THE PECAN INDUSTRY IN OKLAHOMA

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PREFACE

The writer, a native of Oklahoma, has known something about the pecan industry of the state. Along with countless others he regarded the wild nut with little interest, and preferred to eat the much advertised and widely marketed "papershell" pecan. Noting the magnitude of the state's crop which led the nation in 1947, however, he found renewed interest in native pecan production, and embarked on this study.

Other than government releases, the story of nut crops usually is not well circulated. True, very few avocations or businesses could be of greater interest than information concerning nuts. Only one geographer, J. Russell Smith, has made a particular study of nuts and has become an authority by particular studies of nut crops in the United States. Others concerning themselves in the field principally are those in government position, writing usually in technical and practical vein.

Statistical figures on pecan production and native tree growth are extremely difficult to obtain and compute. The Bureau of Agricultural Economics, United States Department of Agriculture, lists pecans as the most inaccurately reported of Oklahoma crops.[1] Reports, therefore, are actually estimations, a condition responsible for the high degree of guesswork necessary for the establishment of quotations on pecan crop

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[1] K. D. Sloan, Agricultural Statistician, United States Department of Agriculture, Office of Agricultural Economics, Oklahoma City, Oklahoma, Personal Interview by the Writer, (January 26, 1949).

statistics. The chief source utilized to procure pecan figures is that from established growers and farms; under which conditions thousands of roadside trees go unreported. Pecans, for household purposes, are obtained from the backyard tree, their yields seldom appearing in production figures. Much of the crop which is purchased by "foreign buyers" goes unreported.[2] A study of the industry should recognize the necessary high degree of approximation in the establishment of yearly statistical figures.

The purpose in this thesis is to study the magnitude of the pecan industry in Oklahoma and its impact as an agricultural industry on the economy of the state. The geographic study necessitated an inquiry into the history and development of the industry; physical features of the producing areas of Oklahoma, pecan varieties, growing and harvesting, insects and diseases, marketing and uses, and a general comparison of the native pecan area to the cultural pecan area of the Southeast. An effort was made to emphasize the Oklahoma industry as one involving the native shelled pecan kernel of the Southwest as against that of the improved unshelled "papershell" nut of the Southeast.

Principal sources for the material of this thesis were from field studies made by the writer, interviews with people connected with pecan industry, government data and unpublished material from the proceedings of various pecan associations. The writer made numerous trips to Tulsa and observed the manufacturing processess there through the cooperation of Mr. Uel Richardson, President of the Oklahoma Pecan Shellers' Association. Visits

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[2]The term "foreign buyers" designates pecan buyers who represent pecan firms outside the state of Oklahoma.

to the pecan area of Okmulgee, Okemah, and elsewhere proved of great value in understanding the operation of native pecan groves.

Dr. Frank Cross, Head of the Department of Horticulture, Oklahoma Agricultural and Mechanical College, along with members of his department lent valuable criticism in the compilation of material. D. C. Mooring, Secretary of the Oklahoma Pecan Growers' Association placed, at the writer's disposal, an unlimited supply of information, both of a published and unpublished nature. Surprisingly, very little has been written concerning the pecan industry in Oklahoma; the greater amount of published information used in the study originated from the cultural pecan area of the southeastern states.

The writer must remain indebted to Dr. David C. Winslow, Assistant Professor of Georgraphy, under whose direction this study was made, for guidance and suggestions during its preparation; to Dr. Edward E. Kesc, Head of the Department of Geography, and Professor George S. Corfield for many valuable suggestions and ideas concerning the subject, to the writer's colleagues for timely aid, and to the library staff of Oklahoma Agricultural and Mechanical College for unstinted cooperation in procurement of information.

B. F. A.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

GEOGRAPHIC DISTRIBUTION OF THE PECAN

Oklahoma led the Nation in pecan production in 1947; in which year the harvest totaled 44 million pounds. This amount was forty per cent of the entire national crop. Although not generally regarded as crop agriculture, the pecan in 1947 ranked tenth in value among crops in the state.[1] Such significant production should warrant further study and it is timely to present the salient features of the industry from the geographic perspective.

The future of the pecan industry is of enough importance in Oklahoma as to warrant further study. Agricultural forces in the state appear to have harnessed this rich natural resource, and its future development appears assured. Commercially, too, nut trees and their crops are becoming ever-increasingly important on both a state and a national scale.

1. Geographic Distribution

The native habitat of the pecan includes all or part of the following states: Oklahoma, Texas, Arkansas, Louisiana, Missouri,

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[1] Office of the Agricultural Statistician, Bureau of Agricultural Economics, United States Department of Agriculture, Oklahoma City, Oklahoma, December 21, 1948.

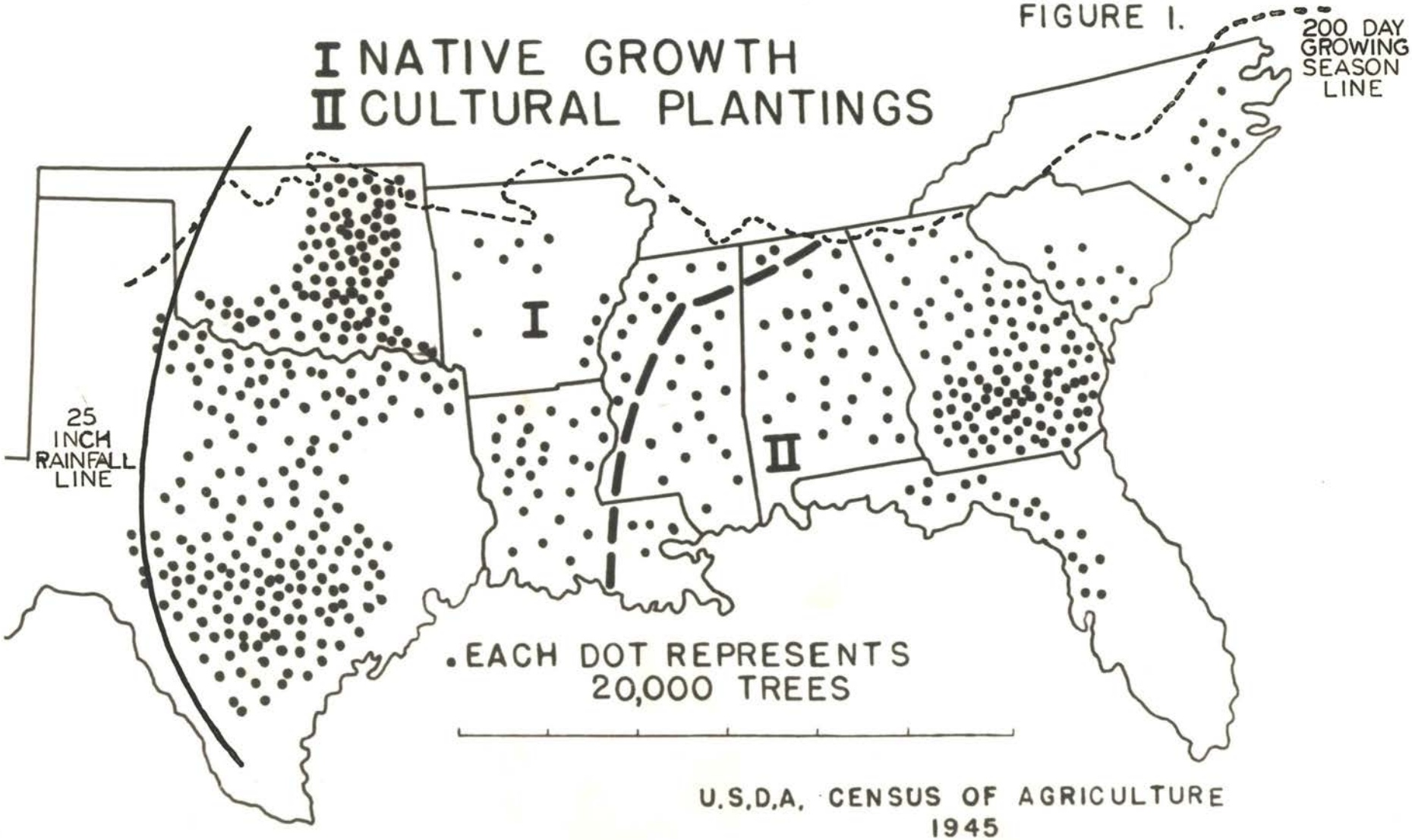
Kansas, Iowa, Indiana, Alabama, Tennessee, Indiana, Kentucky, and Mississippi. The pecan tree is at home along the Mississippi River and its tributaries, and along the valleys and overflow lands of smaller rivers and creeks of native pecan states. Greatest density of native pecan growth prevails in Oklahoma and Texas, except for occasional stands of heavily forested timber in other sections of the native pecan belt (Map, Figure 1). Indigenous pecan woods end abruptly in the west where heavier soils occur, while the eastern boundary blends with cultural pecan area of the Southeast. The larger and older native trees are found along the floodplains of streams, and the smaller and younger trees are on the uplands, possibly distributed there by birds and floodwaters. The native belt, of course, has many improved pecans that are worthy competitors of the highly acclaimed varieties of the southeastern states.

Geographically, the commercial pecan area lies in the southern portion of the United States, with more or less distinct boundaries. The commercial area, where there is most abundant pecan growth, is bounded on the north by the 200 day growing season line (Figure 1). Pecan timber finds the twenty-five inch rainfall a fairly definite western boundary (Figure 1). Clay sub-soil conditions on the west, too, are a limiting factor in native growth. The pecan tree is not considered productive at higher elevations throughout the area, for example; there are few trees in the Ozark region. Low temperatures appear to be the main limiting factor in mountainous sections.

Two different geographic divisions may be delineated within the

TREE DISTRIBUTION
OF THE
COMMERCIAL PECAN AREA

FIGURE I.



U.S.D.A. CENSUS OF AGRICULTURE
1945

area of commercial pecan production, they are: the section of native pecan growth in southwestern United States, and the section of cultural plantings in southeastern United States (Figure 1). Oklahoma, along with other states of the native pecan area of the southwestern protion, is not without improved varieties, but growers consider the native pecan of far greater importance. The southeast division, which has cultural plantings, depends entirely upon the improved "papershell" for its share in the industry.

The Southwest is regarded as the commercial section of the native pecan area. In this portion, Texas ordinarily has had the greater production because of her greater tree population. Oklahoma possesses a great density of tree growth, and her annual production shows a tendency to be increasing. Both Louisiana and Arkansas gather large nut crops each year, but growth is more scattered than in Texas and Oklahoma. All of the states of the commercial Southwest have acreages planted to improved varieties similar to the cultural pecan orchards of the Southeast.

The southeastern section of the United States with its commercial stands, has made the most progress in improved pecan culture. Geogia, Alabama, Mississippi, and Florida possess large acreages planted to pecans. Georgia easily dominates production in the Southeast, showing an annual yield of 23,668,000 pounds of pecans between 1935 and 1944.[2]

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[2]Agricultural Statistics, United States Department of Agriculture, Superintendent of Documents, Washington, D. C., (1947), p. 272.

The period, 1941 to 1946, brought the Georgian growers an annual return of $6,850,000.[3] Alabama is usually regarded as the second most important state of the cultural pecan region. Mississippi has large annual production in both native and improved varieties (Appendix B, and Figure 1). Northern Florida, particularly along the Gulf Coast, has large acreages planted to pecans. The Southwest is indebted to Florida for the development of many fine improved varieties used for propagation of native trees. North and South Carolina, as well, demonstrate advancement in pecan culture in recent years.

Scatterings of pecan trees dot the northeastern United States, however these have very little commercial importance. Although nut production is irregular in the North, the pecan tree finds particular value in landscape plantings. Certain hardy varieties are propagated, adapting themselves to the relatively short growing season.

There are no native pecan trees growing in Arizona, New Mexico, or the west coast states, but some progress is evident in introduced pecan culture. The only productive sections of any consequence, thus far, are the planted orchards in the Yuma Valley of Arizona and the Imperial Valley of California. These two locals offer ideal climatic conditions which consist of a combination of a long growing season and a very hot summer. Experimental plantings of pecans in the rich central valley of California have been disappointing, however future

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[3] Theodore L. Bissell and George H. Piror, Growing Pecans in Georgia, Bulletin Number 501, Agricultural Extension Service of the University System of Georgia, Athens, Georgia, (April, 1947), p. 3.

possibilities appear good.[4] New Mexico orchardists find some success with improved name varieties, but thus far quality has been inferior. Oregon and Washington possess scattered orchards, but the trees seldom bear nuts.[5]

The native pecan area continues into Mexico and adds to that country's food supply. Only the northern and central sections of the country have physical conditions favorable to pecan culture. The tree, endemic to the region, antedates the modern historic period in Mexico. Native people, from early time, have made the pecan harvest a part of their activities. The largest known pecan tree in the world, located in the state of Chihuahua, has a trunk with a circumference of 41 feet and a height of 160 feet.[6] Early utilization of the pecan by the inhabitants is reflected in the location of dwellings near groves.[7] Nut meats are put to use in candy making, and tree bark is processed for medicinal purposes.[8-9] Wild Mexican pecans yield abundantly, although

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[4]D. J. Whitney, "Pecan Culture in Central California," California Cultivator and Livestock and Dairy Journal, Volume LXXVII, Number 16, (October 17, 1931), p. 347.

[5]Knight Pearcy, "Pecans for the Northwest," Proceedings of the Oregon State Horticultural Society, (December 10-11), 1934, pp. 125-126.

[6]"The Largest Pecan Tree in the World," American Pecan Journal, Volume I, Number IX, (June, 1941), p. 18.

[7]Emilia Locke, "La Pacana en Mexico," Year 1929, Number 12, (December, 1934), pp. 388-390.

[8]Ibid., p. 388.

[9]J. W. Park, "The Pecan--Gift of the Americas," Agriculture In the Americas, Office of Foreign Agricultural Relations, United States Department of Agriculture, (August, 1946), p. 131.

they produce irregularly and crops are usually of inferior quality. Improved pecans are being introduced; the best selected varieties of these originated in West Texas.[10] The United States imports some unshelled nuts from Mexico, a total of 352,022 pounds arriving in 1945.[11]

Certain pecan varieties are grown in the souther portion of Ontario Province, Canada. Appreciable production, despite irregularities of yield, supplies nuts for the household uses.[12] Good possibilities pervail for the propagation of selected varieties that will be able to cope with Canada's short growing season.

The outlook for pecan culture in Australia appears promising. Trees were introduced into New South Wales in 1890, where government agricultural experiment stations fostered their propagation. Both the states of Queensland and Victoria are experimenting with planted trees and hopes of future production appears assured. In recent years pecan trees have been planted in England, France, Madagascar, Palestine, South America, and Cuba. Trees introduced in these lands largely originated from the nursery of E. A. Risien, famous nut culturist of San Saba, Texas. The Union of South Africa reports profitable results from trees grown in the southern section of the Dominion.

Pecans are being planted in many geographic sections of the United States, but it is most likely that they will reach the high

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[10]Locke, op. cit., p. 389.

[11]Foreign Commerce and Navigation of the United States, Bureau of the Census, United States Department of Commerce, Superintendent of Documents, Washington, D. C., (1945), p. 81.

[12]James A. Neilson, "Some Further Notes on Nut Culture in Canada," Report of the Ninth Annual Meeting of the Northern Nut Growers' Association, (September 26-27-28, 1923), p. 25.

state of development reached in the commercial areas of the southeast and southwest. It is not economically sound to plant the trees in many localities because of the precedence of other higher yielding crops. Nowhere will the pecan be more economically grown and cultivated than on the otherwise poor, floodplain areas of the native pecan zone.

2. The Oklahoma Pecan Area

The Pecan Area of Oklahoma, which lies within the southwestern portion of the commercial region, includes a belted strip stretching diagonally from the northeast corner of the state to Texas, and throughout the valley of the Red River, (See Figure 2). The map (Figure 2), based upon density of tree growth and production, shows how the Pecan Area may be divided into four zones: Principal Pecan Zone, region with greatest commercial production; Lesser Pecan Zone, with lighter yields; Western Semi-Pecan Zone, with still smaller harvests; and the Eastern Semi-Pecan Zone, with its spotty collections. The Western Semi-Pecan Zone breaks-off sharply into a region of occasional pecan trees. The Eastern Semi-Pecan Zone, is in reality, a transitional belt; in which native pecan growth extends outside the state into Arkansas.

There are forty-seven counties in Oklahoma which are considered to be within the commercial Pecan Area, i. e., as they yield an appreciable amount of pecans. All of the leading producing counties are found in the Principal Pecan Zone (Figure 2). In 1945, Garvin County situated in its southern part reported production in excess of 800,000 pounds, while other counties in the Zone having harvests of more than 400,000 pounds include Lincoln, Carter, and Bryan. In the same year more than 200,000 pounds of nuts also were gathered in the principal belt from the

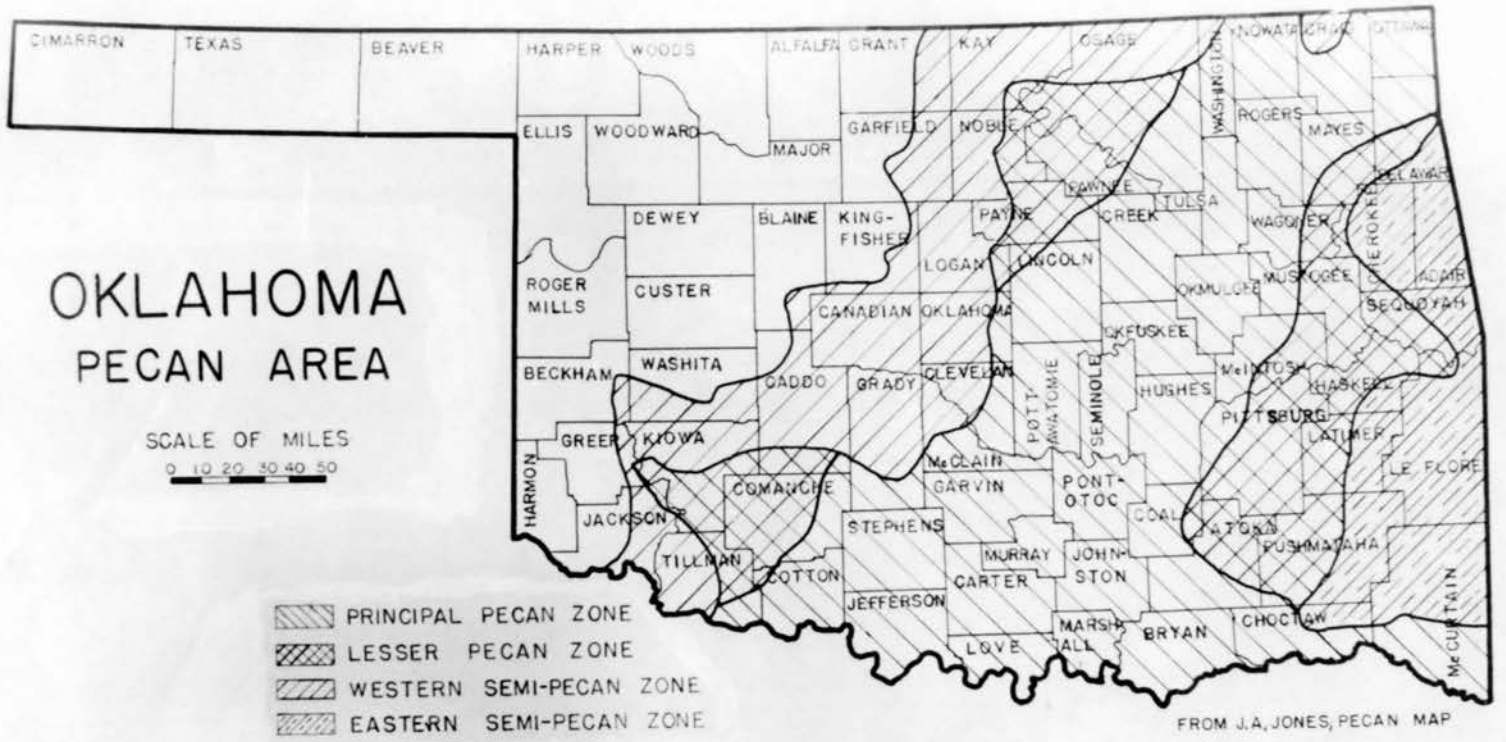
OKLAHOMA
PECAN AREA
SCALE OF MILES
0 10 20 30 40 50
PRINCIPAL PECAN ZONE
LESSER PECAN ZONE
WESTERN SEMI-PECAN ZONE
EASTERN SEMI-PECAN ZONE
CIMARRON
TEXAS
BEAVER
HARPER
WOODS
ALFALFA
GRANT
KAY
OSAGE
NOWATA
CRAIG
OTTAWA
ELLIS
WOODWARD
MAJOR
GARFIELD
NOBLE
WASHINGTON
ROGERS
MAYES
DELAWARE
DEWEY
BLAINE
KING-FISHER
PAWNEE
PAYNE
CREEK
TULSA
WAGONER
CHEROKEE
ROGER MILLS
CUSTER
LOGAN
LINCOLN
OKMULGEE
MUSKOGEE
ADAIR
SEQUOYAH
CANADIAN
OKLAHOMA
OKFUSKEE
BECKHAM
WASHITA
CADDO
GRADY
CLEVELAND
POTT-AWATOMIE
SEMINOLE
McINTOSH
HUGHES
HASKELL
PITTSBURG
LATIMER
LE FLORE
GREER
KIOWA
McCLAIN
GARVIN
PONTOTOC
COAL
ATOKA
PUSHMATAHA
HARMON
JACKSON
COMANCHE
STEPHENS
TILLMAN
COTTON
MURRAY
CARTER
JOHN-STON
JEFFERSON
MARSHALL
BRYAN
CHOCTAW
McCURTAIN
LOVE
FROM J.A. JONES, PECAN MAP

FIGURE 2.

following counties: Marshall, Johnson, Jefferson, Coal, Pontotoc, Atoka, Okmulgee, Seminole, Okfuskee, Creek, Wagoner, Tulsa, and Pottawatomie. Large annual production obtained from these leading counties demonstrates their great density of pecan tree growth.[13]

From its production, the Principal Pecan Zone, it appears, possesses ideal physical factors necessary for large annual yields. It has from 34 to 42 inches of annual rainfall, well distributed in the late spring and early summer (See Figure 7, Chapter IV).[14] A frost-free period of from 200 to 230 days allows the trees in this region ample time to produce a nut crop (See Figure 8, Chapter IV). Highly fertile floodplain soils are of the finest quality in this zone, leading to well-filled nuts and to abundant crops.

The pecan tree has found optimum conditions in the creek and river floodplain areas throughout the commercial pecan area of Oklahoma. The rich alluvial soils of the Verdigris, Deep Fork, Washita, and Neosho Rivers along with their tributaries, have heavily wooded pecan groves. The sandy soils of the Red, Canadian, Arkansas, and Cimarron Rivers are somewhat less satisfactory to pecan growth, but nevertheless the land adjacent to them possesses substantial acreages of pecan timber.

Oklahoma's commercial Pecan Area, particulary its Principal Zone with its great number of trees, presents optimum conditions for successful production of high annual yields. In 1945 the reported number of trees in the state amounted to 1,526,172. Actually this total was far

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[13] Office of the Agricultural Statistician, op. cit., January 26, 1949.

[14] Climate and Man, Yearbook of Agriculture, United States Department of Agriculture, Superintendent of Documents, Washington, D. C., (1941), p. 1074.

short of the true number of trees.[15] Hence, the great number of trees is the basis of the present industry and of its possible expansion in Oklahoma.

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[15]Office of the Agricultural Statistician, op. cit., December 21, 1948.

CHAPTER II

HISTORY AND DEVELOPMENT OF THE PECAN INDUSTRY

1. Origin of the Pecan

The pecan (Hicoria pecan), is a tree indigenous to south central United States and northern Mexico. It is a member of the hickory family, being the most important branch of that group. The word pecan is derived from the Indian term "powcohicoria;" early settlers following the idea later used the expression "Hicoria Pecan," hence the word pecan.

The pecan, by paleontological evidence is traced from Cretaceous times to the present. Fossil remains of both pecan trees and their nuts have been recovered in Texas, embedded in Lower Cretaceous formation.[1] Existence of Juglandaceae, family plant of the pecan, lends further credence to the belief that pecan nut trees lived during this ancient period.[2] It is believed the Gulf of Mexico, during prehistoric time, extended farther to the north; upon recession of its waters, the tree spread throughout the present commercial producing area of the southwest.[3]

Early Spanish explorers carried news of the delicious nut back to the Old World. In 1520, Cabeza de Vaca in his report to the King of Spain, mentioned a soft-shelled nut he had found while exploring the area

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[1]J. H. Burkett, The Pecan in Texas, Bulletin Number 77, Texas Department of Agriculture, Austin, Texas, (June-July, 1924), p. 12.

[2]H. P. Stuckey and Edwin J. Kyle, Pecan Growing, New York: The Macmillan Company, (1925), p. 13.

[3]Ibid., p. 13.

which is now Texas.[4] De Soto, discoverer of the Mississippi River, observed the Indians using pecans in seasoning hominy and corn cakes, for thickening vension broth, and as emergency rations.[5]

During the Eighteenth Century the pecan was distributed from its native habitat to other parts of North America. Following the French and Indian Wars, fur traders brought the nut to the Atlantic seaboard from the Mississippi Valley.[6] Many large old trees in eastern United States mark its early distribution by Indians and pioneer travelers. George Washington was introduced to the pecan—often carrying some of the nuts, which he found palatable, in his pocket for casual eating. Later, he planted a few trees which are still standing at Mount Vernon.[7] In the later part of the Eighteenth Century studies were underway to classify the pecan nut.

2. Growth and Development of the Pecan Industry in the United States

The Nineteenth Century witnessed the transformation of the wild growing pecan nut into an orchard product of great commercial value. Seedlings were carried from the native pecan belt to the southeastern states, particularly to that portion bordering on the Gulf of Mexico in Mississippi and Florida. The early orchards of the Southeast were planted by enterprising men, who were basically nut culturists. Orchard development

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[4]J. S. Woodard, L. D. Roberg, and F. J. Willmann, Pecan Growing in Texas, Bulletin Number 95, Texas Department of Agriculture, Austin, Texas, September, (1930), p. 9.

[5]Stuckey and Kyle, op. cit., p. 12.

[6]Ibid., p. 15

[7]J. Russell Smith, Tree Crops, New York: Harcourt, Brace and Company, (1929), p. 198.

progressed slowly, but by the year 1900 large acreages existed throughout the South. Previous to the development of orchards, the pecan market was based entirely on ungraded native nuts, principally the Texas pecan. The development of orchards, coupled with variety improvement, systematized the pecan and created a specialized industry. At the same time, pecan improvement was progressing in the states of native growth in the West.

The first pecan variety selection was made by a Louisiana negro slave named Antoine in the winter of 1847. This initial step involved the grafting of sixteen trees, some of which are still standing. The efforts of the faithful servant, Antoine, remained virtually unknown, and it was many years before such asexual propagation became a general practice.[8]

Following the Civil War in the late 1860's, newly awakened interest arose in pecan development. The nut had received much notoriety by travelers who carried it throughout both the North and the South. Another milestone in pecan history took place in 1877, when Emil Bourgeois of St. James Parrish, Louisiana, revived the idea of tree propagation. The commercial sale of nursery stock rapidly enlarged at this time. At the close of the Nineteenth Century pecan culture reached as far west as California and as far east as Maryland.

While improvements were going forward in the states to the east, E. S. Risien of San Saba, Texas, was pioneering pecan culture in the west. As an English emigrant, he arrived in Texas in 1872, and soon realized the potentiality of native pecans. Later, Mr. Risien established a nursery at San Saba from which he delivered tree cions (grafting wood) and seeds to

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[8]Stuckey and Kyle, op. cit., p. 18.

other sections of the United States. Foreign countries also soon learned to know his high recommended San Saba varieties. Much credit is due E. E. Risien for making the inhabitants of the native pecan region conscious of their heritage.

Texas had written a significant chapter in pecan history, her seedlings easily dominated the pecan production and marketing scene before the advent of cultivated improved nut of the southeastern states. Early Texas quickly learned the value of these abundant nuts, soon marketing them in the East. By 1880 San Antonio was the pecan center of the country, marketing approximately 1,250,000 pounds in that year.[9] In 1899 the United States produced 3,206,850 pounds of pecans; of the total, Texas harvested 1,810,670 pounds or 56 per cent.[10] This early harvest and profit from ungraded native pecans caused growers to develop orchards and to improve native groves. The Lone Star state experienced its greatest production in recent years during 1935 when an estimated 50,000,000 pounds of nuts were gathered,[11] (See Appendix A).

The period 1900-1920 was one of accelerated growth in the pecan industry. Planted acreages came into production in Georgia, Florida, and Mississippi. The first carload shipment of graded name varieties left Georgia for eastern markets in 1917.[12] Experimentation in pecan culture during these two decades brought about studies in pollination,

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[9] Ibid., p. 19.

[10] H. Harold Hume, The Pecan and its Culture, Published by H. Harold Hume, Raleigh, North Carolina, (1912), p. 7.

[11] Tree Nuts, Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., (October, 1947), p. 17.

[12] Yearbook of Agriculture, United States Department of Agriculture, Superintendent of Documents, Washington, D. C., (1937), p. 845.

propagation, and varietal selection. The advancement of pecan culture necessitated the investigation of disease and insect control, and soil betterment, including fertilization. Greatest progress in this era occurred in the cultural area, while the native belt continued to reap the usual annual harvest of wild nuts.

Figure 3, a cultural pecan orchard, shows typical plantings that are common throughout the Southeast. Oklahoma owns many cultural orchards similar to those to the region to the east of the Mississippi.

After the turn of the twentieth century, the southeastern states saw the pecan orchard become a pawn in the hands of the speculator. Individuals uninterested in pecan culture itself planted orchards, that were sold at highly inflated prices. Sales of pecan lands ranged upwards from $385 per acre for newly planted pecan crops.[13] Speculative activity prevailed for about twenty years in the cultural pecan region. Ultimately, extensive plantings experienced at this time proved of great value to the industry, (Figure 3).

The state of Georgia experienced the most phenomenal growth among the states within the cultural pecan region of the Southeast. Georgia's tree population was 30,000 in 1900; 109,900 in 1920, and 2,368,000 in 1925.[14] The state increased its production of the newly developed "papershell" pecan from 354,046 in 1909 to 2,544,377 in 1919.[15] National leadership in the years 1936, 1939, 1942, and 1945 proves Georgia's

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[13] H. P. Stuckey, "Reminiscent Sketch of the Pecan Industry," The Pecan Journal, Volume 1, Number 6, (March, 1941), p. 10.

[14] F. W. Gist, "Development of the Pecan Industry," Proceedings of the National Pecan Growers' Association, (September 25-26-27, 1928), p. 91.

[15] Stuckey and Kyle, op. cit., p. 10.

An Improved Pecan Orchard of the Southwest

Figure 3.

(Courtesy of Professor George S. Corfield)

dependability as a pecan producer (Appendix B).[16] From 1935 to 1944 the state harvested a yearly average of 23,638,000 pounds.[17] Greatest concentration of plantings is located today in the locality of Albany in the southwestern corner of the state. The eastern cities provide the chief market for the Georgia "papershell" pecan, buying the bulk around Christmas time.

Cooperatives in the South grew out of the numerous marketing problems incurred from increased production of pecans. Growers endeavored to pattern their cooperatives after the well-organized California groups. The National Pecan Growers' Exchange, inaugurated at Albany, Georgia, in 1920, represents a very successful cooperative organization. The government-subsidized National Pecan Marketing Association, which was established in 1930, met with only mild interest. Early cooperative efforts were received with little enthusiasm in the native pecan belt. Essential aims of cooperative exchanges, at present, are to grade pecans, to advertise the industry's products and to sell the nuts to the best available consumers.

Relative stability and continued growth characterized the pecan industry between 1920 and 1930. Except for poor yields in 1920 and 1922, production continued to rise (Figure 4). In 1933 the average annual yield was 13,733,000 pounds or 46.2 per cent greater than the year 1919.[18] The southeastern states maintained the greatest increases, while the native region of the west, surprisingly, showed a consistent gain. Prices during

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[16] Tree Nuts, op. cit., p. 17.

[17] Agriculture Statistics, United States Department of Agriculture, Superintendent of Documents, Washington, D. C., 1935-1944.

[18] H. L. Crane, The Pecan Outlook, Bureau of Plant Industry, United States Department of Agriculture, Washington, D. C., (1935), p. 1.

the period showed a marked upturn, advancing to twenty-five cents per pound in 1925.[19]

The early depression years witnessed a slight letdown in the industry. Many large orchards in the Southeast did not receive sufficient care and a few went into decadence. Indifferent management, often in the form of absentee ownership, resulted in bad practices of orcharding. From 1931 to 1933, Florida's production declined more than one-third, while Georgia's production decreased more than one-half. Curtailment of demand and lowered price of nuts were both factors responsible for the declining harvest in all sections of the country. Even in 1932, improved varieties sold for as low as 9.9 cents per pound.[21]

While the southeastern pecans were suffering a light period of recession, the native pecans west of the Mississippi showed a comparatively large increase.[22] Native pecan production showed an annual average gain of 27,000,000 pounds between 1930 and 1940; Texas and Oklahoma combining in 1935 to produce 78,880,000 pounds.[23] Growers and shellers there were rapidly becoming conscious of the profitable possibilities of native nut production. In recent years production figures of the native section reached new heights, despite occasional bad years (Figure 4).

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[19]E. C. Butterfield, "Status of the Pecan Industry and the 1925 Crop in Texas," Proceedings of the National Pecan Growers' Association, (October 13-14-15, 1925), p. 16.

[20]Crane, op. cit., p. 3.

[21]Fruit and Nut Prices, Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., (October, 1947), p. 51.

[22]Crane, op. cit., p. 3.

[23]Tree Nuts, op. cit., p. 12.

The five year period, 1941-1945 produced a yearly average of 123,318,000 pounds which amounted to an increase of 296 per cent over a previous similar length period, 1921-1925. During the same periods an increase of 666 per cent was shown for improved variety pecans.[24] Leadership in the industry in recent years has been shared by Oklahoma, Georgia, and Texas. Appendices A and B show how the state of Georgia has maintained a stable increase in its production while Oklahoma and Texas have experienced wide fluctuations both with very good years and very bad years.

The story of the growth and the development of the pecan industry can be told in two phases, they are: the development of the cultural region of the Southeast, utilizing the "papershell" improved varieties, and the development of the native belt in the Southwest, utilizing the native nut to be machine processed into kernels. When the value of the native pecan was realized, it was carried from the native region to the Southeast, where seedlings were planted, propagated, and extensively developed into an orchard crop similar to cultural fruits, (Figure 3). Growers in the native zone in recent years took a lesson from the growers of the cultural region and developed the native groves on a commercial scale.

Development of an expanded production in the native tree zone is coupled with the invention and improvement of nut processing machinery. The invention of shelling equipment opened a new avenue of consumption in the market for shelled kernels. The first commercial shelling of

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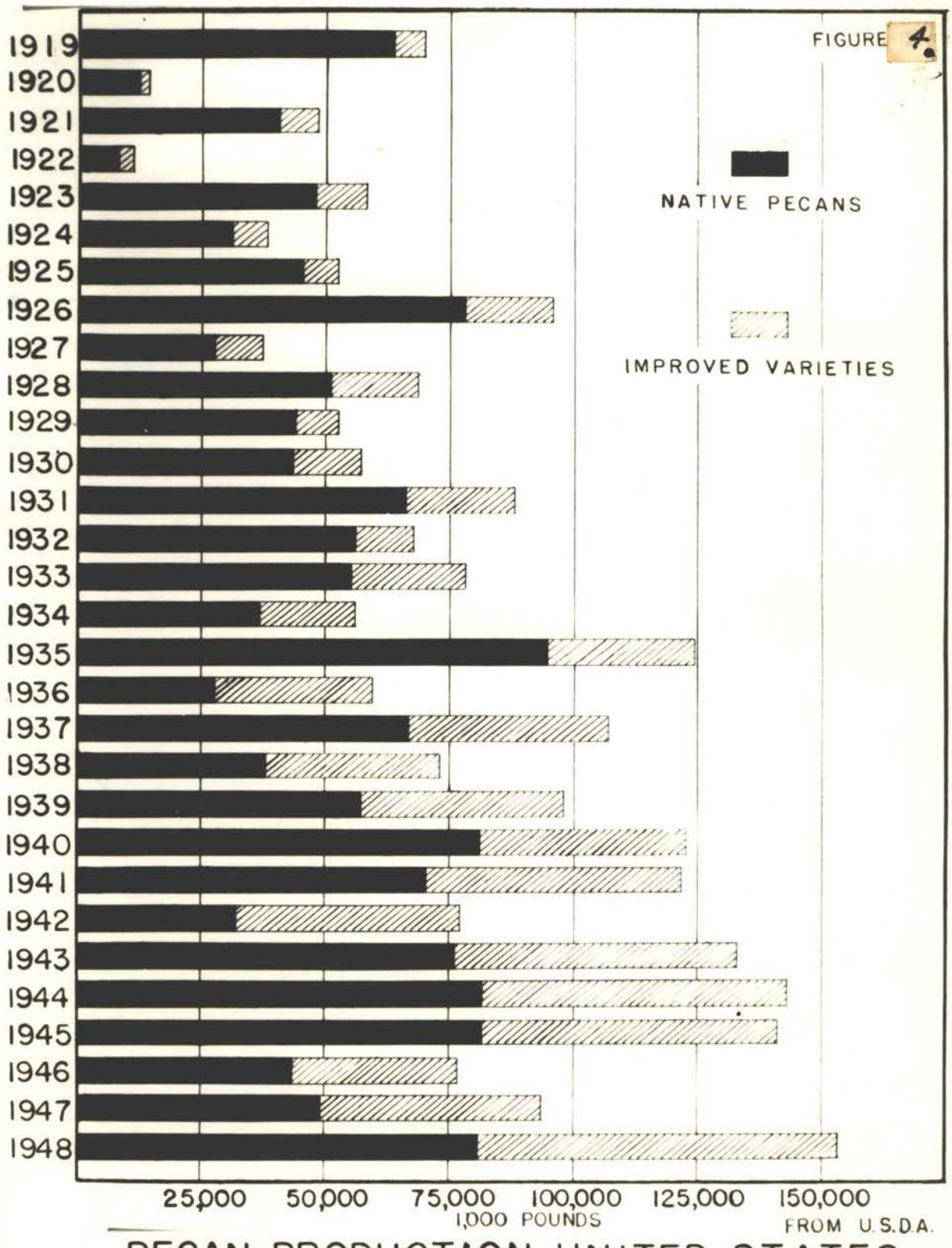
[24] H. L. Crane, "Past, Present and Future Research on Pecan Production Problems," Proceedings of the Twenty-Seventh Annual Meeting of the Texas Pecan Growers' Association, (July 13-14, 1948), p. 68.



PECAN PRODUCTION-UNITED STATES

pecans took place in St. Louis, Missouri, in 1884.[25] In 1910 machinery began to show an economic influence upon the pecan market, and in 1930 made its greatest impact on the market price in the form of a higher and more stable price for native nuts. Thus, the pecan industry of Oklahoma depends almost entirely on shelling machinery to maintain its status in the nut market.

3. Pecan and Nut Association

Numerous organizations exist today to foster, coordinate, and disseminate reliable information concerning many phases of the pecan industry. Association membership is comprised mainly of nut culturists, nurserymen, growers, shellers, and government horticulturists. Oklahoma has three very active groups, namely: Oklahoma Pecan Growers' Association, Oklahoma Pecan Shellers' Association, and Northeast Oklahoma Pecan Growers' Association.

The Oklahoma Pecan Growers' Association was organized January 13, 1926, and incorporated January 5, 1927.[26] Since its first meeting in November, 1927, annual meetings and pecan shows have been held except for two years of World War II. A report of the proceedings provides a valuable source of information for all who are interested in pecan culture. Membership in the organization now totals about 200.

Other organizations that are highly significant and are promoting

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[25] Stuckey and Kyle, op. cit., p. 138.

[26] D. C. Mooring, "Report of the Secretary-Treasurer," Proceedings of the Oklahoma Pecan Growers' Association, (December 5-6, 1944), p. 1.

pecan culture both on a state, a sectional, and a national scale are: Texas Pecan Growers' Association, Northern Nut Growers' Association, Louisiana Pecan Growers' Association, and West Texas Pecan Growers' Association. The Texas Pecan Growers' Association, a very old and well established group, has done much to promote the industry throughout the native pecan zone. The members of this group were instrumental in securing official designation of the pecan as the state tree of Texas.

4. Government Assistance in Pecan Culture

Both state and local public agencies are active in the development of the pecan industry. The United States Department of Agriculture became interested in nut culture in 1885. Appropriations were received from the United States Congress in 1901 to carry on nut experimentations. In that year the authorization prescribed the establishment of the Bureau of Plant Industry, United States Department of Agriculture, an agency which is still active.[27]

The United States Department of Agriculture operates three field stations for pecan improvement, all located in productive areas. They are situated at Brownwood, Texas; Robson, Louisiana, and Albany, Georgia. These field laboratories carry on experimental work in all phases of pecan culture. They are concerned with the study of pecan varieties,

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[27] "Address by Dr. L. C. Corbett, "United States Department of Agriculture, Report of the Fourteenth Annual Meeting of the Northern Nut Growers' Association, Washington, D. C., (September 26-27-28, 1923), p. 2.

insects and disease control, soil improvement, and increased methods of production.

The Agricultural Experiment Stations and United States Extension Service are actively engaged in pecan development; both work in close harmony with state colleges, pecan associations, and individual growers. The experiment stations are engaged in carrying out investigations concerning many phases of pecan culture. At this writing, the Agricultural Experiment Station, Oklahoma Agricultural and Mechanical College plans for the establishment of a pecan field stations, to be located in Lincoln County, one of the state's most productive regions. The Extension Service, with its agents, acts as a clearing house for pecan literature, and as a source of technical and scientific information.

CHAPTER III

VARIETIES AND THEIR IMPORTANCE

Variety selection is important to the industry in the same way that it is important to any other agricultural industries. Through such selection can be determined those qualifications necessary for a good variety, they are: adaptability to climate, soil, length of the growing season; yielding ability; purity of strain; and resistence of harmful insects and diseases. It is also of prime importance to produce such varieties that can best satisfy the wants of a quality conscious market.

A pecan variety comprises a classification used to designate those nuts having similar character. Any native nut with peculiar characteristics might be considered a separate variety, however only those standard groups that have undergone cultural development until they yield true to form are generally considered varieties. The classification of pecans into varieties is still in its early stages, nevertheless the trend is toward groupings similar to those used for well-established fruit crops.

Pecan nuts differ in size and shape. The consuming public categorically speaks of the pecan as either native or "papershell." The consumer also may easily detect a difference in flavor or taste between the two. However, both native and improved varieties differ, in a true sense, from each other by size and shape of leaf, color and markings of the bark, height of the tree, texture and color of the wood, color and size of the

nut and even shape of the buds.[1] In the final analysis, nevertheless, the nut itself determines the variety.

Factors that are responsible for creating differentiation among varieties include: amount and distribution of rainfall, number of growing days, and type of soil. In some cases, particular varieties may grow in an area, but will not bear nuts. Pecans, influenced by physical factors, may be broadly classified as western, eastern, and northern varieties.

Native and improved varieties of pecans are classed and tested by various means. Tables I and II show how Oklahoma pecans may be tested. In testing the cracking pressure of nuts, the degree of permeability and hardness of the shell can be determined. The kernel percentage may be checked to arrive at the amount of meat in comparison to shell waste. The size of nuts can be measured by the number of pecans that can be contained in a one-pound measure.

1. Native Varieties

Native pecan varieties originate from wild trees. They are unimproved by man, other than casual care given to the ground cover and the thinning of the grove. Native pecans are, in reality, unclassified and unnamed varieties. Only those that possess sufficient qualities to warrant development are given names to distinguish them.

Figure 5 A-B illustrates that usually the native kind is smaller and is less uniform than improved varieties; such characteristics may not,

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[1] O. S. Gray, "Origin of Some Pecan Varieties," Farm and Ranch, (Newspaper Clipping--Date and Volume Unknown), p. 5.

however, be considered detrimental, as the native is desired for its high quality of flavor and great percentage of kernel. Great variability is noted upon testing and classification samples of native pecans.

The Horticulture Department, Oklahoma A. & M. College, Stillwater, Oklahoma, has classified native nuts from counties in northeastern Oklahoma.[2] Table I shows how native nuts may possess a great variability, both in number of nuts per pound and in amount of kernel shelling in per cent.

TABLE I

Shelling Percentage and Number of Nuts Per Pound of Seedling Pecans from Counties in Northeastern Oklahoma

COUNTIES	NUMBER OF NUTS PER POUND	KERNEL SHELLING PER CENT
Washington	108	49.71
Rogers	90	56.12
Tulsa	99	55.77
Muskogee	81	48.98
Kay	79	40.82
Payne	121	43.09
Creek	83	52.91
Lincoln	93	60.06
Okfuskee	109	50.24
Okmulgee	79	58.61
Mayes	88	50.48
Nowata	132	48.05
Wagoner	85	44.40
McIntosh	72	54.80
Osage	130	56.53
Noble	80	45.81

[2]The Pecan Shellers of Tulsa, Oklahoma, currently are sponsoring a contest (1946-1951), in an effort to secure native pecans worthy of development. During the early months of 1949, 149 different samples were received for testing. Native samples listed in Table I represent samples from counties of northeastern Oklahoma.

2. Improved Name Varieties

Certain of the improved varieties are preferred by pecan growers, while the consuming public is hardly cognizant of these separate categories. There are a number of varieties that stand in high esteem within certain circles, while others are only slightly less popular. Varietal selection may be largely determined by the desires of the individual grower; nursery advertisements may be an important factor in making this selection. In such choice, susceptibility to insects and diseases must always be considered. The sheller requires a particular size of pecan to fit his processing operation; the name variety for his use is often too large.

Improved name varieties are likewise tested to determine their quality and characteristics. Table II shows the resultant tests made on

TABLE II

Cracking Pressure, Kernel Percentage, and Number of Nuts Per Pound of Name Varieties[3-4]

VARIETY	CRACKING PRESSURE, POUNDS PER SQUARE INCH	PER CENT OF KERNEL	NUMBER OF NUTS PER POUND
Western Schley	50.68	54.71	61
Nuggett	44.55	57.76	89
Success	127.79	56.29	42
Stuart	92.05	47.13	44
Schley	41.15	56.43	62

[3]Herman Henrichs, "Results of Pecan Cracking Tests on Some of the 1939 Exhibits," Proceedings of the Oklahoma Pecan Growers' Association, (December 4-5, 1940), pp. 12-17.

[4]Frank B. Cross, "Pecan Varieties," Proceedings of the Oklahoma Pecan Growers' Association, (December 4-5, 1945), p. 25.

five of Oklahoma's more prominent varieties. In Table II the cracking pressure shows the greatest difference, denoting the degree of hardness of shell. The per cent of kernel shown is high for the average nut. The number of nuts per pound, as shown in the table, is of small quantity, except for the Nuggett, a small nut; this fact is characteristic of the improved variety nuts, ordinarily a much large nut.

Oklahoma pecan growing conditions are favorable to a long list of improved name varieties, among which are those which follow:

Stuart: Indigenous to Mississippi, the Stuart has become Oklahoma's most popular variety. The illustration (Figure 5-B) shows the nut to be uniform in size. Although quality of the kernel is only average, it ranks above average in shelling percentage and easily separates from the shell. The tree is well rounded and uniform, but cannot withstand strong winds. Stuart trees are late in coming into production, but annual average production is high.[5]

Success: The Success, another native of Mississippi, usually ranks next to the Stuart among more popular Oklahoma improved varieties. The illustration (Figure 5-A) pictures the Success nut as above average size and uniform. The kernels are only average, but they separate fairly easily from the shell. Often the nuts do not fill well. Another disadvantage is the weakness of the tree. Growers find it late in coming into bearing after propagation.[6]

Burkett: Late maturity restricts the Burkett to the southern part of the state, however it has many desirable characteristics, among them being: high quality kernel, effective kernel extraction, and satisfactory tree structure. Figure 5-A pictures the Burkett as more round than other varieties.

Schley: This variety, originally of Mississippi, finds popularity among many Oklahoma growers. The Schley, illustrated in Figure 5-B, has good market appeal because of its above-average size. The quality of the kernel is superior. Other varieties grown locally dominate over the Schley because it does not thrive well in some areas.

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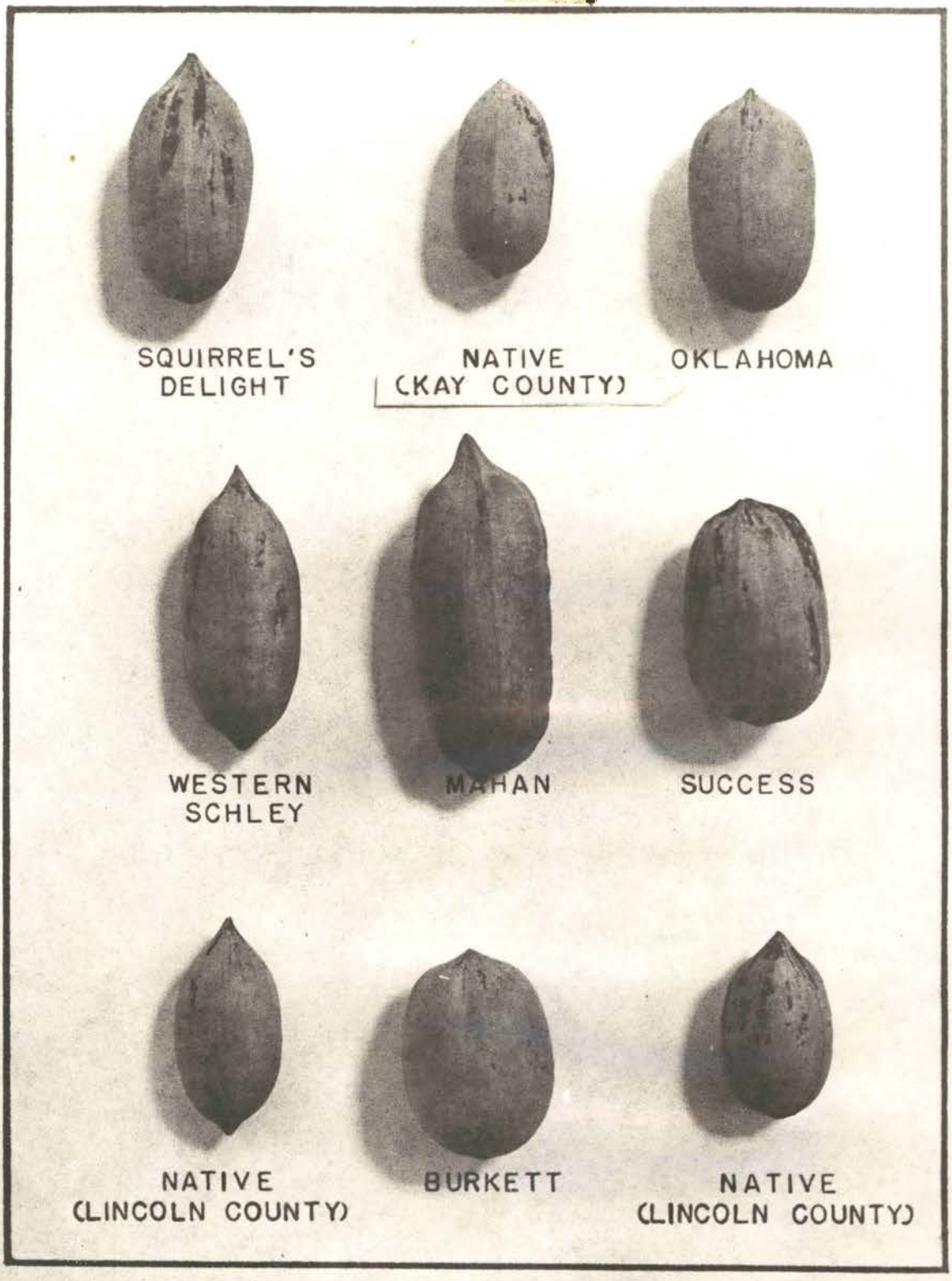
[5] Ibid., p. 22.

[6] Ibid., p. 22.

FIGURE 5-A.



IMPROVED AND NATIVE PECANS GROWN IN OKLAHOMA

FIGURE 5-B.

STUART

SAN SABA IMPROVED

MOORE

NATIVE (MAYES COUNTY)

SCHLEY

NATIVE (MAYES COUNTY)

NUGGET

NATIVE (MAYES COUNTY)

MONEYMAKER

IMPROVED AND NATIVE PECANS GROWN IN OKLAHOMA

Moore: This variety was developed in western Florida. It is gaining prominance in Oklahoma because of high steady production. The illustration (Figure 5-B) represents the Moore as being slightly smaller than other name varieties. This nut has the outstanding quality of being a steady annual producer.[7]

Western Schley: This variety is a quality nut, and is successful in all sections of Oklahoma. The nut is elongated and presents a well-rounded appearance (Figure 5-A). Outstanding qualities of Western Schley are: easy kernel extraction, effective shelling, and strong tree structure. One disadvantage of this nut is susceptibility to scab.[8]

Moneymaker: The Moneymaker, endemic in Louisiana, has been broadcast widely and has found optimum growing conditions in Oklahoma. The illustration (Figure 5-B) pictures the nut as more round than other varieties. The tree is a heavy annual producer.[9]

Nuggett: The Nuggett, another original Texas variety, has gained some popularity among Oklahoma growers. The nut is slightly smaller than other varieties (Figure 5-B). Ranking ahead of all other varieties in its cracking and shelling qualities, the Nuggett usually extracts a perfect half kernel. Light annual yields and unsatisfactory dropping habits are disadvantages.[10]

San Saba Improved: Oklahoma is a little too far north for this variety, although many trees are found in the state. This highly improved Texas variety is very thin shelled and stands in high favor in the "papershell" pecan market. Figure 5-B pictures the San Saba as a large nut, uniform in size. The tree is a good producer, but has a tendency to bear in alternate years.[11]

Mahan: From Mississippi, the Mahan is liked by some growers, but is considered below the top ranking improved varieties. The nut is decidedly larger than other varieties, but does not fill well (Figure 5-A). It receives attention from the consumer because of its size. Abundance of foliage makes the tree popular for landscaping purposes.

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[7] Ibid., p. 23.

[8] Ibid., p. 22.

[9] Ibid., p. 23.

[10] John Kemper, "Pecan Varieties for Denison, Texas, Area," Proceedings of the Oklahoma Pecan Growers' Association, (December 6-7, 1939), p. 24.

[11] J. F. Rosborough, C. L. Smith, and L. D. Romberg, The Pecan in Texas, Texas A. and M. College Cooperating with United States Department of Agriculture, Extension Service, College Station, Texas, (1945), pp. 64-65.

Squirrel's Delight: This variety, introduced from Texas, is well distributed throughout the state. In recent years, it became particularly susceptible to scab diseases, and growers have not planted the variety. Qualities making it a favorite with some growers are good quality nut, early bearing, and high quality crops.[12]

Oklahoma: The Oklahoma is endemic to the state. Upon discovery in Carter County in 1911, the nut was developed and named. Late maturity and a long growing season restrict the Oklahoma to the southern part of the state. Figure 5-A illustrates the Oklahoma as a nut of uniformity and good size, however the kernel content is only fair. This variety does not receive a great deal of attention from Oklahoma growers.[13]

Williamson: Another Oklahoma discovery, the Williamson is no longer propagated by the state's growers. It was introduced to the public in 1918, originating in Johnson County. General lack of interest in the nut has stemmed from its inability to fill properly.

Name varieties form a basis for standardization and high yields within the pecan industry. They are symbol of peak development in pecan culture. It is the goal of the Oklahoma industry to limit the number of these name varieties and to advertise them so that they may become well-known to the buying public.

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[12] Cross, op. cit., p. 23.

[13] A. G. Hirschi, Nurseryman and Member of the Northern Nut Growers' Association, Oklahoma City, Oklahoma, Personal Interview by the Writer, January 24, 1949.

CHAPTER IV

GROWING AND HARVESTING IN OKLAHOMA

Pecan production in Oklahoma is based upon grove thinning and developments to harness the state's vast native pecan timber. Unsystematic gathering is peculiarly common in nut trees, and accounts for a large portion of the state's production. Surveys show that only five per cent of native pecan timber is effectively developed.[1] At this time, growers are clearing pecan lands, in this way hoping to increase production. Native pecan areas bid for a chance to produce nut crops despite heavy density of stands and excessive underbrush. Relative importance of pecan growing is difficult to measure as an agricultural industry because of its infancy and the varied methods used in its growing and harvesting, but present trends evince its greater significance in the future within the state.

Culture of pecans in Oklahoma differs somewhat from that of Georgia and other states of the Southeast. Those states founded their industry on a cultured pecan orchard, while Oklahoma utilizes the indigenous native grove, (Figure 6). Well established and mature southeastern orchards allow routine care, which results in consistent production, (See Figure 3,

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[1] H. S. Price, Jr. "Acre Value of an Undeveloped Native Pecan Grove," Proceedings of the Oklahoma Pecan Growers' Association, (December 9-10, 1946), p. 20.

Chapter II). The orchards of Georgia, Alabama, and Florida maintain better orcharding practices that include such measures as systematic spraying, scheduled cultivation, and yearly pruning. Oklahoma endeavors to follow Southeastern methods of orcharding with her native groves.

Oklahoma possesses a number of improved pecan orchards that are highly successful, however the state's industry does not look to these for its future development, but relies on the native groves. The state's improved orchards, nevertheless, are important for supplying local demand for "papershell" pecans and for supplying grafting wood for the propagation of native trees. The improved orchards likewise tend to set a pattern which so-called groves hope to follow. Oklahoma's improved pecan orchards are not unlike those of the Southeast, illustrated in Figure 3, Chapter II.

Oklahoma's oil and gas interests have holdings which include large acreages of potential nut producing lands, generally unsuited for other purposes. Most of these oil properties continue to remain unproductive because owners lack interest in selling, and leaseholders fail to provide the necessary capital to clear wooded areas. However, a few enlightened enterprisers entered the pecan business after discovering their land holdings would yield a profit.

Initial cost of grove development in most sections presents a formidable obstacle. Although unworked pecan land can be purchased as low as $8.00 to $10.00 per acre, the total cost of clearing may amount to $60.00 per acre. There is a large outlay for machinery which may exceed $6,000.00 and together with labor costs these constitute a sizeable

A Native Pecan Grove of Oklahoma

Figure 6.

(Courtesy of Extension Service, Oklahoma A. and M. College)

expenditure during development. Growers must be well financed to withstand mounting costs while awaiting remunerative yields.

Pecan growing is handicapped by lack of machinery for care and harvesting, therefore the grower must rely to a great extent on hand labor. Some ingenious growers devise workable machinery for thinning and harvesting. The industry awaits the development of more effective machines to better consummate grove development, care, and harvesting.

Characteristics of the Pecan Tree and Pecan Nut

Belonging to the hickory family, the pecan tree often exceeds 100 feet in height, and in some instances some trees approach 170 feet. Older trees possess heavy foliage arrangement and make excellent shade trees. Many native trees, because they were stunted due to crowding, are difficult to classify as to age. Crowded conditions cause taller trees to be devoid of lower limbs, thereby sometimes creating grotesque structures and uncontrolled growth, (See Figure 6). Oklahoma pecan trees grow considerably larger and are more productive when properly thinned and treated. Much shorter and more uniform trees result from improved orchard pecan trees.

The pecan nut develops after the tree has reached maturity, (See Table III). An immature tree does not develop nuts due to the lack of nutritive elements; all of which are entirely pointed toward the tree's vegetative growth. Upon maturation, the tree stores carbohydrates and other foodstuffs, which are available for nut production. In order to form nuts, the tree must develop a balanced relationship between its

nitrogen and carbohydrate content.

Proper nut filling embodies a high degree of fat, carbohydrates, water, and numerous other undetermined constituents. The degree to which nuts are filled, or how well the kernels develop, rests on a number of inter-related factors: (1) size of crop in relation to foliage, or ratio of number of leaves per nut; (2) average size of nuts; (3) condition of leaves; (4) second or later seasonal growth of trees; (5) size of preceding crop and how well nuts were filled; (6) disease and insect injury to the nuts, trees or foliage; (7) weather conditions; (8) effect of cross-pollination in increasing embryo size.

Pecan trees show a tendency toward inconsistancy in bearing habits. Trees may bear nuts early or late in a season, or in alternate years. Some varieties come into bearing early in life and produce abundant crops, but give unsteady yields in later years. The pecan culturist works in constant pursuance of the ideal tree which will produce sustained yields of good quality nuts.

Profitable pecan growing requires the keeping of yearly records of tree yields. This is particularly important in newly developed groves and in young orchards, so as to determine which are the better trees for future development. Stuckey and Kyle have recorded particular varieties and their yields over a period of years in Table III (Page 39).

Nut yields vary greatly per tree. Oklahoma has many old trees that produce three hundred pounds annually; a few of these tend to show a diminishing harvest, however old trees often serve to sustain a growers' production. Production figures from the original varieties prove

TABLE III

Average Yield in Pounds of Nuts for Selected Trees[3]

VARIETY	SIXTH YEAR	SEVENTH YEAR	EIGHTH YEAR	NINTH YEAR	TENTH YEAR	ELEVENTH YEAR	TWELFTH YEAR	THIRTEENTH YEAR
Moneymaker	7.92	11.32	27.02	5.85	33.92	15.45	19.25	52.00
San Saba	5.52	11.07	7.47	5.95	17.95	14.00	-	47.00
Stewart	.40	4.70	7.95	6.95	3.40	5.50	-	10.50
Success	3.00	x	x	x	x	x	x	x
Schley /1	6.00	x	x	x	x	x	x	x
Moore /2	2.50	x	x	x	x	x	x	x

- Years in which there was no production
x Records not kept in these years.
1 Produced one pound in both fourth and fifth year after planting.
2. Produced two pounds in the fourth year and no poundage in the fifth year after planting.

interesting: San Saba, 100 years old, yielded 480 pounds of nuts in one year and an average of 215 pounds during 28 years; Halbert, 110 years old, yielded 400 pounds in one year and 200 pounds annually for 10 years. These heavier yielding trees have a tendency to grow in groups; the original Hollis variety and two others bore 870,995, and 1,060 pounds in 1919.[4] An Oklahoma grower produced 17,500 pounds of pecans from ten acres of older native tree growth.[5]

Individual tree production measures the returns of grove and orchard. Likewise profit or loss acrues on the returns of an individual

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[3]H. P. Stuckey and Edwin J. Kyle, Pecan Growing, New York: The Macmillan Company, (1925), p. 132.

[4]Ibid., pp. 130-137.

[5]E. E. Mount, grower, located on the Deep Fork River, Okmulgee, Oklahoma, records annual yields in better producing sections of his grove.

tree. A newly planted one may not bear nuts until the eighth or tenth year, and may not bring substantial profit to the owner until the twentieth year. Propagated trees, by the top-worked method, bear nuts in the second or third year, thereby shortening the period between initial investment and profit.

1. Adaptation to Climatic Factors

Being a deciduous tree, the pecan grows in a wide range of temperate climates, however trees yielding appreciable amounts of nuts confine themselves to regimes possessing the long growing season, a hot summer, and a cool to cold winter. Climate, in the long run, is a paramount factor affecting the success or failure of annual nut production.

Pecan growth appears suited to climatic regions of the South and Southwest. Optimum conditions for pecan growth are found in three transitional climatic zones of Oklahoma, namely: (1) humid sub-tropical, (2) middle latitude steppe, and (3) humid continental (warm sub-type).[6]

Precipitation.--Pecans ordinarily demand about forty inches of annual rainfall. However, proper conservation of available moisture is more important than an abundant supply. Likewise, a favorable seasonal distribution of existing rainfall should prevail; i. e., a greater amount of moisture is required during filling of the nut and

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[6]Thomas A. Blair, Climatology, New York: Prentice-Hall, Inc., (1942), p. 149.

a smaller amount during yearly growth development. Slightly less rainfall may be needed in well-drained, over-flow regions.

In Oklahoma a decreasing amount of precipitation, coupled with inadequate soil structure, results in sparse pecan growth toward the western part of the state. The map (Figure 7) shows the low annual rainfall of the northwest part of the state; in which the climatic regimes with less than thirty inches rainfall practically devoid of growth. The area of 42 to 34 inch rainfall regimes constitutes the most productive Oklahoma pecan zone (Figure 7).

Excessive moisture may prove a detriment to successful pecan yields. Heavily water-logged soil with a steadily rising water table may cause irreparable damage and result in unhealthy trees. Super-abundance of precipitation in spring and summer often results in disease and poorly filled nuts; both of which conditions may cause crop failures. When such over-abundance of rainfall is anticipated, growers should make adequate drainage provisions to avoid consequential damage to trees.

Drought years with their resultant scarcity of precipitation are a constant hazard to pecans; the extreme dryness of 1936, was partly responsible for that year's crop failure. In that year, for illustration, Lincoln County, ordinarily a heavy producing area, with an average of 34 inches of rainfall, received only 18.60 inches, scarcely enough to grow pecans.[7] Spring and early summer droughts, such as prevailed in

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[7] Climatic Summary of the United States, Climatological Data, Section 42-Oklahoma, Volume XLV, Number 13, United States Department of Agriculture, Weather Bureau, Wasington, D. C., (1936), p. 58.

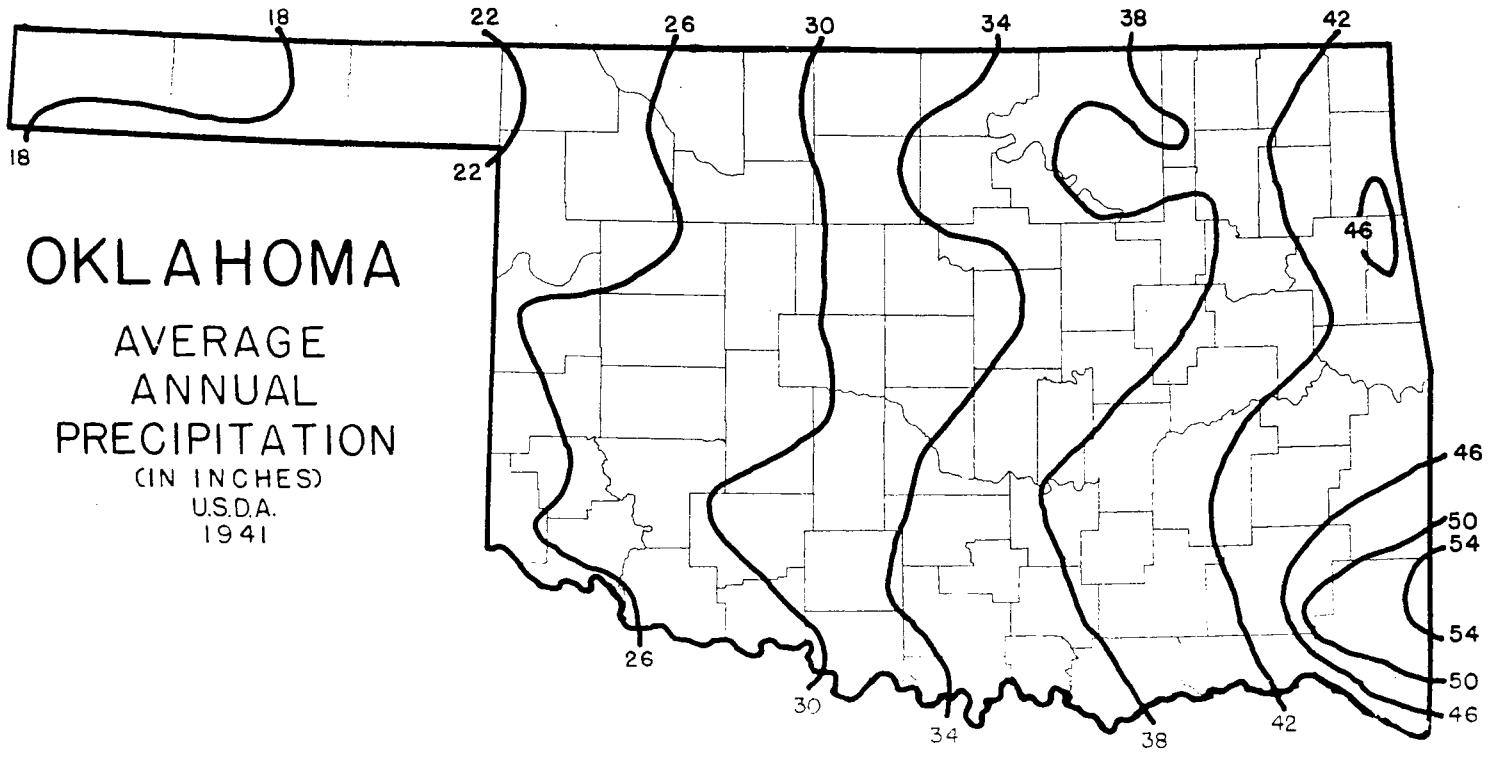
OKLAHOMA
AVERAGE
ANNUAL
PRECIPITATION
(IN INCHES)
U.S.D.A.
1941
18
22
26
30
34
38
42
46
50
54

FIGURE 7.

that year, prove detrimental because leaf and shoot development at that time is most active and depends upon feeder roots to supply necessary energy. Dry period in autumn, if not of long duration, are not considered dangerous and may even be considered beneficial because carbohydrates manufactured by the leaves go into nut filling during these later months; whereas in wetter periods, materials are often expended on tree growth.[8]

Temperature Requirements.--The pecan, a deciduous tree of a semi-hardy type, does not adhere strictly to particular temperature regimes, however successful nut production is not always present in many of the climatic zones where some pecan growth exists. A long hot growing season is necessary to develop and mature nuts. Oklahoma's long hot summer, with temperatures that may be 100 degrees Fahrenheit or better from June to September, adequately furnishes hot weather requirements needed for pecan development.[9]

Trees vary widely in the amount of winter cold required to break their rest period and in the amount of extreme winter temperatures they will endure. Severe cold is sometimes injurious to the tree; this fact being particularly true of young immature growth. Some varieties are more susceptible to cold conditions than others that have adapted themselves to such climates.

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[8] C. L. Smith, "Some Factors Affecting Annual Production of Pecan Trees," Proceedings of the Oklahoma Pecan Growers' Association, (December 9-10, 1947), pp. 35-37.

[9] Climate and Man, Yearbook of Agriculture, United States Department of Agriculture, Superintendent of Documents, Washington, D. C., (1941), p. 1074.

Many believe that rapid and wide fluctuations of temperature are the true cause of winter injury rather than extremely cold temperatures.[10] Unusual cold, during the winters of 1905, 1918, and 1930, injured trees and brought about decreased yields.[11]

Low temperatures, in the form of late spring frosts, cause frequent damage to pecan trees in certain sections; particulary to those areas of southern Oklahoma and northern Texas where the varieties are less hardy. Early maturing varieties are more often subject to frost injury than those that start their growth later; the resultant damage to many of these particular varieties is discernable when the nuts fall in early June. Frost often causes the husks to stick to nuts, thereby creating an additional harvesting problem.

Growing Season.--Pecan trees yield best in areas having more than 200 frost-free days. Major producing areas of the Southeast take advantage of 225 to 250 days in producing record nut crops. Trees grow well in the North, but the short growing season renders inferior and sparse yields. California's climate provides a sufficiently long growing season, but the wide diurnial range in temperature curtails pecan production. Trees in lower latitudes do not bear well because insufficient cold in winter does not meet the chilling requirements necessary for deciduous nut trees.[12] The hot dry climates of Oklahoma

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[10] Smith, op. cit., p. 137.

[11] Office of Agricultural Extension, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma.

[12] Crane, op. cit., p. 32.

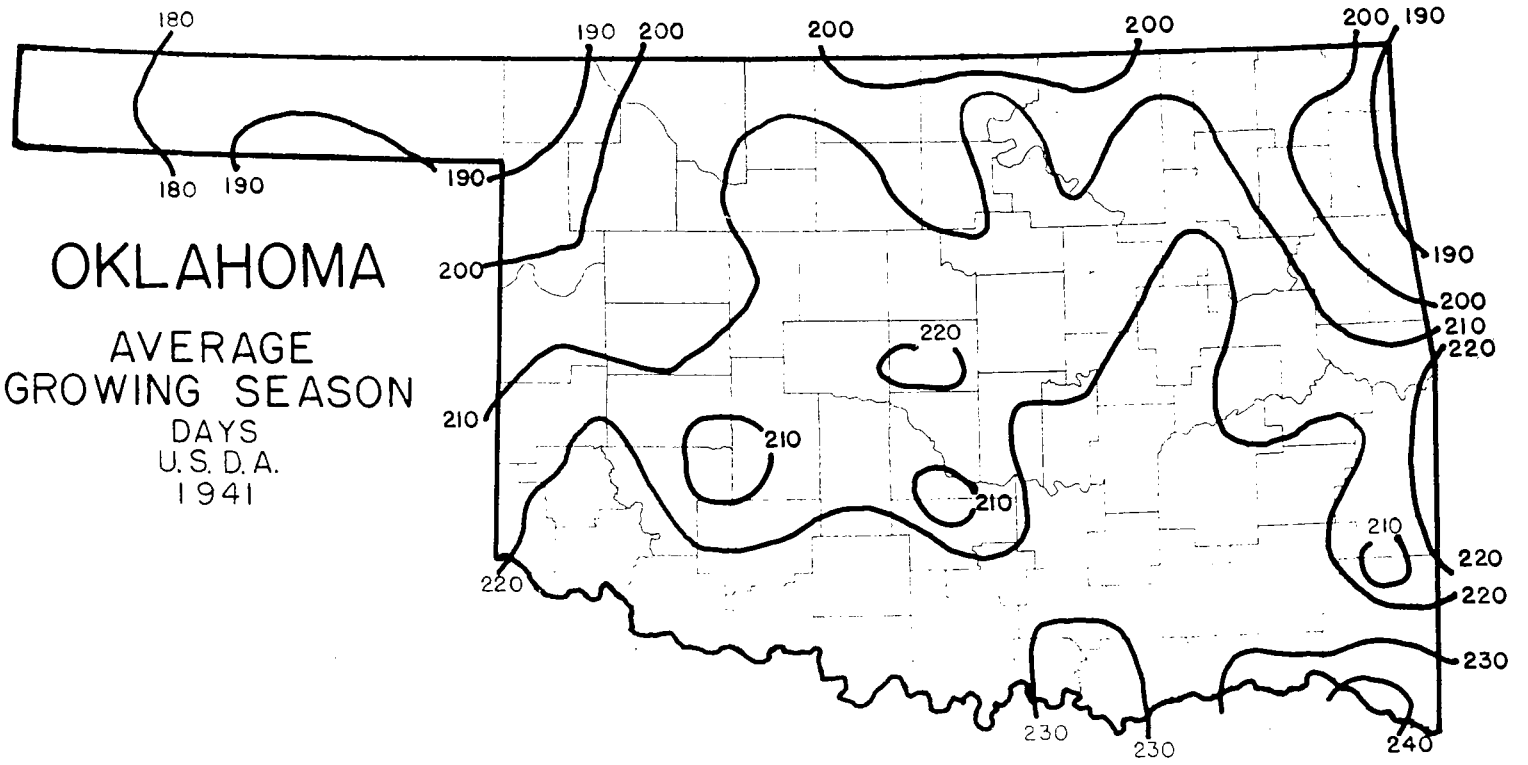
OKLAHOMA
AVERAGE
GROWING SEASON
DAYS
U.S.D.A.
1941
180
180
190
190
190
200
200
200
200
190
190
200
210
220
210
210
210
220
220
220
230
230
230
240

FIGURE 8.

and Texas, with their long growing seasons, prove conducive to tree growth and high yields of pecans.

Two sections of Oklahoma having long growing seasons present optimum conditions for high pecan productions, they are: the northeastern part of the state, with 200 to 215 frost free days, which harvest the greatest production, and the southern Red River Valley region, which has 210 to 230 growing days, (See Figure 8). Counties in the northwestern section of Oklahoma provide only 188 to 206 growing days; an amount insufficient to satisfy pecan culture.[13]

Particular pecan varieties are very responsive to the length of the growing season. The northern part of the Oklahoma pecan belt is often considered the transition zone of northern and southern varieties. Therefore, a few northern varieties find the extreme northern part of the state with its shorter growing season agreeable to productive yields, while some Gulf Coast varieties, accustomed to long growing seasons, are successfully propagated in the southern part of the state. However, conditions in Oklahoma do not favor all varieties that are introduced from elsewhere.

2. Soil Adaptation

Soil ranks next to climate as the factor most important to

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[13]Fred LeCrone, "Pecan Variety Preferences," Proceedings of the Oklahoma Pecan Growers' Association, (November 25-26, 1941), p. 27.

pecan growth. The ideal soil for pecans combines a fertile loam as top-soil with a good clay mixture as sub-soil; the latter designed for proper tree anchorage of the extensive root system and the former for nourishment of feeder roots. Sandy soils of acid reaction or heavy soils of alkaline reaction, along with all gradations between these types, are agreeable for successful growth, depending upon rainfall and other climatic factors.[14] Regardless of the soil type, for prosperous tree growth it is necessary that there be good drainage, sufficient depth, and enough fertility. Even in an area of satisfactory soil types, favorable pecan growing may be handicapped by nutritional deficiencies, poor drainage and aeration conditions, low yielding varieties, and insect and disease susceptibility of the trees. Of greatest significance is the top three or four feet of soil, which supplys necessary plant food.

Most of the native pecan growth is on alluvial soils of flood-plain areas along stremas. Alluvial materials provide rich soils to sustain growth. The lowlands are periodically enriched by the over-flows which add to the fertility of the soil. Two requirements necessary on bottom lands are good drainage and sub-stratum penetration of waters; both of these are needed to avoid damage to the root systems of trees.

Upland soils are agreeable to cultural pecan growth, but they must be carefully selected; the most suitable ones being those close

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[14] D. C. Mooring, "Starting and Caring for a Pecan Grove in Oklahoma," Proceedings of the Twenty-Seventh Annual Meeting of the Texas Pecan Growers' Association, (July 13-14, 1948), p. 49.

to bottom lands of rivers and small streams. Oklahoma upland areas are not adverse to pecans, but competing crops may take precedence. Upland soils are frequently deficient in nitrogen and organic matter, or in some cases in available phosphate, potash, calcium, and magnesium; all of these constituents being vital to proper nut development. Soils also should be fertile and deep enough to hold a large supply of moisture. About one and one-half to three feet of sandy soil underlain by a porous clay sub-soil provides the most favorable upland soil.

Pecan growth has been observed on thirty-one different upland soil series and twenty-four different valley series. According to Marbut's classification, the best soil groups producing pecans in Oklahoma are Miller, Osage, Verdigris, and Waverly. The Miller series, in particular, support dense growth. Of outstanding importance to pecan culture are the Verdigris loams and the Osage silty clays of northeastern Oklahoma.[15]

3. Grove and Orchard Development

Oklahoma's production consists of two types of pecan growing, they are: native grove development and improved variety orcharding. Native groves are responsible for well over ninety per cent of the state's annual pecan crop, although improved orchards must not be completely disregarded. Hence the study must emphasize the importance of native

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[15] J. J. Skinner, E. D. Fowler, and A. O. Alben, Pecan Soils of the Gulf and Southeastern States and Maintenance of Their Fertility, Circular Number 492, United States Department of Agriculture, Washington, D. C., (November, 1938), p. 2.

grove thinning, which is the clearing of superfluous tree growth and other brush from pecan lands. Professor Fred LeCrone, Horticulture Department, Oklahoma Agricultural and Mechanical College, lists six steps involved in grove development, they are: (1) Removal of foreign timber, (2) Filling in vacant areas, (3) Setting up soil management system, (4) Checking trees to locate best producers, (5) Removal of excess and inferior trees, (6) Management of established grove.[16]

The next procedure in profitable pecan growing, following orchard establishment or grove development, is the inauguration of a systematic propagation program. J. Russell Smith, eminent geographer and nut culturist, has stated that by budding, grafting, and planting the pecan tree in orchards, the South has made the greatest contribution to Causcasian agriculture since America gave the world tobacco, corn, and potatoes.[17] Grafting of the first pecan trees in 1847 by the negro slave Antoine, is often referred to as the beginning of a new tree industry.[18] Selection of varieties through budding and grafting can build and perpetuate the industry.

Thinning Native Groves.--Thinning pecan groves is the clearing

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[16] Fred LeCrone "Shall I Top-Work My Pecan Grove," Proceedings of the Oklahoma Pecan Growers' Association, (December 9-10, 1946), pp. 18-19.

[17] J. Russell Smith and M. Ogden Phillips, North America, New York: Harcourt, Brace and Company, (1940), p. 313.

[18] Clarence A. Reed, "The Beginning of Pecan Growing as an Orchard Industry," The National Horticulture Magazine, Volume 24, (January, 1945), p. 213.

of excessive timber and brush together with other growth from prospective commercial lands. This procedure constitutes the initial step in pecan grove development. Grove thinning must be carried on in a systematic manner and its application at this time involves slow, laborious methods and entails large initial expense. Vast acreages in the state remain to be cleared, however few sections exist that have not had some improvements. The illustration (Figure 6) shows a native grove that is in need of some systematized thinning practices.

Methods of thinning pecan timber involve a variety of techniques. Large growers employ the use of the versatile bull-dozer in uprooting trees and leveling ground. Others use poison to girdle large trees; after these trees die, they are felled and burned. Hand labor is employed in cutting, piling, and burning the accumulated timber and brush. A few operators devise methods of thinning to suit their particular groves. One Oklahoma farmer, for example, holds registered patents on his brush cutter.

Care should be taken to avoid thinning out the trees too rapidly. Pecan trees, which are accustomed to heavily wooded timber, are intolerant of intense light conditions and must be thinned gradually to prevent injury. Thinning of trees at the proper rate results in strong trees, which can withstand the intense Oklahoma winds, and that can properly develop annual nut crops. Good judgement by the grower is essential to systematically thin the timbers and select future producing trees.

A number of other problems arise from grove thinning; some of which remain unsolved at this writing. Thickly wooded sections on property

adjacent to newly thinned groves hinder air circulation, resulting in an eventual scabbed condition of the trees. After clearing, the construction of dikes may be necessary in order to prevent wash of valuable soils by overflow waters.[19] Cleared groves frequently develop frost pockets, a condition that results in poorly filled and defective nuts.[20]

All growers agree that trees need growing space, yet a common fault exists in too close establishment of them in both native and improved orchards. Figure [illegible] shows native trees too close for the greatest possible yields of nuts. Healthy isolated trees show the results of sufficient root room. Distance between trees should be approximately 70 feet; some growers recommend a distance of 80 to 100 feet between them. In thinning native groves, heavy producing old trees often are preserved, even though poorly spaced.

Top-Working Grafts.--The most generally accepted method followed for propagation of native pecan trees is top-working. This method involves grafting the tops of substantial limbs on mature trees, thereby taking advantage of the root system and trunk of a fully grown tree to obtain quick returns. Age and size of top-worked trees may vary with the individual preference of the grower, however very large old trees are not recommended. The number of grafts inserted on a particular tree

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[19] W. S. Price, Jr., "Development of the Native Pecan Orchard Based on Sixteen Years Experience," Proceedings of the Oklahoma Pecan Growers' Association, (December 5-6, 1944), p. 33.

[20] W. S. Price, Jr., "Development of the Native Pecan Grove," American Pecan Journal, Volume 1, Number 4, (January, 1941), p. 11.

also depends on the judgement of the individual grower. The work is done mainly in the spring when tree sap exists in plentiful supply. Buds also are placed on the tops of grown trees, but approximately 90 per cent of all Oklahoma propagation is done by grafting.[21]

Trees are top-wroked for numerous reasons. A native tree, which neither bears nor produces a good grade of nuts, may be converted to an improved variety by top-working. Planted trees, proven unworthy after trial, may be grafted from successful producing trees. Native cions (propagating wood) of heavy producers are grafted to the top of either a sturdy well balanced tree or to an unsatisfactory variety that is susceptible to disease. Both native and improved varieties that have been unimproved can be hastened into production by top-working fairly large trees; these will soon show good or bad satisfaction by this method or trial.

Stock (cions) for top-working may be obtained from a nursery or secured from a tree planted for propagation purposes. The proper method is to cut cion wood during the dormant period in winter, seal it with wax for preservation and store it in temperatures ranging from 32 to 38 degrees Fahrenheit to maintain dormancy. Stock of ideal size is ordinarily about six to eight inches long and contains three buds.[22]

When grafting, the cambium of the cion must come into contact with the cambium layer of the tree. The cion is first whittled to a

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[21] Department of Horticulture, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma.

[22] J. F. Rosborough, C. L. Smith, and L. D. Romberg, The Pecan in Texas, Texas Agricultural and Mechanical College, Cooperating with United States Department of Agriculture Extension Service, College Station, Texas, (1945), p. 75.

wedge-shape and driven into the prepared section of the tree. Then, after contact is made, the graft is wrapped with tape, followed by a wax application to cover and protect the grafted region. Shoot and branches, which are directly below the grafted area, must be cut in order to direct all vitality to the new graft. Two or three grafts are usually placed on a large limb to insure against loss. Grafts should be applied in such a manner to establish a well-formed tree.

Budding and grafting require the services of expert workmen. The number of cions (grafts) inserted per day may vary; a few experienced propagators graft 300 to 350 cions in an eight hour day. Expert propagators frequently work for hire to growers.

Budding.—Budding is of minor importance in Oklahoma, whereas in Texas, the pecan growers prefer this method to grafting. Two types of buds are successfully used; they are the ring and patch bud. Budding pecan trees is a more difficult operation than grafting and the percentage of losses is slightly higher. Nonetheless, budding has the advantage in that it can be carried on in the spring and late summer, whereas grafting operations are restricted to the spring of the year. For Oklahoma, thus far, budding remains a nursery device despite its versatility.

It is important for the cambium of the bud to contact the cambium layer of the tree as in bark grafting. The bud is inserted in the specially prepared cut of the tree. Careful setting, binding, and waxing of the bud are all important for active growth. Branches near the inserted bud should be removed to insure the prepared zone of sufficient vitality.

Planting.—Direct planting of pecan stock from nurseries is employed for some purposes, but the abundance of existing native tree growth in the state makes this practice infrequent. A really practical purpose for

nurserystock is its use in supplying yearly cion wood for the growers' grafting program. For Oklahoma direct planting of pecan trees largely remains a nurseryman's practice.

The planting of seedling nuts is another nursery technique used in the state on a small scale. Seedlings of native trees are planted to develop particular varieties for later propagation. This practice was originally a common means used by growers of the Southeast, but it has long since been abandoned in favor of other methods.[23]

Transplanting.—Pecan trees are often transplanted from a place where there is inadequate spacing. This practice should be carried on during the dormant period in winter. Healthy trees from five to seven feet tall are the best types to transplant.[24] The specimen to be transplanted must possess the necessary characteristics for future production.

4. Care During Seasonal Growth

The native pecan grove requires the same year-round attention and care as is needed for the improved pecan orchards. During growth and dormant periods, the grower busies himself with the upkeep of the pecan grove or orchard. Although the pecan is a native forest tree, it readily responds to proper methods of cultivation and care.

In the husbandry of his grove, the grower must be on constant

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[23] H. P. Stuckey, Southern Horticulture, Atlanta, Georgia: Turner E. Smith and Company, (1944), p. 209.

[24] Charles Pfile, "New Methods of Transplanting Pecans," Proceedings of the Oklahoma Pecan Growers' Association, (December 5-6, 1944), p. 23.

guard against loss of nuts to birds and animals, as well as, tree damage caused by domestic animals. Birds, especially crows, convert the nuts to their use. Squirrels are attracted to pecan lands and they take a sizeable amount of the annual crop. Domestic animals grazing on pecan lands may bruise the bark of the trunks of the trees, or damage the roots.

Cultivation.—Groves and orchards react favorably to cultivation practices much the same as any other crop. Cultivation benefits pecan tree growth in a number of ways: weeds are disposed of, thereby releasing available food nutrients and moisture for feeder roots; winter green manure crops receive seed bed preparation; and many destructive insects are buried. The time for cultivation in the spring depends on planned-for green manure crops, fertilizer uses, and weed growth control. Later cultivations are necessary to keep the land in proper condition; these are especially necessary to insure a clean grove for easy gathering.

In an orchard or established grove, cultivation should be intensive to benefit all feeder roots. The most important area to be worked lies directly under the branches, where root activity is greatest. Care should be taken to plow shallow so as to avoid possible injury to roots near the ground level; the requirements for such operations find the disc plow most suitable. Cultivation frequently results in soil erosion when orchards and groves reside on hillside land; if excessive wash occurs by this procedure, the practice of clean cultivation should be curtailed or discontinued.

Cover Crops and Inter-crops.—Cover crops and inter-crops are frequently planted in groves and orchards to protect and enrich the soil. Additional incomes are reaped from the grazing of cattle, and also from the sale of marketable crops. J. Russell Smith refers to this procedure

as two-story agriculture.[25] Thirty per cent of the pecan crop in Oklahoma is produced under some state of cultivation, in which cover crops predominate.[26]

Cover crops are usually grown to enrich the soil, while inter-crops are grown especially for profit; the latter is particularly applicable when income is needed to supplement returns from young orchards, while the former is peculiarly valuable on poor soils and steep slopes.

The type of cover crop planted depends upon the nitrogen and humus needed; aside from this soil building, the moisture holding capacity and the physical structure are also improved. Summer crops may be lespedza, soybeans, or cowpeas. Winter crops may be rye, wheat, barley, hairy vetch, or sweet clover.[27] Certain sections of the state successfully grow Kentucky blue grass, red top, white Dutch clover, orchard grass and Timothy.[28] Cover crops known to harbor diseases and insects are avoided.

Cash row crops are of particular value in enlarging orchard and grove income; the remuneration received from inter-crops often exceeding returns from nut crops. Melons, vegetables, and berries often can be profitably grown. Fruit trees are frequently grown in the form of peaches, plums, and apples. Some cotton is grown successfully in groves and orchards because of its short roots, while corn usually cannot be grown because

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[25]J. Russell Smith, The World's Food Resources, New York: Henry Holt and Company, (1919), pp. 542-562.

[26]Sam Durham, "Common Sense Pecan Pastures," Proceedings of the Oklahoma Pecan Growers' Association, (November 25-26, 1941), p. 15.

[27]Ibid., p. 14.

[28]Rosborough, Smith and Romberg, op. cit., pp. 28-29.

of its lengthy root system.[29]

Excellent pasture on cleared land of native groves awaits domesticated animals. Where there are warm flood plain conditions, pastures are made available one month earlier than in the higher areas. Early pastures prove profitable to growers, who may be cattlemen utilizing the lengthened pasturing season to graze their herds.

Fertilization.—When pecan trees exist on soil that is infertile, commercial fertilizers are applied. Cover crops may offset many nutritional deficiencies, but are slow in their process, therefore mineral fertilizers are administered for quick results. Trees readily respond to such soil building with greater amounts of better filled nuts. A systematic program of fertilization harmonized with a cover crop program, can maintain the proper fertility and enhance annual yields. Commercial fertilizers cannot be used continually as their expense may be greater than the returns from nuts.

Mineral fertilizer formulas may vary with the deficiency of the particular soil; hence, if soils are low in nitrogen they must receive a greater part of that element and when a deficiency of potash exists, that element should predominate. Ordinary mixtures may be 4-8-4 or 6-12-6 (Nitrogen-Potassium-Calcium).[30] Applications vary with the age of the tree and the specific deficiency of the soil. Fertilizers should be applied during March and April, i. e., when vegetative growth is most active. Soil building materials should be spread beneath the tree on the ground

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[29] Ibid., p. 27.

[30] G. H. Blackmon, Pecan Growing in Florida, Bulletin 437, Agricultural Experiment Station, University of Florida, Gainsville, Florida, (October, 1947), pp. 40-44.

containing feeder roots.

If available, farm manure can be applied to pecan soils; however, such material seldom offers an even balance of the necessary nutritive elements, being particularly deficient in phosphorous. Of course, it may be applied along with sufficient amount of mineral fertilizers.

Spraying and Dusting.—An adequate spray program is an essential part of systematic culture. Control of diseases and insects can best be dealt with in this manner. Spraying operations are carried on in the spring and summer, but the time of application will depend on the particular disease or insect pests that need to be overcome. Much research needs to be done on the time, method, and cost of an adequate spray and dusting program for Oklahoma.

Specialized orchard machines are available to spray trees, however they are expensive and very few are installed in Oklahoma groves. Other difficulties that deter spray machine operations in native groves are the height of many trees and the rough terrain in some sections.

A number of basic chemicals and compounded mixtures find standard use in combating insects and diseases. Chemical compounds, sold commercially, which find general use are Zerlate and Bordeaux Mixture, both used to combat scab and casebearer. The novel compound DDT is effectively used on the pecan weevil. New mixtures constantly must be experimented with to combat new encroachments of diseases and insects.

Airplane dusting, in the experimental stage in Oklahoma groves, has been found only partially successful; on the other hand, this method meets with pronounced sucess in the southeastern states. Two factors are objectional to airplane dusting in the state, they are: strong Oklahoma winds scatter materials, and tall trees necessitate high flying causing

wide dispersal of chemicals. Airplane dust unfortunately does not penetrate to scabbed portions of lower leaf surfaces. Proper timing, the prevailing factor in dusting, cannot be supplied efficiently by airplanes.[31]

Pruning.—Pruning directs tree growth and helps to form better developed structure. This practice finds special significance in Oklahoma were it is necessary to protect pecan trees from the state's brisk winds. Development of shorter trees, by cutting them back, makes harvesting and spraying easier. The dormant season is the best time for pruning because interference with growth processes can best be avoided at that time. Pruning should be used only when needed because the practice results in delayed growth and loss of nuts.[32]

Pruning requires the services of an expert who knows proper methods of cutting so as to protect the tree structure and allow for future development. The pruner must develop a strong undivided trunk for withstanding heavy winds and to support heavy nut crops; he should direct branches to form a well-rounded foliage; and he should also prune the branches so as to avoid future interference with one another. After pruning, lower branches should be high enough to avoid interference with harvesting and cultivation machinery.

Surgery.—The pecan grower must possess a knowledge of pecan tree surgery in the yearly upkeep of his grove. A pecan tree is subject to three common injuries all of which require tree surgery, they are:

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[31] F. A. Fenton and W. W. Ray, "Airplane Dusting for Pecan Insects and Diseases," Proceedings of the Oklahoma Pecan Growers' Association, (December 4-5, 1945), p. 68.

[32] Frank B. Cross, "Pruning Pecan Trees," Proceedings of the Oklahoma Pecan Growers' Association, (December 2-3, 1936), pp. 61-63.

pruning cuts, cavities, and splitting crotches. Tree surgery requires an intimate knowledge of the pecan tree structure to properly treat the various tree wounds. For proper tree surgery, the grower needs a complete supply of tools in order to avoid further injury to the tree in performing the work.[33]

5. Harvesting

The harvesting or gathering season begins with first droppings of nuts in September and continues until they are retrieved. The standard time for harvesting is, however, regarded as the period extending from September until January; it is also at this time that the pecan market is most active.

By its very nature, about one-half of the pecan crop remains unharvested. Estimates of ungathered nuts run as high as fifty per cent. There are a number of reasons for this condition, namely: dense underbrush which creates a formidable obstacle against nut picking in undeveloped areas; total neglect of fallen nuts, leading to annual losses; and a shortage of labor, resulting in unsystemized gathering. Those nuts that remain too long on the ground become rancid. More thorough gathering of pecans in Oklahoma can be carried on only through the education of land owners to the value of their crops.

Methods and Techniques.—Modern methods of harvesting pecans are not greatly different from earlier ways of nut gathering. In order to cause the nuts to fall, they are flailed or knocked to the ground by hand,

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[33]Lyman Coe, "Pecan Tree Surgery," Proceedings of the Oklahoma Pecan Growers' Association, (November 21-22, 1934), pp. 18-22.

using bamboo or wooden poles. Some mechanical means have been put into play for tree-shaking purposes. A few growers stretch a cloth covering under the trees to catch the nuts, later sorting twigs and sticks from them. Nuts are ordinarily gathered in containers, and later removed to the owners' storage bin. Nut harvesting, while simple, involves much hand labor.

At this writing, some progress is being made toward the development of harvesting machinery. Vacuum machines, successfully used in gathering other commercial nut crops, are hindered in pecan lands by a superfluous amount of fallen tree wood that litters the ground and impedes the machine's operation. A number of successful tree shakers, used for dislodging the nuts from the tree, have been devised by individual growers; One bumps the tree by means of a heavy hydraulically powered weight, mounted on a tractor; another shakes the trees by a belt attachment connected to a tractor fly wheel; while still another jars the trees directly with a light tractor. Precaution is necessary to prevent injury to trees by such machines while they are operating in groves and orchards.

In harvesting native groves, a system of markings should be devised to denote the annual performance of individual trees; such markings can indicate heavy production, disease condition, or any other particular characteristics of the tree. Systematic tree markings, as well, aid in establishment of production records and in maintainence of perpetual inventories concerning grove conditions.

Labor.—The labor aspect of the pecan industry involves seasonal harvesters and regular employees. This phase of the industry offers a multitude of problems and seriously forestalls more rapid progress. Little standardization of labor exists in Oklahoma groves. The design and

installation of labor-saving devices is slow, requiring the grower to depend upon an inadequate labor force.

Labor growers depend on regular employees to carry on the general year-round tasks necessary to maintain a functioning grove or orchard. Some growers even maintain living quarters for workers and their families, while others rely on help from nearby farms and urban commuters. The families of regular employees assist in the gathering during harvest time. A full-time employee must be a good grafter and be generally well versed in other chores of a pecan farm.

Many additional laborers are required at harvest time to gather fallen nuts. A gatherer also may assist in knocking the nuts from the trees. Incentive pay scales create a wide differential in the productive power among gatherers; one worker may gather as little as 35 pounds daily, while another may secure as much as 150 pounds. The availability of laborers to harvest depends upon the ease with which nuts can be gathered; a plentiful supply of workers usually being on hand when a dense ground cover of nuts is present. The unavailability of labor at harvest time in some years causes losses of an undetermined volume.

Wages paid pecan laborers show a lack of standardization; they may vary with the different growers and according to the particular task performed. A regular employee receives wages commensurate with other farm laborers, due regard being given to expert grafters or to others who perform skilled services. Gatherers are paid on a piece-work basis, with the pound as the unit of measureement. Pecan gatherers were given three and four cents per pound from 1943 to 1945 and five cents per pound in 1942. Wage scales for piece-work depend on a number of factors, including: cleanliness of groves, thickness of fallen nuts, prevailing prices of nuts,

and general condition and convenience within the grove or orchard. Growers with clean orchards may pay comparatively lower wages per pound and still give a greater remuneration to gatherers for their work than those with densely forested groves who pay higher wages per pound. Income for improved nuts gathered in well-developed orchards and groves depend entirely on the density of ground nuts. During harvest, workers hired to flail nuts from trees receive hourly wages rather tha incentive wages. In 1947 they received an average wage of one dollar per hour.

Casual Harvesting.—Holiday nut gathering and collecting on shares both remain important ways of procuring a sizeable amount of the state's annual crop. The Sunday gatherer, particularly, is traditional in Oklahoma. In the fall of the year, citizens of all classes journey to the country to gather pecans. Pecans are picked up along the roadside and on farms. Those gathered on agricultural lands are on shares; such a method netting the owner one-half, one-third, or some other agreed amount of the harvest. This type of undertaking is poorly conducted and results in much waste. The high cost of labor involved in gathering on shares provides a difficult economic hurdle for the industry as a whole. Nuts which are gathered in this manner too, result in many lost retail sales, since a day's gathering trip may supply the demands of a family for an entire year.

The crop is similarly gathered in large quantities on shares by a land owner's tenants, neighbors, and friends. This system is poorly conducted and like "Sunday gathering" produces a great loss of nuts and leads to high cost for labor. Farm operators, on whose property nuts are gathered, remain uninformed or unconcerned as to their loss of profits through such haphazard share gathering. This system, however poor, is

considered productive because most of the nuts gathered in this manner would otherwise be unharvested.

6. Diseases and Insects

Diseases and insects greatly aggravate the pecan industry. They may be responsible for partial or near crop failures in some years. While the dryer Oklahoma climate may act as a preventive for particular pests troublesome in other areas, there are others that may find conditions favorable to their spread. Varieties that may be immune to some diseases and insects are easy prey for others. There is a long list of diseases and insects attacking the nut, foliage, and tree.

Some of the prominent diseases of the pecan tree in Oklahoma follow:

Pecan Scab: Until recent years pecan scab was relatively unimportant in Oklahoma, but it has now gained a foothold and is probably the most significant disease enemy of the trees. The fungus attacks the leaves, shoots, and nuts, resulting in immature droppings and poorly filled nuts. Dampness is necessary for pecan scab development. General orchard and grove sanitation measures are necessary to combat the disease. The year-round growing program should include spraying for scabbed condition. Recognized varieties susceptible to scab should not be planted or propagated.

Rosette: This disease attacks trees grown on nutritionally deficient soils found lacking in organic substances. Soils excessively administered with lime or nitrogen may also create conditions ideal for rosette. The disease attacks the leaf, shoots, and limbs of the tree, in that order; with eventual death to the latter. Trees infected by rosette yield very small, if any, nuts. Rosette can be successfully treated by the addition of zinc sulphate to the soil.[34]

Important insects which damage pecan trees in Oklahoma are as follows:

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[34]Stuckey, op. cit., p. 247.

Pecan Nut Casebearer: This insect constantly torments growers of Oklahoma pecan trees. The casebearer was responsible for the greater share of the crop failure in 1942.[35] Various stages of caterpillar growth attack the tree; first the buds in spring, then the young nuts in June and July, and later when the nuts are mature. Spraying can successfully combat the casebearer, either arsenate of lead or nicotine sulphate can effectively destroy this insect when applied during the laying of the eggs.

Walnut Datana: Great damage was done to Oklahoma pecans in 1935, 1936, and 1937 by the insect, Walnut Datana. It attacks the foliage, which leads to a loss of food supply for the nuts. Successful destruction of the insect is accomplished by spraying with calcium arsenate and by dusting with lead arsenate. Another method of disposal is hand picking and destruction during the early stages of larva life. Oklahoma's 1938 crop was saved by successfully deploying the insects' natural enemy, Trichogamma Minutum against it.[36]

Pecan Weevil: This insect finds a home throughout the extent of the pecan area and is well situated in Oklahoma. It attacks early filling varieties and very often accomplishes an "August Drop;" nuts falling to the ground within four to ten days during that late summer month. The weevil attacks the nut directly by boring it. They can be shaken to the ground to be destroyed or be later plowed under. Infected groves should be harvested early to avoid further damage. The popular Stewart and Schley varieties are favorite prey for the pecan weevil; these should not be planted or propagated where this insect exists.[37]

Pecan Phylloxera: Recent insects in Oklahoma are the so-called gall insects, referred to as Pecan Phylloxera and closely related to plant lice. These gall attack the tree, foliage, and nuts. Activity of the insect involves sucking the different parts of the tree, resulting in devitalization and eventual nut droppings. Applications of mixtures of nicotine sulphate and lime-sulphur effectively check phylloxera. Summer heat usually destroys the second generation of this harmful

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[35]F. A. Fenton, "Insect Enemies of the Pecan in Oklahoma," Proceedings of the Oklahoma Pecan Growers' Association, (December 5-6, 1934), p. 18.

[36]Ephriam Hixson, "The History and Control of the Walnut Datana; Outbreaks in Oklahoma and the 1941 Outlook," Proceedings of the Oklahoma Pecan Growers' Association, (December 4-5, 1940), p. 65.

[37]Theodore L. Bissell and George H. Firor, Growing Pecans in Georgia, Bulletin 501, Georgia Agricultural Extension Service of the University System of Georgia, The United States Department of Agriculture Cooperating, Athens, Georgia, (April, 1947), p. 18.

insect.[38]

7. Off Years

The habitual "off year", when production is low, proves of great annoyance to the pecan industry. The regular occurance of such years of lesser yields has been a significant factor in impeding progress in the industry. In the twenty-five year period extending from 1919 to 1943, there were five years when the crop was four million pounds or less; this production constitutes a sharp contrast to the 1947 crop of forty-four million pounds. In 1938 only about two million pounds valued at $119,000 were harvested in the state; this amount should be compared to the Georgian crop of the same year when twenty-one million pounds were harvested. Many growers traditionally expect an off year following a good year. Poor years are detrimental, furthermore, because there is a diminished effort on the part of the commercial growers and land owners to gather pecans. Uncertainty of the crop has had a harmful effect on the industry; a condition which effect growing, shelling, marketing, and pecan culture.

The main cause of bad years is undeveloped variety selection. When varieties are perfected that will yield regularly, without overbearing, a greater continuity of production will be established. Trees producing large crops overuse food materials, thereby resulting in lack of necessary materials the following year. The industry possesses trees, both native

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[38] Arthur M. Phillips and John R. Cole, Insects and Diseases of the Pecan in Florida, Bulletin 411, Agricultural Experiment Station, University of Florida in Cooperation with United States Department of Agriculture, Gainsville, Florida, (June, 1945), p. 26

and improved, that yield sufficient crops every year; these are the ones around which the industry must hope to build.

Other reasons for bad years further complicate the situation. Climatic conditions play a significant part in shortening the crop by numerous ways, such as: drought periods, early frosts, late freezes, severe cold spells in winter, and insufficient rains during nut development. Insect and diseases seriously reduced the crop in 1936, 1938, and 1942.

The off year stigma can be overcome. The graph (Figure 9) shows how Georgia achieved steady increased production, without serious bad years, by the application of improved cultural practices and proper varietal selection. Bad year production is not a characteristic peculiar only to pecans, other nut crops and cultural fruits, similarly, have been plagued by the difficulty in the past and successfully overcame it.

The off year is one of the many problems needed to be overcome, but there are many more; such as usually prevail in any new industry. Each year new methods and ideas are overcoming the difficulties that burden the industry. Time and experience are needed to establish the pecan industry along-side the many other crops as a true agricultural industry.

CHAPTER V

PRODUCTION IN OKLAHOMA

The amount of pecan production in Oklahoma depends on the number of trees, how well they bear and how efficiently they are harvested. Agriculture statistical reports counted 1,526,172 trees within the state in 1945.[1] Native nut crop production is similar to any domestic crop or systematized orchard fruit, however natural laws are still a large factor influencing a good or bad crop of pecans in the state. Man adds to the woes of both high and low production under prevailing environmental conditions by his irregular harvesting methods. Appreciable gains in reliable production are beginning to appear because of improved grove care, and better harvesting techniques.

Comparative production figures for Oklahoma and Georgia warrant analysis. Georgia's production trend reflects a high stability, whereas Oklahoma has experienced erratic yields (Figure 9). From 1935 to 1944 Georgia averaged 23,688,000 pounds yearly, showing a steady upward trend in yield each year; whereas Oklahoma's yearly average, for the same period, was 17,210,000, maintained, however, through heavy producing years off-setting

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[1] Office of the Agriculture Statistician, Bureau of Agricultural Economics, United States Department of Agriculture, Oklahoma City, Oklahoma, (January 26, 1949.)

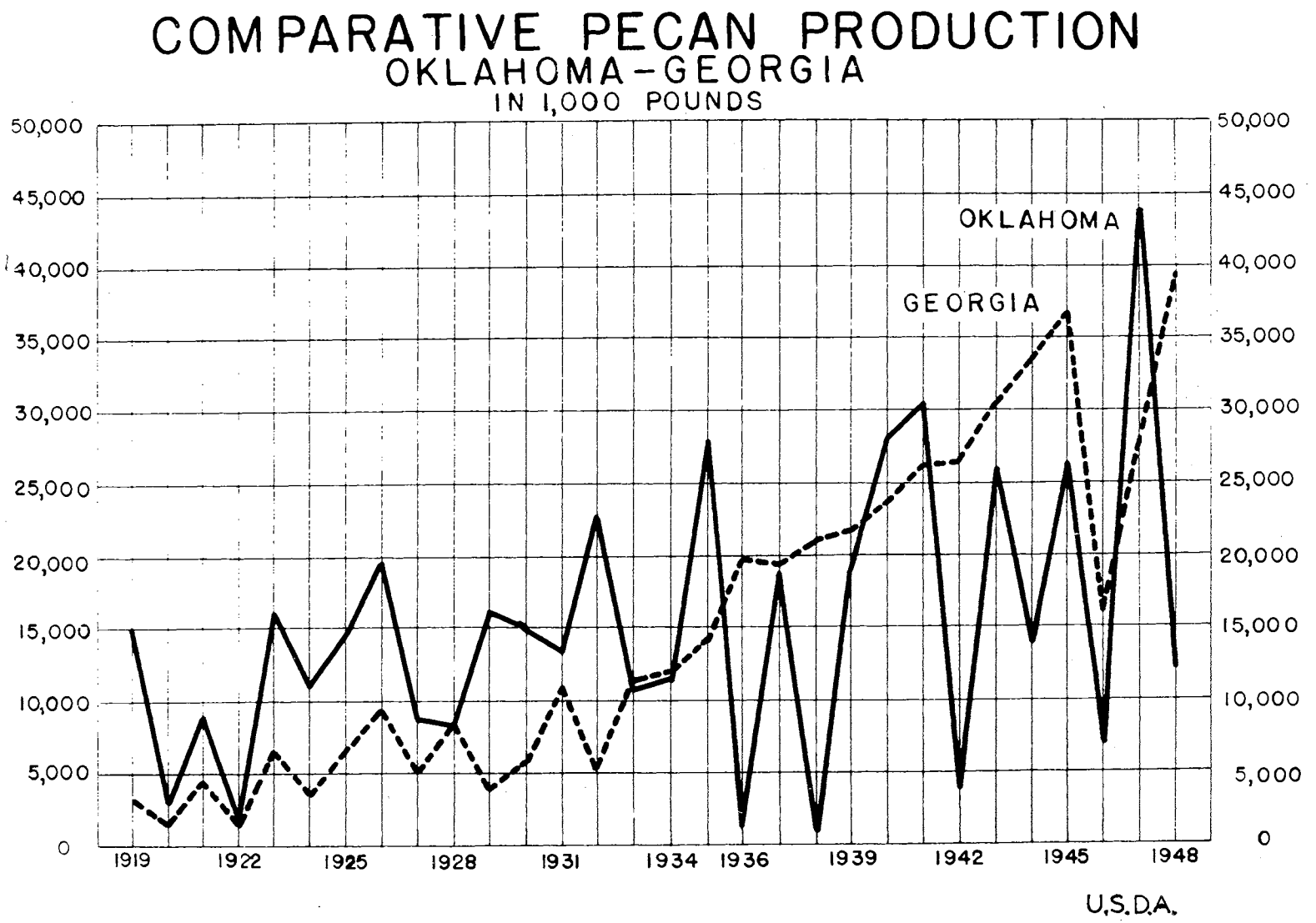
COMPARATIVE PECAN PRODUCTION
OKLAHOMA-GEORGIA
IN 1,000 POUNDS
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
OKLAHOMA
GEORGIA
1919
1922
1925
1928
1931
1934
1936
1939
1942
1945
1948
U.S.D.A.

FIGURE 9.

poor years.[2] Georgia's large production stems from highly developed pecan orchards with standard varieties and efficient marketing organizations. Georgia must rely entirely upon the improved "papershell" pecan, whereas Oklahoma production is almost entirely that of the native tree. Improved varieties account for only about five per cent of the Oklahoma crop.

1. Early Production

Previous to 1919 there were very few records made of pecan production because of its wild tree character. Failure to recognize the pecan as a crop is attributed to its unlimited native growth and its irregular productivity. Both early white settlers and Indians in Oklahoma gathered the pecan as a food ready for eating; very little use being made of the nut as a basic ingredient food. Many large groves were destroyed by settlers' clearances and by prairie fires. It was not unusual to harvest a tree by first cutting it down. The Seminole Indian Nation was cognizant of the pecan's value, nevertheless, and had an early tribal law that imposed a fine of five dollars upon any person mutilating a tree.[3]

In 1919 the state experienced a large crop which totaled 15,000,000 pounds, followed by three mediocre years (Figure 9). The Fourteenth Census (1920) valued pecan production at $174.00 per reporting farm for Oklahoma

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[2] Agricultural Statistics, United States Department of Agriculture, Superintendent of Documents, Government Printing Office, Washington, D. C., (1947), p. 272.

[3] "An Important Food Source for Indian Tribes", American Nut Journal, Volume VI, (Number 4, 1927), p. 29.

and Texas.[4] From 1923 to 1930 substantial crops were produced, with the smallest crop amounting to 8,000,000 pounds. In 1926 a large crop yielded 19,700,000 for the state, forming a sizeable share of the record national crop.[5] The large crop of 1926 was worth an estimated $500,000, with Durant, Oklahoma, handling one-half of it.[6] Prices were agreeable during the period. They amounted to well over ten cents per pound for native seedlings and around thirty-five cents for improved varieties (See Figure 12, Chapter VI.) Variety improvement was undertaken at this time on a large scale, centering around Ardmore in southern Oklahoma.

The depression marked a period of high yield and low prices. In 1932, 1934, and 1935, Oklahoma produced more than one-third of the nation's crop.[7] The 1932 crop even surpassed its pre-season estimate of 5,000,000 pounds and nearly doubled the 1931 harvest. There was very little inducement to gather nuts in that year, however, at a market value of three and four cents per pound.

In 1936 and 1938 crops were nearly total failures, producing only 2,000,000 pounds each year due to drought and disease. Pre-season predictions

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[4]Fourteenth Census of the United States, (1920), Volume VI, Agriculture, Bureau of the Census, United States Department of Commerce, Superintendent of Documents, Washington, D. C., 1922.

[5]Carl H. Robinson, "Pecan Crop Prospects," National Pecan Association Bulletin, Thirteenth Annual Convention, (September 22-23-24, 1937), pp. 5-8.

[6]"Durant Nut Center," Oklahoma Extension News, Volume 8, Number 11, (September, 1927), p. 1.

[7]Tree Nuts, Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture, (October, 1947), p. 21.

of seven per cent crops in these years were justified.[8] In 1937 and 1939 over 18,000,000 pounds were harvested, creating ideal averages for those years. The graph (Figure 9) indicates how its greatest modern production was established in 1940 and 1941. The 1941 crop of 30,600,000 pounds was 41.7 per cent of the native variety production for the United States.[9] These two gainful years in succession lent credence to the idea that greater possible crop stability was possible; they likewise served to foster renewed interest in pecans.

Production during the second World War was greatly enhanced by an agreeable price, reaching twenty cents per pound for native nuts in 1945 (Figure 11 and 12, Chapter VI). The added price incentive resulted in more thorough collecting of nuts from groves and isolated trees. In 1942, the crop satisfied pre-season estimates; although it produced only 4,000,000 pounds. A 26,000,000 pound crop in 1943 easily surpassed early season estimates. In 1944, even though the demand was great and the price was good, only 14,000,000 pounds of nuts were gathered. Early predictions were far lower than the large crop finally harvested in 1945.[10] Oklahoma growers received an average of 18.5 cents per pound for both native and improved pecans between 1942 and 1946; this factor was responsible for more effective collections at this time.

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[8] K. D. Blood, "Estimating Pecan Production," Proceedings of the Oklahoma Pecan Growers' Association, (December 9-10, 1947), p. 21.

[9] G. P. Collins, "Trends in the Production and Distribution of Pecans," Proceedings of the Oklahoma Pecan Growers' Association, (December 4-5, 1945), pp. 26-32.

[10] Blood, op. cit., p. 22.

2. Recent Production

A poor pecan crop was expected in 1946, and the resulting yield of 7,000,000 pounds substantiated early reports. The entire country, in fact, experienced a short crop during the year; this condition probably did much to maintain the highly satisfactory prices.

Oklahoma's peak production in 1947 almost doubled that of Texas and Georgia. The large crop established a precedence of unpredictability. As late as November of that year only 28.8 million pounds were expected, but the final yield netted 44 million pounds. A good year was expected, but not one that was to yield 37 million pounds greater than the previous year.[11] Production of natives was near the 41 million pound mark, and improved varieties over 3 million pounds. Many growers did not find an immediate market for their large supply of nuts. The huge crop in 1947 has had a definite influence on the present outlook on pecan culture.

Early predictions in October of 1948 indicated an 18,000,000 pound crop in the offing for the country. Estimates by states were above the average except for Oklahoma. Then, early frost took its toll of the native pecan crop. Many of the available nuts in the state, furthermore, went unharvested because of the unfavorable price and the high cost of labor. The final yield in Oklahoma for 1948 amounted to only 12,000,000 pounds.[12] In the meantime, the national crop surpassed all previous

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[11] Office of the Agricultural Statistician, Bureau of Agricultural Economics, United States Department of Agriculture, Oklahoma City, Oklahoma, (January 26, 1949).

[12] Ibid., (January 26, 1949).

years, amounting to 153,812,000 pounds for the ten leading states.[13]

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[13] Production, Farm Disposition and Value Principal Fruits and Tree Nuts, 1947 and 1948, (Report), Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., (January, 1949), p. 23.

CHAPTER VI

MARKETING AND PROCESSING IN OKLAHOMA

Traditionally the market for pecans is different from other food commodities, due to their use as a delicacy and seasonal novelty nut. The pecan, since it is not a staple, has not followed the conventional demand pattern. Native shelled pecans seek a market that will dispel the idea that their use is as a luxury food, and will tend to establish their use as a basic dietary ingredient. Present day shelling is responsible for creating a new merchantable item--the pecan kernel; itself, a vast improvement over the previously ungraded wild native pecan, and potentially a more salable commodity than the well-established "papershell" pecan.

The state's pecan market contains many ills, which include: insecure consumption, maladjusted price structure, high freight rates, poor advertising methods, and a generally weak marketing organization. Leaders of the industry in the state are cognizant of measures necessary to assure steady market demand, to systematize the industry and to make the consuming public conscious of the distinctive Oklahoma Pecan.

Early in 1949, pecan men were seeking state legislation to aid in the marketing of Oklahoma grown pecans. The Twenty-third Session of the Oklahoma Legislature was presented with a bill to create the Oklahoma

Pecan Marketing Advisory Commission, an Oklahoma Pecan Marketing Fund, and utilize the existing offices of the Oklahoma Planning and Resources Board to carry out the broad powers set forth in said bill. Essence of the bill is to create a fund for the industry through utilization of the state's tax machinery. Functional sections, included in the text of the bill, follows:

> SECTION 6. Consistent with the general purposes of this act, it shall be the duty of the Chariman of the Oklahoma Planning and Resources Board to establish subject to the approval of a majority of the Oklahoma Pecan Marketing Advisory Commission.
>
> In the administration of this act the Chairman of the Oklahoma Planning and Resources Board shall have the following duties, authorities, and powers when approved by a majority of the commission. To conduct a campaign of marketing research, education, and publicity; to find new markets for pecans and pecan products; to give, publicize and promulgate reliable information showing the value of pecans and pecan products for any purpose for which they may be found useful and profitable; to make public and encourage the widespread national and international use of the special varieties of pecans grown in Oklahoma; to investigate and participate in studies of the problems peculiar to the producers of pecans in Oklahoma; to take such action as he may deem necessary or advisable in order to stabilize and protect the pecan industry of the state and the health and welfare of the public; to sue and be sued; to enter into such contracts as may be necessary or advisable; to appoint employ officers, agents, and other personnel, including experts in agriculture and the publicizing of the products thereof, and to prescribe their duties and fix their compensation; to make use of such advertising means and methods as he may deem advisable and to enter into contracts and agreements for marketing research and advertising within and without the state of Oklahoma; to cooperate with any local, state, or national organization or agency, whether voluntary or created by the law of any state or by national law, engaged in work or activities similar to the work and activities of the commission, and to enter into contracts and agreements with such organizations or agencies for carrying on a joint campaign of marketing research, education, and publicity; to lease, purchase, or own such real or personal property as may be deemed necessary and amend all necessary and proper order, resolutions and regulations for the procedure and exercise of his powers and the performance of his duties.
>
> SECTION 7. There is hereby levied an excise tax of one-quarter (1/4) of a cent a pound upon all pecans grown in the State of Oklahoma and sold through a commercial channel, beginning with and

including pecans harvested in the crop of 1949 and each and every crop thereafter. Said tax shall be collected from the grower by the first purchaser at the time of sale, and shall be deducted by the first purchaser from the price paid to the grower.

SECTION 8. Each first purchaser shall by September 1 of each year obtain a license from the Oklahoma Tax Commission at a cost of one dollar. It shall be deemed a violation of this act for any first purchaser to purchase or buy pecans from a grower unless he holds a valid license. Said license shall be valid for twelve months beginning September 1 of each year.

Each first purchaser obtaining said license to buy pecans shall keep records of all his purchases and sales of pecans, and not later than December 31 and April 30 of each year shall remit to the Oklahoma Tax Commission the amount of tax collected since his last payment. Records of pecan purchases and sales kept by first purchasers of pecans shall be available for inspection by duly authorized representatives of the Oklahoma Tax Commission at any time during regular business hours.

SECTION 9. There is hereby created a separate and distinct fund to be known as the Oklahoma Pecan Marketing Commission Fund, and all monies derived from the levy of the excise tax provided for in Section 7 of this act shall be deposited with the state treasurer, who shall credit the same to the Oklahoma Pecan Marketing Commission Fund, and all monies so deposited hereby are appropriated for expenditure in the administration of this act and for the payment of claims based upon obligations incurred in the performance of the activities and functions set forth in this act, in the fiscal year beginning July 1 following the year in which the tax is collected. All claims must be duly approved by the Oklahoma Pecan Marketing Advisory Commission and signed by the Chairman and secretary.

Requests for government price supports are regularly denied the pecan growers of Oklahoma. In 1948 a delegation of them tried unsuccessfully to secure price subsidies from the United States Commodity Credit Corporation. The only year in which subsidies were paid on pecans was 1942, when 75 per cent parity prices supported that year's crop. Under the 1942 agreement, the Commodity Credit Corporation authorized the American Pecan Growers' Association of Albany, Georgia, to carry out its program which included price support, loans, market surveys, studies of pecan

uses, and investigation of ways necessary for increasing pecan consumption.[1]

Cooperative marketing of native pecans in Oklahoma has met with little success. Lack of localization, standardization, and systematic cropping has prevented devlopment of successful cooperative organizations in the Oklahoma pecan belt. The National Pecan Marketing Association, in 1930, established four local sub-markets at Stroud, Okemah, Ardmore, and Okmulgee; all have long since dissolved. Many growers do not subscribe to pecan marketing cooperatives as a means of selling their commodity.

Pecans are competing in a market with both domestic and imported nuts of many sorts. In 1947, walnut, filbert, and almond production totaled 102,600 tons.[2] The imported Brazil nut ranks high in both domestic and commercial uses. The consuming public enjoys rare delicacies in cashew, pistachias, and pignolias nuts. The period, 1935-1938, showed importations of nuts averaged 57,059,000 pounds yearly.[3] Imposition of of import duties serves somewhat to protect domestic nut production against foreign varieties. The wide variety of nuts available today creates a nut-conscious public that can be designated, by-and-large, as a substantial market for pecans. A shortage of imported nuts during the war years had the effect of creating an open market for pecans, but now the many imported nuts are plentiful meeting a part of the demand.

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[1] "Pecan Group Maps Plans to Hike Nut Consumption," The Albany Herald, Albany, Georgia, (November 18, 1942), p. 4.

[2] Tree Nuts, Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., (August, 1948), p. 1.

[3] Ibid., p. 3.

The "large buyers" purchase a sizeable share of the Oklahoma crop.[4] It is estimated that they take about one-half of the annual harvest.[5] In 1939 the Southern Pecan Shelling Company, San Antonio, Texas, and the R. E. Funston Company, St. Louis, Missouri, bought about 75 per cent of the crop in Oklahoma, Texas, Louisiana, and Arkansas.[6] Agents for large buyers compete with state shellers in their quest for nuts. Buyers and agents are located in the productive areas, purchasing directly from growers or a "first purchaser."[7] The large buyer grades and shells pecans. He also buys for resale, anticipating eventual profit. For illustration, in 1935 the Southern Pecan Shelling Company bought that year's suprlus pecans and sold them in 1936 at a profit of $500,000.[8] The marketing flow chart shows how large buyers play a significant role in pecan marketing in Oklahoma (Figure 10).

Prices.--The pecan market of Oklahoma is subjected to a considerable fluctuation in price. However, the price of pecans is more

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[4]The term "Large Buyer" is used to designate established pecan buyers who have long purchased pecans. Their influence on the pecan market is considerable.

[5]K. D. Blood, Agricultural Statistician, United States Department of Agriculture, Office of Agriculture Economics, Oklahoma City, Oklahoma, Personal Interview by the Writer, (January 26, 1949).

[6]The Pecan Shellers of San Antonio, Federal Works Agency, Works Progress Administration, United States Government Printing Office, Washington, D. C., (1940), p. 8.

[7]"First Purchaser" designates the pecan buyer who purchases directly from growers and gatherers. He is usually a poultry dealer. The first purchaser serves as a collection agent for small quantity purchases to be sold in a larger quantity to a sheller or "large buyer."

[8]The Pecan Shellers of San Antonio, op. cit., p. 8

MARKETING CHART FOR OKLAHOMA PECANS

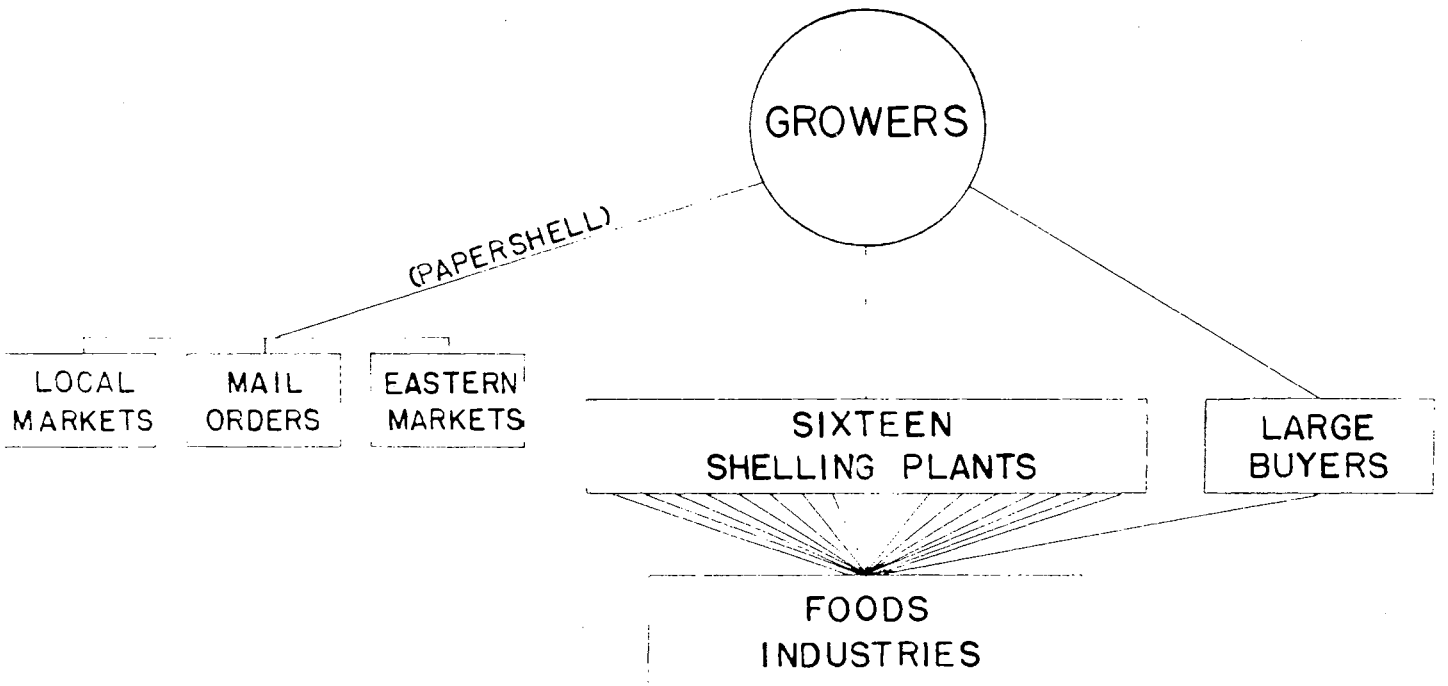

FIGURE 10.

steady than the production (Figure 11). Prices today are much more satisfactory than at the turn of the century when Oklahoma and Texas pecans were sold in carload lots at two to four cents per pound. About 1910 the price advanced to sixteen cents, partially due to the entrance of cracking machinery which enabled dealers to market shelled pecans obtained from ungraded native varieties.[9] Further improvement of processing after 1930 gave native kinds an additional price advantage in the market. During the depression years the price of native pecans hovered around five cents per pound (See Figure 11 and 12). The offering for native pecans was steady from 1935 to 1941, averaging seven cents per pound; such a price being considered too low for profitable production.[10] During the war years, native seedling pecans were priced at over twenty cents; consequently, added interest in the industry at that time is not surprising. Consumers paid more than one dollar per pound for shelled pecans during the wary years. Following the war, pecan prices reached another peak of 30.8 cents per pound in 1946.[11] Low price quotations in 1948 caused many nuts to go ungathered. In 1949 the pecan market witnessed a slight recovery.

Prices for native nuts are generally less than for improved

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[9] H. P. Stuckey and Edwin J. Kyle, Pecan Growing, New York: The Macmillan Company,(1925), p. 145.

[10] K. D. Blood, "Pecan Production Statistics," Proceedings of the Oklahoma Pecan Growers' Association, (December 5-6, 1944), p. 44.

[11] Office of the Agriculture Statistician, Bureau of Agricultural Economics, United States Department of Agriculture, Oklahoma City, Oklahoma, (January 26, 1949).

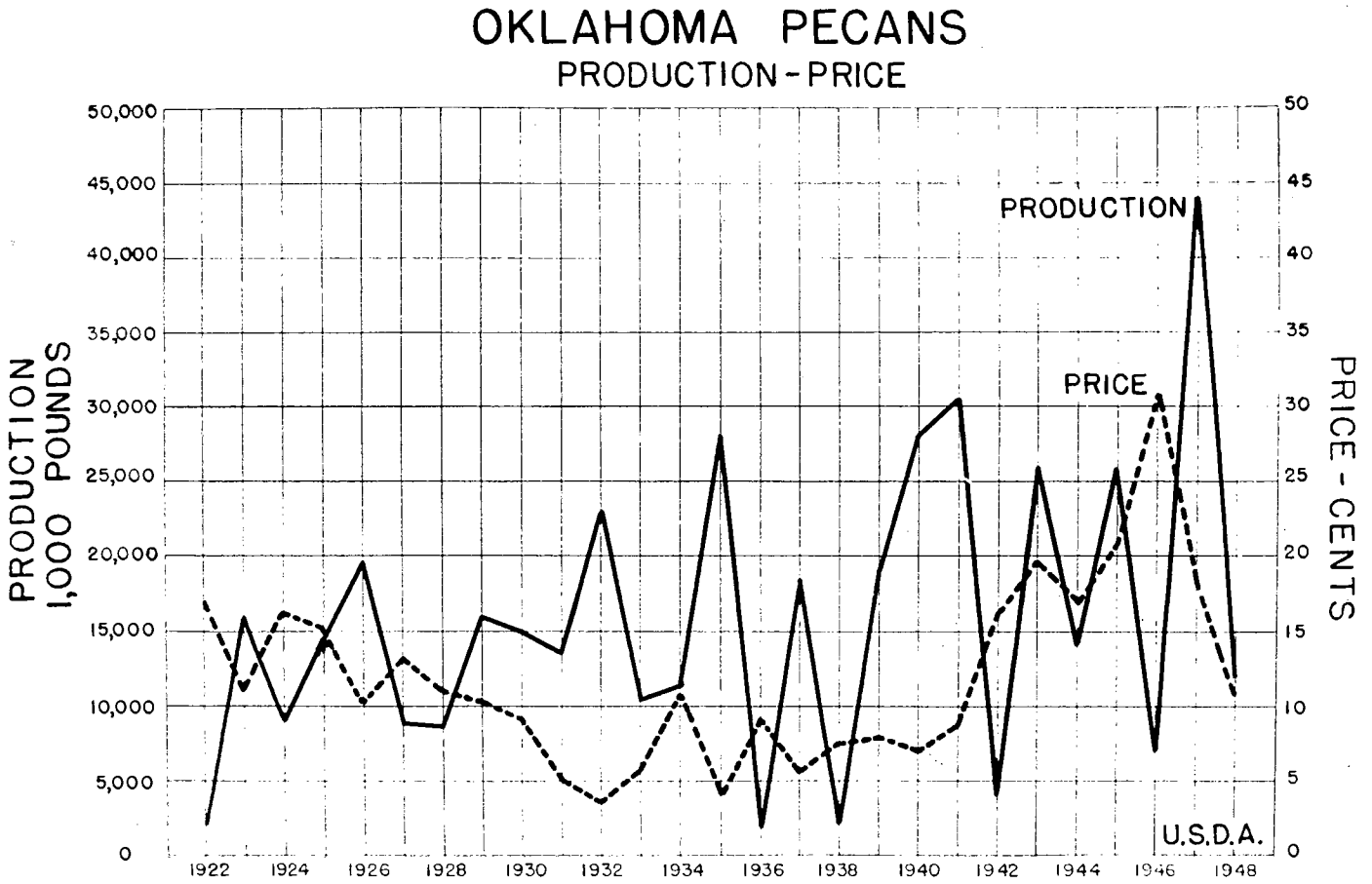
OKLAHOMA PECANS
PRODUCTION - PRICE
PRODUCTION
1,000 POUNDS
PRICE - CENTS
PRODUCTION
PRICE
U.S.D.A.
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
50
45
40
35
30
25
20
15
10
5
0
1922
1924
1926
1928
1930
1932
1934
1936
1938
1940
1942
1944
1946
1948

FIGURE 11.

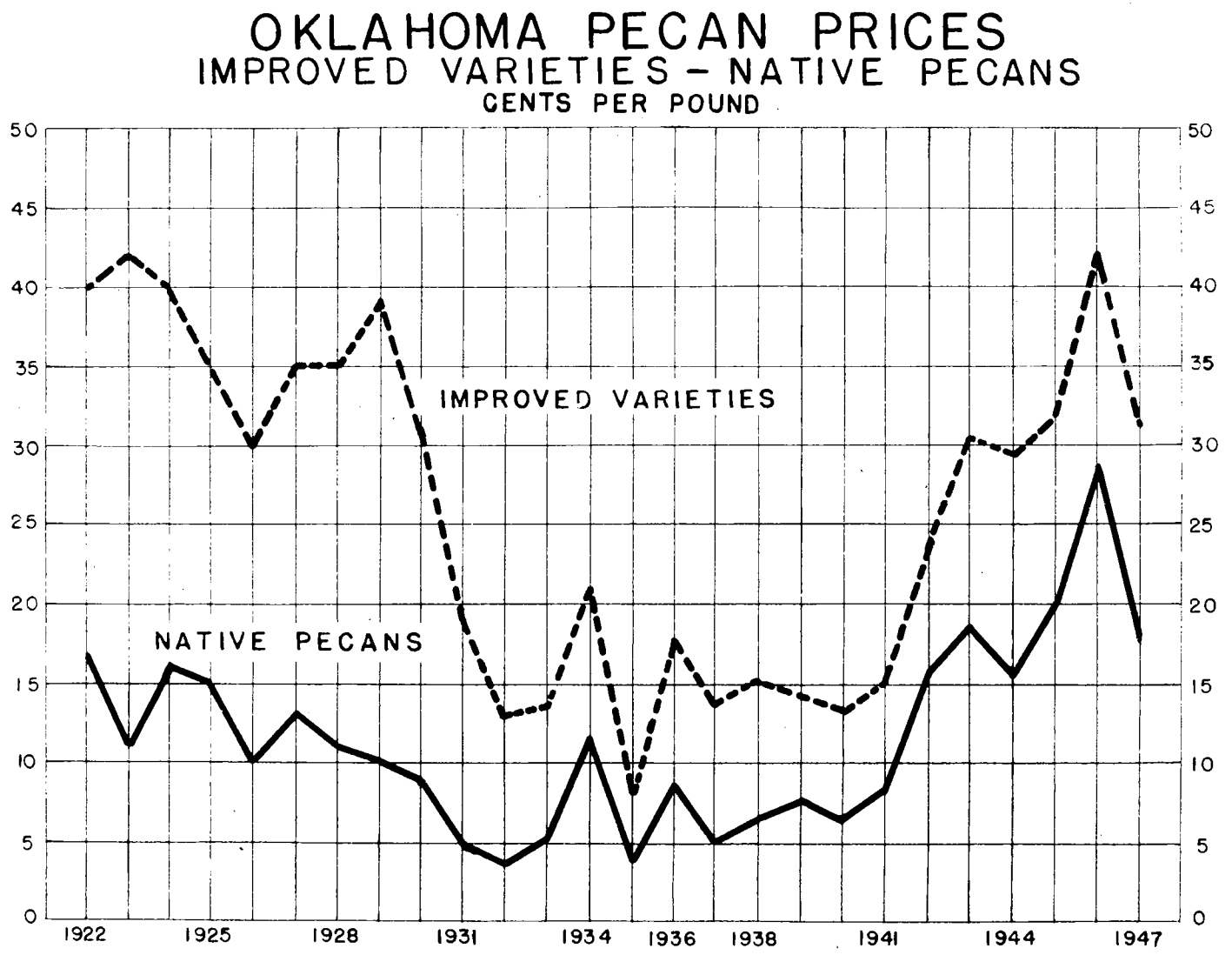
OKLAHOMA PECAN PRICES
IMPROVED VARIETIES – NATIVE PECANS
CENTS PER POUND
50
45
40
35
30
25
20
15
10
5
0
IMPROVED VARIETIES
NATIVE PECANS
1922
1925
1928
1931
1934
1936
1938
1941
1944
1947
U.S.D.A.

FIGURE 12.

varieties, on the other hand, with the advent of pecan processing machinery in the period 1930 to 1940 the price differential between native pecans and improved "papershell" varieties gradually narrowed (Figure 12). Oklahoma improved varieties command a slightly higher price than the same grades from other states. They were priced at 42.2 cents per pound in 1946.[12] Grading, and systematic merchandizing are other reasons why improved varieties usually receive higher prices than native pecans.

Transportation.—Shipment of pecans takes the form of large lots of unshelled nuts and smaller lots of shelled kernels. In 1947 approximately twenty-nine million pounds of unshelled pecans left the state by railway carload lot and by highway truck.[13] In the same year twenty million pounds were processed by the shellers, the majority of which were delivered in small lots to destinations outside the state.

Carload lot shipments are the chief mode of handling pecans which leave Oklahoma. Carload shipments are directed to large buyers located in San Antonio, Texas, St. Louis, Missouri, and Chicago, Illinois. Heavy shipments are also delivered to Tulsa for either storage or shelling. Table IV shows freight charges on unshelled pecans representing hundredweight rates on 30,000 pound minimum loads.[14]

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[12] Fruit and Nut Prices, Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., (October, 1947), p. 51.

[13] Blood, op. cit., (January 26, 1949).

[14] J. W. Tipton, Traffic Manager, St. Louis-San Francisco Railway Company, Tulsa, Oklahoma, Personal Letter to the Writer, (March 24, 1949).

TABLE IV

Carlot Rate Charges Per Hundredweight of Pecans, 30,000 Pound Minimum Loads, in Cents[15]

From OKLAHOMA ORIGINS BELOW	To TULSA, /1 OKLAHOMA	To CHICAGO, ILLINOIS	To ST. LOUIS, MISSOURI
Ardmore	30	84	55
Pauls Valley	28	84	55
Muskogee	15	73	43
Okmulgee	15	73	43
Wynnewood	28	84	55
Tulsa		73	43
Pawhuska		73	43
Shawnee	23	76	48
Enid		76	48
Chandler	19	76	48
Bristow	14	76	48
Oklahoma City	23	76	48

/1 Represents shipments within the state, delivered for storage and shelling.

The marketing of Oklahoma pecans is encumbered with high freight rates. In 1949 pecan deliveries took the form of Second Class Postal matter. The existing request before the Interstate Commerce Commission stipulates a Fourth Class rate for pecans; acknowledgment of this request would reduce overall freight costs approximately forth per cent.[16] With a reduction in freight charges lower pecan prices to the consumer would probably increase demand. Shipments are generally calculated on a F. O. B. (free on board) basis.

Geographic Distribution.—Native pecans from Oklahoma are sold

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[15] Ibid., (March 24, 1949).

[16] Uel Richardson, President of the Oklahoma Pecan Shellers' Association, Tulsa, Oklahoma, Personal Interview by the Writer, (February 1, 1949).

in all parts of the country. Shelled kernels, that are scheduled for food processing and packaging, find greatest market demand in large metropolitian areas. Local shellers usually seek distribution outlets wherever possible in an effort to reach undeveloped markets. Large established pecan buyers possess distribution channels with large retail and wholesale organizations, who in turn have both sectional and national outlets.

Oklahoma "papershell" varieties rely greatly on the local market. Some growers have developed a lucrative mail order business for their improved varieties, (Figure 10).

The foreign export market offers a possible outlet for pecans, of which Oklahoma will supply a sizeable proportion. The exportation of American pecans are handled through brokers, therefore figures showing the total amount of Oklahoma pecans going to foreign countries cannot be analyzed. In recent years total American exports were of appreciable significance. In 1946 exported pecans, both shelled and unshelled, totaled 2,081,462 pounds valued at $1,079,159. Canada is the principal importer of pecans, taking both shelled and unshelled nuts. Mexico, Great Britian, and Sweden also take a small share of the American crop.[17] The export market will probably never absorb a great quantity of American nuts because of transportation costs and infrequency of demand.

1. The Shellers

Pecan shelling firms are fast becoming an important business force

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[17] United States Exports of Domestic and Foreign Merchandise, Report Number F. T. 410, Department of Commerce, Superintendent of Documents, Washington, D. C., (1946), p. 35.

in Oklahoma. Commercial shelling has developed through the stages of hand shelling and partial merchanization to the present technique of complete machine processing. At the present time, approximately ninety-eight per cent of the harvested native crop reaches shelling plants. Improved varieties constitute about two per cent of the total volume processed by a few of the state's shellers.[18] Oklahoma shellers are equipped to process a yearly average of 18,000,000 pounds, shelling 20,000,000 pounds of the 1947 crop.[19] Plants range in size from four to forty-five crackers. The number of modern shelling plants operating in the state grew from ten in 1940 to sixteen in 1948. The map (Figure 13) shows distribution of pecan shelling plants located throughout Oklahoma's pecan producing area. The Oklahoma Manufacturers Directory for 1949, lists the following operating plants:[20]

Bixby Canning Company - - - - - - - - - - - - Bixby, Oklahoma
Chandler Pecan Company - - - - - - - - - - - Chandler, Oklahoma
Coalgate Pecan Cracking Plant - - - - - - - Coalgate, Oklahoma
Horn Seed Company - - - - - - - - - - - - - - Oklahoma City, Oklahoma
Madeira Food and Materials Company - - - - - Tulsa, Oklahoma
Oklahoma Pecan Shellers - - - - - - - - - - - Tulsa, Oklahoma
Oklahoma Pecan Processing Corporation - - - Wewoka, Oklahoma
Oklahoma Poultry and Egg Company - - - - - - Tulsa, Oklahoma
Pet Pecan Company - - - - - - - - - - - - - - Vinita, Oklahoma
Pruitt Produce Company - - - - - - - - - - - Muskogee, Oklahoma
Rollo Pecan Factory - - - - - - - - - - - - - Wynnewood, Oklahoma
Shawnee Warehouse and Cold Storage - - - - - Shawnee, Oklahoma /1
Steele Pecan Shelling Company - - - - - - - - Tulsa, Oklahoma

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[18]Uel Richardson, "Pecan Shelling in a Modern Plant," Proceedings of the Oklahoma Pecan Growers' Association, (December 9-10, 1947), p. 10.

[19]Uel Richardson, President of the Oklahoma Pecan Shellers' Association, Tulsa, Oklahoma, Personal Interview by the Writer, (March 11, 1949).

[20]Oklahoma Manufacturers' Directory, Oklahoma Planning and Resources Board in cooperation with Engineering Experiment Station, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma, (1948).

Southwestern Pecan Company - - - - - - - - - - Bristow, Oklahoma
Vernon Pope - - - - - - - - - - - - - - - - - - Beggs, Oklahoma
Welch Nut Company - - - - - - - - - - - - - - - Oklahoma City, Oklahoma.

/1 Oklahoma's largest shelling plant.

Shellers buy direct from growers or First Purchaser. The latter is a person who is engaged in buying and selling pecans on a small scale. The large growers provide a dependable source of supply. Some shellers are growers and supply a portion of their own needs. Storage of nuts by the sheller spreads his purchased supply for processing over a longer period of time.

When purchasing, the sheller desires an ideal-sized nut to pass through his machinery, and one that produces the highest quality of kernel per nut. Pecans a bit elongated, but not too round, are necessary for proper cracking. Extra large nuts are considered less desirable because usually they are improperly filled.

The amount of personnel necessary in a shelling plant depends upon the number of cracking machines in operation. The average-sized plant uses three workers for every two crackers. Large operational units with a minimum labor force is typified by Oklahoma's largest shelling plant. It operates with 28 women and 11 men.[21] Only women employees are used for final inspection of kernels. A prerequisite demanded of pecan kernel inspectors is good eyesight. Male employees are utilized for heavy manual labor. The plant superintendent must possess a thorough knowledge of processing combined with the ability to maintain plant

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[21] Lahoma Williams, Secretary-Treasurer, Shawnee Warehouse and Cold Storage Company, Shawnee, Oklahoma, Personal Interview by the Writer, (February 24, 1949).

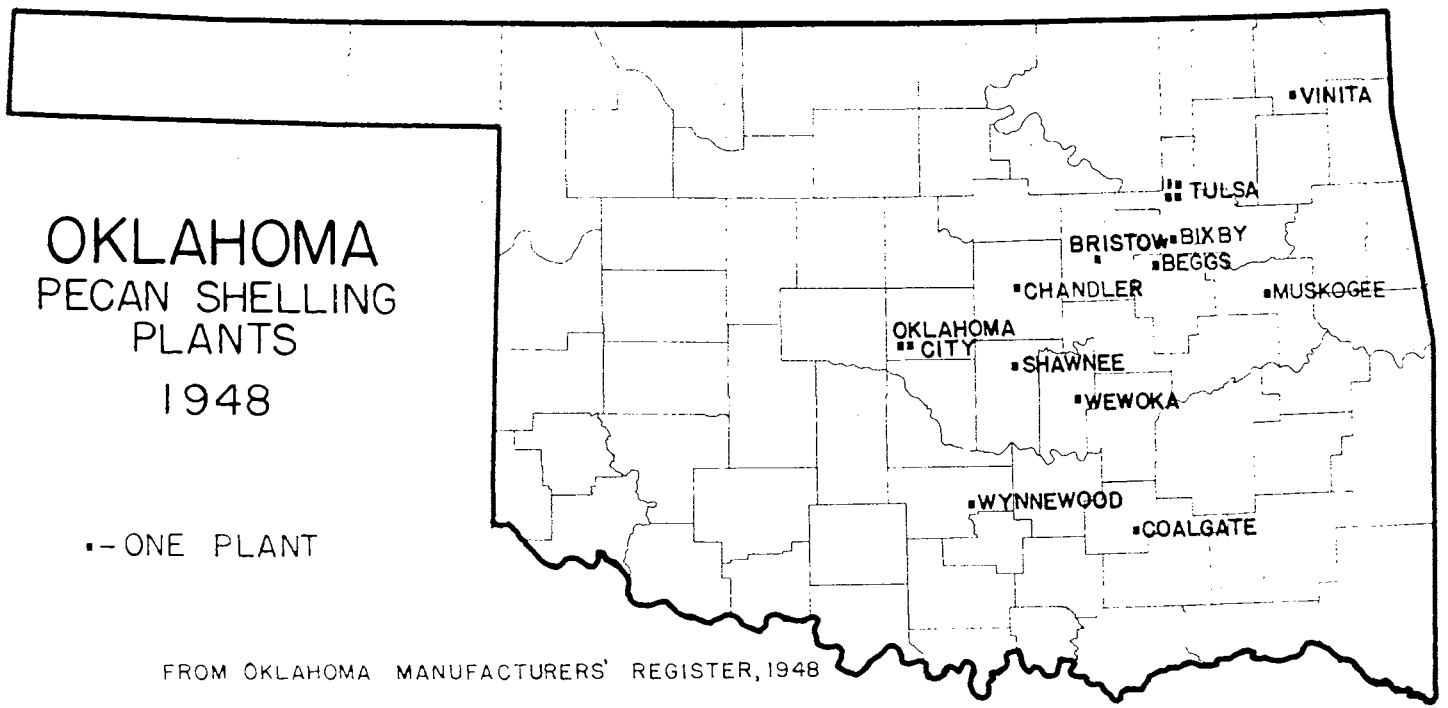
OKLAHOMA
PECAN SHELLING
PLANTS
1948
▪ - ONE PLANT
VINITA
TULSA
BRISTOW
BIXBY
BEGGS
CHANDLER
MUSKOGEE
OKLAHOMA CITY
SHAWNEE
WEWOKA
WYNNEWOOD
COALGATE
FROM OKLAHOMA MANUFACTURERS' REGISTER, 1948

FIGURE 13.

machinery.

Modern cracking machines are purchased from manufacturers of special nut processing equipment who distribute approximately twelve different types of machines. Prices range from $100,000 to $1,750,000. Individual machines are made in different sizes to fit the magnitude of a particular plant operation. Each cracker requires a prescribed complimentary group of machines to thoroughly carry out the complete operation of shelling. An unusual case is the Rollo Pecan Factory, Wynnewood, Oklahoma, which uses a complete outlay of machinery hand-made by the owner, Mr. John Rollo.

Plant Operation.—Plant processing may vary in size, number of workers, and with the individual taste of the plant manager. A large ideal plant, operating on a year-round basis, may have a flow pattern in manufacturing as follows:

Step 1 - Grading: The initial machine grades the pecans into sizes of 8/16, 9/16, 10/16, 11/16, 12/16, and 13/16 of an inch. During the step, debris of the orchard is removed. Nuts are processed by the individual sizes.

Step 2 - Soaking: The modern plant uses a humidizer to wash, sterilize, and soften the nut for better cracking. The humidizer maintains a temperature of 180° Fahrenheit. Steam of the humidizer impregnates the shell for ease in cracking and maintenance of large kernels throughout the process. The poundage handled by this step depends upon the size in process.

Step 3 - Cracking: Pecans are cracked singly. Proper cracking involves the application of pressure to both ends of the nut at the same time. About 60 per cent of the nuts leave the cracker in perfect halves. Production is gauged by hourly cracking poundage. A typical cracker may crack 86 pecans per minute.

Step 4 - Shellers: About 50 per cent of the shells are removed by the shellers. This is a paddling process, beating off the loose shells.

Step 5 - Grader: Sieved shelves separate pecan pieces from halves. Two sizes of halves and two sizes of pieces are obtained.

Step 6 - Shell Remover: The shell and kernels move on a belt under a vacuum unit. The vacuum inhales all the available loose shells.

Step 7 - Halve Picking Machine: Pecan halves are further extracted from shell material.

Step 8 - Halve Grader: The pecan meats are delivered to a sieved grader which slects extra large, large, medium, and small halves. Remaining pieces are also sorted by the grader.

Step 9 - Picking Table: Kernels enter the picking table operation by individual sizes. The picking table divides the kernels into perfect halves, extra large pieces and stick-tites. At the picking table, all kernels flow over a belt to be inspected where undesirable meats are culled.

Step 10 - Drying: Drying cabinets contain shelve space for 76 pans of pecan meats. Normal room temperature air is circulated to dry the moisture left by the humidizer.

Step 11 - Boxing: After boxing, meats are placed in a sterilizing room which is air tight; the nuts remaining there for twelve hours, awaiting shipment or storage.

Machine processing seeks to extract half meats. Pieces, other than halves, undergo continuous processing until they are eventually graded down to (a) large, (b) medium, (c) small, and (d) granules. The remaining material which is too small to merchandise as nut meats, is accumulated and sold as oil stock.

In the marketing of Oklahoma pecans, the sheller plays a leading role. He transforms the ungraded native pecan into graded shelled kernels. Pecan meats are obtained only after approximately two-thirds of the nut bulk has been discarded as shell waste. The sheller must maintain a ready market that can absorb his production and avert excessive storage charges or other unwarranted costs.

2. Storage

Storage facilities are maintained to assure the buying public of a year-round supply of pecans. In May, 1948, approximately 50 million pounds of shelled and unshelled pecans were in storage throughout the United States. Storage in Oklahoma consists principally of unshelled

nuts. Frozen kernels, used successfully for some purposes, is a secondary mode of storage. Most of the Oklahoma pecan crop usually can be stored in the state. The Tulsa Cold Storage, a Tulsa firm, reserves pecan space for 15 million pounds of sacked nuts.[22]

The recommended maximum period of storage for pecans is 12 months, although nuts successfully have undergone storage for as much as two and three years. Storage of large quantity lots is a customary practice.

Assessment charges for storage of large quantities are eighteen cents per hundredweight for the first month and nine cents for each month thereafter. Storage fees on smaller quantities are charged on a basis of twenty-four cents per hundredweight for the first month and twelve cents for each month thereafter.

Proper storage conditions sustain the color, texture, and flavor of the kernel. Recommended temperatures, ranging from 32 to 34 degrees Fahrenheit, protect against rancidity of the oil content of the nut. Frozen kernels are stored at zero Fahrenheit.[23] In addition to proper temperatures, stable humidity of 74 to 80 per cent must be maintained to preserve the pliability of the nut and to guard against brittleness for cracking.[24] Storage space should be devoid of light to prevent a blanching effect on the kernels.[25] Storage vaults should be free from "foreign" odors to

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[22]George L. Hancock, President, Tulsa Cold Storage, Tulsa, Oklahoma, Personal Interview by the Writer, (March 11, 1949).

[23]Ibid., (March 11, 1949).

[24]Ibid., (March 11, 1949).

[25]Fred R. Brison, The Storage of Shelled Pecans, Bulletin Number 667, Texas Agricultural Experiment Station in cooperation with Agricultural and Mechanical College of Texas, College Station, Texas, (March, 1945), p. 15.

prevent any absorption by shelled meats. Before being placed in storage vaults, shelled nuts should undergo proper packaging in order to preserve their value. Pecans are frequently delivered too long after harvest, thereby increasing the danger of rancidity.

CHAPTER VII

UTILIZATION OF THE PECAN

Historically, the pecan was considered a food only to be eaten without cooking.[1] The nut, in the past, has not found use as a basic food, but as a delicacy, decoration, dessert ingredient, particularly suitable for holiday consumption. The public, until quite recently, accepted pecans only as a seasonal novelty, finding its greatest use of them following harvest time around Thanksgiving and Christmas. Many people restrict consumption to casual eating, using hand-shelling methods of processing. In recent years the pecan has become of greater commercial value due to their increased use in the daily diet. The industry tends to promote new uses for the commodity and thus raise the annual consumption of nuts. The Oklahoma pecan industry is primarily interested in the consumptive use of pecan kernels rather than unshelled nuts.

Nuts are absorbed either directly by the household or by commercial markets. In 1948 the Oklahoma farm household consumed 500,000 pounds of pecans valued at $60,000. The ten leading producing states, including Oklahoma, in the same year used more than 12 million pounds valued at $1,508,000 in farm households.[2] The domestic cook finds a great

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[1] Isabel K. Billings, "Pecan Industry in the United States," Economic Geography, Volume 22, Number 3, (July, 1946), p. 220.

[2] Production, Farm Disposition and Value Principal Fruits and Tree 1947 and 1948 Seasons, (Report), Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., (January, 1949), p. 23.

number of uses for the pecan; at least 800 pecan recipes have proven successful.[3] Improved "papershell" varieties make up the bulk of raw pecan consumption in the home, because of their thin shells and large kernels.

1. Food Value in Pecans

Pecan kernels have the greatest nutritive value of all nuts and are distinctive in possessing one of the most concentrated forms of energy-producing food, where small shipping bulk is concerned.[4] This distinction is brought about due to the following characteristics: a high proportion of fats, an ample percentage of protein and an appreciable amount of carbohydrates. The large fat content is responsible for a high caloric value. Oklahoma native pecans are higher in oil content that both native and improved varieties of other states.[5] Pecans contain copper, iron, calcium and phosphorous. Vitamins A, B and G exist in small but significant quantities. Table V shows comparative nutritional values contained in nut meat kernels; in which illustration, the high fat content of pecans is clearly shown.

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[3]Elam G. Hess, "21,155 Pecan Recipes," Proceedings of the National Pecan Growers' Association, (October 13-14-15, 1925), p. 41.

[4]H. G. Heller and Frank B. Cross, The Chemical Content and Nutritive Value of Oklahoma Pecans, Mimeographed Circular M-176 Oklahoma Agricultural Experiment Station, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma, December, 1948, p. 4.

[5]Ural Richardson, President of the Oklahoma Pecan Shellers Association, Tulsa, Oklahoma, Personal Interview by the Writer, February 1, 1949.

TABLE V

The Comparative Composition of Nuts[6]

KIND OF NUT	FAT PERCENT	PROTEIN PERCENT	CARBOHY-DRATES PERCENT	ASH PERCENT	CALORIES PER OZ.
Pecan	71.2	11.0	13.3	1.5	205 /1
Brazil Nut	66.8	17.0	7.0	3.9	190
Coconut, Dried	50.6	5.7	27.9	1.7	160
Peanuts	47.0	32.0	24.4	2.6	175
Chestnuts	5.4	6.2	42.1	1.3	50
Almonds	54.9	21.0	17.3	2.6	175
Walnuts	56.7	27.6	11.7	1.9	195

/1 The calories in Oklahoma native pecans is approximately 225 per ounce.[7]

Fats are the leading food principal in pecans, being directly responsible for the richness of flavor. Pecan fat, unlike most other food fats, is highly digestible and can be readily assimilated by the body processes. A low melting point in pecan fat fosters nut palatability and digestibility. Freedom from any laxative effect as well as from allergic characteristics aid in the fat dietary processes.

The protein quality of pecans is not so high as other nuts, however comparative values place them in a catagory with milk, eggs and meat, showing a closer resemblance to that of milk that to the others. The nitrogen in pecan protein is distributed in the kernel in such a manner as to produce a high nutritive value. The much advertized amino acids are present in the form of lysine and cystine, both necessary in

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[6]H. P. Stuckey and Edwin J. Kyle, Pecan Growing, New York: The Macmillan Company, 1925, p. 98.

[7]Richardson, op. cit., February 1, 1949.

metabolistic processes.

Carbohydrate quantity is low in pecans, averaging about 13.3 per cent of the total food value. Existing carbohydrates contain about 9.03 per cent sucrose and 21.90 per cent invert sugars, both easily absorbed in dietary functions. Pecan sugars are not of great value because they are offset by the tannin contained in the integuments (indentations) of the kernels. There are no starches in pecan carbohydrates.[8]

Mineral elements, that are not considered of great consequence when compared to other foods, exist in small quantities. The amount of iron is low, consisting of only .0026 per cent to 100 edible portions of pecans. Calcium, amounting to .089 per cent, is not sufficient to maintain the supply of this most important mineral.[9] The small phosphorous content is sufficient to supply about one-fourth the necessary needs of an adult. Pecans contain an appreciable amount of copper, so essential to the utilization of iron in the body system.

Pecans are considered a good source of vitamins A and B, along with a small amount of Vitamin G. Riboflavin and Niacin, both important B-complex factors exist in important amounts. Thiamin, necessary in relation to growth, is present in quantities exceeding 25 per cent of the total vitamin factors.[10] Native kernels possess a large amount

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[8]F. A. Cafori, "Nutritive Property of Nuts," Journal of Biological Chemistry, Volume 49, Number 2, (1921), pp. 389-397.

[9]Henry C. Sherman and Caroline Sherman Lanford, Essentials of Nutrition, New York: The Macmillan Company, (1944), p. 393.

[10]Heller and Cross, op. cit., p. 3.

possess a large amount of pantothenic acid, another important vitamin factor. A minute quantity of vitamin G, which is vitally necessary for growth is present. Very little vitamin C and no vitamin D are present in pecan kernels.

Pecans are aseptic, free from putrefactive bacteria and do not readily undergo decay in the body. They are free from tapeworm, trichinal and other infectuous food organisms. A very small amount of harmless acid is present in pecans. Toxic elements contained in the outer coating of the kernel are easily assimilated with nutritive food.

Pecans are often classified by dietitians as a substitute for meat or similar concentrated foods. They possess a decided advantage over meats, since they are practically free from detrimental uric acid contained in meats. Nuts are also free from the tissue wastes found in meats. Dr. J. H. Kellogg, eminent food expert, has suggested nuts as a good substitute for milk.

2. Pecan Uses

The principal commercial consumers of the native pecans of Oklahoma are three groups of food processors: (1) Candy makers, (2) Ice cream manufacturers, (3) Bakers. The following chart shows such distribution.

TABLE VI

Nuts Used in Foods Industries in Order of Importance[11]

CANDY MAKING	ICE CREAM	BAKING
1. Almonds	1. Walnuts	1. Pecans
2. Pecans	2. Pecans	2. Walnuts
3. Walnuts	3. Pistachios	3. Brazil Nuts
4. Brazil Nuts		4. Almonds Filberts

[11]Luther Seaburn, "Pecan Markets and Marketing," Proceedings of the Oklahoma Pecan Growers' Association, (December 5-6, 1944), p. 40.

Next to almonds, pecans supply the principal tree nut for candy making. Recognition of their value for candy antedates other endemic nuts; having been used in the form of pecan pralines to feed the French Soldiers of Colonial Louisiana. Candy makers put the nut into a great variety and types of candies because of its considerable richness; a quality that often acts to retard the pecan's purchase by some consumers. Pecans blend well in candies and usually can improve any created mixture.[12] Makers of candy prefer natives over improved varieties because of their appearance and flavor. Although pecans rate high as an ingredient in candy manufacturing they are not yet a necessity; a fact clearly demonstrated in 1946 and 1947, when the candy manufactuers refused to pay the high prices in those years.

Ice crea manufactuers find the pecan particularly suited to their industry. The rich flavor produced from pecans results in a decided advantage over competitive flavors used in the industry. Buyers for the ice cream industry, therefore, purchase the natives of the southwest because of the excellent flavor characteristics. The year-round availability of pecans also is important to the, giving the industry a continuous supply of the ingredient.[13]

The baking industry consumes large quantities of pecans. A large baking concern, which has national distribution for its products, may

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[12] O. B. Elmer, "The Use of the Pecan by the Confectioner," Proceedings of the National Pecan Association, (September 27-28-29, 1932), p. 117.

[13] "Pecans for Ice Cream From-Deep in the Heart of Texas," The Ice Cream Review, Volume 26, Number 5, (December, 1942), p. 10.

purchase 200,000 pounds annually.[14] Bakers use pecans to make fruit cakes, pies and breakfast rolls. Baking houses need shelled kernels of the highest quality and are cognizant of Oklahoma's rich native types.

The packaging of pecans for sale, both shelled and unshelled, has created a wide scope of distribution. In the last few years the shelled pecan appeared on the market in cellophane bags, a development which has created a highly desirable merchantable item. Oklahoma's unshelled nuts have also found a ready market in packaged form, being sold through retail outlets and mail order channels. The chief impediment to shelled kernel sales is the high price. Perhaps the best distribution is carried on by the chain stores, who purchase most of their nuts from large buyers. Packaged shelled pecans are sold in five, three, two, and one-fourth ounce sizes, in order to stimulate consumer demand.[15] Unshelled varieties, both native and improved, find an appeal in market demand through their distribution in fancy mesh bags.

Those processed and sold as salted pecans rank fourth in value behind brazil nuts, raw pecans and cashew nuts. Principal processing centers are located in the eastern metropolitan centers. In 1940 the the factory value of processed salted pecans amounted to $904,908. Table VII shows the leading states in salted pecan production, and may indicate the influence of large city consumption on pecans.

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[14] W. A. Deacon, Manager; Raw Materials Equipment Division, National Biscuit Company, New York, New York, Personal Letter to the Writer, March 16, 1949.

[15] N. Voll, Manufacturing Purchasing Agent, The Kroger Company, Cincinnati, Ohio, Personal Letter to the Writer, March 14, 1949.

TABLE VII

Production of Salted Pecans by States(Factory Value)[16]

STATE	VALUE
Illinois	$204,293
New York	170,517
Massachusetts	136,696
Ohio	123,108
California	49,158
Michigan	29,566
Washington	24,907
Pennsylvania	22,696
Missouri	12,074
Colorado	11,284
Wisconsin	8,546

New uses for pecans are continually being suggested; all of which constitute potential merchantable items. Pecan oil, pressed pecans and pecan meal are under close scrutiny in an attempt to widen the market and further consumption. Pecan oil has been satisfactorily substituted for other oils in the making of mayonnaise and in baking. During the late war it was successfully substituted for olive oil.[17] A palatable butter has also been made from the oil. Pressed pecans, made by a partial extraction of the oil content, is in demand by consumers, who desire a less-rich pecan food.[18] They also show promise in the making of bread and cereals. Meal from the nut likewise suggests a new base

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[16]Sixteenth Census of the United States, 1940, Volume II, Part I, Group I, Bureau of the Census, United States Department of Commerce, Superintendent of Documents, Washington, D. C., p. 195.

[17]Thomas H. Whitehead and Hilda Marshaw, Studies in the Utilization of Georgia Pecans, Bulletin Number 4, State Engineering Experiment Station of the University of Georgia, The Georgia School of Technology, Atlanta, Georgia, Volume 1, Number 5, (December, 1938), p. 6.

[18]G. H. Blackman, "Some New Pecan Products," Proceedings of the Southeastern Pecan Growers' Association,(February 24-25, 1937), p. 56.

for baking mixtures.

3. By-Products

Shells of pecans possess a broad range of possible use in industry, and the great annual waste of them warrants continued research. The industry hopes to dispose of its shells to the plastics industry, which requires large amounts of vegetable fiberous materials of this nature. Pecans are classified, catagorically, with other agricultural residues, among them being: fruit pits, shells of other nuts, peanut hulls, straw and stalks; many of which are already used extensively in industry. Pecan oil also can be classified as a by-product, when it is extracted from the waste stock discarded from shelling plants.

Shells

Shells are classified as furfural, a woody fiberous texture. The fiberous vegetable materials in pecan shells possess a number of the desired characteristics so requisite to the plastics industry, they are: hardness, chemical inertia, and freedom from absorption. However, the relatively high oil content contained in the shells creates an undesirable liability. Shells, as a vegetable material, can find a use only when reduced to a flour, which is measured to mesh sizes of -100, -200, and -325. Use of flour is restricted in its consumption by industry because of competitive residues, however possible application may be considered. The glue trades could use pecan flour as a filler. The ceramic industry uses fine coarsely ground vegetable materials to form brick products; a use which also could employ pecan shell flour. The oil content in pecan shells has prevented their use in phenolic type resin mixtures used for making plastics. Plywood makers have found

pecan flour satisfactory as an extender in adhesive mixtures. Laboratory studies reveal a number of possible ways in which shell products could be used, they are: for hand soaps, as soft grit in blasting materials, and as a burnishing and polishing agent.[19]

At this writing, although of minor importance in the amount of utilization, the greatesteconomic use for pecan shells is derived from their tannin content. A shortage of tannin exists, creating a ready market and a favorable price, amounting to about $25.00 per pound. Tannin is extracted from the inner shell liner and partitions of the nut. Pecan tannins are sold to the oil industry and the leather industry; the former, who use them to mix with drilling muds, find their quality particularly high. Oklahoma native pecans constitute a more reliable source for tannins than improved variety nuts.

Shells possess some possible use as a fuel. The have a calorific value of 7,000 British Thermal Units, which is about 60 per cent of the heat value of coal. The R. E. Funsten, Company of St. Louis, Missouri, pecan buyers and shellers, use pecan shells as fuel in plant operations. When calculated on the basis of coal prices, shells are worth about $4.50 per ton as a fuel. On a commerical scale, pecan shells for fuel are restricted by short supply.

Oil

Possible industrial use of pecan oil is approaching development, however high cost and limited amount preclude extensive utilization.

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[19]E. C. Lathrop, Head: Agriculture Residues Division, Bureau of Agriculture and Industrial Chemistry, Agriculture Research Administration, United States Department of Agriculture, Personal Letter to the Writer, March 21, 1949.

The chief source of oil is the waste stock of commercial shellers; a quantity amounting to about three per cent of the total of pecan meats handled by the shellers. The J. R. Fleming Company Inc., Weatherford, Texas, processes the bulk of the waste stock for oil, producing annually about 800,000 pounds.[20]

Pecan oil could be used in many ways, however at this time the commercial supply goes largely to the drug and essential-oil trade. Refined pecan oil can be used in glycerine, shampoo, sulfonated oil and soaps. Raw oil may be used directly for soapstocks, thereby eliminating a cost measure in refining.[21] Pecan oil has been recommended as the best oil available for cosmetics; its use in these shows highly credible results.[22]

3. The Pecan Tree as Lumber

The pecan tree may be considered a valuable source of hardwood lumber. Heretofore pecan tree lumber has been relatively unimportant, but today the lumber industry of the southeast is fast utilizing this durable hardwood. At present, pecan lumber in Oklahoma is negligible in commercial cutting because the nut products remain of greater economic value than the tree's wood. It appears likely, then, that in the future the state will extract reasonable amounts for commercial use.

Pecan is similar to walnut which it often replaces. The wood surface lends itself to a high polish and can be easily worked, although

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[20]J. R. Fleming," Producing By-Products From Pecans," Chemigic Digest, Volume VIII, Number 5, (May, 1949), pp. 25-26.

[21]Whitehead and Warshaw, op. cit., p. 7.

[22]Fleming, op. cit., pp. 25-26.

very often special tools are necessary to overcome its toughness. Uniformity of color combined with a richness of tone and freedom from defects render the wood capable of a variety of uses.

Utilization of pecan lumber involves its application in furniture making, for cabinet working, in interior trim, as sliced veneers and for general industrial use. The automobile industry annually contracts for large amounts of the wood because of its great strength and low cost. The wood finds discriminating use in reception rooms, executive offices, libraries and fine homes. It is interesting to note that the furniture, in the executive offices of the Bank of England, is made from pecan wood.

CHAPTER VIII

GEOGRAPHIC FACTORS AND ECONOMIC OUTLOOK OF THE PECAN INDUSTRY IN OKLAHOMA

The pecan industry of Oklahoma in recent years reached unprecedented heights, yet the industry is still in its infancy as compared with other agricultural industries and related tree crops. Growers contend that only one-half of the annual crop is gathered at this time. An authoritative source estimated that the national pecan crop could be increased tenfold if the need arose.[1] Further development of the industry here depends on a number of factors that include: grove thinning and development, systematic harvesting methods, and market development.

Geographically, pecan development in the state will probably restrict itself to the Native Pecan Belt show in Figure 14 on the bases of climate and soil factors. Expansion of the industry does not depend upon the new plantings of trees, but rather, on thinning and clearing of the existing pecan lands within the Belt. Authorities point out that it is not sparsity of pecan trees, but rather over-abundance that curtails annual yields and future development.

Pecans rank high among Oklahoma's leading crops; their value of $31,338,000 for the past decade warrants a high rating in the agricultural industries, (See Figure 14). The 1947 crop, valued at $8,118,000,

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[1] J. Russell Smith and M. Ogden Phillips, North America, New York: Harcourt, Brace and Company, (1940), p. 313.

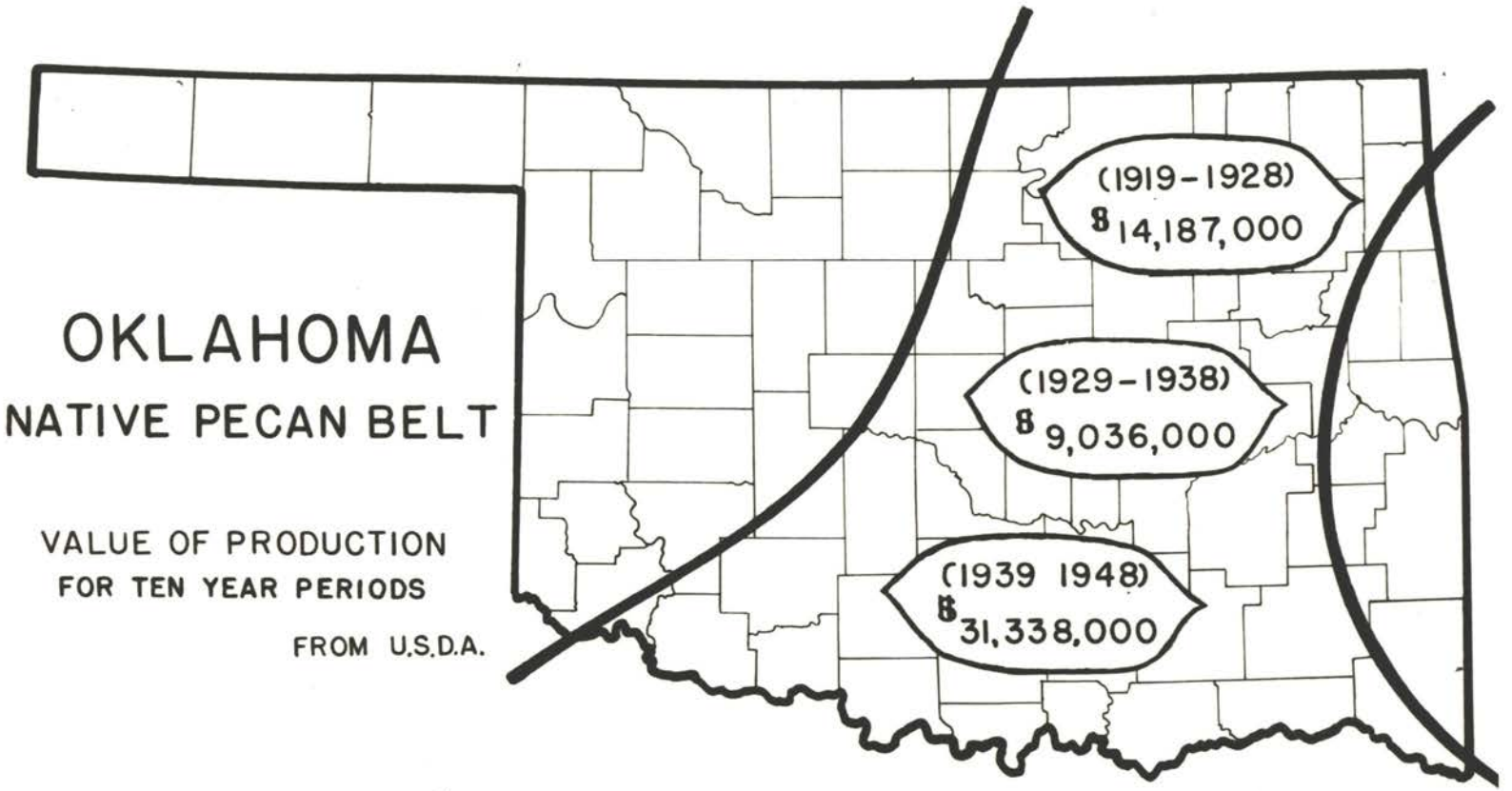
OKLAHOMA
NATIVE PECAN BELT
VALUE OF PRODUCTION
FOR TEN YEAR PERIODS
FROM U.S.D.A.
(1919-1928)
$14,187,000
(1929-1938)
$9,036,000
(1939 1948)
$31,338,000

FIGURE 14.

offers some striking contrasts when compared to other Oklahoma crops. In that year, broomcorn, long a ranking national leader of the state, reaped an income of $3,472,000. Barley for the same period sold at $3,089,000. Even the farm evaluation of wild hay ranked below pecan income in 1947, being $6,916,000. Three comparatively new crops, mung beans, cowpeas and soybeans, ammased incomes totalling $1,455,000, far below the production figure of the annual pecan crop.[2] The illustration (Figure 14) shows how the 1947 crop nearly equalled the ten year period value from 1929 to 1938, and it also shows how in recent years pecans have become a great cash crop for the state.

The Oklahoma native pecan section is gradually showing it's superiority over the cultural pecan area of the southeastern states, both in production and consumption. During the years 1930 to 1935, the native pecan belt displayed a much larger percentage gain than the southeastern states, which appeared to be leveling-off and even to be showing a diminishing return in nut production. In 1947 more than thirty-seven per cent of the nation's pecans originated on Oklahoma trees, while Georgia, principal producing state of the Southeast, showed a yield of only twenty-three per cent.[3]

Oklahoma farmers disregarded the native nuts as a commercial commodity for many years, other than for household use and casual eating

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[2] A Statistical Handbook of Oklahoma, Agricultural Experiment Station Miscelaneous Publication Number 14, Oklahoma Agricultural Experiment Station, Oklahoma Agriculture and Mechanical College cooperating with Bureau of Agricultural Economics, United States Department of Agriculture, Stillwater, Oklahoma, (1949) pp. 29, 35, 20, 25, 27, and 28.

[3] Tree Nuts, Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C. (August, 1948), p. 8.

purposes, it had limited demand, but in recent years they saw the great potentialities in pecans, increased the existing production, and proceeded to penetrate the established pecan market. Machinery for shelling the kernal developed new customers. Oklahoma improved "paper-shell" pecans also show a significant gain in yields; the annual production amounting to about three per cent of the national crop.[4] The advancement of name varieties in the state is due to the many importations of improved stock from the Southeast and Texas.

Within the last few years, pecan shelling plants have come to the front in Oklahoma, supplying a ready outlet for a large portion of the state's pecan crop. They are geographically located throughout the commercial pecan area of the state, where they can be of most use to the industry. The plants employ about 300 workers in sixteen establishments. Approximately $300,000 is invested in processing machinery, aside from a large outlay for buildings.[5] The sheller is largely responsible for creating a merchantable item, the shelled kernel, thereby marketing the bulk of the native crop.

Firms in Oklahoma provide ample cold storage space to handle the yearly crop. Facilities at Tulsa, Oklahoma house a large portion of the annual crop. The Tulsa Warehouse and Cold Storage is equipped to store 15,000,000 pounds of shelled and unshelled nuts. This firm also stores a sizeable amount of the Texas crop, awaiting marketing outlets in

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[4]G. P. Collins, "Trends in the Production and Distribution of Pecans," Proceedings of the Oklahoma Pecan Growers' Association, (December 4-5, 1945), pp. 26-29.

[5]Uel Richardson, President of the Oklahoma Pecan Shellers' Association, Personal Interview by the Writer, March 11, 1949.

eastern United States. Provision of adequate storage permits supplying nuts on a year-round basis.

The city of Tulsa, situated in the heart of the rich pecan lands of northeastern Oklahoma, is fast becoming the pecan center of the state and possibly the pecan capitol of the world. Durant, the earlier pecan collection center of southern Oklahoma, long since has relinquished the lead to Tulsa.[6] The Tulsa area offers capable pecan facilities in five modern shelling plants, and the largest pecan storage plant in the world. A promising enterprise exists in the Madeira Food and Materials Company, of Sand Springs; in which establishment pecan and black walnut shells are processed for sale to industry. Ardent nut culturists, and enthusiastic growers and shellers are a pillar of strength in the Tulsa pecan community.

At this writing, progress is being made on numerous "pecan fronts." The Oklahoma pecan shellers, through a pecan seedling contest, seek a better nut to facilitate processing operations.[7] Government subsidies are on the legislative agenda to insure the grower of annual price supports. The pecan marketing bill, recently presented to the state legislature, will provide monies for the promotion and marketing of the Oklahoma pecan.[8] An appeal for lower freight rates, needed in order to lower the marketing cost of pecans, is in the hands of the U. S. Interstate

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[6]Oklahoma Extension News, "Durant Nut Center", Volume 8, Number 11, (September, 1927), p. 1.

[7]Frank B. Cross, "Oklahoma Pecan Seedling Contest," Proceedings of the Oklahoma Pecan Growers' Association, (December, 9-10, 1948), p. 21.

[8]Joe Howell, "Report of Marketing Expansion Work," Proceedings of the Oklahoma Pecan Growers' Association, (December, 9-10, 1948), pp. 70-77.

Commerce Commission. A pecan experiment station, under the direction of Oklahoma Agricultural and Mechanical College, is scheduled for establishment in the heavy producing pecan region of Lincoln County.

The marketing problem is critical and must be solved. Oklahoma remains a pecan exporting state, seeking a market for the anticipated yield of 20,000,000 pounds yearly. Production appears assured, if the price warrants the gathering, therefore a larger consuming public must guarantee a market to the Oklahoma pecan grower. Oklahoma pecans should be advertised more extensively, and the public should be educated more fully as the the nutritive value in native pecan kernels. Younger enterprisers are needed to enter the industry and await the gainful production of pecan trees. Late in life, Luther Burbank states; "That were he a younger man, he would go to the Southwest and raise pecans." Factors that deter individuals from entering the pecan business are a large capital outlay and a lengthy waiting period before substantial remuneration is forthcoming. A planted cultural orchard may not show a profit until the twentieth year. A characteristic peculiar to pecan growing is that the majority of people who enter the business are older men; many of these seek only an avocation in pecan culture.

In the geographic sense, man has not taken full advantage of the natural harvest in supplying his wants from the nut crops at hand. He works much harder and often secures much less from many other agricultural crops.

What is the future of the pecan industry? The test of this thesis has attempted to show that many factors favor the success of the industry. The total income of $31,338,000 over the past decade, much of it obtained through a minimum of effort, must surely be some reflection of

the great value of the pecan. The industry appears to be well managed, with grower, sheller and that interesting individual, the nut culturist, cooperating in forwarding it's welfare. It seems a simple matter indeed, to develop the native groves and create new orchards, from which may be harvested this rich concentrated food, for man's diet and use, the pecan nut.

Production of Pecan by Leading States of the Native Pecan Region, 1919 to 1948
(1,000 pounds)

Year	Oklahoma	Texas	Louisiana	Arkansas	Missouri	Illinois
1919	15,000	35,000	5,000	3,640	1,000	230
1920	3,000	2,000	700	560	250	210
1921	9,000	19,000	5,600	2,900	350	155
1922	2,000	2,000	600	390	750	165
1923	16,000	20,000	4,250	2,970	350	200
1924	11,000	12,500	1,750	2,200	500	200
1925	14,700	12,000	5,530	3,120	600	23
1926	19,700	41,900	6,000	4,850	1,500	315
1927	8,900	9,600	2,250	3,250	400	90
1928	8,400	29,500	5,500	3,000	300	30
1929	16,000	21,000	2,650	2,250	900	150
1930	15,000	13,500	7,973	3,000	600	210
1931	13,500	35,000	8,192	4,750	1,800	247
1932	23,000	22,800	6,164	2,800	12,500	212
1933	10,500	27,000	10,575	4,200	13,500	223
1934	11,500	15,000	4,172	2,600	550	266
1935	28,000	50,000	8,792	4,000	1,250	508
1936	2,000	10,400	7,176	2,240	380	126
1937	18,400	27,000	11,088	5,265	1,008	686
1938	2,100	23,000	6,688	2,240	207	224
1939	19,000	19,000	7,176	3,543	875	500
1940	28,000	41,000	8,784	2,902	775	496
1941	30,600	22,100	5,600	4,260	1,500	887
1942	4,000	10,300	6,400	3,400	500	500
1943	26,000	26,000	12,000	4,600	1,120	1,300
1944	14,000	45,000	14,400	4,200	625	490
1945	26,000	32,250	9,200	4,900	1,500	1,050
1946	7,000	22,500	9,000	1,200	500	140
1947	44,000	21,000	4,400	3,850	-	-
1948	12,000	43,000	15,000	5,740	-	-

U.S.D.A. (Bureau of Agricultural Economics), January, 1949

APPENDIX B

Production of Pecans by Leading States of the Cultural Region, 1919 to 1948
(1,000 pounds)

Year	Georgia	A/1 Mississippi	Alabama	North Carolina	South Carolina	Florida
1919	3,200	2,600	1,400	240	600	1,200
1920	1,550	715	600	130	220	440
1921	4,500	2,700	1,800	150	800	1,200
1922	1,500	1,100	1,350	260	360	880
1923	6,600	2,400	2,500	480	680	1,600
1924	3,600	1,932	1,686	560	770	1,300
1925	6,400	5,094	2,200	330	550	1,916
1926	9,400	5,500	3,100	780	1,300	1,516
1927	5,000	3,200	1,260	660	750	1,144
1928	8,400	6,500	3,500	690	730	2,000
1929	4,000	2,520	1,620	660	580	1,000
1930	5,600	5,380	3,132	690	900	1,150
1931	10,496	6,000	4,130	1,050	950	2,348
1932	5,160	2,334	2,080	830	820	784
1933	11,440	5,457	4,104	1,210	1,224	1,529
1934	12,000	2,464	3,483	1,540	1,232	1,365
1935	14,080	6,496	5,400	1,860	1,310	1,989
1936	19,880	4,200	5,830	2,440	2,475	2,640
1937	19,680	8,979	7,844	2,730	2,030	2,480
1938	21,090	4,788	5,376	3,000	2,035	3,575
1939	21,830	7,884	9,862	1,500	2,418	3,472
1940	23,600	3,096	5,698	2,625	2,344	3,564
1941	26,220	6,890	12,870	3,670	2,512	4,672
1942	26,500	6,300	10,080	2,400	2,394	4,600
1943	30,500	9,000	12,222	3,120	2,656	4,524
1944	33,500	9,000	12,600	2,175	2,129	5,100
1945	36,850	7,250	12,100	3,200	2,642	4,234
1946	16,000	4,350	8,740	1,344	1,406	4,526
1947	27,685	2,900	7,440	2,040	2,550	2,774
1948	39,600	10,585	17,000	2,752	2,660	5,475

U.S.D.A. (Bureau of Agricultural Economics), January, 1949.

A/1 Mississippi is included because improved varieties outranked native pecans in that state for the first time in 1948.

Value of Production of Pecans in the Principal Native Pecan States 1919-1948
(Thousands of Dollars)

Year	Oklahoma	Texas	Louisiana	Arkansas	Missouri	Illinois
1919	2,400	5,600	1,450	728	1,170	48
1920	510	500	217	129	45	40
1921	1,080	2,470	1,176	464	52	25
1922	342	404	130	72	129	28
1923	1,776	2,860	795	496	61	34
1924	1,771	2,162	460	649	126	36
1925	2,220	2,064	1,095	580	109	4
1926	1,990	4,777	1,038	771	243	54
1927	1,166	1,574	457	523	81	13
1928	932	3,628	764	453	49	4
1929	1,648	2,436	484	304	119	22
1930	1,380	1,552	1,148	399	73	29
1931	688	1,995	770	318	146	20
1932	828	980	512	196	76	15
1933	588	1,674	740	298	96	17
1934	1,368	1,710	517	255	70	27
1935	1,176	2,550	765	326	101	27
1936	184	1,040	875	231	31	9
1937	1,016	1,758	904	306	52	41
1938	160	1,688	633	180	14	15
1939	1,548	1,668	686	327	72	45
1940	1,980	2,979	851	262	68	45
1941	2,683	2,114	562	463	139	81
1942	659	1,754	984	545	66	80
1943	5,091	5,206	2,418	1,052	240	277
1944	2,404	8,232	2,688	989	137	106
1945	2,377	6,772	1,954	1,135	317	223
1946	2,157	6,742	2,774	438	190	37
1947	8,119	4,486	1,127	739		
1948	1,320	4,860	1,759	611		

U.S.D.A. (Bureau of Agricultural Economics), January, 1949.

APPENDIX D

Value of Production of Pecans in the Principal Cultural Pecan States, 1919-1948
(Thousands of Dollars)

Year	Georgia	Mississippi	Oklahoma	North Carolina	South Carolina	Florida
1919	1,216	728	448	84	252	372
1920	542	250	174	49	68	141
1921	1,350	756	504	48	232	312
1922	560	368	436	102	130	309
1923	2,501	821	908	195	256	483
1924	1,458	655	641	198	273	448
1925	2,227	1,554	790	128	220	602
1926	2,670	1,490	936	280	335	377
1927	1,600	906	420	228	238	321
1928	2,201	1,430	928	212	213	544
1929	1,112	625	447	191	184	290
1930	1,512	1,006	714	193	235	297
1931	1,144	648	537	193	152	286
1932	599	273	245	128	110	95
1933	1,258	562	558	211	175	157
1934	1,548	404	488	294	207	179
1935	1,394	721	616	340	208	199
1936	2,624	517	717	451	398	309
1937	1,905	758	659	425	279	185
1938	2,259	475	566	409	262	309
1939	2,479	686	998	231	324	292
1940	2,724	389	638	382	311	341
1941	3,018	680	1,413	577	331	474
1942	4,814	1,029	1,683	442	436	752
1943	8,670	1,886	3,133	906	719	1,060
1944	8,724	1,933	3,293	688	624	1,143
1945	10,282	1,609	3,272	963	779	1,010
1946	6,461	1,381	3,176	535	551	1,507
1947	7,558	721	2,093	652	657	628
1948	5,079	1,376	2,307	532	379	605

U.S.D.A. (Bureau of Agricultural Economics), January, 1949.

APPENDIX E

Seasonal Average Price Per Pound for Pecans
In the Principal Native Pecan States 1919-1948
(Cents Per Pound)

Year	Oklahoma	Texas	Louisiana	Arkansas	Missouri	Illinois
1919	16	16	29	20	17	21
1920	17	25	31	23	18	19
1921	12	13	21	16	15	16
1922	17.1	20.2	21.7	18.5	17.2	17
1923	11.1	14.3	18.7	16.7	17.4	17
1924	16.1	17.3	26.3	29.5	25.2	18
1925	15.1	17.2	19.8	18.6	18.2	17
1926	10.1	11.4	17.3	15.9	16.2	17
1927	13.1	16.4	23	16.1	20.2	14
1928	11.1	12.3	13.9	15.1	16.3	15
1929	10.3	11.6	18.2	13.5	13.2	15
1930	9.2	11.5	14.4	13.3	12.2	14
1931	5.1	5.7	9.4	6.7	8.1	8
1932	3.6	4.3	8.3	7	6.1	7.0
1933	5.6	6.2	7	7.1	7.1	7.5
1934	11.9	11.4	12.4	9.8	12.7	10
1935	4.2	5.1	8.7	6.8	8.1	5.4
1936	9.2	10	12.2	10.3	8.2	7.1
1937	5.5	6.5	8.2	5.8	5.2	6
1938	7.6	7.3	9.5	8	6.8	6.7
1939	8.1	8.8	9.6	9.2	8.2	9
1940	7.1	7.3	9.7	9	8.7	9.1
1941	8.8	9.6	10	10.9	9.3	9.1
1942	16.5	17	15.4	16	13.2	16
1943	19.6	20	20.2	22.9	21.4	21.3
1944	17.2	18.3	18.7	23.5	21.9	21.6
1945	20.7	21.0	21.2	23.2	21.1	21.2
1946	30.8	30	30.8	36.5	38	26.5

U.S.D.A. (Bureau of Agricultural Economics) January, 1949

Seasonal Average Price Per Pound for Pecans
In the Principal Cultural Pecan States 1919-1948
(Cents Per Pound)

Year	Georgia	Mississippi	Alabama	North Carolina	South Carolina	Florida
1919	38	28	32	35	42	31
1920	35	35	29	38	31	32
1921	30	28	28	32	29	26
1922	37.3	33.5	32.3	39.2	36.1	35.1
1923	37.9	34.2	36.3	40.6	37.6	30.2
1924	40.5	33.9	38	35.4	35.5	34.5
1925	34.8	30.5	35.9	38.8	40	31.4
1926	28.4	27.1	30.2	35.9	25.8	24.9
1927	32	28.3	33.3	34.5	31.7	28.1
1928	26.2	22	26.5	30.7	29.2	27.2
1929	27.8	24.8	27.6	28.9	31.7	29
1930	27	18.7	22.8	28	26.1	25.8
1931	10.9	10.8	13	18.4	16	12.2
1932	11.6	11.7	11.8	15.4	13.4	12.1
1933	11	10.3	13.6	17.4	14.3	10.3
1934	12.9	16.4	14	19.1	16.8	13.1
1935	9.9	11.1	13.4	18.3	15.9	10
1936	13.2	12.3	12.3	18.5	16.1	11.7
1937	9.7	8.4	8.4	15.6	13.7	7.5
1938	10.7	9.9	10.5	13.6	12.9	8.6
1939	11.4	8.7	10.1	15.4	14.1	8.4
1940	11.5	12.6	11.2	14.6	13.3	9.6
1941	11.5	9.9	11.0	15.7	13.2	10.1
1942	18.2	16.4	16.7	18.4	18.?	16.3
1943	28.4	21.3	25.6	29	27.1	23.4
1944	26	21.9	26.1	31.6	29.3	22.4
1945	27.9	22.2	27	30.1	29.5	23.9
1946	40.4	31.7	36.3	39.8	39.2	33.3

U.S.D.A. (Bureau of Agricultural Economics) January, 1947.

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