was developed in Yalobusha County, Mississippi, about 1843. It also was a cluster form and became the parent of later cluster varieties. The U.S. patent office report of 1849 mentions still another Mexican stock that was imported prior to that year. It has also been stated that American soldiers, returning from the Mexican War around 1847–1848, brought back additional stocks that were further utilized in various parts of the cotton area but presumably to greatest extent in Texas.

Another Mexican stock reached this country by more indirect route. It was of large and vigorous plant type and had large bolls and white seed like other introductions from the highlands of Mexico. The stock came from Algeria, but doubtless had been carried there at some previous time from the highlands of Mexico. About 1853, two brothers by the name of Wyche emigrated from Germany—one going to Algeria on the coast of the Mediterranean to work for a French colony engaged in growing cotton and the other to the state of Georgia. In about 1857, the brother in Algeria sent a packet of cotton seed to his brother in this country. The development of this seed is remarkable as exhibited among the later big boll cottons of the eastern end of the Cotton Belt.

In 1896, Tracy[10] stated that it was from the Mexican stocks and that, by far, the larger proportion of the short and medium staple varieties of that period had been developed.

Eastern Big Boll Type

Many of the leading big boll varieties developed in the eastern end of the Cotton Belt can be traced directly to or identified as having "blood" of Wyche or the Mediterranean stock of Mexican Upland introduced by the Wyche brothers. The Wyche brother of Georgia acquired a plantation at Oakland, Georgia, where the seed were planted, but due to the early oncoming of the War Between the States, little attention was given to the culture of the new cotton and it was practically lost. In the meantime, Wyche died, but J.S. Wyche (apparently a son or otherwise heir of the elder) later carried on a seed distributing business.

Immediately after the war, or possibly before, much attention was given to the Algerian stocks. J.F. Jones of Hogansville, Georgia, while fox hunting on the Wyche plantation, noticed patches of what appeared to be an unusual cotton. Being a large cotton grower and promoter and distributor of good seed, Jones and his companion, Warren Beg-

garly, obtained some of the Wyche seed. The act called the Wyche family's attention to the value of the stocks. Beggarly first produced and sold seed as Beggarly's Big Boll. After Beggarly's death, his work was left to Jones who during that period (from 1871 to some years after the end of the century) maintained, grew, and distributed this stock under the name of Jones Improved. The improvement consisted of some increase in earliness, which was attended by somewhat smaller bolls. Jones claimed that the Wyche stock was the first big-boll, whiteseed cotton grown in this country. The plants were robust and vigorous with wide spreading branches from near the base and with shorter upper limbs. The bolls were large, ovate and blunt pointed; the seed were medium large and covered with grayish white fuzz and abundant lint. The lint percentage was 31 to 32 and the staple 1 to 1-1/8 inches in length. After about 1873, J.S. Wyche developed his original stock and began to sell it under the trade name of "Mortgage Lifter." The Wyche stock (whether sold under the original name of Wyche, Mortgage Lifter, or Jones Improved) was popular and widely distributed for a long time.

Tyler,[9] who published separate maps showing individual distributions of 67 of the most important varieties of his 1907 survey, indicated that still at that time, Jones Improved occurred to some extent in practically all the states of the main Cotton Belt, and that Mortgage Lifter was so densely distributed that it was present in practically every county of the area. The distribution of Jones Improved, as such, was discontinued earlier than that of Mortgage Lifter due to substitution of more recently reselected stocks out of the former. Pride of Georgia was selected out of the Jones Improved by Jones himself. This new variety retained many of the good qualities of Wyche and Jones Improved, but was somewhat earlier in maturity—the internodes of the fruiting limbs being shortened and the bolls slightly reduced in size. The variety tended toward the semicluster habit slightly. According to Tyler's[9] map for this variety, it had in 1907 about the same distribution as the parent, Jones Improved, but showed a little more density.

Warren Beggarly furnished W.H. Banks (of Newnan, Georgia) Wyche or Beggarly seed from which the latter developed Banks Big Boll, which was somewhat thinly distributed over the Cotton Belt in 1907, as shown by Tyler's[9] map for this variety. Christopher (developed by R.H. Christopher of Asbury, Georgia) was a Wyche stock and in 1907 was concentrated mostly in Georgia and Alabama. Schley was selected from Jones Improved at the Georgia Experiment Station and in 1907 occurred in a number of Georgia counties and at a few points in several other states.

Since Wyche stock was being grown almost exclusively in Troupe County, Georgia, in 1885 when George W. Truitt of Lagrange started the Truitt variety, it seems certain that Wyche is the parent of Truitt. Duggar[8] stated that the parent was the so-called "Old Georgia White Seed," which indicates Wyche or Jones Improved. Truitt selected for several years until he obtained a prolific, medium early bigboll variety. This variety was widely grown for a considerable period of time and Tyler's[9] map shows as late as 1907 that it was heavily concentrated in Georgia, South Carolina and Alabama, and also well distributed, though more lightly, in the other states of the Cotton Belt.

The description of Truitt is much like that of Wyche or Jones Improved. The plants were robust and prolific with 3 to 4 large basal limbs and the main, central stalk with comparatively short branches. The bolls were very large, ovate, blunt pointed, opening wide and easy to pick. The seeds were fuzzy, gray, comparatively large (averaging about 14 grams per 100), lint 3/4 to 1 inch long and of good quality. Also, the seed were well covered and the seed cotton yielded 31 to 33 percent lint. Duggar[8] considered Truitt the type variety of his Big Boll group.

Russell is next in line in this Big Boll series. This variety was originated in 1895 from a single stalk found by J.T. Russell of Alexander City, Alabama, in his field of cotton. Russell was growing an impure stock of Truitt at the time, and supposed that the plant selected was a cross between Truitt and Allen, an Upland long staple variety. The greatest departure in the Russell variety was the variation to green or greenish brown fuzz. There was no indication of the influence of Allen in lint length or in any of the other characteristics. The plants were large and vigorous and with 1 to 3 stout limbs, the fruiting branches were about 2 feet long below and 6 or 8 inches long at the top of the stalk, the internodes were of medium length, the leaves and bolls were large, the staple length about 31/32 and the lint percentage about 31. Duggar[8] stated that Russell resembled Bancroft Herlong. This, however, does not appear to be the case. While the green fuzz color was similar in both, the bolls and plant habits differed. The bolls were distinct in shape from those of Bancroft Herlong and the plant habit was not semicluster in habit like the latter, but more like the Truitt. The green seed, which were very large must have been of some hybrid origin, possibly originated from contamination of old eastern greenseed stock. Since the other plant characters did not show much indication of hybrid origin, it is possible that the green seed character itself may have resulted from mutation. Russell, in spite of the green seed, became a popular variety. In 1907, as shown by Tyler's[9] map for this variety, it was densely and widely distributed throughout the Cotton Belt. The objection to green seed, particularly if the fuzz is long, comes from the presence of small neppy inclusions of green fuzz removed from the seed with the lint by the saws, especially if the seed cotton is damp or wet. Greenness of fuzz also lowers the grade of the linters.

Russell was also known as Big Boll Green Seed and Ozier Big Boll. Tyler's[9] 1907 map for Ozier Big Boll indicates considerable distribution of this variety in Arkansas and Mississippi. It also was shown as occurring at a few places in each of the other cotton states. Rogers Big Boll developed by R.H. Rogers at Darlington, South Carolina, from a mixture of Jones Improved, Jowers (a Peterkin form) and Bancroft Herlong resembled in general the Wyche cotton with the exception that it was somewhat semicluster. This

variety, according to Tyler,[9] was scatteringly distributed over the Cotton Belt in 1907. Strickland was of Wyche stock and developed by J.R. Strickland of Gardo, Alabama. In 1907, it occurred, as shown by Tyler,[9] to considerable extent in upper Georgia, Alabama, and north Mississippi.

In the first decade of this century, two rather important Big Boll cottons also having long staple were developed from the Jones Improved stock. These were the Hartsville and Keenan varieties. In 1902, out of Jones Improved grown on the farm of D.R. Coker at Hartsville, S.C., D.N. Shoemaker made 20 selections. Reselection was done in 1903, and in 1904 Shoemaker turned the work over to D.R. Coker, who continued the development of this cotton. Coker bred, maintained and distributed seed of this stock as the Hartsville variety for a number of years. The plants were medium in height and somewhat stocky, but not of cluster type. The bolls were large, roundish oval, averaging about 60 to the pound. The lint was 1-1/8 to 1-3/16 inches long and very uniform in length and strength. The lint percentage was 34 to 35. The seed were medium large and covered with a heavy coat of grayish white fuzz.

In 1903, a plot of special Jones Improved seed, obtained from J.F. Jones of Hogansville, Georgia, was planted at the suggestion of H.J. Webber on R.C. Keenan's plantation near Columbia, S.C. All the plants in the plot were examined by Webber to determine variation of staple length that may be found in a short staple cotton. While most of the plants had lint only about 1 inch in length, a few had length from 1-1/8 to 1-1/4 inches. Twenty-eight of the better long staple plants were selected and planted the next season by the plant-to-row method. Nine of the rows showed fairly strong transmitting power. Consequently, plants having desirable length in these progenies were reselected. In the ensuing year, selections were limited to six of the above progenies which seemed to reproduce the desired type of lint and plant. After this step, the type appeared to be pretty well fixed. The plants were robust, vigorous and prolific, usually with several long basal branches and a central axis with comparatively short lateral fruiting limbs, bolls large and ovate, blunt pointed, opening well, seed medium large and well covered with grayish fuzz, lint fine but slightly coarser and shorter than that of Columbia (mentioned below), staple length 1-3/16 to 1-3/8 averaging 1-1/4 inches, lint percentage 31 to 32, and under ordinary conditions the crop was of medium maturity. The variety was given the name of Keenan after the owner of the plantation where the breeding work was done and from where the seed was later distributed.

The next important variety of this Big Boll series was Columbia, which was developed from Russell stock instead of from Jones Improved like the two previous ones. In connection with J.H. Webber's cotton breeding work, a plot of Russell was grown on a farm, possibly R.C. Keenan's near Columbia, S.C., in 1902. Every plant in the plot was combed for staple length, which was found to be somewhat variable ranging in general from 1 to 1-1/8 inches. However, a few plants were found that had lint nearly 1-1/4 inches long and one especially good plant having lint about 1-3/8 inches. The plants having the extra length of lint were planted in progeny rows the next year and it was found that the one having the longest lint the year before reproduced the character in marked degree while the others showed no improvement over the Russell parent. Further selection was confined to the one best row. About 75% of these selections had lint 1-1/4 inches in length and 12 others had the 1-3/8 length. In 1904, the 12 plants were planted in plant-to-rows and only one of these turned out to be superior, which made the basis for further selection. With selections from this row, the plant-to-row plan was repeated in 1905 when the material showed reduction to a5 practical fixity of type. Some individual selections were made to continue the breeding lines, but a second selection of all better plants was carried out to obtain bulk seed for an increase planting which occupied about 14 acres in 1906. Some of these seed were distributed and given the varietal name of Columbia.

Throughout the selection work, the aim was to select plants of the Russell type of branching and boll, and away from the green seed and the short staple. The plants were low, compact and of the Russell type, being vigorous and prolific, and having several long branching basal limbs. The bolls were large to very large, ovate, blunt pointed and opening very wide; the seeds were large and white fuzzy, but having some of them, greenish; the lint was very strong, fine and silky and uniform in length which ranged from 1-7/16 to 1-3/8 inches; the lint percentage was from 29 to 33; and the maturity of the plants was medium.

On leaving the cotton breeding work at this juncture, H.J. Webber turned his breeding stocks of Columbia over to D.R. Coker of Hartsville, S.C., who developed from this stock another strain which he named "Webber." Webber 49 and Webber 82 were in turn isolated from the Webber. In the meantime, Coker had organized the Pedigreed Seed Company at Hartsville, which some years later became the Coker Pedigreed Seed Company. Deltatype Webber was developed from Webber 82, and finally, Wilds in 1919 as a result of a cross between Deltatype Webber and Lightning Express. The latter parent was an early postboll weevil, longstaple Upland variety developed from the Express variety from Mississippi.

A series of long-staple varieties, therefore, were developed from an eastern Big Boll cotton previously considered as medium or short in staple length. Possibly, the stocks contained considerable length variability that had not been previously noted. There appears to be no evidence that any Sea Island "blood" entered these cottons. Some cotton workers have believed that all Upland long-staple varieties have been derived from crosses of Upland short staple and Sea Island or Egyptian. Lightning Express also traces back to Big Boll parentage rather than to any older long-staple variety. The eastern series of long-staple varieties retained much of the boll size and many of the other characteristics of the old Wyche Upland cotton.

In accordance with Tyler's[9] survey a number of other old, short-staple varieties, not mentioned above, belonged to the

Eastern Big Boll group. Most of these were of local interest, but some had been or were of very wide interest and later became parents of important subsequent varieties. Some of the old varieties are traced back to seed mixtures of Wyche, or hybrids of Wyche, or derivative with another variety or varieties of the time. At the time of Tyler's[9] study, some of the old varieties were found to be quite variable due to mixed parentage or improper subsequent care of the seed stocks.

Corley Wonderful was a variety developed in Alabama from Russell stock. The lint percentage was reported as being higher than that of Russell. DoubleHeader and Williams Select were Georgia varieties and both derived from Russell by selection. Both varieties had some tendency toward the semi-cluster habit. Several other Big Boll varieties, such as Allen Big Boll, Berry, Dongola, Haralson, Pulnott, Spearman's Choice, Tatum and Todds Improved (each resembling Truitt and Russell) were developed in Georgia in the 1890s or earlier, and doubtless were Wyche derivatives. Allen Big Boll was widely distributed in the Cotton Belt in 1907, but at that time lacked uniformity with many plants showing semi-cluster tendencies. Berry was a more uniform variety, but had a more pronounced semi-cluster habit than its closely related Big Boll varieties. In 1907, Berry was more common in Georgia and Alabama, but also occurred to some extent in about all of the cotton states. Dongola, Haralson, and Spearman's Choice were very similar, the last two reported as coming from the first. In the three, the plants were stocky and vigorous and with a tendency toward the semi-cluster habit. There were 1 to 3 stout branches and the bolls were large. Dongola occurred to some extent in all the cotton states but was confined more to Georgia. The other two apparently occurred mostly in Georgia. Pulnott was typical of the Eastern Big Boll group and pyramid in form, but did not show clustering of bolls. This variety was popular in northeastern Georgia for many years, but about 1907, it was being superseded to some extent by Cook Improved and especially by LongShank (to be discussed later). Pulnott was said to be well suited to poor, wornout lands, but did not become "weedy" when grown on rich soil—being as nearly a general-purpose cotton as Peterkin. Tatum and Todds Improved apparently were confined largely to Georgia. The former showed cluster tendencies while the latter did not. Cummings was another of the Eastern Big Boll cottons which was developed in Alabama sometime prior to 1907. Its tendency was toward the semi-cluster habit and it was quite susceptible to boll rot, which was assigned as the cause of disappearance. This variety in 1907 was confined mostly to eastern Alabama, but was reported from a few points in several of the other states.

Beat-All is a rather interesting old variety reported as having originated about 90 years ago. If it did not come from Wyche, it possibly was derived from other Mexican stocks shipped from Mississippi to Georgia during that period. Description of Beat-All given by Tyler[9] in 1907 shows it to be practically identical with the Wyche or Mexican stocks. The variety was developed at Ellaville, Georgia, by Calvin Carter and Isaac Hart and maintained on the same farm and kept pure by one of the sons of the latter, Emmett Hart, until the time of Tyler's[9] study. Beat-All for many years had been very popular locally in southern Georgia. It was considered specifically suited for poor and wornout land, and it did not do well on rich land in the upper part of the state. Even at the present time, vigorous growing big leaf varieties are found to be best adapted for the area in the vicinity of Tifton, which is in southern Georgia. In 1907 Tyler[9] found the Beat-All variety to be remarkably uniform.

Bancroft Herlong is the variety mentioned by Duggar[8] as resembling Russell. Tracy[10] in 1896 stated that the plants were medium in size, well branched, pyramidal, very prolific with bolls medium in size, round, maturing rather late, lint percent 30 to 32 and staple length 13/16 to 1 inch. He also stated that the variety was semicluster in habit and that it was very popular in Georgia and Alabama. As far back as the 10th census in 1880, Bancroft Herlong was reported from six states: South Carolina, Georgia, Florida, Louisiana, Mississippi and Texas. Tyler[9] in 1907 pointed out that there was considerable variability in the variety which rendered it difficult to evaluate as to type and as to comparison with Russell. At that time, the plants were not uniform in growth, the majority being semi-cluster in habit. Other plants were open and long branched with leaves and bolls large and seed large, fuzzy, green and brown in color.

Bancroft Herlong developed about 1868 by Edward Bancroft of Athens, Georgia, who obtained through the editor of a farm paper, the "Southern Cultivator," a small packet of seed from a man named Herlong of Alabama. On planting the seed and finding the cotton after one year's growth to be too late, seed of this stock was mixed with an earlier variety, probably Dickson. This mixture doubtless resulted in the mixed color of seeds and semi-cluster habit. Tyler's[9] 1907 map for Bancroft Herlong shows that it was well distributed in all the cotton states at that time.

Culpepper was another Eastern Big Boll variety that was related to Wyche and became a prominent variety in the late 1890s and early 1900s. The variety was produced in about 1890 by J.E. Culpepper of Luthersville, Georgia, from hybridization of Wyche and Dickson. The hybrid was selected some five years to improve and attempt to fix a type intermediate between the two parents. However, since there were such wide type differences in the parents, this was not accomplished entirely, as some plants showing the respective characters of parents continued to appear. Moreover, the population generally was semi-cluster in habit, having 1 to 3 long side branches and abundant short and irregularly jointed fruiting limbs. The bolls were large and rounded, the lint percentage was about 35 and the staple length about 15/16 of an inch. Culpepper was hardier and more prolific than either of the parents and produced some better staple. On the other hand, this variety inherited, to some extent from the Dickson parent, susceptibility to injury from anthracnose boll rot. Culpepper, according to Tyler's[9] 1907 map for this variety, was well distributed at that time east of the Mississippi

River. It also occurred west of the river in several counties in each of the three states: Louisiana, Arkansas and Texas.

Cleveland was originated about 1885 by J.R. Cleveland of Decatur, Mississippi, who selected the original seed from a cotton bearing no known name. Cleveland then continued to reselect this stock and distribute seed from it for about 25 years. This stock is not so likely to be of Wyche origin, as of some other old Mexican stock that was being grown in Mississippi at that time. According to Duggar[8] the plants were tall and usually well-loaded with bolls and with limbs of medium or short length, tending toward an erect type of big boll plant. The bolls were fairly large and most of them with five locks. The locks fell out rather easily which was about the only serious fault of the variety. The bolls were roundish and pointed or blunt-ish. The seed were of medium size, fuzzy, brownish white, but some were greenish. The lint percentage was higher than in most big boll varieties being around 35 to 37. The staple length ranged from 7/8 to 1 inch averaging about 15/16 of an inch. Cleveland was one of the earliest big boll varieties. Tyler[9] stated, as observed in his 1907 survey, that the plants were not uniform being both semi-cluster and open in growth habit and that the internodes of the fruiting limbs were medium to short which brought about the earlier maturity. Tyler[9] did not find Cleveland grown enough and to wide enough extent in 1907 to justify mapping its distribution. However, the variety since that time has been one of the more important of the Eastern Big Boll group as parent material. There was extensive development of postboll weevil varieties from Cleveland. These were widely used in the middle and eastern end of the Cotton Belt in the second and third decades of this century.

W.W. Wannamaker of St. Matthews, S.C., developed Wannamaker Cleveland during the period from 1908 to 1916. J.O.M. Smith and M.W.H. Collins of Commerce, Georgia, developed Piedmont Cleveland during the 1912 to 1919 period. Both of these varieties came from the old Cleveland and were each widely distributed by the originators for a number of years. Coker Pedigreed Seed Company, of Hartsville, S.C.; Maretts Seed Farms of Westminster, S.C.; Lee Wilson and Company of Wilson, Ark., and others developed and widely distributed subsequent strains of the Wannamaker or the Piedmont Cleveland varieties.

Cook Improved was another of the Eastern Big Boll group that has also played a prominent part in cotton culture as a parent of post-boll weevil varieties and strains. The variety was originated about 1895 by J.R. Cook of Ellaville, Georgia, from a single outstanding and different plant found in the Beat-All variety which had been planted the year before in a plot alongside a plot of the Dickson variety. He thought the new plant was a natural hybrid between Beat-All and Dickson. Cook Improved was never very uniform due to the wide difference in growth habit of the two parents and perhaps to insufficiently close subsequent selection of the hybrid material. The resulting population of this variety was a composite of long-branched large-boll plants at one extreme; of short-branch or semi-cluster, small-boll plants, at the other; and a large proportion of plants intermediate between the two extreme forms. The bolls in general were large to medium large in size. They were roundish, often blunt and usually having 5 locks. The worst fault of the variety was that the locks fell out easily. In maturity, Cook Improved was early to medium, ranking with Cleveland and Berry Big Boll as the earliest varieties having larger bolls. Cook Improved was prolific and had about the highest lint percentage, around 38, of all big boll cottons. The seeds were medium in size, fuzzy, and greenish or brownish gray. The staple varied from about 13/16 to 15/16 of an inch averaging about 7/8 of an inch. Associated with the semi-cluster forms in the variety, Cook Improved inherited some susceptibility to anthracnose boll rot derived presumably from the Dickson parent. According to Tyler's[9] 1907 map for distribution, Cook Improved was rather heavily concentrated in Georgia, Alabama and Mississippi, but occurred, though more lightly, in the rest of the cotton states.

A somewhat later strain coming from Cook Improved, was Brown No. 1 developed by W.L. Brown of Decatur, Georgia. Slight lint percentage was lost, but this was offset by the larger bolls and the more uniform Beat-All plant habit. The results in this case are an illustration of how a hybrid like Cook Improved can be settled down through careful selection. In this accomplishment, it was necessary, however, to recover largely one of the parental types. According to Tyler,[9] Georgia Best was another derivative of Cook Improved that was more stabilized for the semi-cluster habit.

H.H. Summerour of Duluth, Georgia, originated Half and Half as selected from Cook Improved in 1904. This was done by individual plant selection and progeny row testing. Some of the lines, according to the originator, produced as much as 56% lint. The new variety came into prominence about 1911. The plants were medium early, rather compact; leaves only moderately abundant and of medium size; bolls medium size, and very rounded, about 75 to the point; staple length 5/8 to 7/8 of an inch; and the lint percentage 40 to 46. Until recently, this variety was grown extensively in hill and poor land regions east of the Mississippi River. Also, it has been grown widely on corresponding soil types west of the river and especially in the short cotton areas of western Texas and western Oklahoma. It or its substitute, Hibred, are still grown considerably in these western short cotton areas, being suitable types for harvest by hand snapping or with mechanical strippers. Hibred is a derivative of Half and Half, that is, from a cross of Half and Half and Durango (a Mexican cotton).

At the Alabama Experiment Station, E.F. Cauthen began cotton breeding work about 1908 and started with Cook Improved about 1910. Alabama Station Cook was the first strain produced out of their work. It had smaller bolls, higher lint percentage and more uniformity in growth habit than the old Cook Improved variety. Cook 1010 was developed shortly thereafter, and had still smaller bolls, higher lint percentage, shorter staple and more productivity. In 1913, Cook 3076 was introduced. It had resistance to *Fusarium*

wilt and was the parent of the commercial variety Rhyne Cook and other strains later developed for *Fusarium* wilt resistance by the Alabama station. The wilt resistant Cook cottons were widely grown in the *Fusarium* wilt areas of Alabama, Georgia and other southern states until comparatively recent years. H.B. Tisdale joined Cauthen in 1914, succeeded him in 1923 and has continued the Cook cotton breeding work at the Alabama station since that time. In the early 1930s, he found a plant thought to be a natural cross of Cook and Express. From that plant, the Cook 144 having somewhat longer and stronger staple was developed. Cook 912 or Wiregrass Cook was another strain developed by Tisdale from the Old Cook.

Semi-Cluster Type

The clustering habit in cotton may not in all cases be associated with early maturity. However, cluster and semi-cluster segregates (when occurring in the old stalky, spreading, late-maturity big boll varieties) were earlier than the regular type of the population. In these deviates, the internodes of the main stalk were usually shorter and the fruiting branch length much reduced, even becoming only spurs in extreme cluster forms. The bolls were almost always smaller in the plants where clustering appeared, and the general plant habit was more determinate. Such plants were less likely to develop excessive vegetative growth under conditions of high fertility and over supply of moisture.

In these earlier periods of culture of American Upland cotton (all of the stocks originating further south), it was likely found that balance between tendencies to develop excessive vegetation and that of fruit was poorer than today. When production was greatly reduced on some plants over others (or in given stocks over other sorts) as a result of over vegetative growth or frost effects on lateness, the less vegetative and earlier plants or stocks were more likely selected.

The first early varieties among the Mexican stocks, it appears, were cluster or semi-cluster in growth habit. Observations as to character values in plants before formal breeding began, doubtless, was more casual than afterwards. After more experience was gained in plant breeding, early varieties of more spreading habit were developed.

In the review of development of the Eastern Big Boll varieties, it has been seen that a number of the group showed semi-cluster tendencies while some others were about pure for the semi-cluster tendencies. However, because of retention of the big boll character, such varieties were classified in the Eastern Big Boll group. Most of these also were related by descent to varieties of that group. Some of the more modern varieties of the Eastern Big Boll group are much earlier but have retained the spreading habit to fair degree. Also, they have lost much of the original large, woody plant growth.

Boyd Prolific is the oldest variety of definite semi-cluster type found in the records examined by the writer. It is also one of the oldest varieties known to have been developed from a single plant selection. The primary plant was found in a field of cotton in Mississippi by a Mr. Boyd, who thought the parent variety was Petit Gulf. The new variety Boyd Prolific became very common in that state about 1847. Also, about that time, seed of Boyd Prolific was shipped to Georgia where afterwards it became the parent of Dickson and other cluster varieties developed in the eastern end of the Cotton Belt. According to Tyler,[9] Boyd Prolific was a semi-cluster cotton with 1 to 3 side branches and numerous fruiting limbs with short and irregular joints; bolls medium to small, rounded; lint short, percent 30 to 32; seeds small, fuzzy and brownish gray. In the 1990 census, Boyd Prolific was reported from all the cotton states except Missouri and Texas. Tyler's[9] survey in 1907 showed this variety to occur to some extent in these states and more extensively in the other nine states.

Peerless, a semi-cluster variety, was originated about 1880 in Georgia, but the parent stock is unknown. It resembles Boyd Prolific which, as mentioned above, was shipped there much earlier. It was a popular and standard variety and considered one of the best for many years. The plants were moderately tall, pyramidal in shape, side branches 1 to 3, fruiting limbs short and irregularly jointed, about 18 inches long below, shortening to 2 to 3 inches at top of plant, bolls small to medium in size, lint 7/8 to 1 inch, percentage 32 to 33, seeds rather small, fuzzy, greenish or brownish gray. Peerless was designated by Duggar[8] as the type example for the semi-cluster group. Tyler's[9] 1907 survey map for Peerless showed it extensively used, or that is, regularly scattered over the entire Cotton Belt at that time. Cherry, Cochran, Crawford, Drake and Rameses were derivatives of Peerless, but somewhat local in use in different parts of the eastern cotton states.

Hawkins Improved, as a well-known standard and typical semi-cluster variety, was developed by W.B. Hawkins of Nona, Georgia, from a single plant selected from a mixture of New Era (Eastern Big Boll), Peerless, Dickson, Bancroft Herlong, Boyd Prolific and perhaps others. Tyler's[9] 1907 map for this variety shows it to be distributed at that time over the entire Cotton Belt and occurred in numerous counties in each state. Hawkins made a subsequent selection from his original variety, which was more prolific and which he called Jumbo.

Lewis Prize Prolific was originated by W.B.F. Lewis of Lewiston, Louisiana, but it lacked uniformity. J.W. Fox of Greenville, Mississippi, obtained this stock in the early 1900s and reselected it for several years to improve stability and to increase productiveness. The plants grew rather tall, were semi-cluster, began fruiting early in the season and continued until frost. Extension of the fruiting period was considered by some growers as the variety's chief merit. However, after the boll weevil arrived, the long fruiting period was of little value. The variety was considered very hardy, resistant to drought, as well as to an unusual number of other unfavorable conditions.

Rublee is an interesting one of the semi-cluster varieties because it was reported to be under certain conditions to be self-defoliating, that is, the natural process leaving the bolled plant bald and clean of leaves. The variety was originated by C.A. Rublee of Seago, Texas, perhaps in the early 1900s. Although this development was in the west, the new variety resembled the semi-cluster varieties—Hardin, Sterling, Woodfin and Nonpariel of Georgia and Alabama. It was claimed for Rublee that it was early maturing and especially suited for boll weevil conditions. It, however, did not survive the era of this insect.

Shankhigh or LongShank was a semi-cluster variety that was almost full cluster in habit. It could have been placed in the Eastern Big Boll group on the basis of boll size and relation by descent. The variety was characterized by long shanks or much distance from the ground to the first vegetative side branches and by great tallness. The crop was produced high on the plant and the picker was not required to stoop much or at all in picking. The variety was originated by R.E. and M.L. Branch of Bishop, Georgia, from a single stalk found growing in a field of the Russell variety. The new variety was introduced about 1903 and was quite generally cultivated in northeast Georgia, especially in the vicinity of Bishop, Machen and Eatonton, for a number of years.

Hardin and Drake Defiance were two varieties that were objects of extravagant claims in advertising. One of the claims featured was that the semi-cluster habit prevented the crop from becoming too "weedy" on very rich land. This claim, however, was to a certain extent true. The semi-cluster and cluster types, as heretofore pointed out, had the structural advantages to be earlier, as well as, to maintain a better balance between fruiting and vegetative tendencies not so inherent in the large growing and profuse branch types. Earlier start in fruiting and earlier loading of bolls, however, would prevent any type from going to "bush" as much. The difficulty, on the other hand, is that the development is antagonistic. The excessive vegetative "growers" naturally are late in starting to fruit.

Bennett and Irby,[11] in the early 1890s, roughly divided Upland cottons into two groups, Long Limb and Short Limb—pointing out the former as slow growing and late, and the latter as rapid growing, prolific and early fruiting. They recommended different methods of culture as between the two.

Responses of some of the varieties of the semi-cluster group indicated that anthracnose boll rot susceptibility was associated with this habit of growth.

Cluster Type

The cluster varieties differ from the semi-cluster varieties only in degree. That is, the former group is the extreme case of this plant habit.

Sugar Loaf, previously mentioned as of Mexican origin, was one of the early cluster varieties. M.W. Phillips[12] in discussing cotton culture of the late 1840s in Mississippi stated that he gave his Sugar Loaf or cluster variety less spacing both by row and hill than he did his regular Mexican or the Petit Gulf, which was a large and spreading form. Bennett and Irby,[11] mentioned above, recommended similar differences in cultural practices for their two classes of plant types.

Boyd Prolific, the semi-cluster variety of Petit Gulf origin, was the parent of Dickson which perhaps was the most important cluster variety in the history of Upland culture. Through several years of successive selection from Boyd Prolific obtained from Mississippi, David Dickson of Oxford, Georgia, developed his new variety about 1858. This variety was kept reasonably pure for many years by persistent and careful selection. Being so distinct in type, it was easy to select or to rogue. The plants were early maturing of strict cluster type and having 1 to 3 long side branches. The fruiting limbs were distributed along the main axis and sometimes on the vegetative branches, but were reduced to spurs by very pronounced shortening of the internodes. This arrangement threw the nodes or joints very close together. The spurs were 2 to 6 inches long, usually longer in the middle of the stalk than at the bottom or the top. The leaves were very large, the bolls small and rounded in shape and in clusters as indicated. The lint length was about 7/8 of an inch and the lint percentage 29 to 32. The seed were small, fuzzy and brownish gray. Dickson was considered by Duggar[8] the type example for his Cluster Type group. In the 1880 census Dickson was reported from all cotton states except Missouri and Virginia. According to Tracy,[10] this variety was in common cultivation in the 1890s. Tyler's[9] maps of his 1907 survey showed Dickson still densely distributed throughout the Cotton Belt. Since cotton improvement methods of these earlier times did not bring about earliness to as satisfactory degree in the ordinary spreading forms as in the cluster forms (until the supreme effort to combat the boll weevil took place), growers held on to the cluster and semi-cluster varieties, wherever speedy fruiting and early maturity were advantageous.

Aversion to growing cluster forms did not materially develop until new spreading forms, having as much earliness and yielding response as these clustering forms, were brought out. Also, the cluster varieties were not replaced on rich and moist land until the spreading forms, through breeding, became as satisfactory. When the new forms reached the levels of adaptation mentioned, the faults of the cluster cottons began to be taken more seriously. It was seen with Dickson, particularly, that there was often considerable loss from anthracnose boll rot. Boll worm was worse on the cluster cottons because of proximity of the bolls. It was more difficult to pick the cotton from the clustered bolls as free of trash.

Banana was an old cluster variety mentioned along with some of the other old ones of this type around the middle of last century. Apparently, there is no record that Banana was a parent of any later varieties.

Zellner, a cluster variety, was developed by a Doctor Zellner of Ashville, Alabama, perhaps somewhat later than

Dickson—but also from the old semi-cluster variety Boyd Prolific. It is reported that Doctor Zellner developed his new variety through annual selection over a period of years. Zellner was reported to have been a good variety and similar to Dickson. However, it never became widely grown over the Cotton Belt. The 1880 census reported this variety as occurring only in Alabama. On the other hand, Zellner was being grown in Texas at least to some extent when Welborn Pet was originated. Tyler[9] reported Zellner as no longer cultivated anywhere in the Cotton Belt in 1907.

Welborn Pet was a cluster variety, in general resembling Zellner or Dickson. However, the selections that resulted in the new variety were taken from a field of mixed cotton. Apparently, the population was predominantly of the Zellner variety but included some stock of big boll varieties. Doubtless, only cluster forms were selected for Welborn Pet as a strict cluster cotton. Welborn Pet had less foliage than Dickson in proportion to the size of the plant. This characteristic of having a less degree of leafiness was thought to be associated with earlier and more uniform maturity. The plants were erect with slender side branches and fruiting limbs characteristic of the cluster type, the bolls were round, medium in size, clustered and maturing early, the lint percentage was 31 to 33, and the staple length was about 7/8 of an inch. Welborn Pet was very prolific and one of the best of the cluster varieties. This variety was developed about 1881 in the Red River bottoms by Jeff Welborn of New Boston, Texas. Tyler's[9] 1907 survey showed that the variety was at that time distributed over the entire Cotton Belt, but occurring to somewhat more dense degree in Texas and Arkansas.

Barfield was another typical cluster variety which was introduced by Thomas Barfield of Sucarnoochee, Mississippi, many years ago and it is said that he obtained the stock from the West Indies. This variety became a "bender" type in Mississippi, but was considered a medium staple in Anson County, North Carolina, where it was popular and appeared especially suited to the loam clay soil of the Piedmont section.

Kelly was another cluster variety originated by S.E. Kelly of Appling, Georgia, by selection from Bancroft Herlong. It has been, heretofore, stated that Bancroft Herlong contained many semi-cluster plants as a result of its Dickson parentage. It was possible, therefore, to select truly cluster plants out of such a population. This apparently was done for it is stated that Kelly was very similar to Dickson.

Little's Improved and McCall were two additional cluster varieties that resembled Dickson. The former was developed by J.C. Little of Louisville, Georgia, and the latter by a Mrs. McCall of Bennettsville, South Carolina. It was said that the name "TripleJointed" was proposed for the McCall variety because of the very frequent occurrence of the bolls borne in threes.

Jackson Limbless was one of the later preboll weevil cluster varieties and its chief importance is that it was the parent of Dillon, the first systematically selected Upland *Fusarium* wilt resistant variety. Jackson Limbless resembled Welborn Pet but had more and larger leaves, the leaves were even larger than those of Dickson. Jackson Limbless was taller, had larger bolls, and locks that adhered in the burs better than was the case in the other two cluster varieties. Jackson Limbless was introduced in 1894 by T.W. Jackson of Atlanta, Georgia, but it was not stated whether it came directly from one of the other earlier cluster varieties or was from a segregate or chance mixture found in some variety of another type. Jackson Limbless, soon after its introduction, was exploited a great deal, the claims for it going beyond its actual merit. However, like other cluster varieties, Jackson Limbless was very prolific on rich soils where the long-limbed varieties of that period usually developed too much "weedy" growth. The cluster varieties had no particular advantage on poor land other than where earliness was a needed factor.

The original selections that became the Dillon variety were made in 1900 out of Jackson Limbless at Dillon, South Carolina, by W.A. Orton or one of his associates. From 1902 to 1904 the breeding stocks were grown at Troy, Alabama; in 1905 and 1906 at Natasulga, Alabama; and during the next four years, 1907 to 1910, at Lamar, South Carolina. The first strain was distributed to 1908 and named Dillon. Jackson Limbless itself showed more wilt resistance than the other varieties tested at that time and this attribute was greatly intensified in the Dillon variety by growing the preliminary stocks on wilt infested land, and practicing persistent and careful selection. Dillon was also selected for more production and uniformity of plant habit. The parent variety was losing in its stability by that time.

In the 1920s another cluster variety, known as Mars Rose, was introduced with a great deal of advertising as to its particular merits. The seeds were sold at very high prices, but the new variety was soon found to be merely another cluster form and without any exceptional responses.

Around 1920 when stripper harvesting or "sledding" cotton was coming into practice on the High Plains of Texas, it occurred to those operating these devices that the cluster type might be stripped easiest. However, on trying this form it was found that the "spurs" were too thick and tough to break off without, in many cases, pulling the whole plant from the ground. The semi-cluster type was found to be better adapted for this operation, but the more ideal form is a short-limb, semi-spreading plant that does not run too much to cluster near and at the top. Several investigators have suggested that the cluster and semi-cluster types might be better than the spreading type for spindle picking. Some varieties of these two types have been tried, but with no particular advantage in their favor. Success of spindle picking, as far as type of plant is concerned, appears to depend on absence of over-coarseness of plant growth and minimum vegetative framework in relation to amounts of bolls. The bolls also should occur singly at nodes and in good distribution throughout the vegetative zone of the plant. Bottom limbs should not be too low and long.

Rio Grande or Peterkin Type

The name "Rio Grande" is said to have been applied to the original type of a group of Upland short staple varieties that had high lint percentage and very small seeds, the coats of which were sparse or nearly devoid of fuzz. In all cases, however, a fuzz tuft on the hilum end remained. The parent stock of this type doubtless was of Mexican origin.

The plants were slender in growth, the 1 to 3 vegetative branches were somewhat slight and long spindling and the fruiting limbs were also long, slender and inclined to droop. There was no tendency toward the semi-cluster habit, the internodes were long, and the plant was open branching and had thin foliage. The type was later in maturity than with most small boll varieties of the early group and of most of those of the cluster group. The stems were reddish, generally exhibiting anthocyanin color but not in the intense form found in the ordinary red leaf varieties. The bolls were ovate, pointed, small and opened well, but retained their locks in the burs better than did most of the wide opening boll kinds. The staple was about 7/8 of an inch in length and said to have been wiry and strong. The fuzz that was present was short and brownish gray in color. The general color of the seed was black or darkish depending on the amount of fuzz covering present to obscure the seed coat. The varieties of this group were considered preeminent for poor, droughty, rundownhill land, and general hard conditions of culture.

About the first named varieties that belonged to the Rio Grande type were two listed by Tyler.[9] One of these, Alvardo, introduced into South Carolina in 1848, and the other, Dean, reported from the same state in 1853. The descriptions of these varieties indicated strong resemblance to the later Peterkin variety.

The Peterkin variety developed about 1870 by J.A. Peterkin of Fort Motte, South Carolina, has been considered the most typical Rio Grande type. Duggar[8] so used this variety in his classification of types. Peterkin obtained his starting stock from a Mr. Jackson who had come to South Carolina from Texas shortly after the War Between the States and brought the seed with him. Jackson claimed he had secured the seed in the "back part of Texas." The resemblance of the Jackson-Peterkin cotton to the old Rio Grande type indicated that the two had the same origin.

On developing his cotton, Peterkin grew, maintained and improved the variety for 40 odd years. The lint percentage was increased to nearer 40, the staple length to nearer an inch and the more naked seed forms were removed from the population. As a result of this continued selection by the originator, Peterkin became one of the most uniform varieties of the period and probably one of the most widely cultivated short staple Upland cottons of that time. Tracy[10] stated that there were very few varieties in the 1890s that yield as high lint percentage as Peterkin and that this variety was one of the best of the Rio Grande type. Tyler's[9] map for this variety as based on his 1907 survey indicated that Peterkin at that time was one of the more widely and densely distributed varieties in the Cotton Belt.

Dearing was another variety of the Rio Grande type developed about the same time as Peterkin, 1870, by J.J. Dearing of Covington, Georgia. This variety also had a high lint percentage. Dearing stated that he made all of his selections through a number of years with special reference to lint percentage and attained the level of 45%. However, this variety never spread over the cotton area like Peterkin. Peterkin, in addition to maintenance of his regular variety as mentioned previously, developed a cluster form out of it. This new variety was known as Peterkin Limb Cluster or Peterkin New Cluster, but with the exception of this particular growth habit did not differ greatly from the older variety. Brown Peterkin was another strain having covered seed with the fuzz brown in color.

Moss was a strain of Peterkin developed by Ben D. Moss of Norway, S.C., that reached the level of about 45% lint. In 1907, according to Tyler,[9] Moss was being grown to considerable extent in South Carolina and in a few counties in central Georgia.

Excelsior (not Ezell's Excelsior) was a strain of Peterkin sold by C.F. Moore, Excelsior Seed Farm, Bennettsville, South Carolina. Excelsior differed from regular Peterkin only in that it had a lower lint percentage.

Gold Standard was another variety of the Peterkin type that Moore developed. He stated that while making selections of Excelsior his attention was attracted to a single plant which was strikingly superior to any other plant in the field. The bolls on this plant were large and set thick and close on the limbs and the plant was symmetrical in general appearance. The plant was picked and planted by itself the following year. The appearance of the progeny encouraged further selection, which was practiced for several years or until the new variety was introduced. Many of the seeds were fuzzy and of brownish or yellowish color which suggested the name. In general, the variety was similar to Excelsior except a small portion of semi-cluster plants were present in the population.

Gregg's Improved was developed from a single plant selection made out of Gold Standard about 1900 by S.A. Gregg of Florence, S.C. The new variety resembled the Peterkin type, but in general the seed were fuzzier. The fuzz was both brownish white and greenish white. The lint percentage was high.

Other seed breeders or growers originated a number of subsequent varieties or new names from the Peterkin stock. These, however, were of relatively local distribution and some of the more important names were Audrey, Peterkin, Brazier, Gypsy, Hall, Jersey, Layton Improved, Peebles Choice, Phillips, Pinkerton, Thomas, Wild, and Wise. Each one conformed rather closely to the Rio Grande or Peterkin type indicating fairly careful breeding or handling of the stocks.

Texas Oak and Texas Wood were synonyms for Peterkin. Tyler's[9] maps for these varieties showed the former distrib-

uted rather scatteringly over the Cotton Belt, but the latter concentrated chiefly in the Carolinas.

The Stubbs DoubleJointed was a new strain or variety originated by P.S. Stubbs of Clio, S.C., about 1899. The original selections were made from a field of Texas Wood and reselection of choice plants continued for several years until the linting level reached about 42%. The lint percentage of Texas Wood had been only about 33 or 34. The new variety was said to have been hardy, but doing best in moderately dry years and on rather light soil. The plants were rather large with limbs beginning near the ground and maturity was midseason. There was no indication in the description of the plant growth habit for the particular name "DoubleJointed."

During a series of years beginning about 1890 or somewhat earlier R. Bates of Jackson, S.C., developed about six varieties out of the old Rio Grande type. Tyler[9] classified one of these as of the Eastern Big Boll group, but the other five as of the Peterkin group. Two of the second group, Bates Little Brown-Seed and Bates Poor Land, were being grown widely enough in the Cotton Belt in 1907 to be included among the 57 varieties of the survey, the distributions of which were mapped.

Rich Man's Pride was another variety related to Bates Little Brown-Seed that E.W. Bond of Winterville, Georgia, developed. The plants were short jointed, formed a low compact bush and were early. The leaves and bolls were small and the seeds very small and covered with a short, light brown fuzz. Ginners stated that the seed cotton was difficult to gin, the seeds being very small and the lint strongly attached.

Brannon was another variety of the Rio Grande type. Tracy[10] stated that this variety originated in Texas many years ago. Tyler[9] also reported that its origin occurred a long time ago, but in Louisiana. According to Tyler,[9] Brannon was originated around 1870 by G.W. Brannon in East Feliciana Parish and later improved and maintained by N.B. Riddle of Riddle, Louisiana, and G. Brannon of Lindsay, Louisiana. Brannon has been considered an intermediate between Upland long staple and Peterkin, but the staple length appears short enough and the lint percentage high enough to rule out this idea. Duggar[8] thought that the longer branches and the more straggling form of plant might even permit placement of this variety in the Long Limb or Petit Gulf group. Big Brannon and Little Brannon were, respectively, larger boll and smaller boll strains of the parent variety. Berryhill and West were respective selections of Brannon developed in Mississippi.

HardShell was an old variety grown in Henry County, Alabama, and appearing to be of the Rio Grande type. The name doubtless was derived from the fact that a Baptist minister carried the original stock to the county. One sect of the Early Baptist Church was called HardShell Baptists. The stock was from one of the more eastern cotton states and brought in before the War Between the States. The variety was said to be very hardy and resistant to blight and drought. Woods Improved was a selection from HardShell developed by Samuel Wood of Abbeville in Henry County. Wood stated that this variety was entirely wilt proof. The mention of the blight, drought and wilt resistance of these two Henry County varieties is interesting in view of the fact that this county later became the center of much work in developing resistance to *Fusarium* wilt in several stocks of cotton.

Braddy was a Peterkin type variety, which crossed over during development from the Cluster group to this group. Braddy was produced from a selection out of Simpson made about 1884 by L.C. Braddy of Dillon, S.C. Simpson was a synonym of Dickson. Braddy is an early example of seed selection. It was kept true to type and further improved for a number of years by continual selection. The fields were gone over every year, selecting and marking the best formed and most prolific plants. The seed cotton from these plants was picked and ginned separately from the main crop and used for planting a select field of about 20 acres the next year. The seed produced from the 20-acre area then was used to plant the main crop the third year. This variety was never widely grown, but had a good local reputation. The growth habit was well fixed, the lint percentage about 42, and the plants vigorous, hardy and prolific, and stood up under rust conditions very well. The lint was an inch to more in length, very curly or crinkled and brought a price slightly in advance of that of the ordinary cotton.

Toole was the next variety after HardShell and Woods Improved that turned out to be resistant to *Fusarium* cotton wilt. Although the single primary plant found by W.W. Toole of August, Georgia, in 1894 was in a field of Peterkin on sandy loam soil near the Savannah River. It probably was not selected with the idea of wilt in mind, but it came from an area where wilt or blight at that time likely was present. The plant was outstanding for prolificacy (numerous bolls) and earliness (short internodes) but it stood out perhaps in the main by reason of the fact that it was resistant to wilt and, therefore, had opportunity to develop these traits to high degree. The new variety was especially suited to rich soil and good cultural conditions, for it did not become "weedy" so easily like old Peterkin itself or most other varieties, which were more bushy in growth habit in that period than at the present time.

The plants of the Toole variety, in general, were of the Rio Grande or Peterkin type, but had some slight tendency toward the semi-cluster habit and had bolls somewhat larger. Duggar[8] stated that Toole was sort of an intermediate type between the Rio Grande and Early or King type, that it was very prolific, and that the plants were symmetrical, of medium size and abundantly supplied with fruiting limbs and bolls. The lint averaged medium in length, about 15/16 of an inch, and was said to be strong. The lint percentage was high and the seed small. The seeds were covered with light, brownish gray fuzz. The variety was kept pure by constant selection and maintained on the Toole plantation for a number of years. Toole claimed that he developed a lint percentage level of 40 or 44. This characteristic together with the short internodes, excellent yielding capacity and wilt resis-

tance made Toole a popular and very useful variety for a long time. Tyler's[9] survey map for this variety indicated in 1907 that Toole was grown to some degree in all of the cotton states east of the Mississippi River and that it extended west of the river in Louisiana. The variety was especially concentrated in South Carolina and eastern Georgia.

After cotton *Fusarium* wilt developed to be more of a factor in the southeastern Cotton Belt, especially in some areas, Toole became more concentrated in southwestern Georgia and southeastern Alabama where this disease was worse. Newer strains of Toole, selected especially for wilt resistance were developed in these pronounced wilt areas in the first decade of this century—CovingtonToole at Headland, Alabama; CouncilToole at Americus, Georgia; PettyToole, PerryToole, MathisToole and BrinToole at Dawson, Georgia. It will be recalled that Headland is in Henry County, Alabama, where the HardShell and Woods Improved cottons were developed much earlier.

Dixie was one of the better wilt-resistant varieties developed by W.A. Orton and associates during the earlier part of a 20-year period beginning about 1898 when the Department of Agriculture carried on, in cooperation with state experiment stations and other agencies and farmers, a very active program of research and breeding to find methods of control of cotton *Fusarium* wilt. At the beginning of that period, this wilt disease was becoming a serious problem in cotton production in some of the eastern coastal plain areas of the Cotton Belt. This variety was developed by the regular plant breeding methods used by Orton and associates at that time. The first or primary individual selections of healthy, promising plants were made in infested cotton fields or in special plantings of collections of varieties on heavy naturally infested areas. These plants then were planted by the plant-to-row method on heavy naturally infested land. This process was repeated by taking plants each year from the better progeny rows until the desired strain was developed, that is, having a high degree of resistance to wilt as well as the necessary production qualifications.

As to the starting point of Dixie, Orton in 1901 collected seed of some healthy plants, presumably Peterkin, growing in an infested cotton field on the farm of M.C. Scott near Montgomery, Alabama. These seed along with those of a number of other varieties were grown in comparative plots on infested land at Troy, Alabama, in 1902. Plants, that fall, were selected out of the Peterkin, as well as, out of some of the other varieties that had resistant plants. In subsequent plant-to-row work one of the selections out of the Peterkin produced an outstanding progeny row. It appeared to have some plants that Orton thought were hybrids from cross pollination of one or more of the other varieties the year before.

One of these plants, thought to be a hybrid, was developed into the strain later called Dixie. However, Dixie still resembled Peterkin rather closely. The plants were pyramidal, having large basal branches, long, slender fruiting limbs, leaves medium size, bolls medium, seed small and variable in color but typically covered with greenish brown fuzz.

This, the second, wilt resistant Upland variety developed by Orton, was liked better by the growers than the first one, Dillon, which had the disadvantage of the cluster habit. Dillon was discussed heretofore in the cluster type section of this paper. Dixie was a considerable improvement over the old Peterkin in earliness and size of boll, but lint percentage was somewhat lower. The staple length was around 7/8 of an inch. Duggar,[8] in his series of study of varieties, stated at that time that Dixie was more resistant to wilt than any other Upland variety, but that it was not immune especially where land was badly infested with both wilt and nematodes. This condition, of course, still exists today. Dixie was a standard, wilt-resistant variety until some years later when Dixie 14 and strains of DixieTriumph came into use. Dixie 14, as the strain number indicates, was a selection from the Dixie. The name DixieTriumph indicates its origin, that is, a strain from a cross of Dixie and the Texas Big Boll Stormproof variety. Triumph has been known also as Mebane or Mebane Triumph.

Early or King Type

The varieties classified as of the Early or King type by Duggar[8] and Tyler[9] constituted the earliest maturing group at that time in American Upland cotton. These varieties were earlier than those of the previously mentioned cluster and semi-cluster forms, the earliness of which had been in comparison with older "limby" spreading late maturing varieties. This early group included Sugar Loaf which was the parent form of King, King derivatives, several green seed varieties and some of their derivatives. The Early or King type group also included a number of other very early varieties that resembled King, but may not have been closely related in all cases to Sugar Loaf or King by descent.

Sugar Loaf (not the old Mississippi cluster form of same name) was a very old early maturing variety that apparently originated in North Carolina, but neither the name of the originator nor the exact parental source of stock is known. The plants were slender, having 1 to 3 vegetative branches; fruiting limbs slender with short internodes but with little or no tendency to semi-cluster, leaves medium to small in size, quite deeply lobed; flowers creamy white with or without red petal spots (usually having the latter); bolls small, mostly four-locked; lint short; seeds small; covered with a short fuzz, brownish gray in color.

The chief advantage of Sugar Loaf was its extreme earliness. This variety and others of equivalent earliness were most popular along the northern rim of the Cotton Belt, but never competed very well (further south) with the larger and longer growing varieties that were more advantageous where the season covered a more extensive growing period. Sugar Loaf was grown only in North Carolina for many years, before it spread to any other states. By the time the 1880 census was taken, Sugar Loaf had spread to Tennessee. Seed of this variety, as well as King and derivatives, in the early 1900s, were shipped in very large quantities from North Carolina and Tennessee to Texas and other extreme southern areas, where it was planted

behind the forward waves of boll weevil. In spite of the fact that these fast fruiting varieties usually put on more crop in the midst of the weevils than previously grown local varieties had done, the southern growers (especially those in Texas) did not like the extremely small bolls, the hasty falling out of the locks and the generally weaker growth of the plants, especially in the drier seasons.

The yield of Sugar Loaf was said to have been good on rich land, but less satisfactory than the Peterkin varieties on poor and droughty soils. While the seeds of Sugar Loaf were not reported as green, the variety appeared to resemble more the old eastern green seed form, mentioned earlier, than any of the Mexican highland derivatives that swept over the Cotton Belt in the first half of the 19th century and largely swamped these first American Upland stocks. However, some of the subsequent Sugar Loaf stocks had greenish seeds or mixtures of green seeds. Tyler[9] in his 1907 survey recorded a variety occurring in Arkansas designated as Kings Green Seed.

It is not known whether the old eastern green seed cotton had petal spots. The Sugar Loaf and derivatives generally had petal spots, a distinction not known to apply to any of the Mexican highland derivatives nor to any other commercial American Upland variety. The petal spot, however, is a homologous character occurring in some stocks of about all the cotton species, being much more prevalent among the varieties of some species than among those of other species. The spot is most common in the Sea Island and Egyptian varieties and least common among those of American Upland. In several varieties of the latter form, occasional plants have been seen with petal spots, but the character was never widely prevalent in any of these populations. These spots appear not to have been associated with plants of highest production. The efforts of the breeder in selecting plants having highest level of production possibly prevented any other American Upland variety from carrying this character as a fixed marker.

The Maryland Green Seed and the Tennessee Green Seed varieties, which doubtless were actual relics of the old eastern green seed form discussed in the early part of this paper, apparently did not have petal spots. However, in general characteristics the Maryland Green Seed and the Tennessee Green Seed varieties resembled Sugar Loaf and King. They were even earlier than the Sugar Loaf and King.

Maryland Green Seed was an old unimproved variety that survived in some parts of Maryland as long as home spinning prevailed in primitive areas. This variety was quite distinct and doubtless closely related to the Tennessee Green Seed being, however, more dwarf in habit of growth than the latter. The plants of the Maryland Green Seed though dwarfy were spreading; 2 to 3 feet high; vegetative branches short and fruiting limbs having short internodes; leaves small to medium size, rather deeply lobed, softly hairy; flowers creamy white without petal spots; bolls small usually 4-lock, cotton falling out badly during storms; lint short; lint percentage low; seeds rather large, fuzzy, green.

Tennessee Green Seed, doubtless, was a derivative of the same stock from which the Maryland Green Seed came. Tyler[9] in 1907 spoke of the former as one of the oldest varieties in cultivation. As white settlers moved into Tennessee from North Carolina, they probably carried the green seed stocks with them. During the long maintenance period under Tennessee conditions, the plants though continuing to be early, developed somewhat larger plant size. In general form and growth habit, the Maryland Green Seed and this variety were the same. They both had small bolls and locks that fell out quite easily. It was heretofore stated that during the American Revolution that cotton was grown in Maryland, Delaware, New Jersey and eastern Pennsylvania. In order to mature any crop as far northward as those areas, a variety would necessarily need to be extremely early in setting fruit. The Maryland Green Seed was a remnant doubtless of the stocks that were used in that early northward extension of cotton culture. The stocks out of which the Sugar Loaf was developed, if not identical with the early parental material of the two green seed varieties, possibly were early enough to mature in the northern areas mentioned. While the Maryland Green Seed variety was reported as used only in primitive culture, some green seed stocks were used later in commercial production. In the 1880 census, green seed cotton was reported from five states—Tennessee, Georgia, Alabama, Arkansas and Missouri. Other reports from time to time have indicated that green seed cottons occurred in most or all of the other cotton states, but it is not known to what extent they were related to the old and original eastern green seed kind.

Russell has already been mentioned as having green seed. Farm View Green Seed was a strain of Russell also having big bolls, developed at Goldville, Alabama. Hillis Green Seed was a large boll early strain developed from Rowden in Collin County, Texas. Biard Green Seed was a big boll variety developed from an old green seed variety at Hugo, Oklahoma. Spruiell's Green Seed was developed in Brompton, Alabama, and resembled King in type. One of the parents of the Griffin long staple variety to be described later was a green seed variety.

Tennessee Green Seed was much more widely grown than any other green seed variety of the Early or King type. Tyler's[9] survey map for this variety shows that it had become distributed throughout the Cotton Belt by 1907, but occurred more densely in West Tennessee, Arkansas and northeast Texas.

Trice was an early variety developed from Tennessee Green Seed. The original plants were selected in 1904 by S.M. Bain out of a field of this variety grown on the farm of Luke Trice near Henderson, Tennessee. Trice was a very early variety popular for almost a quarter of a century along the northern rim of the Cotton Belt. Its tendency not to develop excessive vegetation on soils with abundant nitrogen and moisture was a distinct advantage on newly cleared and low bottom land. During the worst part of the boll weevil era, Trice spread further south especially in the central part

of the Cotton Belt. Several strains of Trice during the period were developed in Mississippi and Arkansas.

King as previously mentioned was a derivative of the Sugar Loaf variety. About 1890 when looking over his field of Sugar Loaf cotton at Louisburg, N.C., T.J. King noticed a very prolific stalk of cotton. This plant was harvested singly and multiplied into a new stock which was called King or King's Improved. However, some years afterwards, King sent two lots of seed, one the old Sugar Loaf and the other the new variety, to several experiment stations for trials. The returned reports convinced King that the two stocks were practically identical. Tyler[9] indicated that the plant description heretofore given for Sugar Loaf suffices for the King variety. He considered both as one variety. In Tyler's[9] 1907 survey map for King, this variety is shown to have been one of the most popular ones all over the Cotton Belt at that time. It was densely distributed all over the entire cotton area. Though best adapted in the northern parts of the Cotton Belt, the desire for varieties with extreme earliness in boll weevil conditions caused this widespread use of King and its relatives. King and possibly Sugar Loaf stocks were sold during the early boll weevil period under a number of names: King's Early, Hodge, Mascot, Dozier's Improved, Greer's Early, Spotted Bloom, Purple Bloom, Ninety Day, Little Texas and Reaves Select.

Simpkins Prolific was a prominent derivative selected out of King about 1900 by W.A. Simpkins of Raleigh, N.C. This variety was similar to King and was widely sold for a number of years in areas where earliness similar to that of Sugar Loaf and King was desired. Adams, Broadwell DoubleJointed, Hackberry and Peter's Prolific were other early varieties selected from King, but were in general of more local distribution.

Shine or Shine Early was an early variety developed probably in the 1890s by J.A. Shine of Faison, N.C. Tracy[10] stated that Shine was an early variety of the Rio Grande type and differing little from Peterkin. Tyler[9] placed Shine in the Early group and stated that it was selected from a mixture of Miccasooky and Sea Island. However, he mentioned that no trace of Sea Island could be detected in the variety and that it was very much like Miccasooky, which was an older variety similar to Sugar Loaf or King. The main distinction between King and Shine was that the latter did not have petal spots.

Plains Improved was an early variety developed from a cross between King and OunceBoll at Cone, Texas, and was reported to have been especially suited to the plains region of western Texas.

Tyler[9] also classified about 30 other varieties, which were more or less of local use in respective areas and placed them in the Early or King group.

Long Limb or Petit Gulf Type

The long limb group as classified by Duggar[8] was based on the old and formerly popular Petit Gulf variety. The plants, as heretofore described for Petit Gulf, were very large, and had long and slender vegetative branches and fruiting limbs. The internodes throughout the plants were long and the branches and limbs, particularly the latter, when loaded with bolls tended to sag. The plants, in general appearance, were straggling and open and late in maturity. The leaves, bolls and seeds usually were about medium in size. The bolls were roundish or ovate and abruptly to obtusely pointed. The seeds were mostly fuzzy and the fuzz greenish to whitish brown. The lint was not long but usually about medium in length and the lint percentage was never high. The long limb type was usually restricted to bottom and other good lands. It never produced very well on hill land particularly if run down in fertility.

The old long staple varieties of the Mississippi Valley were also about the same in plant type as the long limb group, the former being more or less arbitrarily placed in a new group by reason of the staple length. The long staple group, however, had usually a longer to long pointed boll.

At the time of Duggar[8] and Tyler's[9] studies of American Upland varieties, the Petit Gulf variety (and those resembling it) had lost most of their popularity. The long staple or earlier short staple varieties with higher lint percentage had made the replacement. Before long staple upland become prominent in the Mississippi Valley and before earliness and higher lint percentage was developed in varieties suitable for good lands especially bottom, the long limb group mainly Petit Gulf was grown extensively on the better land in many parts of the Cotton Belt. The other long limb varieties had practically passed out and Petit Gulf stocks had become badly mixed by 1907. Tyler's[9] map for Petit Gulf distribution at that time, however, showed it to occur in name, at least, throughout the Cotton Belt, but very scatteringly. Two other old varieties, Hagaman and Louisiana according to Duggar[8] appeared to belong to the Long Limb group. Hagaman had somewhat longer staple than found in general in the Long Limb group, but not of sufficient length to be placed in the Long Staple group. This variety was developed from a single or possibly from several stalks selected by F.V.D. Hagaman about 1877 on his plantation near Jackson, Louisiana. The plant or plants were supposed to have come from the old Dean cotton (a Rio Grande or Peterkin variety previously mentioned) some of which was grown on the plantation at the time. However, it was said that Peeler (a long staple type) was the cotton generally grown by Hagaman. It would appear, therefore, that a natural cross resulting from the two varieties was selected and that it retained the long limb characteristics of Peeler, but not enough of the staple length to be classified in the Long Staple group. The variety was reselected and kept pure for over a quarter of a century but remained a rather local one. It was earlier than would be expected of a variety coming from the parentage mentioned and belonging to the type in which it was classified, that is, the Long Limb or Petit Gulf type.

Duggar[8] stated that Louisiana was a cotton in that State with large straggling branches and limbs and small bolls. Tracy[10] mentioned that the name was applied to a large number of short staple stocks of the Louisiana area.

On the basis of growth responses at Auburn, Alabama, Duggar[8] classified Peeler in the Long Limb group. However, according to the staple length produced by Peeler in the Mississippi Valley and the great prominence of this variety in the early period of long staple development, placement in the Long Staple group appears to be the more correct.

Upland Long Staple or Allen Type

It appears that the parent stocks of American Upland long staple varieties in the main were derived from the Mexican cottons rather than from hybrid stocks of Upland and other long staple species of the West Indies. It has already been pointed out that the Hartsville-Keenan-Columbia group was from the eastern big boll Wyche, a highland Mexican Upland medium to short staple form that was brought to Georgia by way of Algeria. Two Upland long staple varieties, Griffin of last century and Sealand of recent date, however, are known to have resulted from hybridization of Upland and Sea Island. Such hybrid source of any others is only problematical. There appears to have been sufficient range in the Mexican Upland stocks (even in those of the highlands of that country) to provide the length, fineness and other characteristics contained in the American Upland long staple varieties without the necessity of surmising contribution from any other species.

In the letters and papers of William Dunbar who lived around the first of the last century, it was stated that the new cottons from Mexico when brought to Mississippi were of rich color, very silky, fine and strong. The Mexican cotton, Alvardo (previously mentioned) introduced before 1825 had long and fine staple. Belle Creole, said to be of Mexican origin was improved and grown by H.W. Vick of Vicksburg, Mississippi, in the 1830s and early 1840s.

As previously stated, the old Upland long staple varieties, like the Long Limb Petit Gulf, had the large branching and long limb woody open type plants such as occurred in the old Mexican derivatives. All Mexican stocks required some re-selection for adaptation before satisfactory responses under Mississippi Valley conditions were obtained. Fresh seed from Mexico during the first year or two of planting was said to produce no more than one-half crop.

After Belle Creole had been developed for Mississippi conditions, Vick stated that the plants were still large and tall, but productive; that the bolls were large and long; and that the lint was abundant, long, firm, silky, soft, lustrous and apparently oily.

Lyman[13] in 1866 referred to the Vicksburg area and that lying north between the Yazoo and Mississippi Rivers up to 34° North Latitude as having always produced the best improvement in Upland varieties. Deer Creek meandering deviously through this alluvial area was prominent as fronting many of the first Mississippi plantations where the earliest breeding of Upland long staples took place. The Mississippi Delta-Vicksburg area is the home of the first American Upland long staple varieties, wherein they were transformed from straight Mexican stocks. Lyman[13] who lived around the middle and early second half of the last century, and who was a writer and promoter of cotton improvement made some statements or suggestions in this connection about as follows: Where a planter aspires to success in his business and high position as a southern agriculturist, nothing is more directly in his line or pays him better for the time it occupies than the development of the most perfect cotton plants, as regards both the amount and quality of staple produced. The superiority of one variety over another may be either in the fineness of staple which the plant yields or the number of bolls on each plant. Some varieties excel in quality, others in quantity. Plant some cotton on the best of land and handle it culturally to best advantage, make plant selections after the bolls open, using two bags, one for bolls from the thriftiest and most prolific plants and the other for bolls that are large, well-developed, and being remarkable for softness and length of staple. In this way, two improved classes of seed can be obtained, one likely to reproduce more heavily and the other more likely to yield a superior staple. The former lot might be labeled "multiboll" and the latter "silk cotton." Plant in separate places but still on good land. In successive years likewise maintain the respective liens and again and again re-select for the particular characteristics sought in the two groups. At the end, then, the agriculturist who pursued such procedure would become widely known as a producer of two superior varieties of cotton, one an Upland long staple and the other a prolific general purpose sort. Proper care in this selection work according to Lyman[13] would enable the planter, in a few years, to produce a staple which for softness and fineness would approach the Sea Island.

By such a method as here described, Vick from his fields of Belle Creole in the early 1840s had developed the Jethro or silk cotton. In 1846, a small packet of the Jethro seed was sent to J.V. Jones of Herndon, Georgia, who in a small way grew the cotton in 1847 and 1848 and liked it. In 1849, there was enough seed to plant an acre from which a bale was produced. This bale was sold in January 1850 on the nearby Augusta market where it was said to have been pronounced by the best and oldest cotton merchants as the finest cotton ever seen in that market.

Bale lots of the 1850 crop were exhibited at the Georgia and the South Carolina Fairs and received diplomas or medals for being the best or first long Upland cotton. The South Carolina Fair exhibit was forwarded to the World's Exhibition in London. One of the most successful South Carolina Sea Island cotton growers, on examining the cotton at the Fair, remarked that if such staple could be grown profitably on upland and ginned on a common saw gin, the Sea Island industry itself would be doomed.

The Jethro cotton also received a medal in London, and samples were sent to Manchester, Paris and manufacturing districts in Belgium where they excited much attention. It was stated from London that the new kind of Upland cotton had many of the characteristics of the finest Sea Island cotton (i.e., soft, silky, long staple, fine, pure and of rich color)

and that if such cotton should become generally grown, it would be a favorable article with the manufacturers of the highest class of goods. On the basis of these good reports, the growing of Jethro in Mississippi was reemphasized and it was continued in Georgia also for a period of time.

J.V. Jones continued to be interested in the Jethro cotton, but somewhat later developed another variety, Six Oaks. This long staple variety was somewhat less vigorous, the bolls not quite as large and the seed practically devoid of fuzz. The staple was quite long, about 1-1/2 inches.

J.H. Jones, also of Herndon, Georgia, bred the Jones Wonderful (Jones Long Staple) from the Jethro variety. This new variety was similar in plant type to Jethro and the old Mississippi Upland long staple varieties. It became rather widely spread and was one of the most popular long staple varieties for a period of time in the general Augusta, Georgia, area and in the long staple areas of the Mississippi Valley. The plants were large, the branches and limbs long and spreading, productive; bolls large, oval, pointed, maturing, medium to late; lint 29 to 30 percent, and staple 1-3/16 to 1-3/8 inches. Tracy[10] quoted J.H. Jones as saying, "There is no other plant known in our agriculture which deteriorates so rapidly and requires such a rigid selection of seed to keep it up to a standard as does cotton." Tyler's[9] 1907 map for Jones Wonderful showed that this variety had ceased to be concentrated in any area, but occurred very scattering and rather evenly in all the cotton states.

As shown above, there was some interest in American Upland long staple cotton from early in the last century. However, it was not until about 1880 when northern buyers began to come south and buy up this cotton that the greater value became generally known to the growers. As a consequence of the knowledge and receipt of larger premiums, these growers began to produce the special cotton more consistently, especially in areas best adapted for it. Prior to this era, Upland long staple in the eastern end of the Cotton Belt had to compete with Sea Island at Charleston and Savannah, and the Mississippi Valley Upland long staple was largely shipped to New Orleans and sold through commission merchants who never returned much premium to the planters.

In this early period, the cotton was all transported to New Orleans by water. It was collected from nearby hill land to the smaller streams, and then from the bottom lands to larger streams and finally from the great alluvial areas to the larger channels where the shipments converged from these tributaries and were sent down the main river. These cottons therefore ranged in length and quality. They were short, medium, long and extra long. Certain trade or regional names were applied to them to indicate quality. "Staples" and "Peelers" were the long staple varieties from the Yazoo and Mississippi Delta plantations. "Benders" referred to cotton of some extra length and character that the boats took up from the plantations in the bends of the river where the soil was very rich. "Rivers" were the hard-bodied cottons from the plantations distributed in general, along the Mississippi River and its tributaries. "Creeks" were the slightly softer cottons from along the smaller streams where there was less bottom land. "Hill cotton" was, as the name implies, the shortest and often the lowest in quality cotton.

About next, after the origin of the Upland long staple varieties already discussed, was the occurrence of Peeler. This variety originated in Warren County, Mississippi, about 1864 possibly from Belle Creole or Jethro stocks. However, it may have arisen from some other Mexican stocks by the selection procedure somewhat as Lyman[13] described. Peeler came on the scene in time to be about at its prime when the northern buyers became interested in the long staple Upland of the Mississippi Valley. The 1880 Census report showed it to be distributed not only in Mississippi, but to some extent at least, in all cotton states of that period except Florida and Missouri. The plants of Peeler were very large and vigorous branching widely, the vegetative branches usually 2 to 3, and coming out 5 to 6 inches above ground which made the plants somewhat long-shanked; fruiting limbs slender, internodes of medium length, bolls medium in size, some maturing rather late; lint long, fine, silky, lint percentage low; seeds medium size and covered with sparse fuzz or partly naked.

Tyler's[9] 1907 map for distribution of the Peeler variety, showed it at that time to be spread over the cotton states rather thinly, except in Arkansas, Louisiana, West Tennessee and northern Mississippi, where it was present in somewhat more abundance.

The trade name "Peelers" was derived naturally from the variety name as this variety made up most of the Upland long staple production when the New England fine spinners began to extensively use this class of cotton. After long staple production spread to other states of the Mississippi Valley, the term "Peelers" grew to be applied to any long fine cotton grown near the Mississippi River in Mississippi, Louisiana, and Arkansas.

The next great step, after the rise of Peeler, in the development of American Upland long staple cotton according to Webber[14] was the origination of Allen or Allen Long Staple by J.B. Allen of Port Gibson, Mississippi, in 1879. According to Allen, this variety came from a single fine stalk selected in a field of Bohemian cotton. The Bohemian variety had been obtained from Louisiana and bore long staple, about 1-1/4 inches in length. It will be seen later that Bohemian is an old Texas variety of Mexican type thought to have come directly from Mexico. The form of this variety, as it occurred in Texas, had only medium length of lint. However, Webber[14] surmised that the socalled Bohemian of Louisiana was probably similar to Peeler, if indeed not identical with it.

Allen, like the other varieties of the old Mississippi Valley long staples, had large plants of considerable open and woody growth. The Allen plants were vigorous, pyramidal, had 1 to 3 long vegetative branches from near the base of the stalk; fruiting branches, moderately short, with internodes of irregular lengths, giving the plants sort of semi-cluster appearance; bolls medium to large, rounded opening very widely and maturing late; lint percentage 28 to 30, staple

1-3/8 to 1-1/2 inches, fine and silky; seed medium size and covered with white fuzz.

The white seed indicated Texas and Mexican highland origin. On the other hand, length and fineness of the lint might be thought of as indicating hybridity with Sea Island. However, Webber[14] stated that it was the belief of the originator that the primary plant selection was simply an individual variation in the pure Upland species.

Allen was a standard variety of American Upland long staple for a long time in areas where this type of cotton was grown. Tyler's[9] map for Allen showed it to occur in 1907 in all the cotton states; however, very sparingly except in certain regions. In the middle region of the Cotton Belt Allen was heavily concentrated in Mississippi, Arkansas, Louisiana and along the Red River in northeast Texas. In the eastern end of the Cotton Belt, rather pronounced concentration of Allen was indicated in South Carolina. Neither the Peeler nor the Jethro and its derivatives gained any lasting foothold there. However, with the spread of Allen in that area, long staple production of Upland became more permanent. The subsequent long staple varieties developed in South Carolina after 1900 have already been discussed.

Allen Yellow Bloom was originated in 1892 also by J.B. Allen who saw and selected out of a field of Allen, a single plant having yellow flowers. This plant was the first and only plant with this color or flower that Allen had ever seen in this variety. Being the plant improver that he was, he became much interested in this new form and from it developed the new variety.

In plant type, the Allen Yellow Bloom was similar to the parent, Allen, except that it had somewhat smaller bolls, slightly smaller seed and the staple was a little longer. The lint percentage was 28 to 29 and the staple length 1-1/2 to 1-5/8 inches.

The yellow color of the flower, such as characterized this variety, led some to think that there had been prior crossing of Sea Island with the parent material. It should be borne in mind, however, that there was no mention of petal spot which is another Sea Island character just as persistent as yellow corolla color in that species. When a character like yellow flower, petal spot, very long fine staple, deeply cut or lobed leaves, yellow pollen, or any other pronounced expression common in Sea Island, is seen in a new Upland variety, it is often surmised that the presence of the attribute in question is a sign of Sea Island "blood." Although yellow flower color is almost never seen in the regular or American Upland form nor in the two Upland botanical varieties (*punctatum* and *marie galante*—to very deep degree), the character is not genetically barred from arising to intense expression within any group of the *G. hirsutum* series. Yellow flower color like many of the other qualitative characters of the cotton genus appears to be included in the category of interspecies homology.

There appears as mentioned above to be only two bonafide or definite procedural records of the development of Upland long staple cotton from Upland and Sea Island crosses. One of these developments took place around 75 to 80 years ago and the other within the last two decades. The former work is in reference to the Griffin variety bred by John Griffin at Refuge Plantation near Greenville, Mississippi, and the latter in reference to Sealand bred at Florence, S.C., by W.H. Jenkins and associates.

The Sealand work was, of course, a much more modern version of cotton breeding involving a great deal of parent material, more crosses and backcrosses, larger progeny populations, evaluations of more of the plant expressions, simultaneous (or repeated) efforts with many differing combinations of crosses, and the assessing of fiber qualities by current or modern technological methods. However, the general principles of systematic repeated backcrossing were similar in the development of both varieties. Organized plans also were followed in each case. The crosses were made and the hybrid material selected and re-selected as each backcross step was taken. The recurrent Upland parent material was also concurrently selected. The recurrent crossing was repeated 4 or 5 times, or until the Upland phenotype appeared re-established. The resulting population then was subjected to successive selection to fix the Upland type genotypically and to recover and stabilize as much of the Sea Island character of lint, as possible.

On the other hand, chance occurrence of occasional plants in Upland crop populations—containing Sea Island "blood" and at the same time having attention drawing superiority and enough stability to produce uniform progenies—hardly seems possible under the conditions of cotton cultural practices that have prevailed in this country. The *G. barbadense* and *G. hirsutum* series (presumably once developmentally identical or closely allied) have through long geographical isolation, grown to differ much in genotype structure. So much so that chance hybrids from them in the usual situations in which they occur can hardly overcome the reactive effects resulting from the great degree of genetic unbalance existing in the early hybrid generations. The extent of the reactive effects is that these plants cannot ["can" changed to "cannot" as noted in Preface] reproduce and live in sufficient number to intercross and become backcrossed to Upland enough times to compete with the rest of the Upland crop plants—wherein if they occur and therefore persist until the selector finds them as practical new plants ready for starting an Upland long staple variety from them.

Another case of yellow flower in Upland cotton and existing without petal spot was that of Coxe Yellow Bloom, a variety of the Rio Grande or Peterkin type. Tyler[9] stated that on the farm of E.A. Coxe near Blenheim, S.C., about 1895, some Sea Island cotton was grown near a field of Texas Wood, a Peterkin variety. The Sea Island did not do so well and was discarded, but in the Upland cotton planted the next year, hybrid plants were found and some seed from one, which seemed promising, was saved and the Yellow bloom variety developed from it. The new variety was uniform and similar to Peterkin except occasional occurrence of some larger plants resembling F_1 hybrids of Sea Island and Upland. The plants of the new variety itself had flower

without petal spots, but with clear lemon-yellow color; the bolls were medium in size, 50% 5-lock; the lint was of short length and similar to that of Peterkin in quality; the lint percentage was high; the seeds were small and most of them covered with greenish or brownish grey fuzz. The few seed not covered were nearly naked. About all of these characters are strictly of the Rio Grande or Peterkin type.

There is circumstantial evidence here that the yellow flower character was derived from Sea Island through the promising plant thought to be such a hybrid, as mentioned. However, it seems rather improbable (and even next to impossible under the conditions of breeding procedure that most likely was followed) for the yellow-colored flower without petal spot and even without any of the other Sea Island quantitative characteristics to be transferred from Sea Island and stabilized in a type like Peterkin, that is, without changing the type of this Upland form in any manner save the color of the flower.

Coxe Yellow Bloom, as indicated above, retained its Peterkin growth habit; Peterkin-like lint, around 7/8 of an inch in length; high lint percentage, around 40; and small seeds. The seed cover also resembled a condition of the Peterkin type, some fuzzy, others partly naked. Those that were black or nearly naked represented, as mentioned, a characteristic of most Peterkin varieties and therefore the presence of such seed in the Coxe Yellow Bloom was not necessarily any indication of Sea Island ancestry. The Coxe Yellow Bloom flower could have been a rare Upland mutation. Some of the Upland forms returned to this country from the Old World have had yellow flowers without the petal spot and without any signs of other characters of other species in their makeup.

Christidis[15] in Greece states that some of the better Upland cotton varieties recently bred in that country have come from plant selections taken out of mixture of American cottons grown in such condition for many years. The varieties making up these mixtures had been imported periodically from the United States during the last 80 or more years. One of the varieties having high quality of lint, staple about 1-1/4 inches, came out of a mixture grown at Gythion located in the extreme southern part of Greece where Egyptian varieties also have been introduced and tried since 1912. Christidis[15] suggested that the Upland varieties from the Gythion mixture possibly contained Egyptian genes.

Apparently, there had been full opportunity for interspecies natural crossing and growth of hybridized and re-hybridized progenies in this mixture. Doubtless, much more mixture of species was allowed to exist than ever was permitted in either Sea Island or Upland culture in the American Cotton Belt. However, both Harland[16] and Silow[17] point out that such interspecies development is hardly possible under conditions of mixed growth among cultivated cotton species.

The primary plant selection that produced the Tanguis variety of cotton was selected out of a field of Upland Suave in the Pisco Valley of Peru by Senor Tanguis in 1908. The Suave crop was said possibly to have contained a small component of Semi-Aspero, a Pacific assemblage *G. barbadense*, because this Upland cotton partly replaced the Semi-Aspero in the area about the time of the American War between the States. This long-time mixed growth would seem to provide an ideal situation for interspecies gene exchange and consequent cross fixation of some of them in the alternate species complexes, if such is possible. However, based on many genetic tests, Harland[16] concluded that this was not the case in the Pisco Valley and that "Tanguis is probably a modified Semi-Aspero preserved as a minor component in Upland fields, owing its early maturity to a process of selection as a consequence of association with Upland."

Silow[17] states that the relationship existing between the Old World cultivated species *G. arboreum* and *G. herbaceum* is the same as found by Harland[16] between the *G. hirsutum* and *G. barbadense* New World species, that is, full fertility in the F_1 and partial sterility and disintegration in later generations. As evidence that intergrade hybrids do not persist and become sufficiently balanced genetically to provide parent material for new varieties, Silow[17] cites cases in southern India, western China and western Kansu. In these areas, *G. arboreum* and *G. herbaceum* are grown together as components of a single crop population, but each species retains its identity—in spite of a certain amount of initial hybridization which later spends itself in sterility or in the formation of freak types that finally die out. Harland[16] mentions several cases in New World cottons where more than one species persists as entities in the same crop and therefore do not provide hybrid swarms and consequently thrifty new types—Hindu (Upland) in the Egyptian crop, Sea Island and *punctatum* in some of the West Indies Islands, *Mariegalante* and *barbadense* in some parts of northeast Brazil.

In addition to the Allen and Allen Yellow Bloom, J.B. Allen produced two other Upland long staple varieties, Allen Hybrid and Allen Improved. The first two varieties were both found to be rather susceptible to anthracnose boll rot, and in 1894, the Allen Hybrid was introduced. The new variety was less susceptible to this disease and was in general hardier. Allen believed this variety to have been from a hybrid of King and Allen, as the original plant had the branching habit and boll form of King but the staple characteristics of the Allen.

In 1898, Allen distributed his Allen Improved, which he believed to have originated from a hybrid of Allen Yellow Bloom and Allen Hybrid. The Allen Improved was an improvement in that its limbs were of more medium length and its bolls fluffed better. It was said that the bolls opened wide like ordinary Upland cotton and were easy to pick. Because of the fluffiness, the bolls suffered less field deterioration than in varieties in which the locks were more tightly netted. The plants were large, but somewhat compact and of medium maturity; bolls medium size, somewhat pointed; seed medium large and tufted with gray fuzz; lint percentage around 27; lint fine and silky, 1-1/2 to 1-5/8 inches in length and fairly strong.

The work that resulted in the Griffin variety, heretofore cited, was begun about 1857. The Upland crossed with the

Sea Island was an old big boll "Green Seed" variety, the opinion (in that part of the country at that time) being that green seed was a mark of hardiness or yielding ability. This feature of this variety and of the other old green seed varieties has not been found reported in other sources. The old eastern green seed stocks, as previously stated, were known to be very early but not high in yield. Griffin's Green Seed may have been from a segregate of Mexican stocks or from some other good eastern big boll stock of cotton. Russell (occurring much later) was, as mentioned, a good hardy big boll green seed variety.

Griffin's objective by this interspecies crossing was to produce in this, so thought of, rugged Green Seed stock, a hardy variety with long and fine lint and big bolls. Selection was practiced on the parents for 5 years before hybridization was started, and was also continued on the recurrent Green Seed parent and, of course, among the hybrid generations while the steps in backcrossing were taking place. The first-generation hybrids, due to interspecies hybrid vigor were 12 to 16 feet high and very unfruitful. These F_1 plants were backcrossed to the Green Seed parental selections by use of the pollen from the latter. The offspring of each succeeding backcross was pollinated by the constantly improved Greed Seed plants for five years. Because of the gradual disappearance of hybrid vigor and the continuous introduction of more of the Upland characteristics by backcrossing, the plants were reduced in size and the fruitfulness brought up to the level, practically, of the Green Seed parent. Each successive cross from the Green Seed parent made on the hybrid material was to stalks least resembling the Sea Island form, but coming from stalks which the year before had most nearly approached the Sea Island lint. The variety was established about 1868 after some 10 years of work, but in order to keep it pure, selection was practiced without intermission until after the end of the century.

Tracy[10] quoted John Griffin as later saying, "Since 1868, I have not omitted a single year in my selections which are guided by length, fineness, prolific tendency, earliness and lately, smallness of seed to humor planters, I can now see that it will take more than the remainder of my life to complete my work, as the variety still improves as at the first."

The variety, as described toward the end of its development period, appeared as follows: Plants 3 to 5 feet high, fibrous and prolific, with 1 to 3 large vegetative branches below, fruiting limbs medium in length; foliage pale green; bolls medium large, ovate blunt pointed, 4 to 5 locks, opening well; seeds medium size, 12 to 13 grams per hundred and gray tufted—green fuzz of Upland parent not retained; lint fine and silky, rather variable in length, ranging from 1-3/8 to 1-1/2 inches, frequently a group of several dozen fibers reaching a length of 2-1/2 to 3 inches; lint percentage 28 to 29, maturity of crop medium.

After John Griffin's death, his son, M.L. Griffin, continued the work. The variety was considered a very good Upland long staple one, but it was not very widely spread outside of the general community until about 1902. Tyler's[9] 1907 distribution map showed Griffin to occur only very, very scatteringly in the different cotton states except those along the Mississippi River where the occurrence was somewhat more common. It also was being grown in several counties of South Carolina.

Moon, another of the older Upland long staple varieties, was developed about 1875 by Jacob Moon of Ashdown, Arkansas, from a single plant selection showing unusually good staple. The name of the parent variety, however, has not been found in any of the records available. Possibly, the selection was either from an older long staple Upland variety or from a long-lint variation in some previous long-limb, shorter staple variety. The plants were tall and long-branched, medium to late in maturity; bolls medium large and oval; seeds medium, fuzzy and gray in color; lint percentage around 30; lint length 1-1/4 to 1-3/8 inches, soft, clinging, silky and especially strong. Moon persisted in Arkansas and Louisiana until after the end of the century, possibly mostly in the river valleys. It also was extended into parts of Texas, chiefly up the Red River Valley.

Cook Long Staple, along with Allen, was another leading long staple Upland variety in the Mississippi Valley area. Cook Long Staple was originated by W.A. Cook of Newman, Mississippi, from a single select stalk observed in a field of common cotton in 1884. This plant may have been a variation occurring in some short or medium staple cotton, or it may have been from mixture of some older long staple variety like Peeler. Allen at the time had hardly been introduced long enough to have become scattered much in such a way. However, Tracy[10] stated that Cook Long Staple and Allen were similar and Duggar[8] and Tyler[9] pointed out similarities of several of the characteristics of the two varieties. Cook believed, however, that such a cotton could arise from amongst ordinary or common cotton. As quoted by Tracy,[10] he said, "I can take any of the so-called distinct varieties of cotton and in a few years develop all the known varieties from it. In other words, they will develop themselves in the course of time. All that is necessary is to watch the fields from year to year, and when a 'sport' is noticed, save the seeds and plant them by themselves."

The plants of the Cook Long Staple variety were tall and pyramidal in shape, with 1 to 3 vegetative branches, or often none; fruiting limbs showing a tendency to semi-cluster, but not as short and having degree of internodal length irregularity of Allen; bolls medium to large, long and pointed, opening well, and easy to pick; seed medium large, fuzzy and of gray color; lint percentage 27 to 28; lint soft and silky, 1-1/4 to 1-3/8 inches in length. Variety was medium late in maturity, vigorous and productive and, according to Tracy,[10] one of the best of that time for rich, low land. Cook Long Staple, like other old long staple varieties, continued to be an important variety especially in the Mississippi Valley until the boll weevil era. Tyler's[9] 1907 varietal distribution map for this variety showed it to occur rather extensively in Mississippi, northern Louisiana and Arkansas, but rather sparingly in the other cotton states.

Floradora was a commercial name given to a stock of seed, thought to be Allen, originally brought to Barnwell, S.C., from the Mississippi Delta by a cotton buyer named Coffin. This stock of seed was first grown and sold for several years by Mrs. W. Gilmore Simms of Barnwell as Simms Long Staple. L.A. Stoney of Allendale, of the same county, recognizing the value of the Simms cotton began to grow and distribute it under the name of Floradora. This effort resulted in introducing Floradora into cultivation throughout the Cotton Belt. After a period of time, the stock apparently deteriorated and Stoney undertook to increase the size of the boll and length of staple by mixing seed of big boll cotton, Allen and Simms or Floradora. This undertaking, however, finally resulted in loss of identity of Floradora. In 1907, Tyler's[9] distribution map showed cotton reported as Floradora to be only very sparingly scattered west of the Mississippi River, but much more common eastward. The variety was still especially concentrated in South Carolina, Georgia and Alabama.

Southern Hope was originated around 1880 by Col. F. Robieu of Louisiana from seed said to have come from Peru. However, this origin hardly seems to be the case since the variety is so similar to the Petit Gulf and the old Mississippi Valley Upland long staple cottons. Stocks from Peru, unless they were of the Upland Suave type, could hardly have been developed into the kind of cotton such as Southern Hope. All other Peruvian cottons are of the *G. barbadense* series. The Southern Hope plants were tall, slender, with 1 to 3 vegetative branches; fruiting limbs quite long and slender; leaves medium to small; bolls medium to large, ovate, but somewhat pointed, opening well and easy to pick; seed medium size, fuzzy, light greenish to brownish gray; lint percentage around 31; lint slightly less long than with typical old long staple varieties, 1-3/16 to 1-1/4 inches, fine and said to have been fairly strong. This variety dropped down in staple length more nearly to that of the so-called "quarter" or bender cottons. Southern Hope was medium late in maturity and persisted for a quarter of a century or more in the Delta areas of Louisiana and Mississippi having been preserved in a fairly pure state by the growers who used it during that period. Being a little shorter in staple length, it usually was somewhat more productive than most of the old longer staple varieties already described. However, as of Tyler's[9] 1907 distribution map, the variety never moved out of the alluvial areas of Louisiana and Mississippi much, occurring only in an occasional county in the other cotton states.

Black Rattler was said to have originated in Boliver County, Mississippi, but the name of the originator is not known. Doubtless, the name was derived from the fact that the seed were black and having so little fuzz that they rattled when the cotton was being ginned or when the seed were handled. This variety perhaps is a derivative of Allen or of one of the other older rather similar varieties, being a variant with respect to seed coat and the other differences that occur. Duggar[8] stated that Black Rattler had plant type similar to Allen. Tyler's[9] description indicated that the type of growth, in some respects, was somewhat intermediate between those given for Allen and Southern Hope. The black seed character should not be taken necessarily as an indication of Sea Island "blood." Nakedness of seed is merely one of the series of homologous characters of the genus.

The plants of Black Rattler were rather large, with 1 to 3 vegetative branches; fruiting limbs slender with internodes of intermediate length; leaves medium to small; bolls small, pointed, burs sharp to pickers hands; seeds small and fuzz covering apparently reduced only to tuft at small end; lint percentage around 31; lint fine, but not as silky as that of Allen, 1-3/16 to 1-1/4 inches in length. The variety was one of the typical so-called "quarter" cottons. Tyler's[9] distribution map for Black Rattler showed that, in 1907, its growth was heavily concentrated rather close in to the Mississippi River and to the tributaries in Arkansas and Mississippi. In the cotton states outside of the central area mentioned, Black Rattler occurred in no more than one to five counties in any one of these states.

Keno was an old variety, and another of the so-called "quarter" cottons. It was originated by Mand Adkin, Omega, Louisiana, by selecting the best plants for three years in a 50-acre field of common cotton. Since this Keno was typical of the older Upland long staple varieties of the Mississippi Valley, no doubt the series of mass selection work that Adkin practiced in the common cotton applied to plants coming from mixtures of some Upland long staple seed in other cotton (or the common cotton represented deteriorated stock of an older long staple variety). The plants that were taken must have been relatively uniform among themselves or the resulting variety would not have had any degree of uniformity at all. It was stated that Adkin's work represented the only plant selecting ever employed to stabilize or to improve the variety. However, when Adkin finished his preliminary work, he sold the stock to A.S. Colthrop, Talba Bena, Madison Parish, Louisiana, who with other planters of that parish kept the seed pure for a long time. The Keno was known also by a number of other names or synonyms such as Adkin, Eureka, Colthorp, and Dalkeith.

Keno, under this main name and the several synonyms during its varietal life cycle, was rather widely grown in the Cotton Belt, especially in areas more suitable for longer cotton. It was medium late in maturity and, therefore, was the more popular toward the lower side of the Mississippi Valley cotton area.

The Keno plants were tall and slender, rather open in growth, with none to three vegetative branches coming out 6 to 8 inches from the ground; fruiting branches long and slender with fairly short internodes; bolls rather small, pointed; seed rather small, fuzzy, and gray in color, small percentage only fuzz tufted; lint percentage around 28, lint soft, fine, silky, 1-3/16 to 1-1/4 inch in length.

Sunflower was about the latest preboll weevil Upland long staple variety of the old Mississippi Valley series that was developed before these cottons were all practically swept away by the advent of this insect into that area. Sun-

flower was also the only variety of this series that bridged the transition and became one of the parents of the most important and most persistent series of Upland long staple varieties in the Mississippi Valley to survive the ravages of the boll weevil. This series was the Foster, Delfos and Missdel, and their several subsequent strains. The cross involved was with Mebane Triumph and will be discussed later.

Marx Schaefer of Yazoo City, Mississippi, around the turn of the century, was a grower and seed selector of Upland long staple cottons and had been advised and assisted by S.M. Tracy of the Mississippi Agricultural Experiment Station. He had grown and reselected Southern Hope and perhaps other varieties and was experienced in this effort when he began the development of Sunflower. In 1900, in order to make an extra planting, Schaefer obtained the planting seed from a nearby oil mill. The field in which these seed were planted soon attracted attention by the vigorous growth of the plants, and when the crop began to mature it was readily seen that the cotton was of superior quality. Selections of seed (mass selection) from the best shaped and most prolific plants were made that season and the same method of selection was followed for each succeeding crop for a period thereafter. This procedure resulted in more uniformity in plant growth habit, higher productiveness and some increase in earliness over most of the other Upland long staple varieties of that period. This improved stock turned out to be an excellent new Upland long staple variety and Schaefer named it "Sunflower." Doubtless the seed obtained at the oil mill were made up largely of or almost altogether of a good long staple variety, such as Southern Hope, Allen, Cook Long Staple, Floradora, or of others prevailing in the seed collecting area of that oil mill. Tyler[9] stated that Sunflower was not entirely distinct from other long staple cottons, but belonged to the Southern Hope type and was barely distinguishable from pure Floradora and some forms of Allen. Duggar[8] also stated that the Sunflower plants were typical of the group.

The plants of Sunflower were tall and pyramidal, with a slight tendency toward the semi-cluster habit, vegetative branches 1 to 3, rather upright in growth, often absent; fruiting limbs slender, growing outward and a little ascending about 2 feet long at base and having somewhat irregular internode lengths two to three inches long at top and internodes very irregular; leaves medium in size; bolls medium small about 40% 5-lock, ovate, blunt pointed, opening well; seed medium size and covered with fuzz, greenish gray to white; lint percentage around 28; lint very fine, long and silky, 1-3/8 to 1-1/2 inches in length. Tyler's[9] distribution map of the 1907 crop showed Sunflower occurring mostly in the Mississippi Delta and South Carolina. There were only a few scattering points in the rest of the Cotton Belt where it occurred at all.

About 40 additional old Upland long staple varieties, some of which appeared to be merely new names of other varieties, were reported by Tyler[9]. Some of these were also mentioned or briefly described by Tracy[10] and Duggar[8]. Thirty-five of these are discussed or mentioned below. Two such varieties (Sego and Veale) were strains of Keno and were developed in Louisiana. Three varieties (Golson selected in Alabama, Haywood selected in Arkansas and Pride of Louisiana selected in Louisiana) were strains of Allen. Bragg Long Stable of North Carolina and Cobweb of Mississippi were said to have been derived from interspecies crosses. Such origin, however, can be no more than a surmise as is the case with many other Upland long staple varieties. Tracy[10] stated that Bragg Long Staple had the appearance of having been a hybrid of Upland and Sea Island, but that the single plant from which the variety was developed came from a single stalk of a field of an ignorant grower who knew nothing of the parentage of his cotton. The plant description given is similar to that of other Upland long staple varieties except that the staple was very irregular. Owing to the mixed character of the sample from Tracy's[10] variety test, it was classed commercially as "short." Even if the primary plant resulted from some Sea Island x Upland cross, the progeny stock had not been developed into populations of sufficient uniformity, particularly as for the lint, to be called an agricultural variety.

Cobweb was an old variety originated about 1880 by W.E. Collins of Mayersville, Mississippi. Tracy[10] stated that Collins claimed that the variety was derived from a hybrid of Peeler and Egyptian. According to Tyler's[9] information, the cross was Peeler and Sea Island. The description of Cobweb given by Tracy[10] was quite similar to his description of Peeler except that the Cobweb lint percentage was somewhat lower and the lint some longer. It is more likely that Cobweb was a long selection out of Peeler than from an interspecies hybrid. Unless Collins followed a procedure similar to that of Griffing, Cobweb could hardly have arisen from the source claimed by Collins.

Two of this more miscellaneous group of Upland long staple varieties were developed from crosses of short and long staple Upland varieties—Blue Ribbon in South Carolina from a cross of Dickson and Allen, and Pollock in Mississippi from a cross of Peerless and an unknown Upland long staple variety. Black Ribbon was a black seed or sparse fuzz form selected out of Blue Ribbon. Three other Upland long staple varieties of this group as developed in the eastern end of the Cotton Belt were Bailey in North Carolina, Commander in South Carolina and Eastern Beauty in Georgia. No information as to parental source for these was given. There was a number of these old varieties for which no parental source was given that occurred in the Mississippi and Red River basins: Adams Long Staple, Breadfield, Burek, John Bull, Kirk, Matthews, Parker Long Staple, Popcorn, Stearns and Willis in Mississippi; Davis Long Staple and New Century in west Tennessee; Holmes and Marsten in Louisiana; Coley, Willey and Willow Smith in Arkansas; and Boozer, Flemming, Owen, Sandy Land Staple, Shaw and Tucker Long Staple in the Red River and Clarksville area of Texas.

Role of Old Upland Long Staple Varieties

It has been noted in the discussion of this Upland long staple group of varieties (that is, other than the ColumbiaHartsville-Keenan group and Columbia derivatives discussed in

the Eastern Big Boll section), that they about all originated in the Mississippi Valley or have arisen from stocks rather immediately derived from that area. The typical older ones and those generally considered as the more standard Upland long staple varieties during the whole pre-boll weevil period, as previously mentioned, originated within a comparatively small delta area in Mississippi and Louisiana. These varieties also stood up under maintenance longer there than elsewhere. Varieties that were continued in cultivation beyond this range, even on bottom land, usually became slightly shorter in staple length or tended to deteriorate, in general, sooner than those that remained in the special area.

This cradle of the American Upland long staple varieties was too isolated from Sea Island culture, as mentioned before, for general natural hybridization to occur, which would be necessary for hybrid varieties to arise without special crossing manipulations carried on by man. The natural region for such to occur would have been in the overlapping fringes of Upland and Sea Island culture in the Southeast. It is not likely that growers anywhere in the Cotton Belt were content with mixed growth of hybridizing stages of the two species to the extent that stabilized interspecies forms would have time to arise. All pronounced mixtures would have constantly been discarded in favor of the growth of one or the other of the species in the pure state.

Duggar,[18] in his studies, noted that most of the Upland long staple variety seeds were heavily covered with whitish fuzz and observed that, "If the length of staple in these long staple Upland varieties were the results of hybridization between Sea Island and the ordinary short staple Upland varieties, we should expect the hybrid more frequently to inherit the naked or bare seed from its Sea Island parent." It also has been stated in this paper previously that both Harland[16] and Silow[17] pointed out that intergrade varieties between Sea Island and Upland as well as between *G. arboreum* and *G. herbaceum* did not occur in mixed culture.

In the earlier cotton breeding or improvement work, a number of workers in the state experiment stations and in the U.S. Department of Agriculture from time to time undertook to make use of Sea Island or Egyptian cotton in hybrids with Upland cotton to develop better varieties. The only successful case of such work by any of these institutions has been the recent Sealand.

The growing of Upland long staple above 1-1/8 inches and longer has always been attended with some drawbacks, and the areas where these cottons could be produced to advantage have been much more limited than in the case of short staple cottons. In the pre-boll weevil period, the long staple varieties were never grown extensively, nor so consistently, outside the old special areas. Nowhere else did they approach so closely the yield of short staple cotton. The long growing season, rich soil, and not too dry atmosphere such as prevails, in general, in the special areas were essential to the success of this type of cotton.

As noted in the previous plant descriptions of the varieties of the old Upland long staple group, these plants were open and lax, with main stalk, vegetative branches when present, and the fruiting limbs slender; leaves medium to small and lobing deeper cut, leafing never dense due to long internodes and absence of extra branching; and with tendencies to grow to large size and with fruiting over long period of season, pronounced. The old long limb or Petit Gulf short staple type was similar in respect to plant growth and fruiting habits. In these old forms as described, there was less tendency, apparently, for the plants to go to "weed" or "bush" and consequently, as a case of such physiological unbalance, fail to fruit properly.

In contrast with the big boll coarse-growing leafy types, such as characterized both the eastern and western big boll groups, this was not the case. These types, under highly fertile and excessively humid or wet conditions, would produce much branching and dense foliage, but little or practically no fruit. Climatic and soil conditions that permitted the old Delta Upland long staple and Petit Gulf spreading types to grow and fruit over a long period of time provided the necessary conditions for relatively heavy fruiting. The Upland long staple varieties, derived from the big boll groups (like Columbia and relatives, and Flemming (Tyler[9]) including a few others of the miscellaneous Upland long staple lot) responded differently in the Old Valley areas. They never thrived so well there, but it was such stocks that permitted extension of long staple growing to less humid and wider areas. The staples of the latter were never quite as fine and silky and as long as the old typical group.

Along with the Sea Islands and the finer and longer Egyptian varieties, American Upland long staple has been the type of cotton supplying the best raw material for the fine spinners. Most of the other long cottons of the world are rather coarse for such spinning. The cottons of the West Indies (other than Sea Island, the North Brazilian and the Peruvian) are generally too coarse for this use. The last two especially have been used for knit goods and for mixing with wool. Possibly, at present, there are certain industrial uses found for long coarse cottons.

It has been often stated that much quality in American Upland cotton, especially in the long staple group, passed out with the advent of the boll weevil. This belief, apparently is incorrect as for strength of lint. As a whole, the American Upland long staple varieties have been relatively weak in comparison with the different short types.

In Tyler's[9] study of the varieties, he reports single fiber breaking strength values for a large number. The 23 Upland long staple varieties that were tested averaged only 4.8 grams while 21 Western Big Boll stormproof varieties averaged 6.5 grams. Next, in order of strength was the Early group, 14 varieties averaging 6.3 grams. The third strongest was the Eastern big boll group, 63 varieties averaging 6.2 grams. The Peterkin varieties with 21 averaged, ranked fourth with a level of 5.9 grams. The Long Limb group was fifth in strength, but only one variety was represented, the value being 5.4 grams. The Semi-Cluster group was sixth in strength, 15 varieties averaging 5.3 grams. The Cluster

group was seventh, having a strength level of 5.2 grams, but only two varieties were represented. There was considerable variation among the varieties within each of the groups especially when the number was large and representing varieties from a wide area. The widest range in the Western Big Boll Stormproof group was from 9.0 to 4.8 grams. The second range was from 7.8 to 5.2 grams, and the third range from 7.1 to 5.6 grams. The Eastern Big Boll group being a very large one, showed a varietal range from 7.7 to 4.6 grams. The next widest difference was from 7.6 to 4.8 grams. The Peterkin group of varieties ranged from 7.3 to 5.0 grams with the second range being from 6.4 to 5.3 grams. The Semi-Cluster group ranged from 7.1 to 4.5 grams with next being from 6.9 to 4.7 grams. The two cluster varieties had strength values of 5.1 and 5.2 grams.

The Upland long staple group varied in strength from 7.2 to 2.8 grams. The second range was from 6.0 to 3.5 grams, the third range from 5.6 to 3.6 grams and the fourth range from 5.5 to 3.7 grams. The strongest variety was Moon (which was somewhat shorter in staple length, had larger bolls) was bred in southwestern Arkansas possibly in the Red River Valley. It is likely to have been more closely related to the Texas Big Boll Stormproof group than to the old Mississippi Valley long staple stock. Flemming was the second highest in strength. This variety, bred near Clarksville, Texas, had large bolls, shorter staple and was similar to Boozer and other varieties of the Red River Valley area, which were not of the true Mississippi Valley type. Columbia was third in rank from standpoint of strength. This variety as previously noted originated among the Eastern Big Boll group. The strength as determined by Tyler[9] is given below for several of the typical Mississippi Valley long staples.

Variety	Single Hair Strength
Peeler	4.1
Allen	4.3
Cook Long Staple	4.7
Floradora	4.5
Griffin	5.0
Black Rattler	4.8
Cobweb	5.3
Sunflower	4.9

Griffin (from a known cross with Sea Island) and Cobweb (thought to have come from such a cross) showed highest values of the eight varieties. However, these values may not be of significant difference.

Webber[14] pointed out that the Upland long staple varieties were weak and should be improved before becoming perfectly satisfactory, and stated that this could be done by special selection as the individual plants of these varieties differed greatly in strength of lint. However, it was indicated, at that time, that these cottons were in great demand for spinning fine yarns. In 1900, 80,000 bales of this cotton were used by the fine spinners and in 1904 about 105,000 bales were produced. Also, according to Webber,[14] spinners in that period stated that Allen could be handled successfully in warps from 50s to 70s and in filling up to 120s or 125s. For Peeler, the range was somewhat lower, but it was noted that this variety was much older and had changed or deteriorated somewhat. Peeler at that time was capable of being spun for 40s to 50s warp and 50s to 70s filling.

Mississippi Valley Post Boll Weevil Upland Long Staple

After the advent of the boll weevil, all sorts of early short staple varieties, as heretofore mentioned, were tried in the Mississippi Valley as well as elsewhere in the Cotton Belt. These produced fairly good crops in the Mississippi Delta, but the commodity was so much reduced in quality that former customers of the Trade found it not suitable to meet the needs of their clientele. D.N. Shoemaker in Texas had selected an early long staple strain out of the Upland Bohemian variety and D.A. Saunders had crossed Mebane Triumph and Sunflower, the latter being one of the pre-boll weevil Mississippi Valley Upland long staple varieties described above. The cross was made on J.F. Foster's farm which was located in the Red River Valley near Shreveport, Louisiana.

E.C. Ewing, who began cotton breeding work at the Mississippi Experiment Station in 1911, obtained seed of Shoemaker's strain which had been designated as Express and seed of Saunders hybrid strain which had been named Foster after the farmer on whose place the hybrid was made and the new stock developed. Ewing first developed the Express variety finding that two strains of it, Express 350 and Express 432, stood out as best. These strains, especially the Express 350, restored Upland long staple production in the Mississippi Valley in spite of the presence of the boll weevil. During and immediately after World War I, Express not only occupied most of the bottom land of the general Mississippi Valley, but was also grown in many of the other large valleys of the Cotton Belt. Lightning Express and several other strains were developed by other cotton breeders.

The Coker Pedigreed Seed Company of Hartsville, South Carolina, developed eight strains of Express from 1922 to 1932: Lightning Express and subsequent strains 1, 2, 3, 4, 5, 6 and 7. This company obtained the parent material, Express 28350, in 1917 from E.C. Ewing of the Delta and Pine Land Company, Scott, Mississippi. Lightning Express, especially the last four strains, had considerable resistance to *Fusarium* wilt. Express 121 originated from a single plant, selected by W.E. Ayres, out of a field of Express 432 near Stoneville, Mississippi, in 1921. Delpress 3 was developed out of Express 1221 by H.A. York at the Delta Branch Experiment Station, Stoneville, Mississippi, about 1926. York also developed Express 317-734 from Express 432 stock. Arkansas 17 (Express 17) was developed at the Arkansas Experiment Station in 1926. It and several other Express strains of this Station came from Express 432. Burdette Express and

Dortch Express developed in the early 1920s came from Express 350. In the late 1920s and early 1930s H.B. Brown, then at the Louisiana Experiment Station, Baton Rouge, Louisiana, developed several Express strains using possibly both old parent stocks 350 and 432. Bobshaw 15 and Bobdel (Bobshaw 16) developed by the Robertshaw Company, Heathman, Mississippi, in the late 1930s arose from Delpress 3. Delpress 3-11383 intervened between Delpress 3 and Bobshaw 15. Further information about development of the Express group may be found in an article by Ware[19] in the U.S. Department of Agriculture Yearbook for 1936.

Breeding work on the Foster variety also was begun in 1911 by Ewing but continued by his successor H.B. Brown, who also worked on Express and other stocks. In 1915, E.C. Ewing went with the Delta and Pine Land Company, Scott, Mississippi, and has been with that company as cotton breeder since. In the early 1920s it was seen by Brown that Foster was a better variety for the Mississippi Valley Upland long staple areas. Therefore, it was substituted gradually for the Express strains. Foster which had been designated as Delfos (two groups: Delfos 6102 and Delfos 631) held sway in this area for a decade or more when it began to wane. Staple prices did not justify its production on such an extensive basis when faced at that time with high yields of Stoneville and Deltapine.

Some acreage of Delfos, Express and other similar Upland long staple varieties, however, have been maintained, and some breeding work continued for special areas and uses, and to preserve the type. This has been done mostly with Delfos, Missdel (formerly Delfos 631) and Express, and derivatives of the three groups. Missdel breeding has been continued by the Delta Branch Station, Stoneville, Mississippi; the Delfos by this Station, the Stoneville Pedigreed Seed Company, Stoneville, Mississippi, and the Louisiana Experiment Station, Baton Rouge, Louisiana. The Express breeding has been carried on by the Delta Branch Station and by the Louisiana Experiment Station but no newer strains of any consequence have arisen from this group. On the other hand, Delfos has been a better source for breeding material. Delfos 9169 is a current strain of the Stoneville Pedigreed Seed Company, Delfos 444 a current strain of the Louisiana Experiment Station, and Delfos 651 a current strain of the Delta Branch Station.

Besides the two varieties of Delfos, that is, Delfos itself and Missdel, two additional varieties have been separated out of the Delfos group: Washington (Delfos 719) and Wilt Resistant Delfos (Delfos 425).

The Missdel resembled Express in fiber quality but, as with Express, it was difficult to develop productive strains from this variety. However, the Delta Branch Station pursued work for a number of years on both the 6102 (Delfos) and the 631 (Missdel) varieties. At first, the name Delfos at that Station was applied to both groups with new strains from the former (6102) having even numbers and from the latter (631) having odd numbers. Delfos 2, Delfos 4 and Delfos 6 therefore were of the Delfos variety. Delfos 3506 and Delfos 9431 were selections of Delfos 4. Delfos 651 and Delfos 4729 were selections from Delfos 6. Delfos 050, Delfos 42-43, and Delfos 42-72 were selected from Delfos 651. Delfos 1020 was selected from Delfos 9252 (see below) at the Stoneville Station, and Delfos 531-824, apparently was developed by the Stoneville Pedigreed Seed Company.

Missdel 910 and Missdel 1 came from Missdel 631. Missdel 3 was a selection from Missdel 910 and Missdel 5 and Missdel 1 WR from Missdel 1.

Carolina Foster developed by the HumphreyCoker Seed Company, Hartsville, S.C., and Coker Foster developed by the Coker Pedigreed Seed Company also of Hartsville, S.C., were derived from Delfos 6102.

Delfos 444 and 425 mentioned before were developed by H.B. Brown at the Louisiana Experiment Station from Delfos 6102. Several subsequent strains from 425 also were developed. These were Delfos 425-112, 115, 919 and 920. Brown also developed Delfos 130A-022 from Delfos 6102.

Bobshaw 2 was developed from Washington (Delfos 719) by the Robertshaw Company, Heathman, Mississippi. Delfos 339 was developed by O.A. Pope from Delfos 719 at Knoxville, Tennessee. Delfos 719-5 and Delfos 719-829 were developed also from Delfos 719, but the particular breeder's name is not recalled.

The Stoneville Pedigreed Seed Company of Stoneville, Mississippi, in the case of long staple worked only with the Delfos 6102 group. Neely[20] of that company has prepared a chart showing the relationship of subsequent strains diagrammatically. The chart is as follows on the next page.

Neely[20] points out that the Company's current strain Delfos 9169 is different from the Delfos 531 series for which it was substituted. It also differs from Washington, Delfos 425, and Bobshaw 2. Although Delfos 9169 came from the Delfos 531 series, it has larger bolls, shorter staple, higher gin turn-out, better picking qualities and is adapted to a wider range of conditions than were the Delfos 531 strains. The plant type is medium vigorous spreading and prolific, foliage medium, early for a big boss staple cotton; bolls 65 to 75 per pound of seed cotton, rather round, mostly five-lock, opening well and easily picked, but storm resistant; Staple 1-3/32 to 1-5/32; character medium in fineness, strength and uniformity; lint percentage 35 to 38; seed average 4000 to pound and of extra high milling quality.

Ewing Long Staple, though not introduced commercially under this name, was for several years carried by E.C. Ewing in his breeding nursery under the designation D & PL 37-45. W.H. Jenkins of Florence, S.C., and the late C.J. King of Sacaton, Arizona, each obtained D & PL 37-45 stocks and further bred them. The D & PL 37-45 stock was tested by the Delta Branch Station for a few years. Jenkins and King referred to their strains of this stock as Ewing Long Staple.

The Ewing Long Staple or D & PL 37-45 stock was developed from a cross made in 1918 by Ewing between Salsbury and Foster 11-63, a noncommercial breeding strain. Some selections out of this cross appeared to have been further crossed with Meade. In the course of selecting and

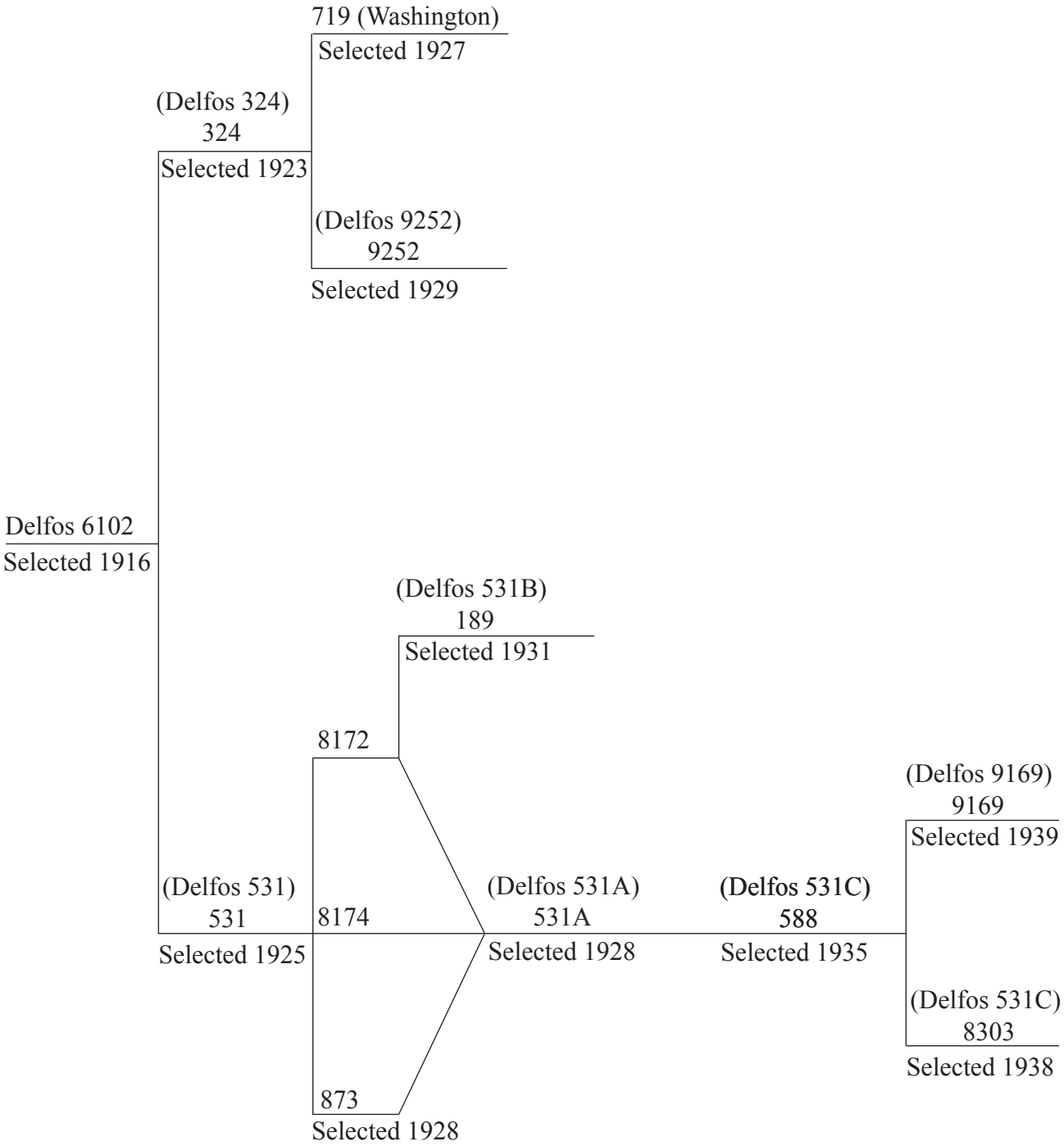

Fig. 1. Pedigrees of long staple Delfos 6102 cottons bred by Stoneville Pedigreed Seed Company, 1916–1938.

reselecting this Meade cross, the lint was found to be very long, but weak. To improve the strength of this lint, some of the plants were crossed with Wilds 3 about 1931. As a result of this cross, stronger fiber and better picking bolls were obtained, but the fiber was shorter than in the earlier crosses. It was this material that became D & PL 37-45. The U.S. Field Station, Sacaton, Arizona (King) developed two Ewing Long Staple strains, 1-1-5 and 1-1-1-5.

Although Wilds was referred to in the Eastern Big Boll section of this paper and shown to be derived from a source different from that of the Old Mississippi Valley Upland long staple varieties, strains of the Wilds variety have been grown to considerable extent in the Mississippi Valley from time to time in the last 20-year period. This variety was derived, as mentioned before, from a cross of Lighting Express and Deltatype Webber. The original cross was made in 1919 by George J. Wilds and H.J. Webber. Wilds and strains 2, 3, 4, 5, 6, and 7 were developed by Wilds during the period 1928 to 1935. Since that time strains up to number 19 have been introduced.

In the 1939 catalogue of the Coker's Pedigreed Seed Company, Wilds or the Coker-Wilds variety was described as follows: Plant semi-dwarf, determinate, medium open, flat topped, 1 to 3 vegetative branches, well-spaced fruiting branches, foliage dark green, medium thin, leaves medium size; bolls round ovate, slightly pointed, 65 to 70 to pound of seed cotton, open wide, fluff good, storm resistant, pick like short varieties; lint percentage 33 to 35; staple length 1-3/8 to 1-1/2 inches, strong, silky; maturity early and production excellent.

Wilds 415 was a strain of Wilds selected and grown at the Pee Dee Experiment Station, Florence, S.C. Deltatype Webber 2139 was selected by J.W. Neely at the Delta Branch Station, Stoneville, Mississippi, in the late 1930s. It was derived from some old Deltatype Webber seed that had been carried over for several years. Victory Wilt was a strain of Wilds which was developed and sold for a few years by W.W. Wannamaker, St. Matthews, S.C. Some of this cotton was grown in the Mississippi Valley. The Delta Variety of long staple with several strain numbers was grown and sold by the Humphrey-Coker Seed Company at Greenwood, Mississippi. This company operated a branch of their business at Greenwood in the 1920s.

In the Red River basin near Clarksville, Texas, in the 1920s, an Upland long staple variety known as Snowflake was grown and the seed distributed to several Upland long staple growing areas. Then in the late 1930s, another Upland long staple variety designated as Clarksville Long Staple was found to be grown by a farmer near Clarksville. Possibly the latter was a derivative of the former. (See Ware[19] for additional discussion on earlier development of Delfos, Missdel and other Upland long staple varieties.)

Intermediate or Miscellaneous Type

Only the varieties that were never relatively pure or subsequently had become mixed with one or more varieties of another type or types actually belonged to this so-called intermediate type. Duggar[8] placed several varieties, most of which originally belonged to other types, in this group for the reason that much mixture was shown. A number of the varieties of Tyler's[9] list of 612 were not assigned to any type. Due to lack of available information or to obvious mixture, such varieties could not be classified in any of the regular types. The mixed stocks, however, could have been placed in this, the intermediate group, merely as a matter of catch-all.

Western Big Boll or Stormproof Type

The Western Big Boll Stormproof type of cotton is usually referred to as the "Texas Big Boll," "Texas Stormproof" or "Stormproof." Under the conditions of the dry and windy climate of the Texas region, the Mexican Big Boll Upland forms brought over from similar dry and plains-like areas of that country retained several traits including: 1) more of their tendency to bear large and pendant bolls, 2) to carry over in more pronounced degree storm protecting bract and bur structures, and 3) to preserve more of the smugness of lock adherence than persisted in the stocks that were carried on to the Mississippi Valley and to the eastern states where dry winds were less selective. However, the Mexican stocks throughout the Cotton Belt always contained more of these characteristics than were ever possessed according to old reports by the old eastern green seed forms. The more pronounced differences that distinguished the Eastern Big Boll and the Western Big Boll Stormproof types pertained to the characteristics of the bolls and their accessories. The storm-resistant attributes were less evident in the former group with some varieties (through the manner of seed selection practiced) losing more of them than others. Except on river bottom lands or in wet seasons, the Western Big Boll group usually had smaller plant size than the Mexican varieties of the Mid-South or East. As a rule, these stocks had much the largest plant size in the Mississippi Valley. In all cases, however, the growth habit was gradually altered toward best vegetating and fruiting balance by seed selection. The natural tendencies toward this end resulted in the different regional types, which have been under discussion in most of this paper. The cluster type was an early one found especially suitable for excessively rich low land and for earliness.

Doubtless, some settlers from the States had gone into parts of the Texas territory of Mexico before Stephen F. Austin, the colonizing promoter, went to the lower Brazos Area in 1821. It is likely that cotton seed was carried from the older Cotton Belt by all settlers who went to Texas, especially by those who planned to farm and most of them did then. This seed may have been of the old eastern green seed sort, but it is probable that these people were aware of the Mexican stocks and, therefore, soon took steps to obtain new supplies direct from that source and acclimatize them. The new homeland being a part of Mexico at that time, such pro-

curement (it seems) would have been natural and practical.

It is not known what kind of Upland cotton Stephen F. Austin referred to as growing 9 to 12-feet high and also producing heavily. It is likely that such cotton was an acclimatized Mexican form. Early eastern green seed stocks, it seems, were rather small or of too frail growth habit to reach such proportion. About all references (some previously mentioned) to first experiences with growing fresh Mexican stocks in this country indicate that they were long-seasoned and that the plants were very large, lanky, limby, and leafy, and not very productive at first. Such responses, however, can be understood. The movement of the stock was from an area where the growing season is in the short-day months. On being grown in this country, the plants were exposed to the photoperiod effects of the long-day months, which in such stocks promote excessive vegetative growth at the expense of fruiting. Doubtless, the stocks that Austin's settlers planted had been acclimatized by other inhabitants of the area or had been obtained from prior plantings of Mexican stocks further eastward.

Under the conditions of the great climatic change, pronounced environmental shock was effective in breaking up or isolating favorable responding genotypes. These better balanced and, therefore, more fruitful forms were readily recognized by the growers who would save seed from them. In this way, desirable plant habit having the necessary production characteristics for the new adaptation or ecological area in question was established. As heretofore mentioned in the discussion of Mexican stocks that formed the bases of most of the other types, the extent to which these stocks broke up under the new Cotton Belt regional environments was observed. The varieties of the Mexican forms that arose in the early period (in the parts of Texas settled at that time) apparently were predominantly of the Big Boll Stormproof type. The forerunner varieties of the Long Limb, Long Staple, Cluster, Semi-cluster, Peterkin and Early types, on the other hand, seem to have arisen in the more eastern environments and from Mexican stocks brought, in the main, directly to the Mississippi Valley from Mexico. However, the older settled parts of Texas have had (since varietal records were available) representative stocks of most of the different Cotton Belt types. It probably should be assumed, mostly at least, that these other types were not so much of Texas origin, but were redistributed to that part of the country after the differentiation had occurred in the more eastern environments.

No very definite record in Texas, of the continuity from first Mexican stocks to those that were later found labeled by variety names, appears available. Therefore, any tracing of the primary germplasm record from definite Mexican introductions to the later cottons observed and recorded there by variety names can be no more than surmise. The earliest stocks, doubtless, were generally spoken of as the Mexican cottons. Then as certain more resourceful growers accomplished greater acclimatization and consequently other more favorable production responses in a given stock by seed selection, this new stock became particularly known. Interested neighbors would obtain some of the special seed for planting and, if liked, the cotton became more widely spread. The name of the originator, the name of the nationality of the originator or the name of some outstanding feature characterizing the new stock usually was applied as the new variety name. Possibly the first variety name of the Mexican cottons in Texas was "Stormproof" or "Schuback." The former designation indicated an outstanding feature of the variety and the latter possibly was the name of the person who originated the variety. These names apparently applied at first to a particular stock that arose as by the process just described. The name "Stormproof," however, later expanded to be understood as applying to the whole type or group of varieties having such characteristics.

Two varieties, Bohemian and Meyer, were perhaps next in order. They had characteristics similar to the Stormproof and perhaps were derived from it. The Bohemian variety was originated about 1860 by a Bohemian settler named Supak who lived at Travis, Texas. This is a case of the nationality of the originator becoming the variety name; however, the stock was also known as "Supak." Bohemian became widely popular and was extensively grown in Texas for half a century or more. Even in 1907, Tyler's[9] survey showed it to occur all over the cotton growing parts of the state at that time. Its distribution, however, stopped almost abruptly at the borders. The variety was reported in the other cotton states, but the occurrence was very scattering.

The Meyer or Myers variety came into use only a few years after the origin of the Bohemian, possibly about 1865. Meyer was developed from Bohemian at New Bremen, Texas, by a farmer by the name of Meyer. This is a case of the variety taking the name of the originator, as was partly the case with Bohemian. The variety was grown to considerable extent for a long time, but almost altogether in Texas. It was still grown there in 1907, as reported by Tyler,[9] occurring in a large zone of oval shape across the central part of the state in a southeast-northwest direction. It was reported by Tyler[9] in only three counties in each of three other cotton states.

Rather soon, perhaps, not long after the Meyer cotton came into use, W. J. Smilie of Baileyville, Texas, began to sponsor the Stormproof variety under the name of Texas Stormproof. It was stated that this stock was closely related to Bohemian and Meyer, but it is not known how much re-selection Smilie did on the old Stormproof stock or whether he also made use of Bohemian and Meyer in making up his stocks for growing and selling the seed. The Texas Stormproof variety, as such, existed for a long time. It, though badly mixed with other varieties, was still distributed extensively all over the Cotton Belt when Tyler's[9] survey was made in 1907. Texas Stormproof occurred in about as dense distribution in larger portions of most of the other cotton states as in Texas. Possibly the condition of the great mixture obtained bolstered the wide adaptation.

The following varietal description, by Tyler,[9] applies in general to the three varieties Bohemian, Meyer and Texas

Stormproof (mixed plants in the last one not included) indicating that, at least, in original forms they apparently were quite similar. Strength values for the fiber of the three varieties are given separately at the end of statement of description, but not much difference is shown between Meyer and Texas Stormproof. Bohemian had a somewhat lower value.

The three-variety description is as follows: Plants rather large, 2 to 3 stocky vegetative branches, often nearly prostrate, fruiting limbs numerous long and somewhat drooping; internodes short and regular providing good production; leaves quite large and foliage heavy; bolls large, ovate, bluntly pointed, mostly 5-lock, usually turned down by their weight, also this aided by drooping branches and limbs; involucual bracts large and bur segments broad, forming roof for pendent open bolls; locks clinging well under this covering; seed large and very fuzzy, fuzz white or gray to brownish gray; lint percentage 31 to 34 and lint length around 15/16 of an inch; single fiber strength of Bohemian 5.3 grams, Meyer 6.5 grams and Texas Stormproof 6.6 grams.

This group of three made up the key varieties in the development of the Western Big Boll Stormproof type. They were parents of the bulk of the subsequent varieties constituting the entire group. Still later varieties that have been quite important as parent material in developing several of the great varieties that survived during the boll weevil era are traceable also to Bohemian, Meyer and Texas Stormproof. Information gathered in the 10th or 1880 Census showed Stormproof or Schuback to be the most commonly grown variety in Texas at that time. This variety was reported as being preferred in the black prairie or Texas Blackland and occurred in 40 counties of that area. Meyer was reported from four of these counties and Bohemian from one. Apparently, the big distribution of these two came after 1880.

It has been indicated previously that eastern varieties were more or less continuously transferred to Texas and grown there. The 10th Census reported Dickson in 24 counties of southeastern Texas and it was stated that this variety was preferred in the timbered and sandy lands of that area. Also, it was stated in that report that varieties from Tennessee and North Georgia produced the largest yields in the coastal area. Dickson from North Georgia was mentioned especially as an early variety to escaped effects of caterpillars. Petit Gulf was mentioned as occurring in 15 counties and Bancroft Herlong in 10 counties. Sugar Loaf was reported from three counties and Peeler and Moon each from two counties. The 10th Census reported 27 varieties, in all, as used in Texas at that time. The other 17 varieties, with the exception of Cheatham in 10 counties, were never very prominent there and likewise, according to other records, never became widely grown elsewhere. Hefley was reported in three counties: Bagley and Armstrong each in two; Metagorda Silk, Poor Man's Relief and Kemps Long Staple each in one. Tyler[9] showed that a much larger number of varieties, other than the Western Big Boll Stormproof group, was in Texas in 1907. The especially early varieties of the northern part of the eastern area of the Cotton Belt, as previously mentioned, had become very heavily planted there at that time as a boll weevil control measure.

W.L. Boykin and A.D. Mebane were doubtless the two most outstanding early cotton improvers or breeders in Texas. They were practical cotton growers who learned about the plants by keen observation and accumulated great knowledge of these plants through sustained memories. The work of these men in the 1880s and 1890s also paved the way and preserved superior breeding stocks for the professionally trained breeders, who came on the scene about 1900 and the first decade of this century to beat the boll weevil.

Boykin settled on a farm near Terrell, Texas, in 1869 and grew and re-selected Meyer cotton for about 10 years. About 1880, he made mixed plantings of Meyer and Moon, the latter the long staple cotton of Arkansas, previously described. Out of this mixture came selections from which Boykin developed his improved variety. However, it seemed apparent that very little or none of the Moon composition survived in this material unless it was some extra staple length. This new stock was similar to Meyer in type, but more storm resistant. Boykin's method of selection was the best bolls from the plant forms that he liked. His method of selecting for storm resistance was to tie a string abound the tips of the locks, attach a pound weight to the string, hold up the boll by the pedicel and select only bolls which retained their cotton under this strain. According to Tyler,[9] the variety in general habit and appearance was like Meyer and the older varieties of the group. The bolls were very large and quite storm resistant, though easily picked. They were pendant, the lint percentage around 34, the lint length about 1-1/32 inches and the strength of single fiber 5.2 grams. Boykin or Boykin Stormproof, as the variety was named, was very widely grown for years in Texas and some adjoining states. Tyler's[9] survey, however, indicated that in 1907 its popularity had greatly waned. Some of it occurred in each of the cotton states, but only in few scattering counties. Also, it was not much more common in Texas by that time than in the other states.

A.D. Mebane was about 30 years younger than W.L. Boykin and continued the improvement of the big boll stormproof cotton long after the elder man had become inactive. Mebane's father and family settled at Lockhart, Texas, about 1873 when the son was about 18 years of age. Young Mebane soon decided to be a farmer and, in the beginning, became intensely interested in crop plants particularly in cotton plants—that is, how they grew, why some plants produced more than others, what relation did the habit of growth have to production, how might the crop be improved, etc. Having this sort of an inquisitive mind, he accumulated a library on plant life and studied these books and pamphlets along with observations of plant behavior in the field. When this young man heard of an improved variety, he purchased seed and tried to further improve on it. As a result of this procedure, a number of varieties and types were tested. These included a collection of the big boll sort, as well as, many of the smaller boll varieties from the eastern cotton states. After a severe storm and beating rain in the fall of 1882, Mebane concluded

that Bohemian, Meyer and others of the big boll stormproof group formed a much better base for improvement than the eastern varieties (the cotton of which was about all strung out or on the ground after the storm subsided).

The eastern varieties generally had higher lint percentage, but Mebane remembered that among the bolls and plants he had previously studied in the big boll group, there was much variation in lint percentage—an opportunity to sort out a higher linting big boll cotton. As a result of the storm, Mebane had noted also that among the plants of the big boll group, there was much individual difference as to how well the locks stuck in the burs. On closer examination, he found the locks of some of the plants had scarcely been disturbed at all. These plants were pulled and taken in for later study. Some of these plants were shorter, stockier and tougher and with more extensive root systems. In that day, cotton plants generally were much taller, lankier, more limby and leafy, more indeterminate in growth habit and much lower in lint percentage than of today. Being more switchy, they were whipped around by the wind to greater extent and, therefore, more cotton knocked out even when the locks were of the adhering kind. Mebane was not only interested in higher production, more lint percentage, big bolls, storm resistance and more compact plants, but was interested in a deep and extensive root system to withstand the great droughts of Texas. He practiced the plan of pulling up his plant selections in order to reselect for the more extensive root systems. Mebane's ideal cotton plant was one with long roots sinking deep into the ground and with short sturdy stalks with fewer leaves—the growing power focused on production of fruit and not on the plant's entirety. After Mebane would go through with his procedures, the better plants (those conforming to his ideal type) were massed and planted in a breeding patch for further study the following season and for increase of seed.

Mebane had not met W.L. Boykin until about 1885 when they both attended a Grange meeting in Corsicana, Texas, and happened to get acquainted. Soon after this meeting, Mebane obtained a shipment of 10 bushels of seed of Boykins's cotton and planted the Boykin variety at Lockhart for comparison with his own stock. It is not clear in the information available whether Mebane switched entirely to this stock for his future breeding material. It is likely, however, that since he was practicing mass selection that he made use of all stock that provided his ideal of plant type and performance. Before systematic plant breeding like that of Boykin and Mebane was started in Texas, farmers hauled 1,800 to 2,000 pounds of seed cotton to the gin in order to obtain a 500-pound bale. In those days, the seed were worthless. Vast amounts were destroyed every year and laws were enacted to prevent ginners and farmers from dumping them in streams. There was more economy in that day in increasing lint and decreasing seed by breeding than is the case today. Mebane appreciated the value of higher lint percentage in his day and steadily increased it over the years in his variety.

Mebane picked bolls that suited himself and from plants he thought desirable. With his keen mind, he could remember the type he wanted and picked or selected from memory. He studied, ginned and evaluated each boll separately and then massed those approaching nearest his ideal. As this cotton was developed, the seed were sold to neighbors and to other farmers in the general surrounding country and soon became known as Mebane cotton. In the long period of Mebane's mass selection work and having definite aims in mind, he changed his plant type considerably. The shift was from the more lengthy main stalk and prominent vegetative branches (both having the longer internodes as of the parental forms) to the more compact growth habit. The latter habit was accompanied by low and "close-in" fruiting performance that began earlier not only along the main axis, but also on the formerly more sterile like side branches. The fruiting zone, therefore, was pulled in, shifting the vegetative-fruiting balance of the plant from that of more extended or outer boll bearing to that of a more concentrated or inside crop of bolls. Besides developing the stockier, sturdier, less wind whipping tops and stronger rooted plants for improvement of storm and drought resistance, more earliness and a much better plant type for use in the one coming boll weevil era was established. Mebane also appeared to have maintained the previously mentioned advantages of the boll and accessory structures of the parental type as to storm resistance. His biggest single improvement considered at the time, however, was the materially raised lint percentage.

At the end of this stage of improvement of the Mebane variety, which was around 1895 to 1900, the varietal description was about as follows: Being of the general stormproof type but modified over parental form in more essential features of growth habit. Plants strong and thrifty, beginning to fruit near ground and close to stalk, vegetative branches and fruiting limbs with relatively short internodes; bolls pendulous when mature, large ovate, blunt pointed, mostly 5 lock, opening wide and easy to pick; seeds medium size and heavily covered with whitish to brownish and somewhat greenish fuzz; lint 15/16 to 1-1/32 inches in length and 37 to 39 percentage; season of maturity medium early.

Breeding cotton to A.D. Mebane was more of a hobby or profession than a commercial enterprise. While he was interested in better cotton for his farming operations and for selling to his neighbors, great exploitation of his art never seemed to appeal to him. However, as the boll weevil spread over Texas and his cotton appeared to produce and triumph in spite of this insect, he became more interested in wider use of it. Mebane's cotton was, therefore, more widely distributed in 1898 and 1899. In 1900, Seaman A. Knapp named it "Triumph" because he said it would triumph over the boll weevil. This cotton then became known as Mebane Triumph. This variety was a rather uniform and distinct looking one. Being bred on black waxy land, it was definitely a variety better adapted in general to the blackland or black prairie of Texas than elsewhere (more to be said about this cotton later).

Jackson Round Boll was another of the older varieties of the Stormproof type and likely originated from one or more

than one of the first Big Three (Stormproof, Bohemian, and Meyer). Jackson Round Boll was developed by James Jackson of Preston, Texas, a town located in the Red River country of that State. Jackson began his selection work in 1882 and for some years selected desirable plants, picked and placed the cotton in a separate bag, which was carried along during harvesting. Enough seed was obtained in this manner to plant the following crop. In the fall of 1897, however, Jackson found a single plant in his field that he thought to be about ideal. The cotton from this plant was kept separate and the seed planted the next year in a block to itself. The new variety arose from this planting and because of the distinct roundness of the bolls, it was named Jackson Round Boll. The variety also sometimes was called Apple Boll because of the boll shape.

The plants were somewhat upright and strong in growth, basal or side vegetative branches few or none; fruiting limbs on main axis and side branches having short internodes; leaves large; bolls large, very round, borne on short stiff pedicels, ordinarily not drooping but holding the locks in well, mostly 5 lock; seed large and fuzzy, fuzz gray; lint percentage around 35; lint length 15/16 to 1-1/16 inches; medium late in maturity. Tyler[9] gave the single fiber strength as 7.6 grams, which is toward the high side for the Stormproof group. Jackson Round Boll was selected on the rich bottom land of the Red River and on a hillside adjoining and, therefore, appeared to be well adapted to a range of soil. This variety according to Tyler's[9] survey was found to be grown scatteringly in most of the cotton states by 1907. However, this survey indicated that it was much more common in the Red River Valley and black prairie of Texas. Jackson Round Boll was the parent of Long Star later to be discussed.

Patton Round Boll was a local Texas round boll variety of the Stormproof group, developed about 1899 by selection by a grower by the name of Patton of Montague County, Texas. This variety was in general similar to the Jackson Round Boll, but not known to be directly related.

The Rowden variety was developed by Rowden Brothers, Wills Point, Van Zandt County, Texas in the late 1890s. The parental stock apparently was the Bohemian variety which as indicated elsewhere has been the primary source of most of the important Texas Big Boll Stormproof varieties and also of some of the Mississippi Valley long staple varieties. The original seed stock was first obtained by H.H. Carmack of Wills Point in the fall of 1897 when traveling through the bottoms of the Sulphur Fork Creek about 50 miles north of Van Zandt County. On seeing an excellent variety in cultivation in these bottoms, Carmack obtained two bolls from the grower who stated that the cotton was the Bohemian variety. The bolls were given to Will Rowden, one of the brothers who was a renter at that time on the Carmack farm. After a few years of work in developing this variety, doubtless by a mass selection method, Rowden Brothers began to sell seed and the new cotton soon became known as the Rowden variety. The stock was kept relatively pure and true to type, apparently by mass selection, for years. Rowden was widely distributed and became one of the most popular varieties in Texas and also was grown to considerable extent in some of the nearby states.

The plant type in the Rowden variety was similar to that of the earlier Stormproof varieties of the group, though not as compact in general conformation as the subsequent Mebane Triumph. The plants were vigorous but stocky in growth with 1 to 3 stout side or vegetative branches; fruiting limbs from 2 feet at the base to 6 inches at top in length; internodes regular and of medium length; these limbs and usually whole plant drooping beneath weight of maturing bolls which hung downward when ripe; bolls very large, thick oval, blunt pointed, mostly 5-locked; locks clinging together in single mass and turning down beneath the open bur, but adhering closely and therefore protected by the broad bur segments and above situated large involucre or bracts, easily picked; seeds large, fuzzy, grayish white; lint percentage 33 to 35; length of line 15/16 to 1-1/32 inches; strength of single hair 6.3 grams.

Tyler's[9] 1907 map showed Rowden heavily distributed in most of the cotton area of Texas of that time, as well as in northwest Louisiana, southeast Arkansas and in much of the Oklahoma and Indian Territories. Very little of this variety occurred elsewhere in the cotton states.

Tyler[9] reported three other local variety names that were applied to stocks similar to Rowden: Gibson developed at Stone Point, Texas, by B.F. Gibson; Woodall originated at Farmersville, Texas, by Jot Woodall; and Pride of the Valley selected by Henry Morrison at Savoy, Texas, out of Woodall. The single fiber strength of Woodall, the only one of the three determined, was rather strong, being 7.3 grams.

Texas Bur was a stock of cotton introduced in Georgia by C.E. Smith of Locust Grove, Georgia. It was thought to have been of the Texas Stormproof variety as it was rather typical of that group. Tyler's[9] 1907 map indicated somewhat of a concentration of Texas Bur in west central Georgia, but also it had become spread rather generally in the whole Cotton Belt. Nowhere else, however, were any particularly dense areas shown. In Georgia, the variety became mixed with some of the Eastern Big Boll stocks, which may have partly accounted for its apparently wide adaptation. It was a rather strong cotton, the single hair strength being 7.0 grams.

Ruralist was a name applied to Texas Bur stocks that were introduced by the editor of the Southern Ruralist. It was said that Ruralist represented Texas Bur with the mixtures culled out. Tyler's[9] map for Ruralist showed that in 1907 it was rather scatteringly distributed in about all of the states of the Cotton Belt.

The Harville variety was developed by H.T. Harville of Brownwood, Texas, from a single plant out of a field, doubtless of one of the ordinary Stormproof forms. It was said to be a distinct cotton but (on the basis of description) it was more like the older Stormproof type being about 10 to 15 days later in maturity than Rowden. The outstanding feature of the Harville was its strength, being 7.8 grams for the single fiber. Tyler's[9] 1907 map showed its distribution in

Texas to be of a rather distinct pattern, an oval shaped area in the heart of the state and lying in a northwest-southeast direction. The area for Meyer was similar, but more nearly approaching the southeast coast. Like Meyer, Harville was confined almost entirely to its Texas distribution. However, Johnson Big Boll (a local variety in Oklahoma Territory) appeared to be the same as Harville. Single fiber strength of Johnson Big Boll was 7.6 grams or nearly as strong as Harville.

Nicholson was a stock probably of Bohemian sold by a seed firm in Dallas, Texas. The varietal description furnished by Tyler[9] indicated much resemblance of Bohemian. However, his single fiber value of only 4.8 grams was the lowest of the whole Western Big Boll Stormproof group. The value for Bohemian itself was 5.3 grams. Tyler's[9] map showed Nicholson to occur scatteringly over the Texas Blackland area, but at only a few points, respectively, in each of most of the other cotton states.

There was a relatively large number of other more or less local varieties developed in Texas, as well as, in a few other states originating from one or more of the Big Three varieties. Davis at Bells, Texas, Morning Star at Wolfe City, Texas, and Robinson at Bartlett, Texas, originated from the Stormproof or Texas Stormproof variety. Tyler's[9] test for single fiber strength in the Davis variety was 6.3 grams. As to developments in other states from the Stormproof or Texas Stormproof stocks, Banny Brown was originated at Lacey, Arkansas; Dunlaps Stormproof at Wilmar, Arkansas, and Baggett Improved at Castleberry, Alabama. The stocks in each case, however, were obtained directly from Texas. Tyler[9] reported that the single fiber strength of Dunlaps Stormproof was 6.2 grams and Baggett Improved 5.6 grams.

Texas White Wonder developed at Grande Prairie, Texas, was of Bohemian stock and had single fiber strength of 6.0 grams. Texas Shoe Heel was a local variety in Anson County, North Carolina, and Waldrop a local variety at Arkadelphia, Arkansas. Both were of Bohemian or Meyer stocks obtained from Texas. Roberts or Strahan was developed at Rosenthal, Texas, from apparently a mixture of Bohemian and Meyer. This variety was similar to Rowden and its single fiber strength was 6.9 grams. Warner was originated at Blanco, Texas, from Meyer and Wilson Stormproof developed at Santa Anna, Texas, was similar to Meyer. Maxey and Huebner also were old Meyer-like varieties. Eudaly was a Meyer selection developed at Olin, Texas, and was the variety out of which Edson (to be mentioned later) was selected.

Three Big Boll Stormproof varieties of the older miscellaneous lot were developed from crosses, but none of these became any more than of local interest. Clardy in Arkansas was from a cross of King and Texas Stormproof. Laas in Texas was from a cross of Bohemian and Russell. Piester Stormproof in Texas was from a cross of Texas Stormproof and Poor Man Relief. The Laas variety had a single hair strength of 6.6 grams.

Two other local varieties for which no direct parentage was given were Buxkempner developed at Oenaville, Texas, and Clayton Champion at Abilene, Texas. The former had the highest single fiber strength (referred to above) of any of the whole group of Upland varieties tested by Tyler.[9] This strength was 9.0 grams. The latter variety had a strength level of 5.9 grams.

The Boll Weevil Era

In the discussion of most of the nine types of American Upland cotton, it has been noted that variety succession with certain breeding modifications extended into the boll weevil period. Such varieties and strains have already been described or alluded to. All later or subsequently occurring varieties and strains including the present-day category, with the exception of a few new stocks introduced from Mexico or Guatemala during the early boll weevil period, came either as selections or crosses from the old types. The development of the introduced stocks will be described subsequently.

The boll weevil appearing in Texas first, plans of attack, including cultural alterations, entomological studies, testing new varieties, and attempts at breeding the most suitable varieties, were largely formulated in that state. As a means of putting into effect some quickly operating measures of combat, much seed of earliest possible maturing varieties were obtained and planted. It has been stated, heretofore, that such varieties, especially the smaller boll and less storm-resistant ones, were found not to be altogether suitable for Texas conditions. Efforts, therefore, were turned to breeding for earlier fruiting forms in the otherwise adapted Texas varieties.

The United States Department of Agriculture took the lead in attempting to find ways of controlling the boll weevil or in establishing measures that would aid the growers in producing cotton crops in the presence of this insect. In solving the variety question, A.W. Edson was sent to Texas about 1900 and was followed soon afterwards by additional cotton breeders. Edson, like H.J. Webber, previously mentioned, was a pioneer in plant-to-row breeding. Edson's plan was to travel a great deal to see as many fields of cotton as he could, locate the best varieties in the inspected areas, select individual plants in the best fields, gin separately to determine lint percentage, evaluate for other important plant characteristics, choose a few of the superior plants, and plant the final lot in progeny rows back on the respective farmer's place or where the plants were originally obtained. The idea was to make plant breeders out of the most intelligent growers who already had a good foundation stock and knew what varieties were best adapted. Edson also contacted A.D. Mebane and persuaded him to try plant-to-row breeding. Edson helped Mebane make plant selections, study the plants and conduct progeny row tests.

Edson was an outstanding worker and did a great deal in encouraging the improvement of the Texas cottons, rather than shipping in the early short staple varieties from the eastern cotton states. However, in the midst of his good work he died. In his work with growers, Edson had selected Eudaly (mentioned above) for earliness, but unfortunately had not

had time to perfect it. The new stock was nearly as early as King, but needed more selection for stormproofness. To Edson's memory, the cotton was given the name Edson and distributed to growers in the boll weevil area of Texas of that time. The breeding of this variety apparently was not finished by Edson's successors and, therefore, did not long persist.

In 1904, D.A. Saunders of South Dakota and D.N. Shoemaker of South Carolina were transferred to Texas to take up the general cotton breeding work started by Edson. Also, at this time, headquarters of the work was located at Terrell with the newly established Green laboratory. Hettie Green of New York owned the Texas Midland Valley Railroad and (during the same year) sent her son down to the area that this railroad served to assist in farm problems that were much intensified by the advent of the boll weevil. Green established this laboratory and experimental farm for cooperative work with those interested in the same problems. However, during the following year 1905, Saunders and Shoemaker moved to Waco and Saunders continued temporarily the selection and plant-to-row work with A.D. Mebane. These men also continued to select plants in regular growers' fields somewhat as Edson had done. However, as the work progressed more of the progeny testing and study was concentrated nearer the headquarters. Their work and that of additional associates soon included acclimatization of the imported Mexican and Guatemalan stocks (mentioned above) and also hybridization between certain Upland varieties or types. The work of Saunders and Shoemaker and some of their other associates have been, or will be, mentioned in connection with the varieties and types of the boll weevil era that they developed or assisted in developing. The varieties and types of the boll weevil era will now be discussed. (Much of the information on Texas cotton breeding has been obtained verbally or by letter from A.M. Ferguson, D.A. Saunders, H.C. McNamara, D.T. Killough, and D.R. Hooton).

Mebane Triumph Type

It has been previously indicated that Mebane Triumph was one of the Texas Big Boll Stormproof varieties that survived the boll weevil. A.D. Mebane soon discontinued the plant-to-row work with D.A. Saunders and went back to his old plan of planting his single plant selections in bulk or in mass. After this change, Mebane for many years and without professional breeders' help continued his old boll selection idea. Besides the characters already mentioned as of major interest to Mebane, he also became interested in larger percentage of 5-lock bolls and in burs free of the terminal spines that, when pronounced, scratched or cut the picker's hands. About 1910, Mebane began to produce a cotton with longer staple, but on producing this extra length found that he had lost ground in yield and lint percentage. As a result of this shift, he turned to producing the old type again. He died in 1923.

Mebane's cotton, whether improved by his own method of boll selection and massing or by plant-to-row and massing the better rows (possibly for a few years), stands out as a case of a very long period of so called "type selection." He changed his ideal several times, and as mentioned, got off one time on longer staple. However, his cotton has been essentially of the same general plant type for a long time. The A.D. Mebane Estate continues to keep up, grow and distribute typical Mebane Triumph cotton. On the other hand, this cotton and particularly that of some of the other growths of the variety appeared to lose much of the original good germplasm. After Mebane Triumph became popular in Texas and other adjacent states, a number of other commercial Texas cotton breeders took up the breeding and selling of strains of this variety. Apparently, through plant-to-row selection and selecting only for a few special characters and by not carrying along the whole category of the Mebane Triumph genotype complex, these breeders all lost ground, at least in some respects.

A.M. Ferguson started breeding work at Sherman, Grayson County, Texas, about 1908 and worked on and sold a strain of Mebane Triumph. He later developed earlier strains designating one as Ferguson 406 and the other New Boykin. The latter name was given by reason of the stock having descended through Mebane Triumph from the W.L. Boykin cotton. Ed Kasch of San Marcos, Texas, began growing and breeding Mebane Triumph soon after Ferguson started and introduced his strain of Kasch in 1912. Also, during the following 20 years, Buckellew Mebane was developed and introduced by Buckellew Brothers, Troy, Texas; Bryant Mebane by John J. Bryant, Corsicana, Texas; Harper Mebane by Robert M. Harper, Martindale, Texas; Qualla by H. Conrad, San Marcos, Texas; Chapman Ranch Mebane by Chapman Ranch, Chapman Ranch, Texas; Texas Mammoth by Von Roeder Seed Farms, Knapp, Texas; Bagley's Better Cotton by W.W. Bagley and Sons, Martindale, Texas; and Watson Mebane by Ferris Watson, Garland, Texas. All of these were developed from Mebane Triumph. Texas Special by Stufflebeme Brothers, Itasca, Texas; Aldridge A-1 by Aldridge Seed Farms, Plano, Texas; and Saunders Special by the Saunders Seed Company, Greenville, Texas, were strains of Kasch. Sharp Mebane was developed about 1927 from an unusual plant found in Watson Mebane. This cotton differed from the Watson Mebane in having some longer staple, smaller bolls and more earliness. The variety since that date has been maintained by mass selection. Floyd 8-G Mebane was developed out of one of the other varieties of Mebane Triumph and is somewhat earlier than the old type. Bryant subsequently selected three additional strains out of his older stock of Mebane Triumph. Mebane 804-50 was developed by D.T. Killough and R.A. Hall from Mebane Triumph at the Beeville, Texas, substation in about 1927. Malone's New Mebane, Stufflebeme's New Mebane, and Olander Mebane are more recent developments out of one of the varieties of Mebane Triumph.

Two special groups have been developed from Mebane Triumph, one Western Mebane and the other Oklahoma Triumph 44. Two strains from Mebane Triumph were developed about 1925 by J.R. Quinby at Texas Substation, Chillicothe, Texas. These have smaller bolls, shorter staple, and are earlier. They are of a close fruiting semi-cluster type, are especially adapted to the western plains of Texas and Oklahoma and are generally referred to as Western Mebane. Regarding these two strains, Mebane 140 has been designated commercially as Lockett 140 (Lockett Seed Co., Vernon, Texas) and Mebane 141 as Western Prolific (Von Roeder Seed Farms, Snyder, Texas). Native Mebane is a Western Mebane type developed by Sam Little, a commercial breeder in West Texas. Lockett 140-46 (a later strain of Lockett) and Mebane 140-6801-2-1 are later developed strains.

Oklahoma Triumph 44 is a strain from a very early plant selection taken out of Mebane Triumph in 1914 by Glen Briggs. It was widely grown in Oklahoma in the 1920s and 1930s but has become of much less importance in recent years. During the period, L.L. Ligon developed a number of strains, designating them as Early Triumph. Henry Dunlavy, after 1937, also added a few additional strains of Early Triumph.

Rowden Type

Rowden also is another one of the Texas Big Boll Stormproof varieties, as previously described, that survived the boll weevil for a long period. However, as the original type, this variety is now no longer grown, being substituted by earlier strains of it or of other varieties. The Rowden Brothers kept this variety relatively pure and true to type by mass selection for years. This procedure is like the case of Mebane Triumph, an outstanding example of type maintenance, even including accomplishments in improvement.

About 1925, J.O. Ware, of the Arkansas Experiment Station, developed a new strain or new variety of Rowden, designated as Arkansas Rowden 40, from the Rowden Brothers' stock. A few years later, he developed Rowden 2088 and Rowden 5056. R.L. Dortch of Scott, Arkansas, grew and distributed Arkansas Rowden 40 for about ten years, and in the meantime reselected the variety and designated it as Roldo Rowden. Dortch's latest strain of Rowden is designated Dortch 1. In more recent years, the Arkansas Experiment Station has developed additional Rowden strains such as Rowden 41A, Rowden 41B, Rowden 42A, Arkot 1 (B4), Rowden B5, Rowden B28, Rowden 60A, etc. The Arkansas Rowden cottons, starting with Arkansas Rowden 40, became very popular in Arkansas and also spread to several other states. This variety first came into prominence in Arkansas on the wane of Express and Delfos in this state. The subsequent strains of Arkansas Rowden 40 held place in Arkansas until up in the 1930s when Stoneville and Deltapine became so popular and so widely spread. Current strains like 41B from the Arkansas Experiment Station and Dortch 1 from R.L. Dortch still holds some popularity in Arkansas, but the Rowden type has returned, in the main, to Texas. R.L. Dortch has been a large breeder and grower of Rowden cotton, and has been marketing most of his seed annually in Texas for fifteen or more years. Some of his seed, however, have gone to Oklahoma. Several Texas seed growers who had previously produced Mebane Triumph, Acala, and other Texas varieties turned to handling Rowden 41B. Their starting stocks were purchased from the Arkansas Experiment Station. However, in the last few years, some of these have been growing Deltapine and Stoneville.

J.W. Davidson of McKinney, Texas, about 1918 developed a strain from the original Rowden which was designated as Sunshine. Belton Rowden 793, a selection from the original Rowden, was developed about 1920 and distributed by A.K. Short and D.T. Killough at the Texas Substation, Temple, Texas. H.C. Hurley of Cooper, Texas, about 1923 developed another strain of Rowden which was called Hurley Special. For a number of years, beginning in the 1930s, D.T. Killough and P.B. Dunkle at Denton, Texas, developed strains of Sunshine. Two of these were known as Dentex 74-2 and Suntex 83-3. Robert M. Harper of Martindale, Texas, grew and distributed for a period several years ago a strain of Arkansas Rowden which he designates as Harper DD. Malone Rowden is a strain of the Old Rowden variety developed by J.M. Malone, Wills Point, Texas. Another selection from the original Rowden was made by W.H. Weir and Sons, Sulphur Springs, Texas, which carries the name of Weir Rowden.

Two other varieties, Mexican (formerly very popular in North Carolina) and Miller (grown to some extent in Mississippi and Louisiana for a number of years), belonged to the Texas Big Boll Stormproof group and were very similar to Rowden. Mexican was developed from Mexican Stock carried to South Carolina years ago. The North Carolina Experiment Station bred this cotton and had strain numbers, such as 87-11 and 877-20. Miller was bred in Mississippi from the Rowden variety secured from Rowden Brothers, Wills Point, Texas, 25 or 30 years ago. The variety selected from Rowden at the Mississippi Experiment Station was designated as Station Miller. More current strains of Miller carried strain numbers like Miller 610, Miller 06 and Miller 919. The last two were developed by H.B. Brown at the Louisiana Experiment Station, Baton Rouge, Louisiana.

Lone Star Type

Lone Star, as discussed above, came from Jackson Round Boll in the Colorado River bottom near Smithfield, Texas, in 1905. From one of the selected plants, the strain later called Lone Star was derived. In 1906, the new selections, made near Smithfield by Saunders the year before, were planted on John Gorham's place near Waco, Texas, the headquarters of Saunders. In a few years, the new variety was developed, and John Gorham and his son have sponsored this cotton

ever since. Through the years, Gorham Lone Star has been considered the Standard Lone Star stock. A number of other strains, however, have been developed from this basic variety. C.S. Lankart, Waco, Texas, developed a strain out of Lone Star about 1911 or shortly after the original stock was originated. This cotton soon became known as the Lankart variety. It has been widely grown in Texas for a number of years and the stock is now carried under the names of Lankart 57 and Northern Star. In the course of his breeding work, Lankart separated out a slightly different strain about 1927 and called it Wacona. This strain had somewhat smaller bolls, a longer staple, was somewhat earlier and showed some clustering. The U.S. Field Station, Greenville, Texas, was the headquarters of the Department's cotton breeding work in Texas after 1918. Among the strains of Lone Star developed at Greenville, Texas, was Lone Star D2. Startex 333 was developed by D.T. Killough and G.N. Stroman at College Station about 1927 from Gorham Lone Star. Startex 619 was a later selection made by the former breeder at College Station, Texas.

Stoneville Type

The Stoneville group of varieties or type has constituted one of the great series of cottons of post boll weevil time. When E.C. Ewing began cotton breeding in Mississippi, he (among other parent stocks) brought Lone Star cotton from Texas. In 1911, Ewing selected and developed three strains out of the original Lone Star. These strains were Lone Star 11, Lone Star 15 and Lone Star 132. The primary plant selection from which Stoneville originated was made by H.B. Brown in 1916 from the Lone Star 15 strain. The new strain developed from this plant by Brown was designated as Lone Star 65. This strain was a new type. It was earlier and had thinner foliage and a different growth habit. It resembled some of the features of the Trice variety. A planting of Mississippi Station Trice had been grown in 1916 near the Lone Star 15 plot. (Besides the other stocks brought in for breeding work, Ewing also secured Trice from Tennessee. One of the strains of Trice that he had Brown developed was known as Mississippi Station Trice). Brown believed that the general appearance and responses of Lone Star 65 indicated that the parent plant selection he made in 1916 out of the regular Lone Star type must have been a hybrid with Trice.

However, McKeever[21] noted segregates in Lone Star (in Texas in 1920 and 1921) that resembled Lone Star 65. Based on these observations, McKeever[21] formed the opinion that possibly Brown's primary selection was a variant per se in the Lone Star variety rather than a chance hybrid with some early variety like the Mississippi Station Trice.

Brown set up several lines of breeding material out of the Lone Star 65. The parent and progeny strains were often referred to as Mississippi Station Lone Star. The Burdette Plantation, Burdette, Arkansas, in the early 1920s grew a strain of this material known as Burdette Lone Star. Also, in the 1920s the Coker's Pedigreed Seed Company obtained stocks of some of the Mississippi Station Lone Star strains and developed Coker 100 from one of them.

In 1922, Brown left the Mississippi Experiment Station and helped form the Stoneville Pedigreed Seed Company, Stoneville, Mississippi. He was the cotton breeder for the company and remained until about 1926 when he went with the Louisiana Experiment Station, Baton Rouge, Louisiana. Mississippi Station Lone Star, as well as, some of the Delfos 6102 stocks were transferred to the Stoneville Pedigreed Seed Company along with the establishment of Brown's connection. Soon after the organization of this company, Mississippi Station Lone Star strains in its possession were designated as Stoneville Strains. This is where the name of the type came in.

Neely[20] one of the present plant breeders of the Stoneville Pedigreed Seed Company supplied, in 1949, a chart-diagram that displays the development of the Stoneville cottons as they have been handled by that company from 1923 to 1943. The chart is as follows on the next page.

Stoneville 2 and 5 have been widely grown, but are superseded now largely by Stoneville 2B; however, as indicated by the chart above, Stoneville 5 has been a great source of breeding material, being the parent of Stoneville 2B. The series, Stoneville 4, 4A and 4B6, was a distinct variation and, therefore, was given another variety name, Ambassador. This variety has not done well in this country (except in a few special areas), but was much in demand for China a few years ago. Large quantities of seed of Ambassador in compliance to this demand were exported to China by the Stoneville Pedigreed Seed Co.; also, a great deal of Stoneville 2B was sent.

The two varieties, Stoneville 2B and Ambassador, are each briefly described as follows:

Stoneville 2B: Plant medium size, vigorous, foliage medium light, spreading and prolific, early, one of the few early maturing big boll cottons; bolls large 60 to 70 per pound of seed cotton, open well and fluffy, high percentage of 5-lock bolls, storm resistance good, and picking qualities excellent; lint percentage in valley lands, 34 to 36 in high lands, 35 to 38; staple length in valley lands 1-1/16 to 1-1/8, in high lands 1 to 1-3/32; character of lint, fine, very strong and uniform, seed averaging about 3500 per pound and milling value very high.

Ambassador: Plants very dwarfy, fairly prolific, rather spreading, and main stem thick and stiff, foliage medium and hairy; very early, one of the quickest fruiting and earliest varieties; bolls large 50 to 60 per pound of cotton, rounded with short blunt point, mostly 5-lock, open well, rather storm resistant excellent to pick; lint percentage in valley land 33 to 35 in high land, 35 to 38; staple length 1 to 11/16 inches; character of lint, fairly coarse, strong; seed medium size.

A number of additional strains or varieties have been developed by other breeders from the varieties of the Stoneville Pedigreed Seed Company. Stoneville 20 is a selection made by D.M. Simpson, Knoxville, Tennessee, from Stoneville 5A. This variety is not of commercial value from the standpoint

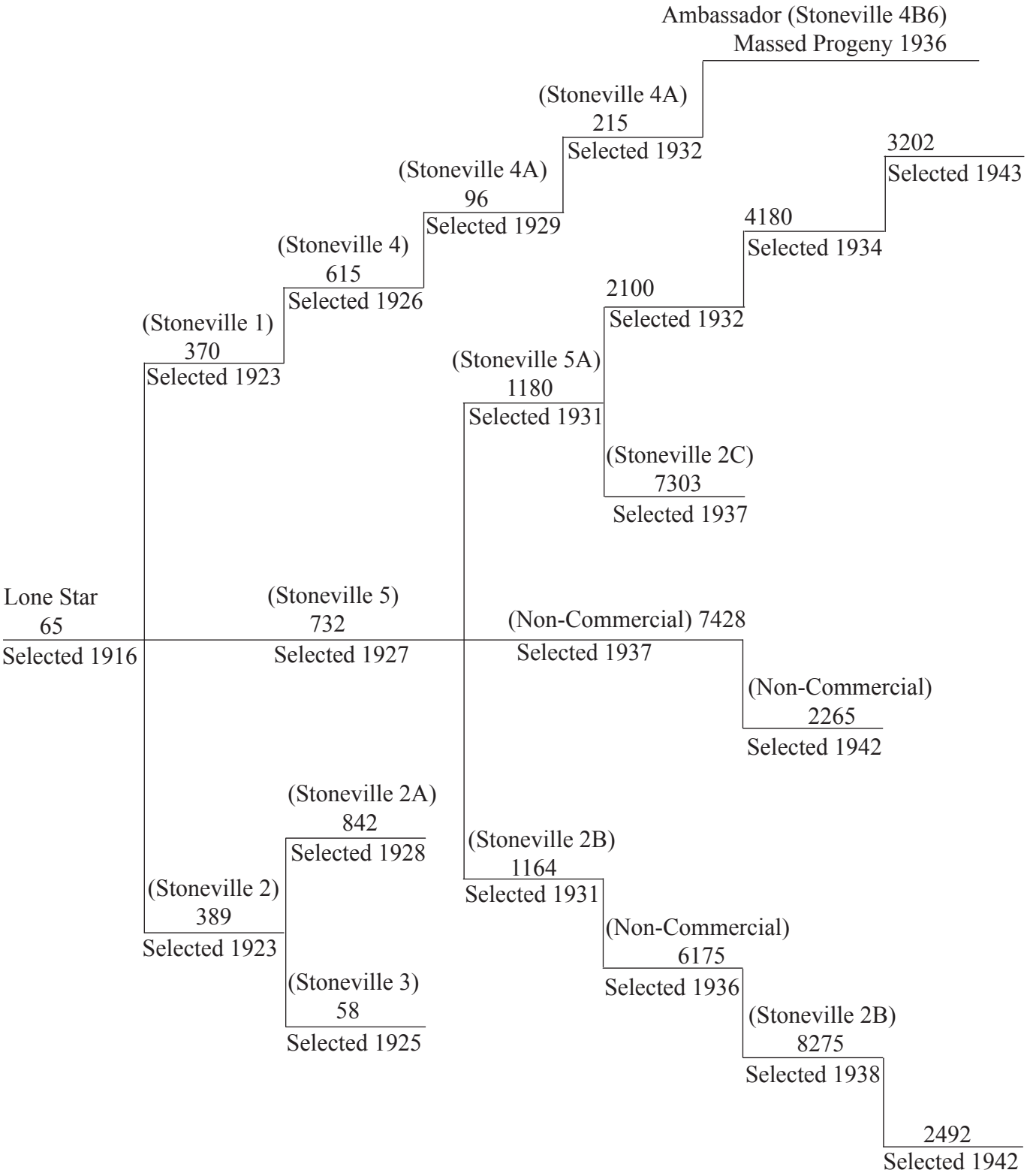

Fig. 2. Pedigrees of Stoneville Cotton, 1923–1943.

of production, but is of great value as breeding material. It is highly resistant to bacterial blight (or angular leaf spot) and has been used to considerable extent in crosses with good commercial strains in order to transfer the disease resistance response to these better varieties. Stoneville 62 was developed in Oklahoma by Henry Dunlavy from Stoneville 2B. This work was done in order to obtain a strain better adapted to the more rigorous climate of Oklahoma. The staple is shorter and coarser and the boll rind is thinner than in the parent variety. A cotton with these characteristics is more easily and satisfactorily ginned after hand snapping or machine stripping. The strain apparently is more resistant to boll rots (bacterial blight) than most other varieties of the area. Stoneville 62 is early and rather drought resistant. Dunlavy also selected several other strains from Stoneville 2B. Some of these were 450, 462, and 551. T. R. Richmond, College Station, Texas, selected a strain from Stoneville 2B designated as 2B-85. J. B. Dick, Auburn, Alabama, selected several strains both from Stoneville 2B and Stoneville 5A. E.H. Presley Tucson, Arizona, developed in the 1930s several strains from Stoneville 4 (Ambassador). These were grown in the Yuma area for several years.

Empire, first designated as Stoneville 135-4-4, was derived from a primary selection made out of Stoneville 2 about 1936. The selection was made and the variety developed by W. W. Ballard, Experiment, Georgia.

The stock was released as the Empire Variety in 1943. Ballard maintained a family of lines and pooled such of these as seemed desirable before the increase or multiplication of the seed stock was begun. After the variety was introduced, it was found that some of the lines were resistant to *Fusarium* wilt. On making the next increase from these lines, Empire Wilt was released in 1948. The staple of Empire is slightly shorter and slightly coarser that Stoneville 2B. The chief advantages of Empire, in addition to being wilt resistant, are local adaptation in Georgia, extra earliness for central and north Georgia, larger bolls, and higher gin turnout. During the last few years, Empire has been introduced into a number of the cotton states and it does well in most places. About the only complaint that has been heard is that in some areas it is more difficult to pick than some other vanities.

Bobshaw 1 is a derivative of Stoneville 5A and was developed by the Robertshaw Company, Heathman, Mississippi. The fiber of this variety is coarser and slightly stronger than that of Stoneville 2B. Bobshaw 1 is grown to some extent in Mississippi and in a few of the other states.

White Gold and White Gold Wilt that succeeded the former, were derived from Stoneville 2B. The White Gold was a productive early variety and the succeeding one is early, productive, resistant to *Fusarium* wilt and has good fiber quality. These varieties or strains were developed by the Marrett Farms and Seed Company, Westminster, S.C.

Stonewilt also is a strain of *Fusarium* wilt resistant cotton that came from Stoneville 2B. This strain or variety was developed by W. W. Wannamaker, St. Matthew, S.C. Stonewilt has been productive, fairly wilt resistant and of relatively good fiber quality.

Dortch 10, according to Humphrey,[22] was derived from a cross of Stoneville 2B and Rowden made about 1936. However, through subsequent in breeding and selection most of the Stoneville 2B characteristics apparently have been recovered. Dortch 10 is more of a Stoneville cotton than of the Rowden type.

Arkot 2-1 is a new variety recently released by the Arkansas Experiment Station. This variety was derived from Stoneville 2B, the primary selection having been made by L.M. Humphrey in 1937. The breeding procedure followed was that of inbreeding and line selection. Arkot 2-1 has quick fruiting and maturing characteristics, and is estimated to be 10 to 15% earlier than most other varieties generally grown. Earliness is always of prime importance under severe boll weevil conditions and particularly in the shorter season of the Northern Delta where a large percentage of Arkansas' cotton crop is produced. In addition, to extra earliness Arkot 2-1 produces along with its competitors in yield and quality.

Paula is a variety developed from Stoneville 2B by Paul Gutchens, Deering, Mo. By having been bred near the northern rim of cotton culture, Paula is early and quite productive in the shorter season areas. The foliage is light; lint percentage 35 to 36; staple length around 1-1/16 inches; bolls medium large, averaging 60 to 75 per pound of seed cotton, fairly storm resistant and easy to pick.

Coker 100 Type

It has been mentioned previously that the Coker 100 type was derived from Mississippi Station Lone Star stock. The particular parent strain apparently was Mississippi Station Lone Star 3 (later designated by the Stoneville Pedigreed Seed Company as Stoneville 3). Before the number "three" was assigned, the strain had been designated as Mississippi Station Lone Star 58 (Stoneville 58). This strain had been selected from the Lone Star 65 through a series of selections and plant-to-row testing carried on by H.B. Brown before he left the Mississippi Experiment Station.

According to Wilds,[23] Coker 100 descended from a selection, the staple of which was 1-1/8 inches in length and made out of Mississippi Station Lone Star 2-58-19 in the fall of 1929 at Hartsville, S.C. The stock had been obtained from the Mississippi Valley under the name and designation of Mississippi Station Lone Star 2-58 or 58.

The progeny row grown in 1930 from Wild's primary selection showed evidences of hybridity. That is, the row contained marked segregation in plant habit and staple length. Many of the varieties appeared to contain Foster or Delfos characteristics. This behavior led Wilds to believe that the parent plant of the row was a Coker Foster hybrid, a chance cross from the Coker Foster breeding material that the Coker's Pedigreed Seed Company was carrying at the time. From the variable 1930 progeny row, a large number of plants that met staple requirements were selected in the Fall of 1930. These were put in plant-to-rows in 1931. Suitable plants were taken from the better of these rows and placed in

a new plant-to-row test in 1932. One of the rows designated as Mississippi Station Lone Star 58-19-1-2 (Mississippi Station Lone Star 33-12) was strikingly different from all other progeny rows.

This row was very early, determinate in growth habit and possessed marked uniformity. The bolls were slightly pointed, of good size, opened well and fluffed to an excellent degree. This cotton was so far superior to sister lines that it alone was increased as much as possible the next year and widely tested in 1934. Further tests and increases continued to demonstrate the superiority of the strain, and it was offered for sale by the Coker's Pedigreed Seed Company in the spring of 1937 as Coker 100. According to Wilds[23] this cotton, save susceptibility to *Fusarium* wilt, combined more good characteristics than any other type the Company had introduced up to that time. Coker 100 soon became widely grown in the eastern end of the Cotton Belt and the Mississippi Valley. Strains 1 through 9 were developed and sold by the Coker Company before the successor Coker 100 Wilt was introduced. The series of Coker 100 strains were very high in yield and high in gin turn-out. The staple was somewhat longer than the Stoneville counterpart, but slightly weaker than that of some of the strains of the latter.

Coker 200 was a variant out of the Coker 100 series and differed from the regular series principally in being still earlier and more determinate in growth habit. This variety did not yield quite as well in the main cotton areas and was used chiefly along the northern limits of the eastern end of the Cotton Belt and in special areas where the boll weevil was severe and extreme earliness an important factor. The staple of Coker 200 was a little shorter and slightly coarser than that of the regular Coker 100 series.

Coker 100 Staple is a longer staple selection out of regular Coker 100. This variety was developed by the Coker's Pedigreed Seed Company for sale largely in the Mississippi Valley where some growers desired more staple length than generally produced by Coker 100 itself. In other respects, this variety is much like the regular Coker 100.

Seed of the original Coker 100 series stock (Mississippi Station Lone Star 33-12) was obtained under the name of Coker 33-12 by O.A. Pope and D.M. Simpson. This strain was inbred and line selected for 5 or more years at Knoxville, Tennessee, and has been used subsequently by the latter worker in developing hybrid varieties. One of these has been designated as Cobal.

For a number of years before the Coker 100 variety was introduced, the Coker's Pedigreed Seed Company had worked on the development of *Fusarium* wilt resistance in their cotton varieties. Coker 100 showed up so well in their breeding blocks, even without resistance, that it was introduced for planting on great areas of the Cotton Belt, which at that time were not infested with this disease. Work, however, was being carried on with stocks of Coker 100 parental material to develop desired *Fusarium* wilt resistance in this material. In 1930, some apparently wilt resistant selections were made in the Mississippi Station Lone Star 2-58 stock. These were placed in plant-to-rows in wilt infested land in 1931. The plants were thinned to two stalks to the hill. The best surviving plants in hills, where the other plant had died, were selected and put in plant-to-rows in wilt infested land the next year. This procedure was continued to 1935 when several rows were judged to be sufficiently resistant to increase. These rows were planted in respective half acre blocks in 1936 on soil badly infested with wilt. The population, as among these blocks, showed wide divergence in plant habit as well as in wilt resistance. One of the blocks (36-9) appeared to be a very promising one. The population was early, uniform, and wilt resistant, but had barely an inch staple. Many selections were made in this block, these apparently having added wilt resistance and slightly longer staple. These plants were propagated in 1937 on wilt infested land, as well as, bulk seed from the parent block (36-9). The selections were planted at two locations and the bulk seed at several. Many plants were taken out of these areas and put in plant-to-rows in 1938. The next year 26 of the 1938 progenies, that showed highest resistance and yields, were planted on half acre blocks on wilt infested land. Subsamples were also tested in other areas.

One of these blocks, 39-5, approached the Coker 100 type, toward which the breeding (as far as type had been concerned) was directed. It is the opinion of Wilds[23] that sometime during the breeding period of this material that it picked up some natural crosses from Clevewilt, which was also carried in the same wilt land tests. While block 39-5 was very similar to Coker 100 in growth habit, the other 25 strains of the 1939 half acre block test resembled Clevewilt in foliage and maturity. The seed from Block 39-5, by sparse planting, was seeded to as much acreage as possible in 1940. This amounted to 32 acres which produced fifty 500-pound bales of lint. In 1941, one thousand acres were planted, and the seed offered for sale as Coker 100 Wilt in the Spring of 1942.

According to the 1949 seed catalogue of Coker's Pedigreed Seed Company, the description of Coker 100 Wilt is as follows: Plants erect, semi-determinate, vigorous, and with well-spaced fruiting branches turning up somewhat; foliage thin with medium sized deeply lobed leaves; bolls round ovate, slightly pointed, 70 to 72 to pound of seed cotton, opening wide and fluffy yet storm resistant, picking quality good both by hand and machine; lint percentage 37 to 39; staple excellent uniform and strong, early and production high; resistant to *Fusarium* wilt and somewhat tolerant to *Verticillium* wilt.

Coker 100 Wilt, since 1942, has rapidly spread over much of the Cotton Belt extending throughout the rain growing area with the exception of western Oklahoma and the blackland prairie and upper plains of Texas. This variety has practically replaced Coker 100 and Coker 200, and is well on its way in extinguishing Coker 100 Staple. By making much use of fiber technological and spinning tests, Coker's Pedigreed Seed Company has constantly improved the quality of lint of Coker 100 Wilt since its first introduction in

1942. This is the first variety in the half century of breeding for *Fusarium* wilt resistance that is just as good on non-wilt land as on wilt land. Wide spread and effective one-variety community standardization of varieties could not be accomplished on a 100% basis in any area of much size without such a variety.

Deltapine Type

The Deltapine type of cotton is the culmination of the life work of E.C. Ewing of the Delta and Pine Land Company, Scott, Mississippi. It has been previously mentioned or noted elsewhere (see Ware[19]) that Ewing began cotton breeding work with the Mississippi Experiment Station in 1911 and brought in Express, Foster, Lone Star, Mebane Triumph, Trice and Wannamaker-Cleveland as parent materials. Also, it has been stated that Ewing joined the Delta and Pine Land Company in 1915 with which his work has been carried on since. During the period 1911 to 1915, Ewing (in addition to other breeding work mentioned elsewhere) developed strains that later provided some of the breeding material entering the Deltapine complex as parents of particular crosses. Modern Deltapine has been formed through a series of compound hybrids. The strains coming from Express were Express 15 and Express 122 and from the Foster parental material, Foster 11.

During the earlier years of work with the Delta and Pine Land Company, strains of Express, such as Express 350, Express 432 and others were distributed. Ewing's first new variety after going with the Company was Salsbury, which was introduced about 1922. This variety was developed from a cross of an early prolific strain of Wannamaker-Cleveland and Express 15. This variety was popular in parts of the Mississippi Valley for a few years or until the introduction of the D & PL series of varieties was begun about 1925. D & PL 4 and D & PL 8 were products of a cross between a local long staple variety, Polk and Mebane Triumph. D & PL 6 came from a cross of Express 122 and Foster 11. D & PL 10 was somewhat more complex. It came from an unnamed non-commercial hybrid and a selected line from Express 122. The make-up of D & PL 11 was still more complicated as to hybridity. It was the first one in the series designated as Deltapine. The following chart shows diagrammatically the development of the rest of the Deltapines in the series up to the present time with the exception of D & PL Fox, which has been introduced by the Delta and Pine Land Co. since the chart was made. The chart also shows the background breeding material from 1911 onward. Some of the earlier D & PL varieties also have contributed to the make-up of the later Deltapines. The Deltapine chart is as follows on the next page.

Although the series of D & PL and Deltapine Varieties up through Deltapine 12 have been excellent cottons, the development of Deltapine 14 was a definite step beyond the others. The change in plant habit of this variety and its wide adaptation and favorable response through the rain fed area of the Cotton Belt and in parts of the irrigated valleys truly establishes it as a national type of American Upland cotton. Deltapine 15, practically speaking, is a replica of Deltapine 14, both having been developed from sister strains. The breeder, E.C. Ewing writes the description of the two as one. His statement is as follows:

> *"Deltapine 14 and 15, plants are medium in size, foliage light to medium, non-determinate growth or continuous in fruiting habit, have long fruiting branches with fairly long internodes giving plant a rather open form and appearance, moderate pubescence. Bolls are of medium size, about 75 per pound of seed cotton and slightly pointed. Seed are small and covered with a brownish-grey fuzz. Fiber length is 1-1/16 to 1-1/8 inches, fiber strength (chandler) 82,000 pounds per square inch, lint percent 38-40 in the Mississippi Delta, higher in most other sections.*
>
> *Deltapine 15 may be distinguished from Deltapine 14 by a more rounded boll, stronger and somewhat longer fiber, and is slightly earlier. The foliage of Deltapine 15 has a slightly lighter or more yellowish shade of green than Deltapine 14 and the corollas are slightly longer."*

Several other cotton breeders have made use of the D & PL and Deltapine varieties in their breeding work. L.M. Humphrey of the Arkansas Experiment Station, by selfed line breeding, developed several strains which he designated as Deltapine A5, A8, A12, and A40. J.W. Neely, Delta Branch Station, Stoneville, Mississippi, likewise developed several Deltapine strains by selfed line breeding. His designations were Deltapine 1003, 1046, 1078, 1096, 2031, and 2139. Two strains of Deltapine 189 and 192 were selected by O.A. Pope and J.B. Dick at Auburn, Alabama. G.A. Hale of the Hale Seed Farms, Burdette, Arkansas, has produced two strains of Deltapine from Arkansas Experiment Station A12. These strains are Deltapine 46 and 78.

Miscellaneous Varieties

There are several varieties and strains that do not belong to the types heretofore discussed. They have occurred in the records of many tests. Most of these, with a few exceptions, are no longer important, however. Here and there in this paper some of these are referred to.

Clevewilt, Farm Relief and Coker 4 in 1 were varieties formerly produced and distributed by Coker's Pedigreed Seed Company. A strain of Rhyne Cook was developed and grown for a few years at the Texas Substation, Tyler, Texas. Wannamaker S and C was a strain from a cross between Stoneville and Cleveland developed by W.W. Wannamaker, St. Matthews, S.C. Dixie-Triumph at the Louisiana Experiment Station by H.B. Brown. Station 21 was a selection of Dixie-Triumph developed at the Coastal Plains Experiment Station, Tifton, Georgia. This Station developed two other strains or varieties, Station C and Pandora. The latter appears

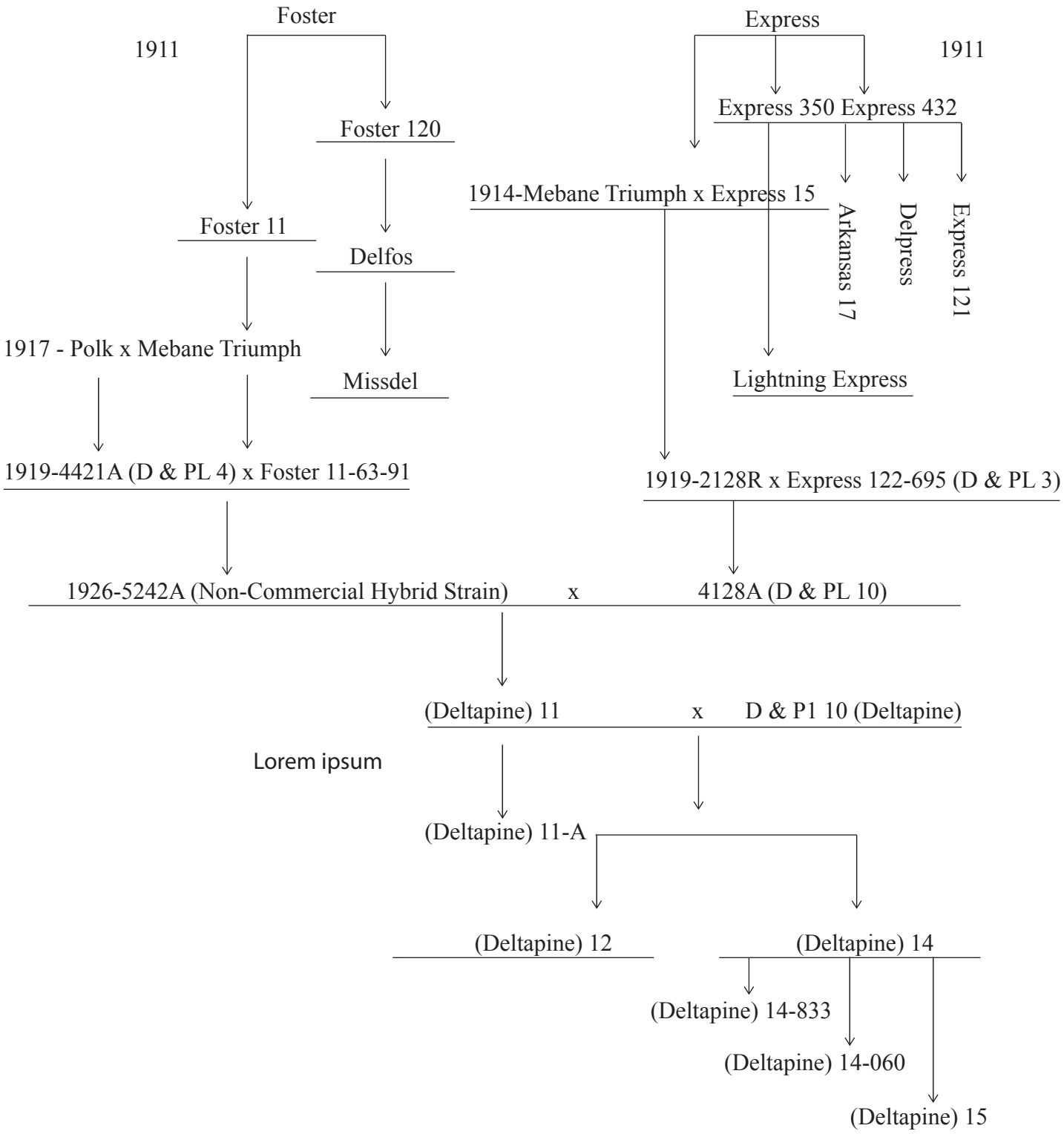

Fig. 3. Pedigrees of Deltapine Cottons, 1911 to ca. 1952.

to be a hybrid between Station C and Station 21. Pandora is a very good variety for southern Georgia conditions. Paymaster and Jennings were bred from Kekchi, the parent stock of which was brought into this country from eastern Guatemala about 1905. Macha is a variety in which the locks are sealed to the burs by special attachments at the terminal end of the lint hairs and very difficult to pick by hand. However, when snapped or machine stripped, the hullers at the gins readily extract the burs. Macha is also referred to as "Stormproof" but is different from the old Texas Big Boll Stormproof. This variety was selected out of Half and Half several years ago by H.A. Macha, Tahoka, Texas. Stormproof 1 is a selection out of Macha made by J.H. Quinby of the Texas Substation, Chillicothe, Texas. The sealing of terminals of lint hairs is a characteristic that sometimes occurs as a variation in cottons of the Western Plains. Western Early was developed from a cross of Westex and Lightning Express made at the Texas Substation, Lubbock, Texas. Westex was a selection from Burnett, an old great Plains variety.

Mexican and Guatemalan Introductions

The Acala and a few other Upland stocks introduced into cultivation after the period of Duggar[8] and Tyler's[9] work were not members, as heretofore mentioned, of any of the nine pre-boll weevil types. They were imported after the advent of the boll weevil and developed behind the advance of this insect or in areas to which it never spread. Acala and most of the other imported stocks resembled the Texas Big Boll Stormproof type somewhat in boll and general plant type, but usually had longer staple. Kekchi in its native habitat in eastern Guatemala was an early type, but when brought to the Cotton Belt it reacted differentially among the several localities where tried. Soon after the boll weevil began to greatly damage cotton crops in south Texas and to spread northward and eastward, these collections of native cottons in Mexico and Guatemala were made to find resistance or to secure new parent material from which varieties could be bred that would at least produce fair production in spite of the insect.

Collection and Acclimatization

While on a trip to portions of Central America in 1902, O.F. Cook (then in charge of investigations of tropical agriculture in the U.S. Department of Agriculture) observed among the Kekchi Indians of eastern Guatemala a dwarfy Upland kind of cotton, which was apparently much less injured by the boll weevil than was a nearby tree of a perennial cotton. Considerable interest arose as a result of this report. Therefore, the Kekchi country was visited again in 1904 to determine the cause of the apparent immunity of the native cotton. The season of that year had been much more rainy than in 1902 and the dwarfish annual form had grown larger and more promising in appearance. A few weevils were found in this cotton, but were being held in check by an ant-like predatory insect, the kelep. Besides, the cotton was a very fast fruiting kind and had a highly developed degree of fruiting bud and boll proliferation. The small involucral bracts were thought to furnish less hiding protection to the weevils, and the excessively hairy surface less chance of their movement or escape from the ants. In other districts of Guatemala, native cottons also with the small involucral bract were observed. In one case, it was noted that because of this particular structure, turkeys ranging among cotton plants were enabled to find the weevils and devour them to better advantage.

Some colonies of keleps were brought to south Texas to determine whether or not they could be established in the cotton fields there. Plantings of the Kekchi, as well as, other collections of the Guatemalan cottons mentioned were also made at several points in south Texas during the next season 1905. The Guatemalan ant, however, did not persist so well. The rather rainy winter of 1904-1905 drowned these ants in their burrows. Plantings of the Guatemalan cottons were tried in Kansas, Maryland and southern California in 1905. The tests in first and second places were to determine the extremeness of earliness.

At the St. Louis Exposition in 1904, F. L. Lewton observed some excellent cotton plants and bolls in an exhibit placed there by the Mexican Government. The material was supposed to have come from the State of Durango of that country. Lewton obtained a small quantity of seed from the Mexican representative in charge of the exhibit and, in 1905, along with the Guatemalan stocks, it was planted in south Texas.

In the 1905-1906 season, cotton explorations were extended to several other districts in Guatemala and to southern Mexico. The northern Departments of Guatemala were crossed by O. F. Cook[24] and B. T. Jordan from Livingston on the east coast. The State of Chiapas in southern Mexico was entered from Guatemala and traversed, and the Gulf Coast reached at Frontera.

Many native cottons have been observed during the expedition, but a single plant of Upland cotton examined on June 17, 1906, by the roadside in the outskirts of Ocosingo in the eastern part of the State of Chiapas attracted special attention. It had upright habit of growth and many well-formed large bolls. The bolls were still green with the exception of one defective early matured one from which locks were taken and examined. It was found that the fiber was longer and more dense on the seeds than with any large boll variety of Upland cotton known at that time in the United States. Also, of the native cottons seen in Guatemala and southern Mexico, this was the most likely specimen of them all. On inquiry of the people of the neighborhood, it was learned that cotton was not cultivated in the vicinity, but that the single plant had grown by accident, probably from seed swept into the roadway from some house that had been doing hand spinning and weaving. In addition, it was learned that cotton for these homespuns was brought every year from San Christobal, a town which lay in a northwest direction and off the

scheduled way of the present mule-back expedition. A few of the unopened bolls of the Ocosingo plant were collected. However, subsequently in the journey, the travelers on pursuing northward encountered heavy rains and the bolls decayed instead of drying out and opening.

Further exploration of southern Mexico was resumed that winter when G.N. Collins and C.B. Doyle[25] made another trip arriving at Tuxtla Gutierrez, Capital of Chiapas, not far from San Christobal in late December. Immediately, search was begun for the big boll cotton seen the previous summer. Baskets of cotton bolls of strikingly large size were observed in a native market of Tuxtla Gutierrez. Being the Christmas season, these bolls apparently were being sold for decorative purposes. A basket of these bolls was purchased and a study made of them. The bolls weighed out 38 to the pound of seed cotton. The staple length was 1-3/16 inches and the fiber was dense on the seeds. On inquiry as to origin, the travelers were told that the bolls had been brought in from Acala, a village about 25 miles toward the southeast. Journeying to Acala, a small patch of cotton was soon located in the outskirts of the town, but the bolls were not as large as those seen and obtained from the storekeeper at Tuxtla Gutierrez. However, the plants otherwise appeared to coincide with the description of the plant seen the summer before at Ocosingo. A small sample of the local seed, said to be the same cotton as seen in the local patch, was obtained from the owner of a nearby primitive cotton gin. In further search for more native cottons, the trip was continued to San Bartolome, San Sebastian, Teopisco, and San Christobal before returning to Tuxtla Gutieerrez. On leaving this place, the northern route to Fronters was followed through Panteper and Pichuacalco, but no other superior looking types of cotton were found.

The collections from Tuxtla and Acala and other miscellaneous ones were also grown in south Texas, along with prior importations in 1907. The several localities in that area being used for this work were Victoria, Kerrville, Mackey, Del Rio, San Antonio, etc. All stocks were observed for both morphological and functional weevil resistance features and tested for climatic adaptation. However, no particular resistant responses to the insect, other than speed in fruiting to escape its main attack in the advanced season, appeared to have been carried over finally. In the acclimatization work, peculiar and strange responses were observed in some of the stocks particularly. The Kekchi form grew 8 to 10 feet high and in many cases was completely sterile. According to Cook,[26] it was small, compact, early and productive in Guatemala—but when raised in Texas, one could not have recognized it as the same species if the origin of the seed had not been definitely known. Kekchi, however, behaved in nearly normal manner in Kansas and Maryland and was much less vegetative in southern California. The stocks that were winter grown as in the low, humid-tropical areas of eastern Guatemala generally were more pronounced in abnormality than those from the highland of southern Mexico where more of the development took place in late summer before the days became so much shortened. However, in south Texas by having several localities to provide some differential in season and then by reason of some potential diversity obtaining in each stock itself, some few plants even in the more abnormal sorts produced a few mature bolls at least at one place. Even with the Kekchi stocks, repeated selection combined with re-growing in south Texas, and then in other parts of the Cotton Belt, eliminated the over vegetativeness, sterility and excessive shedding to the extent that commercial varieties, Paymaster and Jennings were finally, or a number of years later, developed from them.

The Acala and Tuxtula stocks (being from the highland of southern Mexico, a region not so different from Texas in some respects) responded fairly normal the first year in south Texas. The Durango stock (see Cook[27]) also was practically normal in growth habit the first year in south Texas. This response, however, was most likely expected since the State of Durango is much less south than the other collection sources.

The Durango seed in 1905 was in the plantings chiefly at Del Rio and San Antonio. Growth and selection of this stock was continued in 1906 and in 1907 at Del Rio, where a superior strain was recognized. During the following few years, it was isolated and multiplied. In 1911, trials of this strain, which had become known as the Durango variety, were made in various places in the Cotton Belt. It was thought at the time, however, that Durango was more suitable for south Texas and the Southwest, and consequently was tried out in the district around Del Rio and in the Imperial Valley of California more than elsewhere. As much as three acres was placed on one farm near El Centro and about 200 acres were grown around that town and Haltsville the following year. By 1913, the Durango variety had become so popular in the Imperial valley that not only the seed from the 200 acres of 1912 were planted, but all seed possible were obtained from Texas. As developed in the Imperial Valley, Durango become the first Upland variety to go on the one-variety community basis. This variety also did well in many of the Upland long staple areas of the humid part of the Cotton Belt and was grown to considerable extent in some of the large river valleys until it was replaced by Express and Delfos. In the irrigated districts of the Southwest and parts of Texas, Durango was the most popular Upland cotton until it was replaced by Acala.

The Tuxtla stock was also easily acclimatized, but on retaining the very large bolls, which always appears to be associated with considerable lateness, this cotton required a growing season too long for boll weevil conditions. The bolls were uniformly large, the staple length desirable, and the yield good where no boll weevils were present. The stock became known as the Tuxtla variety, but it never was grown to much extent. It was retained a long time by some of the field experiment stations of the U.S. Department of Agriculture chiefly because of the interest in preserving a source of seed of a jumbo type of bolls. Soon after it became a variety, Tuxtla, however, appeared to have possibilities in the irrigated areas of the Southwest where boll weevils did not occur, but it never replaced the more popular Durango or Acala varieties with which it had to compete.

Acala Development

Although Acala (and some of the other varieties that were processed from the foreign collections) settled down as regular agricultural ones and were used as such, they still retained considerable potential genetic variability or nature to further evolve through micro-mutational change. Later stocks of Durango (however, not used long as a commercial crop) segregated into a number of phenotypes as they were continuously grown and selected by some of the experiment stations. This was also true of Kekchi and Tuxtla to the degree that they were line selected. Acala (having been expanded into a great population, spreading into several Cotton Belt environments and having been worked on by a large number of different breeders) demonstrated greatest differential change in form, ecological response and quality of lint.

The selections or harvested stocks of Acala of the first (in 1907) small south Texas acclimatization plantings were transferred and concentrated in one isolated small field at San Antonio in 1908. At that location, the stock was exposed to drought, as well as, to conditions requiring ability to produce good crops in short periods of the season even in the presence of the boll weevil. The work was continued there for several years with the effort being toward establishing a uniform population of good individual plants. As a result of this first step in breeding, an outstanding type was isolated in 1909, increased in 1910, transferred northward somewhat for the first time and planted on a field basis near Waco, Texas, in 1911 (Cook[27]). Out of this field, D.A. Saunders selected 20 plants, which were planted in an isolated block of progeny rows at Waco the following year. The general seed from the 1911 field, however, was used for trial planting at several points in Texas, particularly around Clarksville, Greenville and Waco. In the fall of 1912, all the 20 Waco progenies, except three, were discarded. The three rows were similar in type, but the seed from the lots were designated as Nos. 1, 2 and 3, and planted in separate blocks for seed increase in 1913. In 1914, the three stocks were moved further northward. Numbers 1 and 2 were planted at Clarksville in north Texas, where growers had become interested in the general stocks from the Waco growths, and number 3 was turned over to C. N. Nunn, the local county agent at Okemah, Oklahoma. An isolated field of number 3 was planted in the vicinity and in the fall of 1914, Department workers and Nunn made a series of plant selections, 96 in number, out of that field. Nunn grew them in progeny rows in an isolated field near Porter, Oklahoma, in 1915. (In the meantime, Nunn had allied himself with the Lynde and Darby farming operation located in that area.) Again, through the help of D.A. Saunders and other Department workers, the 96 progeny rows were studied that fall and rows 5 and 8 chosen as the two best. Nunn retained No. 5 for his future use as his own breeding material and Saunders took back the No. 8 stock to Clarksville, Texas, where he had transferred his other Acala stocks No. 1 and 2 from Waco in 1914. Nunn liked the No. 5 better because it was earlier and of more compact growth habit. It appeared to be better than the regular Acala type for the more northern Oklahoma conditions. Saunders and associates on the other hand liked the No. 8 better, doubtless, because it conformed more nearly to the other Clarksville stocks, which they appeared to consider more toward the ideal type needed in the new variety. Nunn, however, grew a bulk planting in 1916 from some of the other better progeny rows of his original 96 of 1915. This growth apparently provided the breeding material that Ferris Watson obtained for starting his Acala breeding program. (Both Nunn and Watson's work further discussed subsequently.)

At this juncture or in 1916, Cook[28] wrote a description of the regular or Clarksville type which is as follows: "Plant of medium height, with strong, erect main stem. Wood limbs or primary branches few, erect or ascending. Fruiting branches short jointed, zigzag, the lower branches long, becoming very short above, giving the plant a semi-cluster appearance. Leaves of medium size, dark green, those of the main stock usually with five lobes, on the fruiting branches three lobes; the lobes long and very sharp pointed, resembling those of the Durango. Bolls medium size—1-1/2 inches or longer, ovate or ovate-oblong with a rather short blunt point; 50 to 60 to the pound of seed cotton. Involucral bracts rather small for an American Upland variety, rarely reaching more than half the length of the mature bolls; teeth long and narrow and somewhat scythe-shaped, often interlacing over the buds. Pedicels of medium length, 1-1/2 inches, burs often pendent, of medium thickness, stormproof, opening wide. Lint 1-1/16 to 1-3/16 inches, usually 1-1/8 full, with good drag and extra strong; clear white without creamy tint. Percentage of lint, 32 to 35."

The Nos. 1 and 2 stocks (planted by Saunders in 1914 in north Texas near Clarksville) and the No. 8 stock (returned from Oklahoma and planted by him in 1916 in that vicinity) continued in production for several years and served as a center of seed production and distribution. During that period, however, considerable variation in the stock occurred, and therefore, the type as described above appeared not to be definitely fixed. D.A. Saunders resigned from the Department of Agriculture June, 1919, and H.C. McNamara, who had been appointed May 15, took over his work. The U.S. Cotton Breeding Station had been established in 1918 at Greenville to be the headquarters of the Acala breeding work. Saunders and later McNamara were in charge of this station. In June, 1919, H.G. McKeever was transferred from Washington, D.C., to assist McNamara with the Acala breeding and other station duties. When McNamara took over the breeding of these stocks, he and McKeever started reduction of diversity shown among the progeny rows and eventually settled on a type very similar to the Oklahoma 8. Field plantings had been made in California from the general Clarksville stocks in 1917 to 1921—demonstrating that this Acala stock was quite suitable in that area. In 1919, ten bushels of this seed was planted in the San Joaquin Valley

at Arvin near Bakersfield. In 1920 a part of the seed of the Arvin production was planted in the Coachella Valley near Indio. The plantings did well in both areas, but especially well in the Coachella Valley.

In 1921, McNamara and McKeever sent seed of five very similar progeny rows, and like the Oklahoma 8 type, to the U.S. Date Garden, Indio for planting. Three of the progenies were direct descendants of the Oklahoma 8 stock and the other two were drawn from the other Saunders stock. In 1922, McKeever was transferred to Indio to continue the breeding work in the Coachella Valley. Of the five selections tested in 1921, Oklahoma 8-1-1-13 (from Okla. 8) and P 12-19-1-3 (from other Saunders stock) appeared the most promising. The former was planted at Shafter, another village near Bakersfield, and in the fall a series of selections made. The plants were numbered as S-1, S-2, etc., the "S" being after the name of Sly, the farmer on whose place the growth took place. The Acala S-5-4-1 of this series became the maintenance stock of the newly established U.S. Field Station at Shafter and was continually used in this capacity until replaced some years later by the P12-19-1-3 stock from the Coachella Valley. The latter had been retained and further bred by Mr. McKeever at Indio. For some years, the two valleys (the San Joaquin and the Coachella) continued with their respective strains, but repeated tests eventually established the superiority of the P12 stock over the Oklahoma 8, and the two valleys then made use of the one stock.

In the P12-19-1-3 work at Indio, plant selections were made each year with the objective being to improve yield, lint percentage, lint index and fiber uniformity as well as more firmly fixed type. The lint percentage was increased during this period from around 33 to around 38. During the earlier years of that work, new increase seed was derived each year from the apparently best single progeny row, which had come from a single plant the year before. When the plants for the successive year are selected only from the current best progeny, the type becomes more firmly fixed and each year difficulty increases as to choosing the best progeny row.

Population Breeding

Later this system was modified to make the breeding base wider and, therefore, not to take the chance of missing the one best row where all were about alike. Then, instead of trying to pick the best row, and therefore discarding all the rest, all best rows were saved and the seed lumped together for increase. On this basis, the breeding constituted a test plot for the selections. Usually, there were several rows to be discarded since differences which were not discernible between individual plants frequently showed up in progeny rows. After a type is fixed, the best way to keep it and to avoid picking up some unrecognized unfavorable character is to keep the lines of descent as broad as practicable rather than to narrow them down to a single plant each year. This is population or type breeding.

The Indio and Coachella Valley breeding and seed increase project not only furnished seed stocks to the San Joaquin Valley, but to the Arizona and New Mexico Cotton production valleys. In 1924, one-half ton of the Indio stock was sent to Arizona, planted in the Queen Creek district and increased there in isolation for several years for distribution to growers in that state.

In the first year growth of this planting, C.J. King and some of his associates attempted to select 100 extra good plants that were alike and typical of the population. These plants were planted in separate progeny rows the next year, but the rows turned out to be quite unlike. Q6 was selected as the best row and this (after another year of selection) gave rise to Q6-2 which was increased and grown for several years around Sacaton, Arizona, but never became of much commercial importance. The Q6-2 plants averaged considerably taller, ranker and later in maturity than fresh stocks from Indio, and often the yield of the former was higher than that of the latter. However, when Q6-2 was grown in the Coachella Valley the two strains differed little, that is the Q6-2 was much like the Indio Acala.

Storey Ranch Acala, Stewart Acala, and Ellsworth Acala as grown in Arizona were either from Indio or Shafter and possibly were of the P12 Indio stock. Santan Acala grown recently to a considerable extent in Arizona was derived from the Stormy Ranch stock. College Acala, maintained for a number of years in New Mexico, was derived from the P12 Indio stock and later re-supply of pure stocks came from Shafter. Acala N28-5 was an earlier maturing strain selected by A.R. Leding from College Acala at the U.S. Field Station, State College, New Mexico. C.J. King and E.H. Presley, the latter of the Arizona Experiment Station, working jointly, developed several strains of Santan Acala, such as Santan 25, 182, 94-5-5-1, 1-1-7 and WR 177. They also developed a strain, Acala 3170, from Shafter Acala.

When variant types came out of the breeding work at Indio, these were given different designations like P2, P7, P18, etc., and kept separated from the main P12 type. After the breeding work was moved to Shafter, "SH" was used instead of the "P" designation, like "Sh" 13, Sh 21, etc. The numbers other than P12, as just indicated, represented stock that had diverged slightly or somewhat from the standard type. These were somewhat earlier or somewhat larger and ranker. P 18, P 20, and P 21 were of the oversize type. P 22 resembled Q6-2.

The Slick Seed Acala was originally picked up by one of the employees of the Shafter Station, and was either out of the old Oklahoma 8 stock or the bulk seed sent from Clarksville, Texas, in 1919. This number was P 1-13-3. The seed stock of the Boswell Company that has been grown in the Corcoran, California, area, according to McKeever[29] stems back to the P 12 stock of the Coachella Valley which was a single plant about 1925. When McKeever began breeding work for the Boswell Company in 1934, he made plant selections in the general fields of this stock. The bulk of the selections were of the standard type. Other types, that

were picked up, were carried in a separate breeding block, but none of the variants were as good as the old type. The Boswell stock was about the same as those simultaneously continued at the Shafter Station.

George J. Harrison succeeded McKeever in the cotton breeding work for the U.S. Department of Agriculture in California when the latter, as mentioned above, went with the Boswell company. Harrison was headquartered on the U.S. Field Station at Shafter and continued with the 12 or more lines that McKeever had left with the Station. These lines were P 2, P 7, P 12, P 18, P 20, P 21, P 22 and several of those of the "SH" (see above) group. According to Harrison,[30] self-pollination was practiced on several hundred marked plants among the several lines. The individual plants that conformed to type and otherwise measured up to requirements were bulked, thoroughly mixed and planted for the first-year increase of maintenance stock. About 60 of the best of these plants, representing the different lines, were held back and planted in plant-to-rows the following year. Suitable plants from these rows likewise were selfed and re-selected for continuing the breeding block and for mass planting for first-year increase for the second cycle of multiplication. These steps were repeated year after year. From the first-year increase, five years were required to multiply the stock enough to reach all of the growers of the California cotton area. New first-year increases, as indicated, were started each year. At the end of the 5-year cycle, the grower obtained a fresh supply of pure seed. The product of Harrison's procedure was designated as Shafter Acala, but of course belonged to the regular Acala 8 type.

This procedure continued until 1940 when variation within the old breeding lines had become quite pronounced—this presumably caused by six years of continuous selfing. For example, P 18 broke up into three distinct phenotypes: P 18-A being very rank and late and P 18-B being low growing, very difficult to self and stalks brittle. With the isolation of the third, or P 18-C, population (which seemed to have several very good features and the fewest objectionable ones of any of the other material), the seed increase stock at that time was based on descent from a single line for the first time in years in the breeding development of Acala in California. One of the good features of the P 18-C was that it contained less abundance, or particularly not as long, fuzz hairs on the seed. Another was resistance to hemipterous insects, particularly to the Lygus group. Subsequent continuous inbreeding brought about variation in this sub-line, but none of the departures were so great as before. This amount of variation permitted new lines to be set up for massing for increase. The P 18-C stock superceded all older Acala stock in the California cotton growers' fields by 1945, and new cycles of increase supplied them through 1948 when 720,000 acres of cotton were grown in that state.

According to Harrison[30] most of the Acala lines, such as had been utilized in the Shafter breeding program, contained a super-abundance of fuzz on the seeds. Much of this fuzz was so long that some of it was removed in ginning, and occurred as sub-staple in the lint causing presumably poor spinning performance of the cotton. One of the characteristics of P 18-C, as mentioned above, was that it had less of this objection. In manufacturing, the mote count was lower and the spun yearn smoother than was the case with the prior Acala stocks. One of Harrison's efforts in his breeding program has been to select plants having shorter and less total fuzz on the seeds. His study of neps in yarn samples of 16 varieties of cotton showed that 61 to 72 percent of all neps examined had seed hairs as, at least, one of their elements.

Besides the "P" and "Sh" stocks utilized in the seed maintenance breeding program, Harrison[30] carried along several other old stocks, as well as, some more recently acquired cottons as potential breeding material. Some of these were S 5-4-1-11-4, S 5-4-1-11-34, P 1-13-3, Kekchi, numerous varieties from the main Cotton Belt, a few other cotton species, and hybrids.

In 1922, John D. Rogers employed Henry E. Dunlavy to begin breeding Acala cotton at Allen farm, Texas. Several stocks of this cotton that year were obtained from different sources and planted as parent material. Among these stocks were five lots of seed (numbered 1 to 5) of five separate first-year progeny rows purchased from D.A. Saunders of Greenville, Texas, who, since leaving the Department of Agriculture breeding work, had gone into the business of private breeding. Having been in charge of the Acala 8 type of breeding work around Clarksville and Greenville, he had obtained representative stocks of Acala from the Department.

In the fall of 1922, Dunlavy made hundreds of selections out of all this material and in 1923, McDonald (J.H. McDonald was plant breeder for Rogers after 1922) repeated similar selection procedure. Rogers Acala 111 came from a plant originally produced in 1923 in the Saunders No. 1 stock, secured the year before lots 1 to 5. In 1930, Rogers had sufficient seed from this plant to seed his entire acreage. All other strains derived from plants from the other sources were discarded and therefore the Rogers Acala 111 became the maintenance stock of future seed production. McDonald continued to breed this stock to maintain and further improve it. Testing records showed that the No. 111 selections was more productive than any of the other selections, that it had a more rounded nose boll, and an increase of linting of 4 or 5%. Several years later, another strain slightly different from the No. 111 was developed and designated as Texacala.

Several other cotton breeders made use of Acala stocks, which were returned from California. B.V. Hasselfield and Cody Lentz of Texas developed respective strains of Acala in the 1920s from the old Indio P 12 line. The several strains of Tidewater developed in the early 1930s by the U.S. Field Station, James Island, S.C., and J.G. Seabrook, Wadmalow, S.C., were from the early S5 (S5-4-1) stock of Shafter. The U.S. Field Station, Greenville, Texas, also in the 1930s developed a number of Acala strains from the regular Shafter Acala. Hunt Acala was a multiplied and rogued stock of the regular Shafter Acala grown around Greenville, Texas, for a few years in the late 1930s. Thrall Acala was seed of regu-

lar Shafter Acala grown in a one-variety community, Thrall, Texas. This operation existed in the late 1930s and early 1940s.

Acala, the development of which has been described above, has been for a number of years (as previously referred to) designated as "Acala 8." However, as pointed out, all of the stocks were not derived solely from Row 8 grown at Porter, Oklahoma, in 1915.

Acala 5

The Acala 5 type, on the other hand, is all traceable back to Row 5 of C. N. Nunn's 1915 Acala progeny row planting near Porter, Oklahoma. In contrast with the Acala 8 type or the Acala 9 type to be discussed later, the Acala 5 cotton was more determinate in growth habit, had shorter internodes, smaller bolls, shorter staple and earlier fruiting tendencies. Some of the subsequent varieties or strains from this type were semi-cluster to nearly pure cluster in habit. These also were quite early, had rather small bolls, rather short staple and poor storm resistance.

Nunn's stock from Row 5 turned out to be rather stable. He rapidly expanded his plantings, and in 1918 put the seed on the market as the Acala 5 variety. This business was quite successful and the variety was extensively distributed in Oklahoma, Arkansas, and to some extent in the northern part of Texas until 1927 when Nunn introduced a new strain of the variety, Acala 5-37. This strain was never quite as good as the parent variety, but was rather widely sold until Nunn's death in 1934. Shortly before his passing, he had developed another strain, Nucala. This one was still earlier and consequently had smaller bolls, shorter staple and little or no storm resistance.

Several other seed growers in Oklahoma and Arkansas also grew and distributed stocks of the Acala 5 variety. Some of them bred or reselected their own strains. Nunn's Acala also provided breeding stocks in the 1920s for the Oklahoma, Arkansas and Tennessee experiment stations. Each of these stations produced several new strains, which usually were rather early. The Arkansas Station had the most extensive Acala breeding program of the three, and besides earliness developed strains that were rather clustery and extremely upright in growth habit. The Arkansas Station develop Acala 37, 892 and several other strains from Acala 5 and C5, C7, C10 and others from Acala 5-37. About 1935 the Oklahoma Station obtained several of the Arkansas Station Acala strains, and re-selected Acala 892 and introduced it to a number of growers. The Oklahoma Station also developed several Acala strains from Acala 5. One of these has been grown to considerable extent in the Brownwood Bottoms near Chickasha, Oklahoma.

After Nunn's death, his stocks were obtained by the U.S. Cotton Field Station at Greenville, Texas, and the Oklahoma Experiment Station. Considerable work was continued on this material, but it had drifted too far toward high earliness and the extremes of the other characters that usually go with this habit to be brought back easily to the genotype balances necessary in most varieties for the present time. The U.S. Field Station selected several strains from Nucala that had excellent fiber quality, but as indicated above, they did not stand up against other varieties. The Oklahoma Station's Nucala strains had too little storm resistance.

Acala 9

Heretofore, as indicated above, all Acala varieties have been classified as of the Acala 5 or Acala 8 types. In 1936, the writer (Ware[19]) placed Young's Improved Acala in the Acala 5 group, mainly on the grounds that the seed stocks were originally obtained from C.N. Nunn who, as stated above, developed the Acala 5 type. Since 1936, it has been discovered that certain derivatives stemming from the Young's Improved Acala have very strong lint and exceptional spinning quality. This special and rather unusual response found in Upland cotton has caused the writer to re-examine the records, and it now appears that Young's Improved Acala did not come from Nunn's special No. 5 row.

Young's Improved Acala, according to Ferris Watson (deceased), formerly of Garland, Texas, and Henry E. Dunlavy of Stillwater, Oklahoma, did not belong to the Acala 5 type, but rather was of the Acala 8 type or still another group which might be considered a third type. On the basis of the current responses, this stock is designated by the writer as the Acala No. 9 type. In the fall of 1916, Ferris Watson obtained a stock of Acala from C.N. Nunn of Porter, Oklahoma. Watson stated that the seed was not from Acala 5, but from the field production of several numbers other than No. 5 and No. 8. Nunn, in 1916, had grown a bulk planting made up from several of the other better 1915 progeny rows.

Watson grew this bulk stock near Snyder, Oklahoma, in 1917, but due to extreme drought and little individual plant expression no single plants were selected. In 1918, Watson transferred his work to Italy, Ellis County, Texas, and planted bulk seed. A second very dry year was encountered and no individual plants were selected. Repeating the bulk planting, the 1919 season was much more favorable and in the fall a large number of selections were made. One plant of this series (selection No. 9) developed into the most desirable type of Acala, Watson stated, he had ever seen. This strain was designated as Watson Improved Acala. The bolls were very large, the staple 1-1/8 inch and the linting percentage about 37. This strain was produced for several years in Ellis county around Italy and Waxahachie, Texas.

In 1922, W.T. Young of Acala (in the irrigated Rio Grande Valley just below El Paso, Texas) obtained the number 9 stock from Watson, grew and mass selected it until 1924 when he started individual plant selections. W.Z. Ryan worked with Young from 1925 to 1935. The two together, by individual plant selection, developed breeding strain Y23, which seemed best suited for irrigation culture in that area. This strain was designated as Young's Improved Acala. Type Y23 had rather rangy plant growth, close jointed limbs, gen-

eral early fruiting and maturing habits, barrel shaped boll, extra strong fiber with length of 1-3/16 inches, lint percentage 38 to 39 and lint index of 8.50. As maintenance stock for Young's Improved Acala, another type No.9 was developed a few years later. This type was closer jointed than Y23, had a different shape boll and the plant in general appearance was dwarfier and more compact. The fiber in No. 9 was somewhat more harsh and stronger than in Y23.

G.N. Stroman, who had done cotton breeding work with the Texas Experiment Station and in a commercial way in Texas, joined the staff of the New Mexico Experiment Station in 1928. Stroman was employed to breed a distinct cotton for New Mexico, particularly to develop earlier maturity. College Acala, mentioned before as grown in New Mexico, was a good cotton, but frost often caught much of the top crop before it matured. Stroman also undertook to improve the lint quality of his newly selected lines by application of fiber technological tests in his breeding work. A fiber laboratory was set up and the proper equipment then available was installed for doing such work.

In addition to the use of College Acala as parent material, other parent stocks were secured, particularly Young's Improved Acala and Watson's Improved Acala. The Young's Improved Acala, presumably, was of the Y23 strain mentioned above. Watson's Improved Acala was of the Number 9 stock, but that continued by Watson after Young's material was separated. Stroman developed strains from the three Acala parent stocks (Young's, Watson's, and College), but the first two provided the better material. Some years were spent in selecting, studying and reselecting this material before any strains were found that fulfilled the new objectives and, therefore, deemed suitable for seed increase to supply to growers. Successive strains from Young's Improved Acala were 49-12, 329-7, 504, 1980, 1064, 1517, 2815 and others. A similar series was developed from College Acala, but none of these appeared suitable for increase of seed for growers. Of the strains listed above, 1064, 1517 and 2815 from Young's Improved Acala and 1450 from Watson's Improved Acala, were increased and put in production. Acala 1517 and Acala 2815 were sister strains derived directly from Acala 1064. In the late 1930s, Acala 1064 was distributed in the Pecos Valley and Acala 1517 in the Mesilla Valley. Later, Acala 2815 replaced its parental stock in the Pecos Valley. Acala 1450 was also grown to some extent in the Mesilla Valley, but it was turned over to Dean Stahmann, who lives in that valley not far from Las Cruces and who developed from it and other miscellaneous breeding stocks (the Mesa, Mountain Valley, and Mesilla strains of Upland Long Staple cotton) that he obtained from Stroman.

The Acala 1517 of the New Mexico strains became the most popular one for a period because of its earliness and high fiber strength. It spread to the Rio Grande Valley below El Paso, Texas, to the Mexican side of that valley and the high valleys of Arizona, such as the Stafford Valley. However, it did not do well in low, hot, irrigated valleys nor in any of the rain fed regions of the main Cotton Belt. Acala 1517 was not resistant to *Verticillium* wilt and when this disease grew in severity in recent years, it was seen that resistant stocks should be developed if possible.

A.R. Leding and L.R. Lytton (of the U.S. Field Station, State College, New Mexico) developed several strains from Acala 1517, some having considerable tolerance to *Verticillium* wilt. Strain W29-1 was one of the better ones and was substituted for Acala 1517 in the New Mexico seed maintenance program in the early 1940s. This strain was known as Acala 1517 Wilt, and it survived for several years, but was found subsequently to be a little low in yields. Much of the Mesilla Valley and that below El Paso are now planted to the long staple Mesilla Acala. Also, in 1949 and particularly in 1950, much of the more severely infested wilt land was planted to Amsak, an American-Egyptian (*G. barbadense*) variety highly tolerant to the disease. The Mesilla Acala, however, is not very tolerant to this disease.

On returning from service in World War II, Stroman in 1945 started a new series of selections, coming largely out of his Acala 1517 and Acala 2815. Three of these strains have been designated as 1517A, 1517B and 1517C. Several others are being subjected to yield, wilt and fiber and spinning tests. Leding and Lytton have continued work with the W29 strains and other selected from other Number 9 stocks. W29-6 shows considerable wilt resistance.

R.H. Peebles of U.S. Field Station, Sacaton, Arizona, obtained some of W29-6 and W29-4 from Leding and Lytton, mixed the stocks, increased the bulk, and arranged for a large planting of this stock in the Stafford Valley in 1950. It appeared that this cotton would have sufficient resistance to *Verticillium* wilt to suffice reasonably well in that valley. Peebles has a strain of Acala 1517 which is designated as Acala Round Boll (Acala RB) which does well along with Santan Acala and Acala P18-C in the hotter valleys of Arizona.

E.H. Presley of the Arizona Experiment Station crossed Acala 1517 and Santan Acala, and developed three strains (Acala 28, Acala 33, and Acala 44) from this cross.This work was done at the Mesa Substation, Mesa, Arizona. In these developments, some back crossing was utilized. Two of these strains, Acala 28 and Acala 44, will occupy much of the Arizona cotton acreage in 1951. The former is generally better for the lower valley, and the latter for the medium and higher valleys. Acala RB was never introduced to growers, and Presley's strains are replacing the extensive growths Santan Acala and Acala P 18-C in Arizona. Presley's strains maintain much of the quality of the Acala 1517 parent and much of the adaptation responses of the Santona Acala parent.

Seeking to find a still better cotton than Acala P 18-C for California (San Joaquin Valley), George J. Harrison sought new strains in other parent material. Extra parent material that was added to the Shafter test and breeding stocks in the late 1930s consisted of two important stocks (1) Acala 1517 and (2) a cross of Hopi (*G. hirsutum punctatum*) and Acala 8. The strain developed from the former is Acala 4-42 and from the latter, Hopi Acala 50 (AHA 6-1-4). The Acala 4-42

was developed by selfed line selection and pooling a few of the best and similar ones, and the Hopi Acala 50 by recurrent back crossing of the hybrid progenies to Acala. The latter cotton has no Number 9 "blood" in it unless some of the later back crossing was done to Acala 4-42 parent material.

Acala 4-42 originated from a single plant selected out of Acala 1517, which had been entered in a variety test at the U.S. Field Station, Shafter, California in 1939. Harrison stated that he picked this plant largely because it resembled Acala P 18-C in plant and boll type. The 1940 progeny row was uniform, but a number of plants were selected from the row and several of the best of them set up to begin a group of selfed lines. By 1942, these lines exhibited earliness, prolificacy, and distinct fiber properties. As a result of subsequent selfing, diversities began to show up and the stocks were separated accordingly into four new lines of families—17, 18, 66, and 86, the last being most distinct in being taller. The fiber properties of the four families are identical, but 17 and 66 show marked resistance to *Verticillium* wilt. Harrison thinks that these two families will shortly become the nucleus for future increase, but that more families will be set up as other favorable variations occur. As a policy, maintenance and further refinements will be based on massing of selfed seed from selected plants of more than one or several similar families, the plants on the whole measuring up to a minimum standard as has been the case usually at Shafter.

The first increase of Acala 4-42 was made in 1945, and by 1949 all of the 957,000 acres of California, except about 450 in Acala P 18-C, were planted to the new variety. According to spinning test reports, Acala 4-42 is superior in quality to that of any previous Acala stocks grown in California. According to the public press, this new cotton is a big factor in revolutionizing the cotton industry of that state.

INVENTORY OF LINT PROPERTIES

The following tabular material is a record or inventory of the fiber quality of Upland varieties and strains grown in experiments in the American Cotton Belt during the period, 1935 to 1949. The expression "Present Status" is a part of the title of this paper on American Upland cotton. The tables, as indicated, present a large volume of spinning and other fiber technological data. This presentation is done with the view of providing information for those who wish to standardize production on the variety basis, and for breeders who are interested in the quality status of present stocks as a basis for future parent material in breeding. As to quality, this is the present measure of what had happened in the evolution of American Upland cotton in this country. Two series of tables are presented, one containing the spinning and associated data and the other, the fiber laboratory data. Both sets of tables apply to the same list of varieties and strains. Separation was made in order to use regular size paper. These data in both series are given in groups by varietal type.

The writer worked out the field plans for producing and ginning these experimental cottons with workers at State and Federal Stations. The Cotton Branch of P.M.A. made the spinning and some of the fiber tests. The University of Tennessee and the Knoxville U.S. Field Station laboratories made other fiber tests. E.E. Berkley and co-workers conducted the X-ray tests and computed and tabulated the data, converting the part of the spinning results obtained by the conventional method to the long draft basis. All spinning results are on the long draft basis. This work was done while the writer and E.E. Berkley were associated at Beltsville, Maryland, in the Division of Cotton and Other Fiber Crops and Diseases, U.S.D.A. R.L. Thurman, College of Agriculture, University of Arkansas, adapted these tables for mimeographing.

Table 1. Skein Strength and Other Spinning Laboratory Data on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types.

		Skein Strength of Yarn[b]					Staple	Yarn	Picker and	
Variety or Strain	Obs.[a]	22s	36s	44s	50s	60s	Length	Grade[c]	Card Waste	Neps[d]
	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 1, Stoneville and Coker 100										
Stoneville 5	10-110	98.50	51.88	40.17	33.60	25.89	0.97	4.26	8.22	21
Stoneville 5A	1-6	88.20	47.86	30.80	31.36	23.80	–	6.00	10.27	18
Bobshaw 1	4-27	100.02	52.14	36.90	33.18	23.89	1.01	4.70	7.58	11
Stoneville 2B	33-100	102.23	51.91	42.67	35.50	28.70	1.05	5.00	7.31	19
Empire	2-43	100.15	52.69	33.20	33.95	26.67	1.00	4.60	7.39	16
Stoneville 37	2-7	96.23	47.04	41.45	29.64	27.55	0.97	5.50	7.15	12
Stoneville 68-3	1-3	102.95	51.20	39.40	33.60	24.90	1.00	5.00	5.65	7
Ambassador	1	98.00	49.00	–	30.00	–	0.94	4.70	6.90	10
Stoneville 62	2-36	95.23	48.82	37.73	30.10	27.35	0.95	–	7.78	14
Stoneville 2C	2-6	100.00	53.83	–	34.00	27.25	–	–	–	–
Stoneville 450	1-2	105.10	51.00	47.10	34.00	31.50	0.98	4.50	6.70	26
Stoneville 462	2-4	110.75	55.00	44.50	33.00	28.60	0.99	4.25	6.45	22
Stonewilt	3-32	96.94	48.72	37.14	31.15	24.64	1.00	5.20	7.78	15
Arkot 2	2-8	96.78	51.82	–	31.59	29.00	0.99	5.54	7.16	19
Paula C	1	103.90	54.28	–	35.31	–	0.97	5.33	8.60	10
Stoneville 551	1-3	108.66	53.00	47.45	32.00	30.70	1.04	4.50	6.80	18
Stoneville 191	1	93.69	48.85	–	30.90	–	0.97	5.33	8.30	16
Stoneville 85	1	98.00	53.00	–	33.00	–	0.94	4.00	13.00	13
Stoneville 061	1	90.00	47.00	–	30.00	–	1.00	4.50	9.00	6
Stoneville 870	1-2	98.30	51.00	41.70	33.80	28.40	0.98	4.00	5.05	9
Stoneville 727	1	105.84	–	42.46	–	27.32	1.00	5.00	8.30	–
Coker 100	15-51	99.57	52.15	39.75	34.07	25.79	1.02	6.20	7.28	20
Coker 200	3-14	97.07	50.26	38.63	32.66	22.23	1.03	6.10	6.24	15
Coker 33-12	2	93.05	48.00	–	–	22.50	1.03	5.25	7.65	22
Coker 100 Staple	3-8	109.07	58.49	–	37.48	30.66	1.07	4.90	7.54	15
Marett White Gold	5-15	103.91	53.67	42.21	34.07	27.32	1.02	5.50	6.89	15
Coker 100 Wilt	3-36	98.32	49.73	40.80	31.62	25.78	1.01	5.50	7.61	15
Stoneville 4B-5-1-1	1-2	97.50	50.00	–	30.50		0.98	4.67	6.80	8
Group 2, Acala 9										
Acala 1064	1	105.95	–	43.63	–	28.58	1.09	–	–	–
Acala 1980	2	117.16	–	47.67	–	32.07	1.08	–	–	–
Acala 1517	6-39	120.57	63.74	51.98	41.39	32.74	1.05	6.80	7.51	25
Acala 2815	2	110.65	–	46.10	–	30.15	1.08	–	–	–
Acala 2029	1	107.30	–	44.60	–	29.50	–	–	–	–
Acala 1450	4	118.70	–	50.38	–	35.41	1.12	–	–	–
Acala 2496	1-9	95.29	50.61	38.70	31.60	32.11	1.06	5.10	6.90	15
Acala W-29	2-7	125.52	70.00	–	48.10	36.60	1.12	6.40	6.60	37
Acala W-29-1	1-31	126.89	68.58	44.60	46.72	34.03	1.06	6.10	7.77	26
Acala W-29-4	1-3	130.23	66.92	–	43.61	40.00	1.09	6.30	–	–
Acala W-29-6	2	127.14	67.04	–	44.58	–	1.09	–	–	–
Acala 43-6	1-3	128.94	69.66	–	–	36.45	1.19	7.70	7.10	30
Acala 43-13	1-3	124.31	63.62	–	–	32.11	1.06	6.30	8.00	26
Acala W-20-1-5-2	2-6	120.22	65.07	–	–	33.99	1.12	7.20	7.30	24
Acala 40-26-1	1-3	113.00	60.00	–	–	32.00	1.16	8.00	–	37
Mesa Acala	1-15	127.00	70.00	–	–	39.43	–	7.40	11.52	21
Acala 1517 Round Boll	3-21	118.04	62.53	–	41.93	29.42	1.06	5.40	7.36	14

Table 1. Skein Strength and Other Spinning Laboratory Data on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types, *Continued*.

Variety or Strain	Obs.[a]	Skein Strength of Yarn[b] 22s	36s	44s	50s	60s	Staple Length	Yarn Grade[c]	Picker and Card Waste	Neps[d]
	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 2, Acala 9, Cont.										
Acala 1517-1-23	1	114.60	–	47.50	–	31.60	1.06	–	–	–
Acala 1517-1-23-11-3	3-7	108.80	58.29	–	–	32.57	1.03	4.90	6.90	10
Acala 1517-1-23-11-5	1-3	115.00	62.00	–	–	31.00	1.06	4.70	5.90	16
Acala 1517-7-49	1	128.10	–	52.50	–	35.20	1.06	–	–	–
Acala 1517-7-49-1-30	1-3	128.00	68.00	–	–	35.00	1.06	5.00	5.40	13
Acala 1517-9-1	1	127.90	–	55.30	–	38.00	1.06	–	–	–
Acala 1517-5-12-7-6 Waxy	2-5	142.67	77.45	–	–	45.49	1.12	5.20	5.90	13
Acala 1517-4-42-44-60	1-12	119.39	63.74	–	38.84	31.87	1.05	5.80	6.62	16
Acala 11	1-10	138.05	73.57	–	47.78	37.31	1.08	6.20	–	17
Acala 4-42	4	115.51	60.81	–	39.64	–	1.04	5.50	–	–
Group 3, Acala 5										
Acala 892	1-9	99.90	49.00	35.00	28.50	20.40	0.95	4.40	7.43	11
Acala 892 mass sel.	1-3	120.04	52.47	–	32.66	–	1.00	6.10	7.50	13
Acala 892-17920	1-3	101.11	51.57	–	31.78	–	0.9 7	5.70	7.00	13
Acala 892-18038	1-3	91.84	44.33	–	33.55	–	0.88	6.30	8.40	10
Acala C5	1-9	108.42	56.70	44.60	37.10	26.10	1.00	5.10	6.50	16
Acala C7	1-3	89.00	43.00	–	24.00	–	0.97	5.00	6.10	13
Acala C 10	1-3	98.33	50.66	–	30.90	–	0.97	5.70	5.70	11
Acala 6510-2	1-3	95.00	48.00	33.30	–	–	0.88	4.30	8.70	16
Acala 6553-11	1-3	101.00	48.00	35.00	–	–	0.88	4.30	7.30	13
Acala 6553-11-4-3	1-3	99.00	57.00	38.00	–	–	0.91	4.00	7.60	12
Acala 6563-12	1-3	95.90	48.00	35.25	–	24.00	0.88	4.00	6.50	13
Acala 6566-18	1-9	91.18	42.65	32.63	23.80	–	0.93	4.80	7.60	10
Acala 6566-3-3-3	1-3	97.40	49.77	–	30.90	–	0.97	6.30	7.70	13
Acala 6583-21	1	89.00	45.00	–	31.00	–	0.88	–	–	–
Acala 911	1-4	114.32	61.02	48.20	–	30.10	1.14	5.10	7.30	11
Nucala	2-10	97.55	48.71	35.53	30.28	22.55	0.96	3.70	7.20	10
Acala 16-4-9	2	93.80	49.25	–	30.05	–	1.02	–	–	–
Nucala 40-10-1-18	1-3	102.97	53.37	–	–	24.30	1.03	4.70	7.60	6
Nucala 1517	1-3	108.54	56.09	–	–	26.03	1.03	4.70	6.80	5
Nucala 72-4-S	1-3	105.75	52.47	–	–	24.03	1.00	4.30	7.60	6
Nucala 71-5-13	1	111.32	57.90	–	37.08	–	1.16	4.70	6.66	10
Group 4, Acala 8										
Acala Shafter	2-24	101.97	49.45	42.96	32.35	27.58	1.04	–	–	–
Acala P-2	1	105.04	–	30.44	–	30.44	1.12	5.00	–	–
Acala P-18-A	1	103.80	–	41.46	–	27.16	1.03	–	–	–
Acala P-18-B	1	98.52	–	40.89	–	26.38	1.03	–	–	–
Acala P-18-C	4-68	97.79	50.49	42.72	31.59	25.21	1.02	6.60	8.14	22
Acala P-20	1	106.04	–	43.14	–	28.28	1.06	6.00	–	–
Acala P-21	1	97.64	–	40.14	–	27.44	1.06	8.00	–	–
Acala P-22	1	103.48	–	40.91	–	26.58	1.06	5.00	–	–
Acala S-5	1	121.48	–	52.03	–	33.48	1.06	–	–	–
Acala S-5-4-1	1	115.88	–	48.59	–	31.18	1.06	–	–	–
Acala 5S-5-4-1-11-14	2-4	117.55	61.80	–	–	30.82	1.06	6.00	6.85	20
Acala 5S-5-4-1-11-34	2-6	102.41	53.68	–	–	26.52	1.06	5.30	8.55	33
Acala P-1-13-3	1-2	111.72	–	47.28	–	32.55	1.11	6.00	–	–
Acala Boswell Blue Tag	1	103.60	–	42.86	–	27.58	–	–	–	–

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	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 4, Acala 8, Cont.										
Acala Q-6	8	115.00	–	46.31	–	29.87	1.05	–	–	–
Acala Santan	2-18	99.64	52.09	45.75	33.53	25.58	1.00	6.70	8.55	33
Acala W-R-!-7-7	1	99.50	–	41.60	–	26.80	1.09	6.00	9.47	6
Acala Santan 25	1	95.72	–	38.06	–	24.34	1.03	5.00	–	–
Acala Santan 182	1-4	98.76	49.00	39.40	23.00	25.58	1.02	6.20	–	–
Acala Santan 94-5-5-1	1-2	104.57	–	42.57	–	28.11	–	8.00	8.98	29
Acala Santan 1-1-7	1-3	85.00	45.00	–	22.00	–	1.03	8.00	–	–
Acala Arizona 3170	1	104.00	–	43.89	–	–	1.06	5.00	–	–
Acala Ellsworth	1	102.96	–	42.37	–	–	1.06	5.00	–	–
Acala College	1	91.80	–	37.97	–	–	1.06	5.00	–	–
Acala N-28-5	4-8	105.82	–	43.10	–	27.30	1.01	–	–	–
Acala Thrall	1-3	96.48	–	–	32.66	–	–	6.70	–	–
Acala Cody Lentz	2	105.64	57.10	–	36.96	–	0.98	–	8.91	16
Acala Hasselfields	1	117.28	61.54	–	40.08	–	0.97	4.00	5.45	–
Acala Rogers 111	1-51	109.72	56.94	46.36	37.09	29.63	1.00	5.00	5.65	26
Texacala	2-9	109.10	56.78	–	34.70	28.93	1.04	6.70	8.70	17
Acala 8	1-5	98.47	46.03	–	32.65	–	0.99	6.20	8.43	14
Acala MyL 36	1	103.20	53.90	–	33.80	–	0.97	4.00	–	–
Acala 8-3-4	1	104.70	55.00	–	36.60	–	1.00	–	9.50	–
Acala 11-2-3-6	1-2	113.15	58.00	–	–	33.20	1.02	–	–	–
Acala 36-13	1	100.00	56.00	–	34.00	–	0.94	5.30	7.40	17
Acala 42-5-1-2	1	116.80	–	46.30	–	31.00	1.03	–	–	–
Acala 100-5	1-3	109.00	58.00	–	38.00	–	0.97	6.30	7.20	28
Acala 108-2	1-3	106.00	53.00	–	32.00	–	0.97	4.70	7.00	21
Acala 109-1-1	1	101.20	–	41.10	–	26.30	1.03	–	–	–
Acala 118	1-3	105.00	54.00	–	34.00	–	0.94	6.00	–	–
Acala 204-2	1-3	110.00	55.00	–	36.00	–	1.03	7.00	7.50	32
Acala 340	1-2	95.65	50.50	36.60	34.60	25.30	1.02	6.50	8.20	–
Group 5, Mebane Triumph										
Mebane Triumph	1-13	91.47	52.40	48.65	29.32	32.03	0.96	5.00	7.90	–
Watson Mebane	1-5	92.18	71.07	46.23	38.43	29.47	0.96	3.80	–	–
Buckellew Mebane	1-8	89.72	68.37	44.58	27.09	27.58	0.94	4.30	7.70	14
Qualla	5-42	91.29	62.21	46.41	36.80	29.97	0.95	4.70	–	–
Cliett Superior	1	97.00	–	49.94	–	30.98	0.94	4.00	–	–
Bryant Mebane	1	96.60	70.47	–	37.17	–	0.94	4.00	–	–
Bryant Mebane (New Str.)	3-11	85.27	–	43.80	–	27.88	0.93	4.60	8.87	–
Texas Special	1-4	85.32	–	44.25	–	29.40	0.94	5.20	15.18	11
Texas Mammoth	1	100.10	–	–	40.20	26.20	1.06	4.00	–	–
Bagley Mebane	1	86.80	–	45.40	–	27.50	0.94	4.00	–	–
Mebane 804-50	1	85.50	58.50	–	28.20	–	0.91	3.00	–	–
Ferguson 406	2-4	89.22	62.80	45.46	32.55	28.99	0.92	3.50	–	–
New Boykin	2-4	88.12	59.88	44.07	30.92	27.63	0.92	4.00	–	–
Kasch	1	90.40	–	48.70	–	30.20	0.94	4.00	–	–
Sharp Mebane	1	98.96	–	51.11	–	33.28	0.94	3.00	–	–
Floyd 8 G-Mebane	1-6	83.03	58.10	43.71	29.45	26.93	0.91	4.80	6.90	11

Table 1. Skein Strength and Other Spinning Laboratory Data on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types, *Continued*.

Variety or Strain	Obs.[a]	Skein Strength of Yarn[b] 22s	36s	44s	50s	60s	Staple Length	Yarn Grade[c]	Picker and Card Waste	Neps[d]
	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 6, Western Mebane										
Lockett 140	2-21	87.64	55.00	45.13	29.96	–	0.88	4.50	10.90	11
Western Prolific	1-9	85.29	57.60	43.35	29.20	–	0.93	4.40	6.73	6
Lockett 140-46	1-3	88.00	–	45.00	24.00	–	0.94	4.00	9.90	6
Mebane 140-6801-2-1	1-3	89.05	–	45.23	–	–	0.81	3.70	9.00	6
Mebane (Native)	1-6	83.50	–	41.50	30.00	–	0.91	5.00	5.70	10
Group 7, Oklahoma Triumph										
Oklahoma Triumph B4	1-45	94.14	69.01	47.97	23.18	30.29	0.90	4.20	9.00	19
Early Triumph 8	1	89.60	–	44.80	–	28.30	0.94	5.00	7.10	15
Early Triumph 1128	2-12	89.49	–	46.69	32.50	29.15	0.91	4.70	6.50	23
Early Triumph 23-1-9	1-3	98.00	–	50.00	37.00	–	0.94	5.30	5.90	18
Early Triumph 25-1-6	1-3	96.00	–	47.00	–	29.00	0.94	5.30	6.30	22
Early Triumph 27-1-12	1-3	88.00	–	45.00	–	–	0.95	4.80	8.10	14
Early Triumph 92-1-1	1-18	90.08	–	46.77	35.00	28.81	0.88	4.30	6.20	13
Early Triumph 328-2-1	1-3	91.00	–	45.00	31.00	–	–	–	–	–
Group 8, Rowden										
Roldo Rowden	1-15	90.77	–	45.83	30.90	29.26	0.95	5.20	10.71	8
Rowden 41-B	1-30	88.72	43.30	44.59	21.40	28.54	0.94	4.80	9.02	8
Rowden 41-A	1-24	87.57	52.00	44.85	29.47	26.40	0.95	5.00	7.69	10
Malone Rowden	1	93.24	67.23	34.94	–	–	0.91	–	–	–
Hurley Special	1-3	84.14	–	46.84	–	29.30	0.95	–	–	–
Sunshine	1-6	86.58	65.70	42.36	32.05	26.13	0.92	4.30	10.77	9
Arkot 1 (B-4)	2-41	110.35	–	58.19	44.40	36.26	1.00	4.70	7.68	11
Rowden B5	2-3	97.85	–	51.80	–	33.40	0.97	4.70	–	–
Rowden B28	1	98.33	–	50.66	–	31.78	0.97	4.70	7.90	16
Rowden 42A	1-5	91.00	47.20	50.23	30.30	31.83	0.96	–	–	–
Supreme 1	1-15	94.32	–	47.76	34.00	28.91	0.93	5.10	8.41	13
Rowden 2088	7-41	99.91	70.46	49.95	39.96	31.53	0.95	–	–	–
Rowden 40-1-4-2	1	89.40	–	44.00	–	25.10	1.00	–	–	–
Rowden 40-1-4-2	1	85.60	–	42.80	–	24.40	0.94	–	–	–
Rowden 5056	1	88.00	60.90	–	28.30	–	0.91	–	–	–
Harper DD	1-3	91.60	–	45.60	–	27.50	0.94	4.60	6.40	8
Mexican Big Boll	3-41	106.04	77.40	55.51	42.53	36.17	–	4.50	–	–
Mexican 87-8-7-13-20	1	91.80	–	46.00	–	29.70	0.94	4.00	–	–
Mexican 87-8-7-3-11	1	105.64	–	–	40.46	24.58	1.00	4.00	–	–
Miller 610	1-6	83.67	44.70	42.15	30.90	–	0.94	–	–	–
Miller 06	1-3	96.00	–	51.00	–	–	1.03	6.00	8.20	9
Miller 919	1-15	91.91	–	46.71	32.00	31.64	0.94	4.50	7.18	8
Rowden 60-A	2-6	101.00	–	50.50	–	31.00	0.97	6.00	6.75	16
Group 9, Lone Star										
Gorham Lone Star	1-10	92.00	52.00	39.97	34.00	22.04	0.99	4.70	5.60	61
Lankart	2-6	99.66	51.58	–	33.60	–	0.95	5.80	6.85	–
Wacona	1-5	92.06	48.91	–	31.22	–		5.80	8.64	14
Lankart 57	1-20	99.02	51.13	37.47	35.31	26.03	0.95	5.40	9.50	20
Northern Star	1-18	101.62	52.68	37.00	33.82	–	0.96	6.80	10.27	14
Lone Strar D2	2	95.65	49.18	–	31.20	–	0.97	–	–	–
Lone Star P4-1-6-4	1	102.64	–	40.94	–	25.06	1.03	–	–	–
Startex	6-42	94.27	48.75	38.96	30.64	24.89	0.92	4.00	–	–

Table 1. Skein Strength and Other Spinning Laboratory Data on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types, *Continued*.

Variety or Strain	Obs.[a]	Skein Strength of Yarn[b] 22s	36s	44s	50s	60s	Staple Length	Yarn Grade[c]	Picker and Card Waste	Neps[d]
	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 10, Delfos										
Delfos 4	1-64	99.12	54.29	38.73	35.67	24.98	1.04	4.00	–	–
Delfos 3506	1-27	97.42	50.40	39.05	33.90	24.58	1.03	5.40	–	–
Delfos 531-C	4-39	103.81	54.84	39.85	37.64	26.94	1.04	6.80	7.43	27
Delfos 531-824	2-6	98.50	50.00	–	35.00	25.50	1.08	8.00	4.90	36
Delfos 6	1	105.44	–	44.14	–	30.60	1.09	–	–	–
Delfos 651	7-10	102.63	52.28	–	36.77	27.58	1.06	6.30	6.52	26
Delfos 651-050	2-9	99.09	52.49	–	34.10	24.58	1.03	5.40	4.90	12
Delfos 651-42-43	3-4	102.97	54.50	–	35.53	26.32	1.04	6.20	8.40	16
Delfos 651-42-72	1-3	105.75	56.09	–	37.08	26.90	1.06	6.00	7.00	22
Delfos 9431	3-9	101.99	54.03	–	37.65	27.59	1.09	6.20	6.60	23
Delfos 588	1	109.84	–	46.51	–	31.40	1.12	–	–	–
Delfos 4729	1	103.68	–	44.26	–	29.66	1.09	–	–	–
Delfos 9169	9-42	103.58	54.99	–	35.55	26.00	1.07	5.50	7.36	13
Delfos 9252	1-4	100.10	50.30	41.30	35.20	27.90	1.05	–	–	–
Delfos 1020	1	94.20	–	38.80	–	27.00	1.12	–	–	–
Delfos 444	1-9	83.91	40.50	34.40	25.65	21.90	1.05	8.00	6.20	16
Delfos 130A-022	1-3	102.00	51.00	–	33.00	24.00	1.03	6.00	4.30	16
Group 11, Washington										
Washington	1-7	108.92	53.81	44.53	32.27	28.96	1.00	6.00	5.40	24
Delfos 719-5	1	100.10	52.20	–	34.50	–	1.00	–	–	–
Delfos 719-821	1	106.00	–	42.40	–	27.80	1.09	–	–	–
Delfos 339-3-2-6-3	1-3	93.00	47.00	–	30.00	–	0.97	4.30	6.20	8
Bobshaw 2	1-6	105.42	56.90	42.62	38.10	27.16	1.03	–	–	–
Group 12, Wilt Resistant Delfos										
Delfos 425	5	97.50	–	–	–	24.70	1.06	–	–	–
Delfos 425-112	1-3	96.00	49.00	–	–	24.00	1.03	6.70	5.10	19
Delfos 425-115	1-3	96.00	49.00	–	–	24.00	1.06	6.00	6.20	18
Delfos 425-919	1-3	106.00	60.00	–	–	31.00	1.06	6.00	6.60	27
Delfos 425-920	2-6	100.50	51.50	–	–	25.50	1.00	6.20	5.20	12
Delfos 425-920	1-3	96.48	51.57	–	–	26.03	1.06	6.30	7.70	13
Delfos 425-920	3-9	99.16	51.52	–	–	25.68	1.02	6.30	6.00	13
Group 13, Express										
Express 17	2-41	110.55	59.14	45.39	38.97	29.00	1.07	4.40	–	–
Express 1049	1	116.20	–	47.40	–	31.80	1.06	5.00	–	–
Express 317-734	1-3	106.00	55.00	–	38.00	28.00	1.03	5.70	4.90	21
Express 317-745	1	90.20	–	36.00	–	22.80	1.03	–	–	–
Express 3-11384	1-4	109.40	57.30	44.37	40.60	29.23	1.06	5.20	–	–
Bobdel or Bobshaw 16	1-48	111.60	59.82	45.46	36.80	29.70	1.05	6.20	8.00	21
Bobshaw 15	2-6	116.00	61.00	–	–	30.50	1.06	6.00	6.70	17
Group 14, Wilds										
Wilds 5 and 9	41	126.89	–	53.64	–	35.78	1.17	–	–	–
Wilds 13, 14, 15, 16, 17	3-66	131.41	69.44	57.62	45.28	39.32	1.24	7.20	11.00	23
Wilds 9, 2, 3, 4, 21	2-6	114.00	61.00	–	–	30.50	1.05	7.30	7.80	28
Wilds Wilt 43-11, 43-18	1-4	118.00	64.00	–	–	37.33	1.29	4.80	12.00	9
Wilds 415	1-2	–	–	–	–	43.00	1.19	6.50	10.80	13
Wilds 1065	2-5	119.20	–	57.85	–	34.40	1.29	6.60	11.00	17

Table 1. Skein Strength and Other Spinning Laboratory Data on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types, *Continued*.

		Skein Strength of Yarn[b]					Staple	Yarn	Picker and	
Variety or Strain	Obs.[a]	22s	36s	44s	50s	60s	Length	Grade[c]	Card Waste	Neps[d]
	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 15, Deltapine Webber										
Deltatype Webber 2139	1-15	119.60	63.29	52.30	–	32.45	1.12	6.50	7.20	20
Group 16, Ewings Long Staple										
D and PL 45, 37-45, 37-45-867	2-6	122.81	63.76	52.05	43.30	34.93	1.22	7.60	7.80	33
Ewings Long Staple 452-79	1-3	124.31	66.94	–	–	32.98	1.22	7.30	8.30	16
Ewings LS 1-1-1-5 and 1-1-5	1-6	117.51	61.50	52.09	37.00	30.50	1.10	7.70	8.30	38
Group 17, Clarksville Long Staple										
Clarksville Long Staple	1	136.80	–	57.20	–	38.60	1.25	–	–	–
Group 18, Delta Dixie and Victory Wilt										
Delta Dixie 4	1	88.00	46.00	–	30.00	–	1.00	4.70	8.30	7
Victory Wilt 2	1	108.00	58.00	–	–	29.00	1.06	–	–	–
Group 19, Deltapine										
Deltapine 11	1-43	97.80	50.45	38.19	32.31	24.67	0.99	4.10	13.14	28
Deltapine 11A	1-2	101.45	42.88	–	26.90	–	1.02	5.00	8.06	–
Deltapine 12	2-12	96.45	28.68	39.07	28.68	24.77	1.03	4.30	7.88	19
Deltapine 14 (44-51)	12-40	99.87	50.85	41.58	32.84	25.70	1.02	5.10	7.32	16
Deltapine 14-833	2-99	100.14	52.40	37.00	33.68	25.99	1.01	5.40	6.64	19
Deltapine 14-060	1-69	103.27	54.62	–	34.92	26.30	1.02	4.90	7.54	14
Deltapine 14 (TCPSA)	2-6	103.94	54.82	–	35.49	–	0.96	5.80	12.52	22
Deltapine 15 (14-135)	1-10	103.82	54.41	–	35.11	26.90	1.01	5.80	9.68	15
Deltapine A5	2-4	99.70	52.40	–	33.05	–	0.98	4.80	5.25	14
Deltapine A-8	1	94.20	–	37.30	–	22.50	1.03	5.00	6.80	19
Deltapine A-12	2-11	96.26	50.67	38.00	31.00	23.15	0.98	5.30	7.02	19
Deltapine A-40	1-3	96.48	49.76	–	30.90	–	0.94	4.30	6.30	7
Deltapine 189	1	100.60	–	40.00	–	25.60	1.06	5.00	5.50	16
Deltapine 1003	1	102.97	54.28	–	35.33	–	0.78	6.30	8.60	19
Deltapine 1078	1	96.48	50.67	–	31.78	–	0.81	6.30	7.90	14
Deltapine 2031	1	103.00	55.18	–	36.19	26.90	1.06	5.30	7.50	24
Deltapine 192	2-4	89.70	45.35	–	28.45	–	0.97	4.50	5.70	16
Deltapine 93-628	1-3	89.98	47.95	–	31.78	22.56	1.03	4.70	10.60	7
Deltapine 8074-09-13	3-9	95.86	50.36	–	31.78	–	0.95	4.30	9.53	17
Deltapine 1096	2-6	103.57	52.92	–	33.50	–	0.98	4.80	7.80	8
Deltapine 78	3-9	111.63	59.22	–	40.96	–	1.02	5.80	7.79	10
Deltapine 1046 Wilt	1	83.00	42.00	–	26.00	–	1.00	4.70	9.40	10
Group 20, Miscellaneous Varieties										
Rhyne Cook Selection	1-3	91.00	43.00	–	26.00	–	0.94	4.30	7.60	9
Cook 912 or Cook Wiregrass	18-41	100.88	52.14	39.51	32.69	–	0.91	4.10	–	24
Cook 144	1-10	100.31	46.54	42.40	31.78	26.10	1.00	5.00	8.17	10
Coker Clevewilt 7-2	2-10	98.22	49.76	39.80	26.41	26.41	1.04	4.70	7.42	11
Cleveland Wannamaker	1-47	94.57	46.40	32.50	28.27	23.66	0.91	3.80	–	
Wannamaker S and C BB4	2-6	96.35	50.16	–	32.11	–	0.97	5.00	5.25	18
Station 21	2-27	95.36	47.19	35.69	29.52	24.00	0.98	4.70	7.82	7
Dixie Triumph	6-43	95.96	49.14	38.20	31.08	26.31	0.94	3.80	–	–
Dixie Triumph 366-789	2-18	81.08	42.17	30.25	26.48	–	0.92	4.70	6.60	13
Paymaster	1-9	102.15	53.20	40.74	35.04	31.32	0.99	6.10	7.33	24
Farm Relief 2	2-72	93.99	48.00	36.79	29.53	22.29	0.98	5.30	–	29
Hibred	1-21	82.31	40.91	30.23	27.66	–	0.83	4.20	9.29	9
Stormproof 1	1-21	89.80	46.50	35.12	28.25	–	0.89	4.80	12.50	18

Table 1. Skein Strength and Other Spinning Laboratory Data on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types, *Continued*.

Variety or Strain	Obs.[a]	Skein Strength of Yarn[b] 22s	36s	44s	50s	60s	Staple Length	Yarn Grade[c]	Picker and Card Waste	Neps[d]
	(no.)	----------(lb per 840 yards of yarn)----------					(in.)		(%)	
Group 20, Miscellaneous Varieties, Cont.										
Caddo	2	86.10	43.85	–	26.60	–	0.97	–	–	–
Kubela 1	1	96.80	–	38.80	–	25.40	1.06	–	–	–
Lacross 69 and 72	2	92.80	–	36.20	–	23.40	0.97	–	–	–
Half and Half	1-45	75.42	36.78	24.30	20.00	–	0.80	4.10	9.00	8
Western Early	2-6	94.35	49.04	–	32.07	–	0.96	5.30	5.85	14
Harpers BL	1	124.00	67.00	–	–	34.00	1.06	7.00	6.90	41
Station C	1-18	87.58	44.81	–	27.32	22.56	0.96	4.60	7.87	9
Supreme 10	3-9	101.27	53.36	–	33.31	26.69	1.01	5.00	7.59	14
Mass LS Cluster	1-3	88.00	45.00	–	24.00	–	0.94	4.00	9.40	7
Coker 4 in 1	5-23	102.23	53.60	43.54	32.46	26.87	1.05	5.70	6.69	17
Group 21, One-Variety Community Crop 1949										
Acala 4-42	15	193.6	118.20	65.70	41.7	36.3	1.060	9.60	9.40	45
Coker 100 Wilt	36	181.8	107.20	58.20	36.9	32.4	1.040	10.50	9.70	30
Delatpine 15	36	192.2	113.20	61.70	40.0	34.0	1.075	10.30	9.60	34
Hibred	12	155.8	90.90	46.90	30.0	–	0.867	10.90	10.70	27
Mebane Triumph	3	148.6	89.00	47.00	–	–	0.937	10.70	11.30	28
Northern Star	3	174.5	103.70	56.80	36.0	–	0.990	10.30	9.60	39
Rowden	24	163.6	96.50	51.10	32.2	27.3	0.972	11.00	10.50	13
Stoneville	27	187.7	112.40	61.30	38.9	32.8	1.062	10.20	9.50	34
Macha	1	155.5	95.50	51.00	–	–	0.906	10.70	12.30	69

[a] Obs. = observation. Minimum and maximum number of samples used (averaged) for any given determination reported.
[b] Skein = weight of 840 yards or a hank of yarn in pounds. In 22s yarn, 22 hanks are required for a pound weight. In 60s yarn, 60 hanks are required to weigh a pound.
[c] Yarn appearance grade number: 1 = A+, 2 = A, 3 = A-, 4 = B+, 5 = B, 6 = B-, 7 = C+, 8 = C, 9 = C-, 10 = D+, 11 = D, etc.
[d] Card web number of neps (entanglements) per 100 in.^{2}.

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 1, Stoneville and Coker 100											
Stoneville 5	18-112	1.060	0.94	0.74	78.9	77.7	77.4	32.0	4.50	–	68.9
Stoneville 5A	6	–	0.95	0.71	74.6	74.2	–	34.2	4.20	–	72.6
Bobshaw 1	12-27	–	1.01	0.78	78.9	80.9	–	32.7	4.42	2.88	77.3
Stoneville 2B	20-110	–	1.00	0.75	75.6	80.3	–	32.2	4.31	3.01	71.6
Empire	9-43	–	0.99	0.76	76.7	78.4	–	32.9	4.11	3.04	70.6
Stoneville 37	7	–	0.93	0.74	79.7	76.0	–	35.4	4.90	–	77.1
Stoneville 68-3	2	–	0.99	0.80	81.0	77.1	–	32.8	4.79	–	78.4
Ambassador	1	–	1.00	0.78	78.0	90.0	–	30.2	4.80	–	82.0
Stoneville 62	5-21	–	0.92	0.71	77.7	81.2	–	30.1	4.41	2.81	75.4
Stoneville 2C	5-13	–	1.07	0.77	72.8	78.6	–	32.2	3.94	2.98	72.7
Stoneville 450	2	–	1.00	0.78	78.2	82.5	–	28.4	4.43	–	73.7
Stoneville 462	4	–	0.97	0.76	78.4	88.4	–	28.7	4.84	–	78.8
Stonewilt	25-31	–	1.00	0.77	77.0	71.3	–	37.4	4.09	2.78	74.8
Arkot 2	8	–	0.97	0.72	74.1	79.5	–	29.8	4.19	–	71.0
Paula C	1-5	–	0.99	0.80	81.0	82.0	–	32.0	4.40	2.97	84.0
Stoneville 551	3	–	1.03	0.79	76.8	82.3	–	30.5	4.59	–	77.0
Stoneville 191	1	–	1.01	0.81		60.1	–	39.0	4.20	–	75.0
Stoneville 85	1-2	–	0.89	0.68	76.0	81.0	–	31.0	4.30	2.90	71.0
Stoneville 061	1	–	0.97	0.72	74.0	76.0	–	36.0	4.40	–	70.0
Stoneville 870	2	–	1.00	0.78	78.0	72.5	–	34.4	4.59	–	71.8
Stoneville 727	1	–	1.01	0.77	76.2	–	–	35.0	4.09	–	68.0
Coker 100	8-51	–	1.02	0.75	73.8	76.7	75.3	36.0	4.06	–	71.6
Coker 200	4-14	–	1.02	0.78	76.9	74.5	72.7	35.6	4.47	2.86	74.1
Coker 33-12	2	–	1.04	0.76	73.0	74.0	–	38.5	4.50	–	79.5
Coker 100 Staple	3-9	–	1.16	0.90	74.3	70.3	–	38.6	3.34	3.02	76.7
Marett White Gold	1-14	1.231	1.00	0.77	77.5	75.6	76.9	34.2	4.40	2.88	71.3
Coker 100 Wilt	2-35	–	0.99	0.77	77.2	74.4	77.4	36.5	4.41	2.89	74.9
Stoneville 4B-5-1-1	2	–	0.93	0.74	79.5	81.5	–	32.5	4.55	–	72.0
Group 2, Acala 9											
Acala 1064	1	1.270	1.12	–	–	–	77.9	35.6	3.90	–	72.0
Acala 1980	2	1.280	1.13	–	–	–	74.4	34.4	3.74	–	74.3
Acala 1517	5-39	1.280	1.10	0.85	77.5	89.1	86.3	31.4	3.74	3.02	73.6
Acala 2815	2	–	1.10	0.84	76.4	80.8	–	35.4	3.82	–	70.8
Acala 2029	1	–	1.05	0.78	74.0	79.1	–	31.9	4.47	–	73.7
Acala 1450	1-4	1.330	1.15	0.90	78.4	78.6	–	36.6	3.43	–	74.7
Acala 2496	5	–	0.97	0.75	77.5	79.4	–	34.6	4.62	–	79.0
Acala W-29	3	–	1.15	0.92	80.6	83.6	–	33.9	3.52	3.04	72.9
Acala W-29-1	15-32	–	1.11	0.87	77.4	86.7	–	30.7	3.34	–	78.6
Acala W-29-4	1-2	–	1.14	0.90	81.0	89.2	–	32.2	3.26	2.87	76.0
Acala W-29-6	2	–	1.12	0.86	–	85.0	–	32.2	2.79	2.79	–
Acala 43-6	1	–	1.12	0.82	73.0	91.0	–	31.0	3.40	–	79.0
Acala 43-13	1	–	1.05	0.78	74.0	87.0	–	32.0	3.70	–	74.0
Acala W-20-1-5-2	2	–	1.16	0.88	76.5	84.0	–	36.0	3.80	–	76.0
Acala 40-26-1	1	–	1.18	0.85	72.0	82.0	–	37.0	3.20	–	63.0
Mesa Acala	5-7	–	1.27	0.96	75.8	82.8	–	37.4	3.06	2.99	81.6
Acala 1517 Round Boll	3-7	–	1.10	0.82	74.0	86.1	–	32.4	3.61	3.05	79.6

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1, *Continued*.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 2, Acala 9, Cont.											
Acala 1517-123	1	–	1.07	0.90	83.9	70.9	–	37.1	4.48	–	74.9
Acala 1517-1-23-11-3	1-3	–	1.05	0.88	83.0	72.0	–	39.0	3.40	–	85.0
Acala 1517-1-23-11-5	1	–	1.09	0.88	81.0	78.0	–	37.0	4.30	–	82.0
Acala 1517-7-49	1	–	1.12	0.94	84.1	80.2	–	25.4	3.99	–	71.4
Acala 1517-7-49-1-30	1	–	–	0.85	77.0	85.0	–	33.0	4.00	–	82.0
Acala 1517-9-1	1	–	–	0.94	84.1	80.2	–	35.4	3.99	–	71.4
Acala 1517-5-12-7-6 Waxy	1-2	–	1.16	0.96	81.0	88.7	–	31.8	3.19	2.94	76.0
Acala 1517-4-42-44-60	3-4	–	1.08	0.81	75.8	87.2	–	32.8	4.20	2.87	81.2
Acala 11	1-4	–	1.16	0.87	78.0	89.5	–	32.2	3.02	2.89	77.0
Acala 4-42	4-5	–	1.13	0.88	–	75.9	–	35.9	2.68	2.73	–
Group 3, Acala 5											
Acala 892	6	–	0.91	0.74	76.7	88.9	–	30.6	5.10	–	76.8
Acala 892 mass sel.	1	–	0.94	–	79.0	84.0	–	31.0	4.70	–	77.0
Acala 892-17920	1-2	–	0.92	–	78.0	92.0	–	30.0	4.80	2.28	75.0
Acala 892-18038	1	–	0.88	–	76.0	86.0	–	30.0	4.90	–	74.0
Acala C 5	2-4	–	0.95	0.74	77.0	87.6	–	29.5	4.20	2.88	75.2
Acala C 7	1	–	0.96	0.79	82.0	77.0	–	35.0	5.20	–	81.0
Acala C 10	1	–	0.97	0.77	79.0	81.0	–	32.0	4.70	–	72.0
Acala 6510-2	1	–	0.86	0.67	78.0	96.0	–	26.4	5.60	–	83.0
Acala 6553-11	1	–	0.88	0.68	77.0	88.0	–	29.4	5.80	–	81.0
Acala 6553-11-4-3	1	–	0.86	0.67	78.0	86.0	–	30.0	4.30	–	70.0
Acala 6563-12	2	–	0.98	0.79	80.4	79.5	–	32.8	5.15	–	81.9
Acala 6566-18	1-5	–	0.90	0.71	78.8	80.6	–	31.6	5.30	2.24	76.4
Acala 6566-3-3-3	1	–	0.97	0.75	77.0	82.0	–	34.0	4.50	–	74.0
Acala 6583-21	1	–	0.82	0.67	82.0	90.0	–	27.4	5.40	–	86.0
Acala 911	2-3	–	1.22	0.91	72.8	80.0	–	35.3	3.86	–	68.5
Nucala	9-10	–	0.95	0.77	80.6	80.7	–	33.0	5.21	–	75.8
Acala 16-4-9	2	–	0.94	0.73	78.0	79.6	–	32.1	5.09	–	78.0
Nucala 40-10-1-18	1	–	0.99	0.80	81.0	80.0	–	–	5.20	–	84.0
Nucala 1517	1	–	1.00	0.80	80.0	82.0	–	32.0	4.80	–	82.0
Nucala 72-4-S	1	–	1.00	0.82	82.0	77.0	–	33.0	5.20	–	83.0
Nucala 71-5-13	1	–	1.00	0.82	82.0	81.0	–	33.0	5.00	–	84.0
Group 4, Acala 8											
Acala Shafter	3-24	1.228	1.07	0.78	76.7	70.1	–	39.0	3.90	–	74.5
Acala P-2	1	1.335	1.16	–	–	–	69.9	38.3	–	–	78.6
Acala P-18-A	1	–	–	–	–	–	71.8	38.6	4.46	–	74.6
Acala P-18-B	1	–	–	–	–	–	66.2	40.1	4.36	–	70.3
Acala P-18-C	1-26	–	1.04	0.80	77.3	71.2	69.3	40.5	3.96	2.95	78.4
Acala P-20	1	–	–	–	–	–	69.9	38.6	3.70	–	81.2
Acala P-21	1	–	–	–	–	–	72.0	38.0	3.60	–	75.2
Acala P-22	1	1.183	1.05	–	–	–	75.6	36.4	3.60	–	77.4
Acala S-5	1	1.297	1.13	–	–	–	78.6	34.6	3.66	–	68.2
Acala S-5-4-1	1	1.292	1.13	–	–	–	80.7	33.7	3.90	–	69.4
Acala 5S-5-4-1-11-14	1-2	–	1.08	0.81	75.0	83.0	–	36.0	3.70	–	79.0
Acala 5S-5-4-1-11-34	1-2	–	1.08	0.80	74.0	77.0	–	40.0	3.95	–	79.0
Acala P-1-13-3	2	1.269	1.11	–	–	–	–	33.0	3.85	–	76.4

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1, *Continued*.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 4, Acala 8, Cont.											
Acala Boswell Blue Tag	1	1.211	1.07	–	–	–	75.7	37.3	3.70	–	79.2
Acala Q-6	4-8	1.243	1.09	–	–	–	80.0	35.7	3.66	–	79.4
Acala Santan	1-9	1.137	0.98	0.70	76.0	75.0	76.2	38.2	4.21	3.03	79.4
Acala W-R-1-7-7	1	–	0.99	0.76	77.3	79.6	–	36.6	4.22	–	80.4
Acala Santan 25	1	1.251	1.10	–	–	–	68.5	38.0	4.30	–	87.7
Acala Santan 182	1-2	1.178	1.01	0.74	76.0	75.2	–	36.7	4.10	–	81.2
Acala Santan 94-5-5-1	1-2	1.175	1.04	0.83	80.9	79.6	83.9	34.6	4.05	–	79.2
Acala Santan 1-1-7	1	–	1.04	0.79	76.0	74.0	–	41.0	4.30	–	82.0
Acala Arizona 3170	1	1.224	1.08	–	–	–	73.4	39.2	3.50	–	76.8
Acala Ellsworth	1	1.192	1.05	–	–	–	77.6	36.4	4.00	–	78.6
Acala College	1	1.226	1.08	–	–	–	66.3	38.8	3.60	–	62.3
Acala N-28-5	4-8	1.164	1.03	–	–	–	76.6	37.5	4.10	–	83.6
Acala Thrall	1-3	–	1.01	0.76	75.0	73.0	–	41.0	4.20	–	80.0
Acala Cody Lentz	1-2	1.090	0.96	0.68	73.0	84.9	–	30.9	4.50	–	75.1
Acala Hasselfields	1	1.095	0.98	–	–	–	80.4	34.8	4.40	–	68.3
Acala Rogers 111	2-60	1.174	1.03	0.76	75.2	87.8	89.8	30.7	4.06	2.60	68.5
Texacala	1-5	–	1.06	0.80	75.9	84.1	–	33.0	4.00	3.07	75.4
Acala 8	1-3	–	0.99	0.76	76.0	78.0	–	37.2	4.42	–	77.7
Acala MyL 36	1	–	0.94	0.73	77.4	75.5	–	35.0	3.80	–	82.6
Acala 8-3-4	1	–	0.98	0.77	78.7	86.6	–	34.1	4.44	–	79.7
Acala 11-2-3-6	2	–	0.96	0.73	75.8	87.6	–	34.6	4.96	–	75.3
Acala 36-13	1	–	0.91	0.68	75.0	87.0	–	35.0	4.20	–	71.0
Acala 42-5-1-2	1	–	1.05	0.81	77.4	81.5	–	34.5	4.42	–	82.1
Acala 100-5	1	–	0.96	0.72	75.0	89.0	–	35.0	3.80	–	73.0
Acala 108-2	1	–	0.92	0.71	77.0	84.0	–	32.0	4.44	2.30	69.0
Acala 109-1-1	1	–	1.00	0.80	79.4	70.8	–	38.0	4.96	–	83.3
Acala 118	1	–	0.92	0.70	76.0	84.0	–	34.0	4.20	–	74.0
Acala 204-2	1	–	0.91	0.69	76.0	84.0	–	35.0	3.80	–	77.0
Acala 340	2	–	–	–	75.6	77.8	–	39.1	3.90	–	70.0
Group 5, Mebane Triumph											
Mebane Triumph	1-13	1.096	0.97	0.66	79.1	68.7	74.8	37.0	4.74	–	75.8
Watson Mebane	1-5	1.052	0.95	0.79	82.8	–	69.3	39.9	5.04	–	69.1
Buckellew Mebane	2-4	–	0.91	0.73	80.7	68.0	68.7	37.1	5.47	–	79.0
Qualla	1-42	1.079	0.97	–	–	–	73.5	37.5	4.95	2.49	76.8
Cliett Superior	1	1.048	0.94	–	–	–	78.0	35.6	5.11	–	–
Bryant Mebane	1	0.997	0.91	–	–	–	77.8	35.4	4.90	–	76.9
Bryant Mebane (New str)	1-4	–	0.89	0.71	80.1	–	–	–	–	2.42	–
Texas Special	1-2	–	0.88	0.69	78.4	71.2	–	35.2	5.27	2.49	78.2
Texas Mammoth	1	–	1.08	0.86	79.3	66.7	–	35.9	4.32	–	63.8
Bagley Mebane	1	–	0.90	0.72	80.0	74.0	–	35.0	4.89	–	74.8
Mebane 804-50	1	–	0.87	0.71	81.3	81.7	–	33.8	5.35	–	76.3
Ferguson 406	1-4	0.999	0.91	0.76	83.6	71.5	72.6	38.4	5.06	2.36	73.4
New Boykin	2-4	1.024	0.90	0.71	79.8	77.2	74.5	35.7	4.96	–	74.0
Kasch	1	–	0.88	0.66	75.3	72.1	–	34.9	5.23	–	72.6
Sharp Mebane	1	1.131	1.01	–	–	–	76.0	35.7	5.16	–	70.6
Floyd 8 G-Mebane	2-4	–	0.90	0.69	76.8	69.0	–	36.8	5.10	–	78.5

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1, *Continued*.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 6, Western Mebane											
Lockett 140	1-15	1.029	0.83	0.68	81.5	84.0	–	31.3	5.36	2.20	79.4
Western Prolific	6	–	0.90	0.74	81.8	79.5	–	33.2	5.32	–	70.4
Lockett 140-46	1	–	0.81	0.67	83.0	84.0	–	32.0	5.80	–	82.0
Mebane 140-6801-2-1	1-5	–	0.86	0.70	81.0	78.0	–	31.0	5.20	2.51	84.0
Mebane (Native)	2	–	0.90	0.70	78.0	74.0	–	38.0	4.95	–	77.0
Group 7, Oklahoma Triumph											
Oklahoma Triumph B4	1-42	1.030	0.93	0.78	79.0	78.5	78.6	34.6	4.95	–	78.7
Early Triumph 8	1	–	0.94	0.75	80.4	75.6	–	35.6	5.09	–	77.0
Early Triumph 1128	6	–	0.93	0.74	78.8	77.1	–	35.4	5.02	–	78.4
Early Triumph 23-1-9	1	–	0.88	0.66	75.0	84.0	–	31.0	4.60	–	76.0
Early Triumph 25-1-6	1	–	0.89	0.66	74.0	80.0	–	33.2	4.80	–	76.0
Early Triumph 27-1-12	1	–	0.90	0.69	77.0	80.0	–	31.8	4.80	–	79.0
Early Triumph 92-1-1	4-6	–	0.90	0.68	76.0	68.8	–	37.1	4.46	2.94	69.6
Early Triumph 328-2-1	1	–	0.84	0.66	79.0	80.0	–	33.5	5.50	–	77.0
Group 8, Rowden											
Roldo Rowden	2-8	1.040	0.96	0.76	77.7	80.1	79.6	32.2	3.86	2.33	79.0
Rowden 41-B	3-16	–	0.93	0.74	79.0	77.9	–	33.1	4.67	2.32	82.0
Rowden 41-A	15-16	–	0.92	0.73	79.1	82.3	–	32.0	5.48	–	78.4
Malone Rowden	1	1.047	0.94	–	–	–	82.6	35.6	5.97	–	78.9
Hurley Special	1-3	–	0.92	0.72	76.9	60.8	85.8	33.5	4.46	2.33	76.6
Sunshine	1-6	1.096	0.92	0.70	79.1	78.2	71.3	34.5	4.92	2.08	77.0
Arkot 1 (B-4)	10-16	–	0.98	0.76	77.9	80.6	–	33.4	4.20	2.72	79.0
Rowden B5	2	–	0.92	0.69	75.5	81.5	–	32.2	4.77	–	74.0
Rowden B28	1	–	0.98	0.78	80.0	76.0	–	34.0	4.80	–	77.0
Rowden 42A	5	–	0.93	0.75	79.8	75.9	–	33.6	5.37	–	82.0
Supreme 1	1-7	–	0.95	0.73	77.0	80.8	–	31.8	5.60	2.33	77.0
Rowden 2088	41	1.066	0.96	–	–	–	85.4	32.2	5.26	–	–
Rowden 40-1-4-2	1	–	0.97	0.79	82.0	80.3	–	32.6	5.91	–	79.0
Rowden 40-1-4-2	1	–	0.90	0.72	80.0	81.7	–	30.4	6.28	–	85.9
Rowden 5056	1	–	0.89	0.72	81.2	84.9	–	33.4	5.98	–	81.0
Harper DD	2	–	0.91	0.72	79.4	78.8	–	33.8	5.27	2.86	78.0
Mexican Big Roll	40	1.116	1.00	–	–	–	86.4	31.4	4.65	–	–
Mexican 87-8-7-13-20	1	–	0.87	0.71	80.9	74.7	–	34.4	5.69	–	79.5
Mexican 87-8-7-3-11	1	–	0.99	0.78	79.1	76.4	–	34.7	–	–	76.0
Miller 610	1-6	–	0.92	0.71	78.9	71.6	68.4	35.7	5.21	–	77.9
Miller 06	1	–	1.03	0.82	80.0	68.0	–	40.0	4.70	–	76.0
Miller 919	2-5	–	0.94	0.73	77.0	74.3	–	37.3	4.08	2.57	74.7
Rowden 60-A	2	–	0.97	0.76	78.0	84.0	–	31.0	5.00	–	74.5
Group 9, Lone Star											
Gorham Lone Star	1-10	1.170	0.99	0.70	74.0	86.0	74.8	35.5	4.62	–	74.9
Lankart	2-6	1.116	0.95	0.75	75.9	84.5	82.0	34.1	4.40	–	69.7
Wacona	1-2	–	0.83	0.60	72.6	77.2	–	36.6	4.23	3.07	66.2
Lankart 57	3-5	–	0.99	0.79	79.6	73.7	–	35.6	4.73	2.88	80.0
Northern Star	5-8	–	0.95	0.71	75.1	86.4	–	31.8	4.34	2.95	72.2
Lone Star D2	1-2	1.118	0.97	0.74	78.6	84.0	79.0	34.5	4.98	–	73.6
Lone Star P4-1-6-4	1	1.170	1.04	–	–	–	78.2	35.5	4.80	–	75.8

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1, *Continued*.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 9, Lone Star, Cont.	–	–	–	–	–	–	–	–	–	–	–
Startex	42	1.013	0.92	–	–	–	78.6	34.9	5.13	–	–
Group 10, Delfos											
Delfos 4	56-61	1.194	1.06	–	–	–	73.7	37.6	4.15	–	–
Delfos 3506	5	–	1.01	0.74	73.4	75.5	–	36.4	–	–	73.4
Delfos 531-C	3-19	–	1.04	0.74	71.0	73.4	–	36.3	3.79	3.35	76.9
Delfos 531-824	2	–	1.18	0.78	72.0	76.0	–	38.0	4.00	–	70.0
Delfos 6	1	1.339	1.07	–	–	–	69.8	40.6	3.87	–	66.9
Delfos 651	2-10	–	1.07	0.78	73.3	77.8	–	35.5	3.95	2.92	75.9
Delfos 651-050	3-4	–	1.07	0.81	75.3	79.3	–	33.7	4.37	–	74.7
Delfos 651-42-43	3-4	–	1.08	0.86	79.8	73.3	–	36.2	4.22	2.87	77.2
Delfos 651-42-72	1	–	1.19	0.85	78.0	76.0	–	33.0	4.30	–	79.0
Delfos 9431	2-3	–	1.13	0.86	76.3	76.3	–	35.5	3.80	3.27	72.3
Delfos 588	1	1.410	1.22	–	–	–	71.8	39.2	3.49	–	68.7
Delfos 4729	1	1.352	1.18	–	–	–	73.0	40.0	3.65	–	68.5
Delfos 9169	11-14	–	1.06	0.79	74.1	77.3	–	36.2	4.24	2.94	75.0
Delfos 9252	4	–	1.06	0.78	73.0	74.3	–	37.6	3.79	–	75.0
Delfos 1020	1	–	1.05	0.71	68.0	65.0	–	42.6	3.29	–	70.0
Delfos 444	7	–	1.03	0.76	72.7	72.0	–	39.9	3.82	–	67.0
Delfos 130A-022	1	–	1.12	0.87	78.0	78.0	–	37.0	4.20	–	71.0
Group 11, Washington											
Washington	2-7	1.185	1.00	0.77	78.7	85.9	78.5	31.1	4.27	–	72.1
Delfos 719-5	1	–	1.02	0.78	76.5	82.2	–	34.8	4.22	–	68.5
Delfos 719-821	1	–	1.04	0.79	75.9	84.2	–	34.3	4.12	–	69.3
Delfos 339-3-2-6-3	1	–	1.01	0.74	73.0	79.0	–	36.0	5.00	–	89.0
Bobshaw 2	6	–	1.04	0.79	75.7	78.1	–	34.1	3.91	–	75.0
Group 12, Wilt Resistant Delfos											
Delfos 425	5	–	1.09	0.87	80.0	78.0	–	39.0	4.20	–	75.0
Delfos 425-112	1	–	1.14	0.87	76.0	78.0	–	38.0	4.20	–	75.0
Delfos 425-115	1	–	1.06	0.76	72.0	77.0	–	35.0	4.00	–	72.0
Delfos 425-919	1	–	1.10	0.82	74.0	78.5	–	39.0	4.20	–	71.0
Delfos 425-920	2	–	1.12	0.85	76.0	70.0	–	41.0	4.00	–	76.0
Delfos 425-920	1	–	1.11	0.83	74.7	75.7	–	39.7	4.13	–	72.7
Group 13, Express											
Express 17	42	1.176	1.04	–	–	–	84.0	33.0	4.31	–	–
Express 1049	1	–	1.10	0.85	77.0	81.9	–	34.4	4.34	–	87.0
Express 317-734	1	–	1.13	0.88	78.0	79.0	–	36.0	4.30	–	75.0
Express 317-745	1	–	1.09	0.81	74.0	79.0	–	36.0	3.85	–	74.0
Express 3-11384	4	–	1.03	0.77	74.8	81.2	–	33.1	3.50	–	73.8
Bobdel or Bobshaw 16	1-17	–	1.06	0.80	75.4	83.0	70.9	35.1	3.94	3.04	75.0
Bobshaw 15	2	–	1.03	0.76	73.0	88.5	–	30.0	3.90	–	72.5
Group 14, Wilds											
Wilds 5 and 9	1-41	1.347	1.17	–	–	–	85.6	33.4	3.50	–	66.6
Wilds 13, 14, 15, 16, 17	2-31	1.400	1.25	0.99	73.4	84.7	85.1	34.1	3.47	3.45	71.7
Wilds 9, 2, 3, 4, 21	2	–	1.06	0.80	75.0	83.5	–	34.0	3.80	–	77.5
Wilds Wilt 43-11, 43-18	1-3	1.480	1.23	1.11	76.0	80.3	–	36.7	3.63	–	75.0
Wilds 415	1	1.410	–	1.13	–	86.0	–	33.0	3.20	–	71.0

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1, *Continued*.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 14, Wilds, Cont.											
Wilds 1065	1-3	1.450	1.22	0.94	70.0	81.1	–	35.8	3.24	–	70.7
Group 15, Deltapine Webber											
Deltatype Webber 2139	3-6	–	1.20	0.94	78.5	80.0	–	34.4	3.70	2.52	75.4
Group 16, Ewings Long Staple											
D and PL 45, 37-45, 37-45-867	6	–	1.25	0.96	77.2	76.9	–	36.5	3.22	–	71.1
Ewings Long Staple 452-79	1	–	1.30	1.02	78.0	72.0	–	37.0	3.10	–	76.0
Ewings LS 1-1-1-5 and 1-1-5	1-3	1.433	1.13	0.82	76.0	86.5	79.3	34.0	3.66	2.92	73.9
Group 17, Clarksville Long Staple											
Clarksville Long Staple	1	–	1.17	0.86	73.2	84.7	–	34.2	3.24	–	69.7
Group 18, Delta Dixie and Victory Wilt											
Delta Dixie 4	1	–	0.95	0.71	75.0	69.0	–	39.0	4.20	–	68.0
Victory Wilt 2	1	–	1.05	0.75	71.0	81.0	–	36.0	3.80	–	70.0
Group 19, Deltapine											
Deltapine 11	1-43	1.125	1.00	–	–	–	80.5	35.4	4.52	–	72.2
Deltapine 11A	1-2	1.200	1.04	0.79	77.9	62.8	79.2	39.0	4.34	–	72.6
Deltapine 12	4-11	–	0.95	0.72	75.9	72.4	75.8	37.6	4.39	–	71.6
Deltapine 14 (44-51)	1-26	1.256	1.01	0.77	76.5	74.9	74.5	36.4	4.58	–	77.4
Deltapine 14-833	5-33	–	0.99	0.75	76.4	76.6	–	36.2	4.38	2.77	75.5
Deltapine 14-060	23-25	–	1.04	0.79	76.2	75.1	–	36.8	4.39	2.77	80.0
Deltapine 14 (TCPSA)	2	–	1.00	0.73	–	74.7	–	33.7	2.82	2.94	–
Deltapine 15 (14-135)	1-19	–	1.05	0.81	81.0	72.0	–	36.9	2.79	2.79	80.0
Deltapine A 5	2	–	0.96	0.71	77.0	76.7	–	34.6	4.19	–	76.0
Deltapine A-8	1	–	0.95	0.69	73.0	65.5	–	37.7	4.05	–	37.7
Deltapine A-12	3-5	–	0.97	0.73	75.2	83.0	–	34.7	4.30	–	34.7
Deltapine A-40	1	–	0.97	0.79	81.0	74.0	–	35.0	4.70	–	35.0
Deltapine 189	1	–	1.03	0.74	71.8	72.0	–	37.1	4.72	–	37.1
Deltapine 1003	1	–	0.98	0.78	80.0	69.0	–	36.0	4.20	–	36.0
Deltapine 1078	1	–	1.01	0.81	80.0	67.0	–	37.0	4.10	–	69.0
Deltapine 2031	1	–	1.11	0.87	78.0	72.0	–	37.0	3.80	–	68.0
Deltapine 192	2	–	0.94	0.74	79.8	76.4	–	33.4	5.04	–	76.0
Deltapine 93-628	1	–	1.04	0.84	81.0	71.0	–	38.0	4.90	–	83.0
Deltapine 8074-09-13	3-4	–	0.92	0.70	76.7	74.7	–	35.7	4.80	2.73	79.0
Deltapine 1096	–	–	–	–	–	–	–	–	–	2.68	–
Deltapine 78	–	–	–	–	–	–	–	–	–	3.11	–
Deltapine 1046 Wilt	1	–	0.93	0.70	75.0	77.0	–	34.0	4.90	–	76.0
Group 20, Miscellaneous Varieties											
Rhyne Cook Selection	1	–	0.91	0.74	81.0	79.0	–	34.0	5.20	–	79.0
Cook 912 or Cook Wiregrass	1-41	0.991	0.90	0.77	–	–	82.1	32.1	4.85	–	74.2
Cook 144	1-10	1.088	0.97	0.75	77.4	75.7	80.7	35.9	4.75	2.60	75.5
Coker Clevewilt 7-2	4-10	1.157	0.99	0.71	75.7	75.8	78.2	35.5	4.33	–	68.4
Cleveland Wannamaker	6-48	0.979	0.89	0.75	79.3	70.9	73.5	36.4	5.15	–	76.2
Wannamaker S and C BB4	2-6	–	0.95	0.73	76.8	73.5	70.7	36.5	4.87	–	71.8
Station 21	1-14	1.079	0.95	0.73	77.2	81.2	83.5	31.6	4.94	2.39	76.7
Dixie Triumph	1-43	1.007	0.91	0.73	79.3	78.6	76.3	34.5	5.02	–	76.4

Table 2. Fiber Laboratory Determinations Showing Lint Length, Strength, and Fineness on Current and Recent Varieties and Strains of the American Cotton Belt. Data Grouped by Varietal Types as in Table 1, *Continued*.

		Length Measurements[b]				Strength[c]			Fineness and Maturity		
Variety or Strain	Obs.[a]	UQ	UHM	Whole Sample	Unif. Ratio	Conv.	Direct	X-ray Angle	Weight	Weight 1945-46	Mature Fiber
	(no.)	----------(in.)----------						(°)	-------(mg/in.)-------		(%)
Group 20, Miscellaneous Varieties, Cont.										–	–
Dixie Triumph 366-789	6	–	0.91	0.70	77.0	72.3	–	34.4	5.07	–	74.0
Paymaster	1-8	1.250	0.96	0.75	79.2	80.0	85.8	34.4	4.12	2.54	79.9
Farm Relief 2	39-42	1.129	1.01	–	–	–	80.3	33.3	4.85	–	–
Hibred	7-21	–	0.78	0.63	80.8	79.7		32.9	5.27	2.65	74.2
Stormproof 1	4-9	–	0.84	0.67	79.5	77.5	–	34.2	4.40	2.63	67.5
Caddo	2	–	0.97	0.76	77.7	79.0	–	36.4	4.92	–	75.2
Kubela 1	1	–	1.02	0.80	78.7	65.3	–	38.6	4.49	–	71.7
Lacrosse 69 and 72	2	–	0.94	0.74	78.5	74.7	–	33.6	3.86	–	64.0
Half and Half	3-45	0.839	0.79	0.69	84.0	77.9	76.4	34.1	5.77	–	73.1
Western Early	3	–	0.96	0.75	78.1	78.7	–	35.7	4.18	–	68.8
Harpers BL	1	–	1.06	0.82	77.0	96.0	–	30.0	3.70	–	72.0
Station C	5-6	–	0.95	0.76	79.6	66.0	–	40.0	4.76	2.06	77.8
Supreme 10	8-9	–	1.01	0.78	76.9	79.8	–	32.3	4.42	2.86	74.1
Mass LS Cluster	1	–	0.83	0.69	83.0	86.0	–	32.0	5.50	–	83.0
Coker 4 in 1	3-23	1.227	1.05	0.80	76.2	75.9	73.4	37.9	4.12	2.87	71.9
Group 21, One-Variety Community Crop 1949[e]											
Acala 4-42	15	–	1.092	0.94	78.0	83.0	–	31.7	4.20	2.82	83.0
Coker 100 Wilt	36	–	1.069	0.86	79.0	75.0	–	34.1	4.60	3.01	87.0
Deltapine 15	36	–	1.091	0.87	78.0	76.0	–	34.8	4.40	2.81	86.0
Hibred	12		0.865	0.71	80.0	74.0	–	34.3	4.60	2.54	82.0
Mebane Triumph	3	–	0.960	0.82	79.0	69.0	–	40.6	4.90	2.62	82.0
Northern Star	3	–	1.002	0.81	78.0	79.0	–	33.7	4.20	2.91	86.0
Rowden	24	–	1.011	0.76	81.0	82.0	–	34.7	5.50	2.42	88.0
Stoneville	27	–	1.087	0.85	78.0	79.0	–	31.4	3.90	3.08	82.0
Macha	1	–	0.920	–	80.0	70.0	–	–	3.70	–	71.0

[a] Obs. = observation. Minimum and Maximum number of samples used (averaged) for any given determination reported.

[b] Fiber length measurements: Upper quartile (UQ), Upper half mean (UHM), whole sample mean, and uniformity ratio (mean of whole sample divided by UHM, quotient multiplied by 100).

[c] Strength measurements: Chandler converted from Pressley Index and Chandler Direct, 1000 lb/in.^{2}.

[d] Fineness measurements: Weight (mg) per inch for 1945-46 provided separately from all other years. For 1945-46, surface area (arealometer) cm^2/mg.

[e] Actual Pressley index values for this group (One-Variety Community) were: 7.48, 6.90, 6.94, 6.78, 5.71, 7.30, 7.14, and 7.11, respectively.

Historical Statistics of Cotton Production in the United States

It has been pointed out in the early part of this paper that the production of American Upland cotton rapidly arose in this country with the development and utilization of Whitney's saw gin. It was indicated also that the growth of the factory system in England, starting some years prior to 1793, had given great emphasis to cotton production in areas where the plant had been grown—for a long time, for domestic uses and primitive manufacture.

As an indication of the rapid rise in factory manufacture of cotton in England, her average annual cotton imports (according to Stine and Baker[31]) increased from 9500 bales in the period 1771–1775 to 52,000 bales in the period 1791–1795. In the beginning of the cotton trade, England imported cotton goods from the East Indies and raw cotton from Turkey and Smyrna. In the period of the Revolutionary War, England began importing also from the West Indies and Brazil. The four countries just mentioned supplied most of the raw cotton to England for some years after the war.

The sources of England's new raw cottons supply in 1787, when very little was received intermittently from the United States, were:

Countries	Bales, 500 lb (no.)
British West Indies	13,600
French and Spanish Colonies	12,000
Smyrna and Turkey	11,400
Dutch Colonies	3,400
Portuguese Colonies, mostly Brazil	5,000
Isle of Bourbon	200
Total	**45,600**

Johnson[32] stated that the World's cotton crop in 1791 amounted to 980,000 bales of 500 pounds, and gave production data of various countries for that year as follows:

Countries	Bales, 500 lb (no.)
India	260,000
Rest of Asia	380,000
Africa	92,000
Brazil	44,000
Rest of South America and Mexico	136,000
West Indies	24,000
United States	4,000
Other Countries	40,000
Total	**980,000**

[a] Most of this production was for primitive uses by the countries growing cotton.

Sea Island Cotton

This paper is concerned with Upland cotton, but it may be of interest here to point out the relationship of Sea Island to the early development of commercial production of American cotton. The first step in this development in the United States was taken in the introduction and culture of Sea Island cotton. In 1791, Sea Island production probably was small, as this date was only a few years after introduction. Sea Island at that particular time had a good opening for establishment. The planters along the sea coast of Georgia and South Carolina were suffering from a depression in the rice and indigo industries, and the equipment and slave labor of their plantations were easily adapted to the cultivation and harvesting of cotton. Sea Island cotton took the lead in the market, as soon as it became known, and sold at very high prices. Another circumstance in its favor was the fact that the long lint could be easily separated from the nearly smooth black seeds by the roller gin, which was then in use. In the decade, 1791–1801, production expanded very rapidly and by 1804, 18,000 bales of 500 pounds were produced. However, in comparison with the great expansion of Upland culture soon afterwards, Sea Island remained always a relatively small, concentrated and specialized industry. Production fluctuated somewhat, but did not materially increase for many years, being approximately the same in 1849 as in 1804. A shift in area, however, resulted in considerable expansion in the 1850s. Between 1839 and 1849, Sea Island along the coast of Georgia declined and the industry spread to northern Florida and south Georgia. Production by states in 1858 was as follows:

U.S. State	Bales, 500 lb
Florida	25,685
South Carolina	26,663
Georgia	10,008
Total	**62,356**

After the War Between the Sates, production varied from year to year but gradually built up from 19,015 bales in 1866 to 104,557 in 1896. From the end of that period to 1918, when the spread of the boll weevil extended over the Sea Island area, annual production ranged from 59,632 to 123,789 bales. Since the advent of this insect, little Sea Island has been grown in this country—5,125 bales in 1922, 15 bales in 1932, 4,491 bales in 1940, and 6 bales in 1948.

American Egyptian Cotton

The production of the Egyptian type of cotton, which is closely related to Sea Island, also has been a small and specialized industry in this country. The growth of the crop has been centered in a few of the irrigated valleys in the Southwest, mostly in Arizona. The growth of American-Egyptian is a comparatively modern industry, coming into production shortly before the Sea Island crop began to decline. The first

variety of Egyptian cotton bred for adaptation in the Southwest was introduced to growers in 1908, and in 1916 the estimated production was 375 bales. In 1918, the year boll weevil damage became severe in Sea Island in the Southeast, the production of American-Egyptian was 36,187 bales. The peak of production in the history of the growth of this type (92,561 bales) was reached in 1920. After that year, production declined to 4,310 bales in 1924 and arose again the next year to 20,053 bales. The annual average production for the period 1928–1932 was 21,000 bales and for the period 1938–1947 was 29,500 bales. There was another decline in production in 1948 and 1949, 3,465 and 3,889 bales, respectively. An upsurge of American-Egyptian production, however, occurred in 1950 due to government control and curtailment of Upland acreage that year.

Sea Island and American-Egyptian cottons have been very useful for certain special manufacture, but solely from the standpoint of volume of production American Upland always has been the significant type. The data pertaining to American cotton given below in Tables 3 and 4 include the production of two special types when they have been in production. The status of these types has been pointed out in order to indicate their relatively small part in total cotton production in this country.

Statistics of Rise in Production

It has been indicated already that commercial production of American cotton for export did not regularly begin until after the close of the Revolutionary War, and that Sea Island was first to be exported. However, according to Stine and Baker,[31] small and miscellaneous quantities of cotton grown in Georgia, the Carolinas and Virginia had been sold in New England, or shipped to foreign countries from time to time. In 1784, eight bags were received in England from the United States. Such exports probably were made up of collections of surpluses from many small producers of different types of cotton grown for home use. The first bag of Sea Island was exported in 1788. Along with the coastal development of Sea Island, primary types of Upland were beginning to be grown in the interior of the seaboard states. According to Phineas Miller, quoted by Stine and Baker,[31] the culture of green seed cotton had just commenced as a crop in the upper country in 1792. That year, two to three million pounds had been raised and picked, but for the want of a suitable gin only a small part of it was prepared for market. Levi Woodbury, as cited Stine and Baker,[31] estimated that the total production of both Sea Island and Upland cotton was the equivalent of about 2,000 bales in 1789 and about 4,000 bales in 1791. Most of the exported cotton was Sea Island until the saw gin came into use for Upland. However, due to the establishment of mill manufacture in New England in the early 1790s, there were more imports than exports of cotton in the first half of that decade. This excess of imports is shown in Table 3. During the War Between the States, 1861–1865, as noted in Table 3, an excess of imports over exports also occurred. More cotton was brought to Northern mills from abroad than was exported from the South on account of the Federal blockade of the Confederate ports.

Table 3 covers the period 1790–1865 and contains data of American cotton production, exports and imports in bales; percentage of consumption (retained production plus imports) in relation to total domestic production; and average price per pound of lint cotton for each of the years. Some additional data are included in Table 4, which covers the period 1866–1948. Records of national acreage and yield per acre apparently were not made before 1866. Table 4, therefore, includes this information in addition to the same type as shown in Table 3.Percent consumption in Table 4 was computed by writer. Consumption supply as shown by percentage values smoother out somewhat in actual practice by the amount of carry-over. The price in Table 3 is the export price, while it is either the New York or New Orleans price. The former is used for the period 1866–1928 and the latter for the rest of the years.

Table 3. American Cotton Production, Exports, Imports, Domestic Consumption, and Price Per Pound, 1790 to 1865 (Holmes[33]).

Year	Production (bales)	Exports (bales)	Imports (bales)	Consumption[a] (%)	Export Price (cents per lb)
1790	3,138	379	697	110.1	25.0
1791	4,184	277	1,112	120.0	29.0
1792	6,276	1,097	5,503	170.2	32.0
1793	10,460	3,565	5,127	114.9	33.0
1794	16,736	9,414	8,592	95.1	36.5
1795	16,736	12,213	8,737	79.2	36.5
1796	20,921	7,577	7,336	98.8	34.0
1797	23,013	18,720	7,761	52.4	39.0
1798	31,381	19,065	7,532	63.2	44.0
1799	41,841	35,580	8,870	36.2	28.0
1800	73,222	41,822	8,696	54.8	44.0
1801	100,418	47,768	170[b]	52.3	19.1
1802	115,063	75,424	1153[b]	33.4	19.3
1803	125,523	70,068	183	44.3	20.1
1804	135,983	76,780	456	43.9	24.6
1805	146,444	71,315	961	52.0	23.4
1806	167,364	127,889	1,485	24.5	22.3
1807	167,364	21,261	6,297	91.1	20.9
1808	156,904	101,981	1,601[b]	34.0	16.7
1809	171,548	186,523	560[b]	--	16.2
1810	177,824	124,116	431	30.4	15.6
1811	167,364	57,775	897	66.0	10.7
1812	156,904	38,220	3,133	77.6	12.2
1813	156,904	35,458	101	77.5	15.1
1814	146,444	165,997	266[b]	--	21.1
1815	209,205	163,864	44[b]	21.6	29.4
1816	259,414	171,299	2,048	34.8	26.4
1817	271,967	184,942	3,086	33.1	33.2
1818	261,506	175,994	4,454[b]	31.0	24.0
1819	349,372	255,720	4,571[b]	25.5	17.4
1820	334,728	249,787	427	25.5	16.1
1821	376,569	289,350	196[b]	23.1	16.6
1822	439,331	347,447	110	20.9	11.8
1823	387,029	284,739	932	26.7	15.4
1824	449,791	352,900	26	21.5	20.9
1825	533,473	409,071	79	23.3	12.2
1826	732,218	588,620	74	19.6	10.0
1827	564,854	421,181	597	25.5	10.7
1828	679,916	529,674	40[b]	22.1	10.0
1829	763,598	596,918	378	21.9	9.9
1830	732,218	553,960	22	24.3	9.1
1831	805,439	644,430	22[b]	20.0	9.8

Table 3. American Cotton Production, Exports, Imports, Domestic Consumption, and Price Per Pound, 1790 to 1865 (Holmes[33]), Continued.

Year	Production (bales)	Exports (bales)	Imports (bales)	Consumption[a] (%)	Export Price (cents per lb)
1832	815,900	649,397	69	20.4	11.1
1833	930,962	769,436	308	17.4	12.9
1834	962,343	774,718	1,574	19.7	16.8
1835	1,061,821	847,263	427	20.2	16.8
1836	1,129,016	888,423	510[b]	21.3	14.2
1837	1,428,384	1,191,905	355	16.6	10.3
1838	1,092,980	827,428	319	24.3	14.8
1839	1,653,722	1,487,882	297	10.0	8.6
1840	1,347,640	1,060,408	1,210	21.4	10.2
1841	1,398,282	1,169,434	107	16.4	8.1
1842	2,035,481	1,584,594	1,835	22.2	6.2
1843	1,750,060	1,327,267	517	24.2	8.1
1844	2,078,910	1,745,812	680[b]	16.0	5.9
1845	1,806,110	1,095,116	386	39.4	7.8
1846	1,603,763	1,054,440	122	34.3	10.1
1847	2,128,433	1,628,549	558	23.5	7.6
1848	2,615,031	2,053,204	22	21.5	6.5
1849	2,066,187	1,270,763	485	38.5	11.3
1850	2,136,083	1,854,474	330	13.2	12.1
1851	2,799,290	2,186,461	512	21.9	8.0
1852	3,130,338	2,223,141	1,423	29.0	9.8
1853	2,766,194	1,975,666	1,141	28.6	9.5
1854	2,708,082	2,016,849	4,425	25.7	8.7
1855	3,220,782	2,702,863	2,295	16.2	9.5
1856	2,873,680	2,096,565	1,678	27.1	12.6
1857	3,012,016	2,237,248	1,109	25.7	11.7
1858	3,758,273	2,772,937	893	26.2	11.6
1859	4,507,993	3,535,373	3,517	21.6	10.9
1860	3,841,416	615,032	1,569	84.0	11.1
1861	4,490,856	10,129	61,731	101.1	22.9
1862	1,596,653	22,770	67,695	102.8	42.6
1863	449,059	23,988	52,405	106.3	52.8
1864	299,372	17,789	68,798	117.0	38.1
1865	2,093,658	1,301,146	10,322	38.3	30.8

[a] Total domestic consumption in percentage obtained as follows: production minus exports, remainder plus imports, this total multiplied by 100, product divided by production to secure percentage.

[b] Excess of foreign exports over total imports.

Table 4. American Cotton Acreage, Acre Yield, Production, Exports, Imports, Consumption, and Price Per Pound, 1866 to 1948.[34]

Year	Acreage	Yield	Production	Exports	Imports	Consumption[a]	Domestic Price
	(1,000 acres)	(lb/ac)	(1,000 bales)	(1,000 bales)	(1,000 bales)	(%)	(cents per lb)
1866	7,599	129.0	1,750	1,323	2	24.5	31.59
1867	7,828	189.8	2,340	1,511	2	35.5	24.85
1868	6,799	192.2	2,380	1,288	6	46.1	29.01
1869	7,743	196.9	3,012	1,980	4	34.4	23.98
1870	8,885	198.9	3,800	2,894	3	23.9	16.95
1871	7,558	148.2	2,553	1,851	7	27.8	20.48
1872	8,483	188.7	3,920	2,437	11	38.1	18.15
1873	9,510	179.7	3,683	2,706	5	26.7	17.00
1874	11,764	147.5	3,941	2,523	5	36.1	15.00
1875	11,934	190.6	5,123	3,003	5	41.5	13.00
1876	11,677	167.8	4,438	2,869	6	35.5	11.73
1877	12,133	163.8	4,370	3,198	7	27.0	11.28
1878	12,344	191.2	5,244	3,265	6	37.8	10.83
1879	14,480	181.0	5,755	3,711	7	35.6	12.02
1880	15,951	184.5	6,343	4,409	9	30.6	11.34
1881	16,711	149.8	5,456	3,430	9	37.3	12.16
1882	16,277	185.7	6,957	4,582	9	34.3	10.63
1883	16,788	164.8	5,701	3,745	15	34.6	10.64
1884	17,440	153.8	5,682	3,740	10	34.4	10.54
1885	18,301	164.4	6,575	4,193	11	36.4	9.44
1886	18,455	169.5	6,446	4,274	9	33.8	10.25
1887	18,641	182.7	7,020	4,557	11	35.2	10.27
1888	19,059	180.4	6,941	4,720	17	32.2	10.71
1889	20,175	159.7	7,473	4,934	19	34.2	11.27
1890	19,512	187.0	8,674	5,859	45	33.0	9.48
1891	19,059	179.4	9,018	5,888	61	35.4	7.68
1892	15,911	209.2	6,664	4,456	90	34.5	8.45
1893	19,525	149.9	7,493	5,309	58	29.9	7.75
1894	23,688	195.3	9,476	7,010	104	27.1	6.38
1895	20,185	155.6	7,161	4,710	115	35.8	8.10
1896	23,273	184.9	8,533	6,172	119	29.1	7.71
1897	24,320	182.7	10,898	7,757	102	29.8	6.40
1898	24,967	220.6	11,189	7,662	105	32.5	6.00
1899	24,327	183.8	9,345	6,228	140	34.8	8.36
1900	24,933	194.4	10,123	6,800	109	33.9	9.38
1901	26,774	170.0	9,510	6,949	202	29.0	8.73
1902	27,175	187.3	10,631	7,084	151	34.8	9.96
1903	27,052	174.3	9,851	6,207	103	38.0	12.84
1904	31,215	205.9	13,438	8,908	129	34.7	9.09
1905	27,110	186.6	10,575	7,118	144	34.0	11.30
1906	31,374	202.5	13,274	8,943	227	34.3	11.24
1907	29,660	179.1	11,107	7,666	153	32.4	11.53

Table 4. American Cotton Acreage, Acre Yield, Production, Exports, Imports, Consumption, and Price Per Pound, 1866 to 1948,[34] Continued.

Year	Acreage	Yield	Production	Exports	Imports	Consumption[a]	Domestic Price
	(1,000 acres)	(lb/ac)	(1,000 bales)	(1,000 bales)	(1,000 bales)	(%)	(cents per lb)
1908	32,444	194.9	13,242	8,955	181	33.7	10.23
1909	30,938	154.3	10,005	6,353	170	38.2	14.66
1910	32,403	170.7	11,609	8,027	245	33.0	14.87
1911	36,045	207.7	15,693	11,116	233	30.6	10.85
1912	34,283	190.9	13,703	9,146	249	35.1	12.29
1913	37,089	182.0	14,156	6,508	273	34.8	13.21
1914	36,832	209.2	16,135	8,702	400	48.5	8.89
1915	31,412	170.3	11,192	6,113	458	49.5	11.98
1916	34,985	156.6	11,450	5,525	311	54.5	19.28
1917	33,841	159.7	11,302	4,402	231	63.1	29.68
1918	36,008	159.6	12,041	5,774	211	53.8	31.01
1919	33,566	161.5	11,421	6,707	732	47.7	38.29
1920	35,878	178.4	13,440	5,973	237	57.3	17.89
1921	30,509	124.5	7,954	6,348	380	25.0	18.92
1922	33,036	141.2	9,755	5,007	492	53.7	26.24
1923	37,123	130.6	10,140	5,815	306	45.7	31.11
1924	41,360	157.4	13,628	8,240	328	41.9	24.74
1925	46,053	167.2	16,104	8,267	340	50.8	20.53
1926	47,087	182.6	17,977	11,299	419	39.5	15.15
1927	40,138	154.5	12,955	7,859	354	42.1	20.42
1928	45,341	152.9	14,478	8,419	479	45.2	19.73
1929	43,232	164.2	14,825	7,035	396	55.2	16.16
1930	42,444	157.1	13,932	7,133	112	49.6	10.08
1931	38,704	211.5	17,097	9,193	138	47.0	6.20
1932	35,891	173.5	13,003	8,895	136	32.6	7.26
1933	29,383	212.7	13,047	7,964	156	40.2	10.92
1934	26,866	171.6	9,636	5,037	112	48.9	12.44
1935	27,509	185.1	10,638	6,267	162	42.6	11.65
1936	29,755	199.4	12,399	5,689	265	56.2	12.79
1937	33,623	269.9	18,946	5,976	166	69.3	8.79
1938	24,248	235.8	11,943	3,512	157	71.9	8.73
1939	23,805	237.9	11,817	6,501	176	46.5	10.03
1940	23,861	252.5	12,566	1,174	202	92.3	11.06
1941	22,236	231.9	10,744	1,162	279	91.8	18.17
1942	22,602	272.4	12,817	1,540	180	89.4	19.96
1943	21,610	254.0	11,427	1,199	145	90.8	20.44
1944	19,651	298.9	12,230	1,997	193	85.2	21.69
1945	17,083	253.3	9,015	3,733	348	62.4	25.82
1946	17,674	234.5	8,640	3,656	284	61.0	34.65
1947	21,380	266.0	11,860	2,025	301	85.5	34.41
1948	22,921	311.2	14,877	4,960	177	67.8	31.94

[a] Total domestic consumption in percentage computed by writer as: ((Production–Exports) + Imports)/Production) * 100. Consumption supply, as shown by percentage values, smoothed out somewhat by amount of carry-over.

[b] New York price 1866 to 1928, New Orleans price 1929 to 1948.

Endnotes

1. Lewton, Frederick L. The Cotton of the Hopi Indians: A New Species of Gossypium. Smithsonian Misc. Pub. Vol. 60, No. 6, 1912.
2. Hutchinson, J.B., R.A. Silow and S.G. Stephens. The Evolution of Gossypium. Oxford University Press, London, 1947.
3. Hammond, M.B. The Cotton Industry, Part 1. American Economic Association, The MacMillan Company, New York, 1897.
4. Crawford, M.D.C. The Heritage of Cotton. G.P. Putman's Sons, N.Y., 1924.
5. Hanby, R.B., History and General Statistics of Cotton in the Cotton Plant. U.S. Dept. Agr. Bul. 33, 1896.
6. Dabney, Chas. W. The Cotton Plant. Office of Experiment Stations, USDA Bul. 33, 1896.
7. Gabbard, L.P. and Rea, H.E. Cotton Production in Texas. Texas Agr. Expt. Sta. Circ. 39, 1926.
8. Duggar, J.F. Description and Classification of Varieties of American Upland Cotton. Ala. Agr. Expt. Stat. Bul. 140, 1907.
9. Tyler, Fredrick J. Varieties of American Upland Cotton, U.S. Dept. Agr. BPI Bul. 163, 1910.
10. Tracy, S.M. Cultivated Varieties of Cotton in The Cotton Plant. Office of Experiment Stations, U.S. Dept. Agr. Bul. 33, 1896.
11. Bennett, R.L. and Irby, G.B. Observations from Experiments on Varieties of Upland Cotton, Ark. Agr. Expt. Stat. Bul. 23, pp. 99-101, 1893.
12. Phillips, M.W. Remarks on the Cultivation of Cotton. Report, U.S. Patent Off. pp. 313-316. 1849.
13. Lyman, Joseph B. Cotton Planting. Report of the Commissioner of Agriculture for the Year 1866. Gov. Prtg. Office, Washington, D.C., 1867; pp. 193-211.
14. Webber, H.J. The Growing of Long Staple Upland Cotton. U.S. Dept. of Agr. Yearbook, 1903. pp. 121-136.
15. Christidis, Basil G. Cotton Varieties for Greece, Cotton Res. Inst. Sindos, Greece, 1932-48.
16. Harland, S.C. The Selection Experiment with Peruvian Tanguis Cotton, Institute of Cotton Genetics, Lima, Peru, Bul. 1, June, 1944.
17. Silow, R.A. The genetics of Species Development in the Old World Cottons, Jour. of Genetics, Vol. 46, No. 1, pp. 62-77, April, 1944.
18. Duggar, J.F. Results of Experiments on Cotton in Alabama. Ala. Agr. Expt. Stat. Bul. 107, 1899 p. 208.
19. Ware, J.O. Plant Breeding and the Cotton Industry, U.S. Department of Agriculture Yearbook, pages 657-744, 1936.
20. Neely, J.W. Personal letter, Stoneville Pedigreed Seed Company, Stoneville, Mississippi.
21. McKeever, H.G. Personal letter January 14, 1951, Corcoran, California. He was associated with the Lonestar cotton breeding work in Texas 1919–1922.
22. Humphrey, L.M. Personal letter, Scott, Ark., dated February 19, 1945.
23. Wilds, Geo. J. Commercial Cotton Breeding, a paper given to a meeting of Georgia Agronomists, Athens, GA, Jan. 23, 1947.
24. Cook, O.F. and C.B. Doyle, Acala Cotton a Superior Upland Variety from Southern Mexico. USDA Circular 2, 1927.
25. Collins, G.N. and C.B. Doyle. Notes on Southern Mexico. Nat. Geo. Mag. March 1922, illus.
26. Cook, O.F. Heredity and Cotton Breeding, U.S. Dept. Agr. B.P.I. Bul. 256. 1915.
27. Cook, O.F. Results of Cotton Experiments in 1911. U.S. Dept Agr. B.P.I. Bul. 745.
28. Cook, O.F. Distribution of Cotton Seed in 1917. U.S. Dept Agr. B.P.I. Bul. 1442, 1916.
29. Much of the information about Acala in California up to 1934 was supplied in a letter from H. G. McKeever, Tachi Farms, Corcoran, California, Sept. 16, 1946.
30. Several statements supplied by George J. Harrison, December 15, 1949, and on several previous dates.
31. Stine, O.C. and Baker, O.E. Atlas of American Agriculture; Part V, The Crops; Section A, Cotton; U.S. Dept. Agr.; Office of Farm Management, Dec. 15, 1948.
32. Johnson, W.H. Cotton and Its Production. Macmillan and Co., Ltd., London, 1926.
33. Holmes, G.K. Cotton Crop of the United States 1790–1911. U.S. Dept. Agr., Bureau of Statistics Circ. 32, 1912.
34. Yearbook of Agriculture 1930 and Agricultural Statistics 1950, U.S. Dept. Agr. Percentage consumption computed by writer. Consumption supply as shown by percentage values smoothed out somewhat in actual practice by amount of carry-over.

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