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Tung Tried: Agricultural Policy and the Fate of a Gulf South Oilseed Industry, 1902-1969

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Tung tried: agricultural policy and the fate of a Gulf South oilseed industry, 1902-1969

By

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The U.S. tung oil industry began as a government experiment in plant diversification but businessmen mistakenly interpreted this interest as an endorsement of domestic production and began growing tung trees in the Gulf South states of Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas. The new crop quickly caught the attention of paint, varnish, and ink companies in the northern and Midwestern states and created a buzz among chemurgists like Henry Ford and other industrialists who eagerly expanded tung acreage. With the erection of the first crushing mill in 1928, the tung oil industry began but it did not acquire any semblance of maturity until World War II.

The war thrust the nascent tung oil industry into strategic status. Used as a varnish on military airplanes and naval vessels, a brake lining, a machinery lubricant, a liner for tin cans, and as electrical insulation, demand exceeded supply. Traditional consumers had such a difficult time purchasing tung oil during the war that they turned to other oilseeds or new synthetic oils. The war both aided and crippled tung oil by highlighting its chemurgic uses and deterring consumers given that shortages encouraged the quest for alternatives. Despite a barrage of synthetic competitors and imports, domestic tung

growers continued production in the hopes that the discovery of new industrial markets would increase demand and attract government support in the form of parity, tariffs, and quotas.

Between 1949 and 1969, a series of agricultural policies granted protection but from the outset federal support proved reluctant and tenuous because production remained miniscule, quotas threatened to heighten diplomatic tensions, and wealthy, part-time growers comprised the bulk of parity recipients. Hurricane Camille has often received credit for bringing a swift end to the industry but imports, competitive oilseeds, synthetics, and freezes had delivered powerful blows to the extent that many farmers stopped growing tung long before 1969. Indeed, Camille proved nothing more than a death knell to a waning industry that had become dependent on government largesse.

Key words: tung, commodity, oilseeds, diversification, chemurgy, agricultural policy

DEDICATION

For my parents Donald and Barbara Snow

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Roosevelt Presidential Library; Rita Millican of Livingston Parish Library; Herb Pankratz of Dwight D. Eisenhower Presidential Library; Lamont Pearson of Margret Reed Crosby Memorial Library; Bobby Ruth Powell of Alachua County Library District; Sarah Pratt of John F. Kennedy Presidential Library; Sarah Roberts of Michigan State University; Lesley Schoenfeld of Harvard Law School Library; Charles Sullivan of Mississippi Gulf Coast Community College; Leigh Ann Vey of Hargrett Rare Book and Manuscripts Library; and Monica Wilkinson of Pike-Amite-Walthall Library. I would also like to express my appreciation to my parents Donald and Barbara Snow for their love and support. Last but certainly not least, special recognition goes to colleagues Karrie Barfield, Cari Casteel, Justin Dornbusch, Sean Halverson, Erinn McComb, Michael Murphy, Karen Senaga, and Alyssa Warrick for their friendship, encouragement, and multitude of "tung" jokes.

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ABBREVIATIONS

AAA	Agricultural Adjustment Act
AFBF	American Farm Bureau Federation
AFCC	Argentine Farm Chemurgic Council
ARS	Agricultural Research Service
ASCS	Agricultural Stabilization and Conservation Service
AOAC	Association of Official Agricultural Chemists
APHIC	Animal and Plant Health Inspection Center
APVA	American Paint and Varnish Association
ASCS	Agricultural Stabilization and Conservation Service
ATGA	American Tung Growers Association
ATOA	American Tung Oil Association
ATOI	American Tung Oil Institute
BAWI	Balance Agriculture With Industry
BEPQ	Bureau of Entomology and Plant Quarantine
BPI	Bureau of Plant Industry
BPISAE	Bureau of Plant Industry, Soils, and Agricultural Engineering
CAAA	Clean Air Act Amendment
CAT	Comision Argentina del Tung
CCC	Commodity Credit Corporation

CIGA	Centro Investigaciones de Grasas y Aceites
CSS	Commodity Stabilization Service
DSID	Department of Seed Introduction and Dispersal
EBV	Epstein-Barr Virus
ERRL	Eastern Regional Research Lab
FCA	Farm Credit Administration
FERA	Federal Emergency Relief Administration
FFLB	Federal Farm Loan Bureau
FHA	Farm Home Administration
FHB	Federal Horticultural Board
FLB	Federal Land Bank
FSA	Farm Security Administration
GACC	Granja Argentina Consejo Chemurgic
GATT	General Agreement on Tariffs and Trade
IAA	Instituto Agrario Argentino
IAGA	Instituto Argentino de Grasas y Aceites
NASA	National Aeronautics and Space Administration
NCCO	National Conference Commodity Organization
NCS	National Security Council
NFBF	National Farm Bureau Federation
NFCC	National Farm Chemurgic Council
NFO	National Farmers' Organization
NFU	National Farm Union

NPVLA	National Paint, Varnish and Lacquer Association
NRRL	Northern Regional Research Lab
NTOMC	National Tung Oil Marketing Cooperative
NVMA	National Varnish Manufacturers Association
OEP	Office of Emergency Preparedness
PATRDL	Pan-American Tung Research and Development League
PCA	Production Credit Association
PCC	Production Credit Corporation
PWA	Public Works Administration
SCS	Soil Conservation Service
SES	Soil Erosion Service
SPI	Section of Systemic Seed and Plant Introduction
SRRL	Southern Regional Research Laboratory
TGCA	Tung Growers Council of America
TGO	Tung Growers Organization
TRDL	Tung Research and Development League
TRF	Tung Research Foundation
TVA	Tennessee Valley Authority
UFW	United Farm Worker Association
USBEP	United States Bureau of Engraving and Printing
USDCL	United States Department of Commerce and Labor
USDA	United States Department of Agriculture
USDC	United States Department of Commerce

USDD	United States Department of Defense
USDS	United States Department of State
USDT	United States Department of Treasury
USSR	Union of Soviet Socialist Republics
VOC	Volatile Organic Compounds
WFA	War Food Administration
WPA	Works Progress Administration
WRRL	Western Regional Research Lab

CHAPTER I

THE TALE OF THE TUNG BELT: AN INTRODUCTION

The tung business was a big business, a multi-million dollar business.[1]

S. G. Thigpen, Sr.

Between 1928 and 1969, a domestic tung oil industry operated along a narrow strip of coastal land stretching from the Florida Panhandle to southeastern Texas. Primarily used in paints, varnishes, and inks, tung oil first appeared on the domestic commodity market scene in the early twentieth century when federal embassaries encouraged the first domestic plantings to diversify the economic botany of the country. Attempting to use cut-over pinelands, large coastal farmers experimented with a variety of crops, tung trees among them. The trees' rapid maturation together with the promise they offered of a fast, convenient method of intercropping attracted a growing number of investors—particularly well-heeled farmers and industrialists who labeled the distinctive region of coastal land the "Tung Belt."

Though boosters strove to establish credibility for tung through advertisements, scientific experimentation, and lobbying, tung's climatic restrictions and vulnerability to freezes and hurricanes made production volatile, even at the industry's peak.

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[1] S. G. Thigpen, Sr., interviewed by Dr. Orley B. Caudill, August 2, 1973, transcript, The Mississippi Oral History Program of The University of Southern Mississippi, vol. 74 (1976), p.9, The Center for Oral History and Cultural Heritage, McCain Library and Archives, The University of Southern Mississippi, Hattiesburg, MS [hereafter COHCH, MLA, USM].

Unsurprisingly, its environmental sensitivity along with the rise of inexpensive imports and inferior (but still effective) rival oilseeds and synthetics gradually ate away at tung acreage and tung oil consumption. Although tung commanded the attention of presidents, congressmen, scientists, and businessmen, the industry could not find a way to escape its protracted decline after World War II. In short, what began as a plausible federal project to achieve botanical independence in the early decades of the century became an economic albatross dependent upon American largesse, government support which prolonged production for two decades after tung had ceased to be a profitable venture. Often blamed for the demise of domestic production, Hurricane Camille did bring a swift and sudden end to tung as a crop but it proved only the final blow to a collapsing industry—a merciful one to the minds of many who had come to see tung as a misguided agricultural endeavor mistakenly propagated past its time by federal money.

During the age of domestic production, tung received mention in an array of works. In 1946, chemist Williams Haynes's *Southern Horizons*, explored agricultural based industrial products in the South, devoting a chapter to the scientific and industrial promise of tung oil.[2] Six years later, in 1952, student Hui Chen Chen wrote an economic thesis titled "The Tung Oil Industry in The United States."[3] That same year, a Bureau of Business Research book by Randolph G. Kinabrew called *Tung Oil in Mississippi: The Competitive Position of the Industry* evaluated the economic prospects of tung.[4] Almost

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[2] Williams Haynes, *Southern Horizons* (New York: D. Van Nostrand, 1946).

[3] Hui Chen Chen, "The Tung Oil Industry in The United States" (master's thesis Southern Methodist University, 1952).

[4] Randolph G. Kinabrew, *Tung Oil in Mississippi: The Competitive Position of the Industry* (Jackson: University of Mississippi, 1952).

two decades later, in 1970, student Ollie Ancil Cleveland, Jr., wrote an agricultural economics thesis that identified "A Procedure for Predicting the Date of Full Bloom of Tung Trees." Contemporary monographs have also included mention of the tung tree.[5]

Modern works that reference tung tend to associate it with coastal pinelands. Agricultural historian Gilbert C. Fite listed tung among southern diversification efforts and World War II strategic commodities in *Cotton Fields No More: Southern Agriculture, 1865-1980*.[6] Environmental historian Albert E. Cowdrey's *This Land, This South: An Environmental History* mentioned the emergence of tung trees on former pinelands. Southern historian Thomas D. Clark's *The Greening of the South: The Recovery of Land and Forest* and environmental historian James E. Fickle's *Mississippi Forests* spoke of tung as an experiment on cutover pinelands.[7] Other scholarly studies of tung tend to be chemical or dated—oftentimes both—and devoted to characteristics of tung trees and tung oil.

Articles discussing uses, oil content, and toxicity appeared in *Economic Botany* and the *Journal of American Oil Chemists' Society*, and sometimes they included background on the Chinese origins of the tung tree and early U.S. plantings. In 1941, H. H. Gardner, P. H. Butler, and F. Scofield published the pamphlet *Tung Oil Culture:*

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[5] Ollie Ancil Cleveland, Jr., "A Procedure for Predicting Date of Full Bloom of Tung Trees" (master's thesis, Mississippi State University, 1970.

[6] Gilbert C. Fite, *Cotton Fields No More: Southern Agriculture, 1865-1980* (Lexington: University Press of Kentucky, 1984), 112, 168.

[7] Albert E. Cowdrey, *This Land, This South: An Environmental History* (Lexington: University Press of Kansas, 1996), 171; Thomas D. Clark, *The Greening of the South: The Recovery of Land and Forest* (Lexington: University Press of Kentucky, 1984), 30; and James E. Fickle, *Mississippi Forests and Forestry* (Jackson: University Press of Mississippi, 2001), 136, 286.

Questions and Answers in an attempt to popularize the tree.[8] Between 1929 and 1973 articles on tung appeared in journals like *Economic Geography*, *Far Eastern Survey*, *Agricultural Science Review*, and the *Journal of Agricultural Food Chemistry*. Subsequently, scholarly references to tung became fewer and more widely scattered but the oil continues to attract scientific attention.[9] While the abovementioned works approached tung from environmental or scientific angles, this dissertation takes another route—policy.

Farm policy in the twentieth-century U.S. attracted and continues to pique the interests of scholars seeking to make sense of an agricultural system once dubbed a "mess" by a former Secretary of Agriculture.[10] Those who wrote of farm legislation did so from a variety of approaches but all addressed the perils of government supported farming. Some like policy historian David E. Hamilton, author of *From New Day to New Deal: American Farm Policy from Hoover to Roosevelt*, and agricultural historian Virgil

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[8] H. H. Gardner, P.H. Butler, and F. Scofield, *Tung Oil Culture: Questions and Answers*. (Washington, D.C.: National Paint, Varnish, and Lacquer Association, 1941).

[9] Modern works on tung oil focus on either scientific experimentation, the years of domestic production, or revival attempts. In "Tung Twister," a 2007 article in Agricultural Research, Erin Peabody of Quality and Utilization of Agricultural Products wrote of efforts to genetically engineer easy-to-grow plants like soybeans with the qualities of tung oil. See, E. Peabody, "Tung Twister," *Agricultural Research*, 55, no. 7 (Aug 2007): 14-15. Tung has also drawn attention as a potential biofuel. See, Ji-Yeon Park, Deog-Keun Kim, Zhong-Ming Wang, Pengmei Lu, Soon Chul Park, and Jin-Suk Lee, "Production and Characterization of Biodiesel from Tung Oil," *Applied Biochemistry and Biotechnology* 148, no. 1-3 (2008): 109-117. In 1998, agricultural economist Courtney Carter along with Lisa House, and Randy Little, Mississippi State University Agricultural Economics professors, authored "Tung Oil: A Revival" in Review of Agricultural Economics and discussed the restarting of a domestic industry as a background for a hypothetical agro-economic venture. See, Courtney Carter, Lisa House, and Randy Little, "Tung Oil: A Revival," *Review of Agricultural Economics* 20, no.2 (Autumn-Winter 1998):666-673. Biology Professor Dr. L. J. Davenport's paper "Tung Oil—The Crop That Was" appeared in *Alabama Heritage* in 1999 and summarized the history of the tung oil industry. See, L. J. Davenport, "Tung Oil—The Crop That Was," *Alabama Heritage*, Summer 1999, 53.

[10] "Agriculture: A Hard Roe to Hoe," *TIME Magazine*, April 5, 1963.

W. Dean, writer of *An Opportunity Lost: The Truman Administration and the Farm Policy Debate*, discussed the failure of political parties to cooperate and find a meaningful solution to the farm problem. Others like political sociologist Bill Winders, author of *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy*, studied the effects of domestic agricultural policy on the world at large.[11] When studying policy, scholars had to be subjective by deciding whether producers or consumer should be the primary beneficiaries of agricultural legislation. Agricultural economist Stephen C. Blank argued that subsidies hurt farmers by preventing them from pursuing other avenues and creating surpluses.[12] Policy expert Ron Kroese, however, noted that despite their pitfalls surpluses proved a "convenient" help to foreign trade.[13] This work, however, falls more in line with *Plowshares and Pork Barrels: The Political Economy of Agriculture* by agricultural economists E. C. Pasour, Jr., and Randal R. Rucker who emphasized that parity, well intended it may be to aid producers and consumers, primarily benefits large farmers, thus worsening rather than reducing the farm problem.[14] Parity transformed tung

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[11] David E. Hamilton, *From New Day to New Deal: American Farm Policy from Hoover to Roosevelt, 1928-1933* (Chapel Hill: The University of North Carolina Press, 1991); Virgil W. Dean, *An Opportunity Lost: The Truman Administration and the Farm Policy Debate* (Columbia: University of Missouri, 2006); and Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy* (New Haven: Yale University Press, 2009).

[12] Steven C. Blank, *The Economics of American Agriculture: Evolution and Global Development* (Armonk, NY: M. E. Sharpe, 2008), 439.

[13] Ron Kroese, "Industrial Agriculture's War Against Nature," in *The Fatal Harvest Reader: The Tragedy of Industrial Agriculture* edited by Andrew Kimbrell (Washington: Island Press, 2002), 102.

[14] E. C. Pasour, Jr., and Randal R. Rucker, *Plowshares and Pork Barrels: The Political Economy of Agriculture* (Oakland, CA: The Independent Institute, 2005), xx, 16. On farm policy, see also Gilbert C. Fite, "American Agriculture and Farm Policy since 1900," American Historical Association Service Center for Teachers of History Publications no. 59 (1964); Harold G. Halcrow, *Agricultural Policy of the United States* (NY: Prentice-Hall, Inc., 1953); Dale E. Hathaway, *Government and Agriculture: Public Policy in a Democratic Society* (NY: The MacMillan Co., Inc., 1963); Earl O. Heady, Edwin O. Haroldson, Leo V.

from a marginal, non-basic crop to a massive surplus crop held in taxpayer-funded CCC storage tanks because growers found they earned more by defaulting on loans than selling openly on the market. At its heart, this is a study of policy detailing the efforts of wealthy, non-basic crop farmers to leverage government assistance for an economically implausible crop, but it also endeavors to contribute to the fields of agricultural and southern history.

This work does not claim to present an exhaustive account but rather explores and analyzes the formation of the domestic tung oil industry and its role in agricultural legislation. Since the timeframe coincides with a period of great mechanical and technological discovery, it touches upon the ways in which tung oil shaped scientific experimentation, industrial growth, and popular culture. Despite frequent coverage in newspapers and magazines around the country and world, few Americans recognized tung nuts in their heyday, in part because their toxicity barred their access to direct consumer markets and so they were encountered in processed form as paints, varnishes, lubricants, and the like. As a result, boosters' efforts to foster a tung culture primarily impacted the Gulf Coast. This crop, derived from exotic Chinese trees, shows how commodities shaped not only farming but economics, trade, foreign relations, and everyday life.

Several historians have emphasized the significance of commodities, but nuts have attracted comparatively little attention even though such crops have much to tell

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Mayer, and Luther G. Tweeten, *Roots of the Farm Problem: Changing Technology, Changing Capital Use, Changing Labor Needs* (Ames: Iowa State University Press, 1965); Allen J. Matusow, *Farm Policies and Politics in The Truman Years* (Cambridge: Harvard University Press, 1967); and Lauren Soth, *The Farm Policy Game: Play by Play* (Ames: Iowa State University Press, 1989).

about arboriculture, marketing, and consumption.[15] Tung's small role in manufacturing also furthered the importance of oilseeds in policy debates.[16] Thus although the poisonous tung nut never became a cultural icon (remaining at best a curiosity or outlier and at worst misunderstood or maligned), this crop offers historians a useful lens through which to view twentieth century America, highlighting the promise and peril of agricultural innovation. If tung was peripheral to the national imagination, its oil made it for a time genuinely important. Indeed, this fast drying oil altered landscapes, state and national politics, agricultural policy, tourism, and even local and regional identity, thus providing a pivotal force behind transformations along the Gulf Coast.

Due to its limited growing area, poisonous makeup, and miniscule cultural recognition, placing tung into the field of commodity studies is difficult.[17] None is a perfect model for tung but several might offer useful comparisons. In *Growing American*

[15] On nuts, see, for example, Jane Manaster, *Pecans: The Story in a Nutshell* (Lubbock, TX: Texas Tech University Press, 2008); Cecil W. Ferris, *The Hazel Tree* (East Lansing, MI: Northern Nut Growers Association, 2000); Susan Freinkel, *American Chestnut: The Life, Death, and Rebirth of a Perfect Tree* (Berkeley: University of California Press, 2007); Bob Chenoweth, *Black Walnut: The History, Use, and Unrealized Potential of a Unique American Renewable* (Urbana, IL: Sagamore Publishing, 1995); and Sandra Wagner-Wright, *History of the Macadamia Nut Industry in Hawaii, 1881-1981* (Lewiston, NY: E. Mellen Press, 1994).

[16] On oilseeds, see, for example, Joshua MacFadyen, "Fashioning Flax: Industry, Region, and Work in North American Fibre and Linseed Oil, 1950-1930" (dissertation, University of Guelph, 2009); Frank D. Gunstone, ed., *Rapeseed and Canola Oil: Production, Processing, Properties and Uses* (Oxford: Blackwell Publishing Ltd, 2004); D. K. Salunkhe, J. K. Chavan, R. N. Adsule, and S. S. Kadam, *World Oilseeds: Chemistry, Technology, and Utilization* (NY: Von Nostrand Reinhold, 1992); and Whitney Eastman: *The History of the Linseed Oil Industry in the United States* (Minneapolis: T. S. Denison and Co., 1968).

[17] Recent examples of commodity histories include John Soluri, *Banana Cultures: Agriculture, Consumption, and Environmental Change in Honduras & the United States* (Austin: University of Texas Press, 2005); Sterling Evans, *Bound in Twine: The History of Ecology of the Henequen-Wheat Complex for Mexico and the American and Canadian Plains, 1880-1950* (College Station, TX: A&M University Press, 2007); Mark Harvey, Stephen Quilley, and Huw Beynon, *Exploring the Tomato: Transformations of Nature, Society, and Economy* (Northampton, MA: E. Elgar Publishing, 2003); John Reader, *Potato: A History of the Propitious Esculent* (New Haven: Yale University Press, 2009); and Cindy Ott and William Cronon, *Pumpkin: The Curious History of an American Icon* (Seattle: The University of Washington Press, 2012).

Rubber: Strategic Plants and the Politics of National Security, Mark Finlay traced efforts to alleviate U.S. botanical dependence on imports by farming rubber domestically, a series of motives and actions mirrored by early tung plantings.[18] Similarities can also be drawn from *Orange Empire: California and the Fruits of Eden* in which Douglas Sackman discussed the importance of place to the expectations of orchardists to "make a million dollars from nature."[19] In much the same way, tung growers intended to transform desolate cut-over pinelands into scenic pink blossoms and make money without expending much effort but like California orange growers, they learned the importance of cultivation. Location also plays an integral role in Gail M. Hollander's *Raising Cane in the 'Glades: The Global Sugar Trade and The Transformation of Florida* where she maintained that studying the effects of a commodity on a particular place will provide hints as to why regions seem to develop their own identity and "political ideology."[20] Given the confinement of tung to a certain climate, it was perceived by producers, consumers, state governments, and the federal government as a southern or more specifically, a Gulf South industry. The extent to which the tung industry was, in fact, southern, however, is exceedingly questionable because many of its growers were absentee farmers, namely businessmen in the North and Midwest.

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[18] Mark Finlay, *Growing American Rubber: Strategic Plants and the Politics of National Security* (New Brunswick, NJ: Rutgers University Press, 2009).

[19] Douglas Cazaux Sackman, *Orange Empire: California and the Fruits of Eden* (Berkeley: University of California Press, 2005), 37.

[20] Gail M. Hollander, *Raising Cane in the 'Glades: The Global Sugar Trade and The Transformation of Florida* (Chicago: University of Chicago Press, 2008), 13. Other commodity works that emphasize local and regional are Donald Attwood, Raising Cane: *The Political Economy of Sugar in Western India* (Boulder, CO: Westview Press, 1992), 12; and Carlos Marichal, Steven Topik, and Zephyr Frank, "Conclusion: Commodity Chains and Globalization in Historical Perspective," in *From Silver to Cocaine: Latin American Commodity Chains and the Building of the World Economy, 1500-2000* (Durham: Duke University Press, 2006), 360.

Nevertheless, these non-southern growers endorsed and shaped the idea of a "southern" tung oil industry so the place approach is appropriate because this analysis centers on the formation and duration of the Tung Belt.

The establishment of domestic tung production took roughly the first three decades of the twentieth century because diversification remained a risk in the eyes of many farmers. The myriad factors undergirding the South's myopic connection with cotton have long been studied and acknowledged.[21] The collapse of the plantation system in the 1930s and 1940s, however, prompted a revitalized commitment to diversify the region's crop base and created an opportunity to employ more responsible methods of cultivation like multi-cropping. Boosters, ranging from innovative farmers to entrepreneurs, drew upon the moment to clamor for regional modernization, industrialization, and crop diversification in order to expand markets, help pocketbooks, fuel state and regional economies, and escape or at least lessen the stronghold of mono-crop culture. Give cotton's long history in the shaping of federal farm policy, such advocates faced an uphill struggle to persuade government officials to extend legislative protection to other crops—tung among them. To be sure, cotton's relationship with tung, which might have promised a way to use orchards as both pastures and fields for cover and row crops, remained almost inconsequential because the Tung Belt had formerly consisted of pine trees, not cotton bolls. But tung advocates still encountered a skeptical Congress, long dedicated to cotton and not at all committed to endorsing multi-cropping which was arguably less efficient than mono-crop cultivation.

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[21] David B. Danbom, *Born in the Country: A History of Rural America*, 2d ed. (Baltimore: Johns Hopkins Press, 2006), 127.

This is not to say that the government did not encourage diversification at all; indeed, it offered some incentives to small farmers to gamble on a new crop like tung. At the same time, however, it bolstered mono-crop agribusiness by offering generous subsidies for basic crops. Although designates changed over time, basic crops were "those deemed of sufficient economic or political importance to be designated by the U.S. Congress for special production controls or price supports."[22] They included cotton, wheat, and corn, and remained the primary target of agricultural policy. This meant non-basic crops like tung attracted far less support. In other words, as idyllic as diversification attempts may have appeared, farmers earned more income from traditional commodities. Aware of the risks, those growing tung persisted, confident that the government would provide financial support should the crop fail, be it through parity or loans.[23] This federal assistance fueled tung production during heights and slumps to the extent that the bulk of domestically produced oil eventually went into Commodity Credit Corporation (CCC) storage tanks. Well intended, CCC loans came to be manipulated by many growers who discovered they earned more from forfeiting their crop and keeping a loan than from selling at market prices. Because the majority of tung growers were wealthy, resided outside the Tung Belt, and never conformed to the ideal of the traditional farmer, their dependence on tax-funded government support drew public criticism.

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[22] The quote is from *Merriam-Webster*'s definition of basic-crop. See, "Basic Crop," http://www.merriam-webster.com/dictionary/basic%20crop (accessed December 20, 2012).

[23] On government support, see, for example, Willard W. Cochrane and C. Ford Runge, *Reforming Farm Policy: Toward a National Agenda* (Ames: Iowa State University Press, 1992), 24. On surpluses, see also, Blank, 439; Geoffrey S. Shepherd, *Agricultural Price Control* (Ames: Iowa State University Press, 1945), 181; and Pasour, Jr., 16, 32. See also, R. Douglas Hurt, *Problems of Plenty: American Farmers in the Twentieth Century* (Chicago: Ivan R. Dee, 2002), 111; and R. Douglas Hurt, *American Agriculture: A Brief History* (Ames: Iowa State University Press, 1994), 323.

While intended by boosters to be a crop for both rich and poor, tung trees were grown primarily by affluent absentee landowners or businessmen farming for a secondary income. Perhaps one of the strongest contributions of tung oil to the historical record blurs the line between agribusiness and the family farm. Money Hill, a St. Tammany Parish tung plantation owned by the wealthy timber baron Charles Goodyear, for example, was as much a family farm operation as agribusiness given the active participation of husband, wife, children, and relatives. While some assume the family farm never existed or died, historian R. Douglas Hurt claims it persists not only in small operations but even in agribusiness firms. As he explains, about ninety-seven percent of farms of all sizes, including agribusiness, are run by families.[24] Tung not only highlights the gray area between agribusiness and the family farm but also fits into works about the increasing dominance of agribusiness throughout the twentieth century. Tung farmers foreshadowed contemporary agriculture because despite having money, they still relied upon agricultural policies to compensate for production costs and make a profit and perpetuate the domestic tung oil industry. Most justified their dependence by blaming the government for encouraging domestic production and then refusing to protect it with satisfactory aid, namely tariffs, quotas, parity. Ironically, while vilifying the government, most growers nonetheless demanded federal support as their due. Still others placed their faith in science by endorsing and even endowing scientific experimentation in the hopes of finding new uses for tung oil to strengthen its position in the consumer market.

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[24] Hurt, *American Agriculture*, 387; and Ingolf Vogeler, *The Myth of the Family Farm: Agribusiness Dominance of U.S. Agriculture* (Boulder, CO: Westview Press, 1981), 6. See also Ronald Jager, *The Fate of Family Farming: Variations of an American Idea* (Hanover: University Press of New England, 2004); and Gilbert Fite, *American Farmers: The New Minority* (Bloomington: Indiana University Press, 1981).

One of tung's best attributes as a subject of historical enquiry may be its potential to contribute to the history of chemurgy, a science dedicated to finding industrial uses for agricultural products.[25] Scientists under the employ of the government or businesses studied commodities like tung oil in an attempt to find new consumer products ranging from pesticides to pharmaceuticals. Almost echoing the technocratic movement of the early decades of the twentieth century, chemurgists strove to solve society's problems through discovery. Tung oil not only exemplifies twentieth-century scientific inquiry, but its domestic time frame, 1928-1976, matches almost perfectly with that of the national chemurgy movement, 1926-1976.[26] These two timelines, both fraught with good intentions and mistakes, show that whenever science creates a solution a problem inevitably ensues. The movement proved so successful at finding domestic substitutes for imports barred or reduced during World War II, that it began to weaken in the post-1945 decades.[27] This diminished status simultaneously struck the domestic tung oil industry because war time shortages had led traditional consumers to seek other oilseeds or petroleum-based synthetics. Even though experimentation had diminished the position of tung oil in oilseed market, growers continued to believe that the salvation of the domestic

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[25] See, for example, Finlay, *Growing American Rubber*; and Mark R. Finlay, "The Industrial Utilization of Farm Products and By-Products: The USDA Regional Research Laboratories" in *The United States Department of Agriculture in Historical Perspective* ed. Alan I. Marcus and Richard Lowitt (Washington, D.C.: Agricultural History Society, 1991).

[26] The chemurgy movement, embodied by the National Farm Chemurgic Council, reemerged in the 1990s in the form of the New Users Council.

[27] Finlay, *Growing American Rubber*, 44.

tung oil industry lay in science.[28] Through testing they may have hoped to touch the wallets of consumers, but through popular culture, rooted in regional stereotypes, they strove to strike the fancies of Americans seeking a glimpse of the South.

The beliefs Americans had about the southern states being different, an economic and cultural throwback to the past, played an integral role in the efforts of tung growers to establish tung trees as a tourist attraction and shape perceptions of southern identity. Both non-southern and southern growers promoted a connection between tung, a New South phenomenon, and Old South plantation culture, perhaps trying to tempt tourists with a combination of twentieth-century scientific efficiency and nineteenth-century stereotypes. Historians tend to agree that the South, given its slave past and agricultural base, developed a different kind economy from the rest of the country, but southern uniqueness remains in question, especially as to whether this divergence from the rest of the country diminished over the decades. Agricultural historian Gilbert Fite, for instance, maintained that southern distinctiveness became less pronounced over much of the last century.[29] In *Industrialization and Southern Society*, James Cobb, a historian of southern economics and culture, argued that industrialization and mechanization did not erase southern distinctiveness. In fact, he claimed southerners used it to maintain their

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[28] On agricultural science, see, for example, Roy Scott, *Eugene Beverly Ferris and Agricultural Science in the Lower South* (Center for the Study of Southern Culture: University of Mississippi, 1991); Margaret Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-1880* (New Haven: Yale University Press, 1975); and R. Douglas Hurt, *The History of Agricultural Science and Technology: An International Annotated Bibliography* (New York: Garland Publishers, 1994). On chemurgy, see for example, William J. Hale, *Chemivision: From to Factory and Fortune* (Haverville, MA: Destiny Publishers, 1952); and Wheeler McMillen, *New Riches from the Soil: The Progress of Chemurgy* (D. Van Nostrand, 1946).

[29] Fite, *Cotton Fields No More*, 207.

distinctiveness as a means to an end.[30] In agreement, southern historian David Goldfield, in *Cotton Fields and Skyscrapers: Southern City and Region, 1607-1980*, insisted that its agriculturally based society, historical subservience to the national economy, and its racial makeup, continued to make the South different from the rest of the country, at least to the 1980s.[31] Dissimilarities ranging from climate to inexpensive land and labor attracted Americans nationwide to the South and to tung trees as an agricultural crop. Though restricted to the South, the bulk of growers did not reside in the Gulf South so the tung oil industry proved a national, not merely regional business.

In many ways domestic tung production reflected the dependency theory in which profits leave their place of origin. It could be said that the Tung Belt resembled an economic colony to the North and Midwest given that many of the tung profits benefited those regions rather than the South. However, the preponderance of paint, varnish, ink, and other companies drawn to the southern states due to tung production cannot be understated. Many growers wanted to attract tung based manufacturers to the South in an attempt to bring, to use technology historian Deborah Fitzgerald's phrasing, the factories to the farms. Located near numerous large cities looking for new ways in which to industrialize and grow, tung cultivation encouraged many companies to move south. Not only did the South offer proximity to tung orchards, but other incentives included tax

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[30] James Cobb, *Industrialization and Southern Society, 1877-1984* (Lexington: University Press of Kentucky, 1984), 163.

[31] David R. Goldfield, *Cotton Fields and Skyscrapers: Southern City and Region, 1607-1980* (Baton Rouge: Louisiana State University Press, 1982), 3. Sociologists William Falk and Thomas Lyson also argue that the south has not lost its distinctiveness. See, William Falk and Thomas Lyson, *High Tech, Low Tech, No Tech: Recent Industrial and Occupational Change in the South* (Albany: State University of New York, 1988).

breaks and minimal union activity.[32] Domestic production made an insignificant contribution to the world tung oil market but it mattered at the regional, county, and city levels. In Mississippi, the Delta in the northwest corner of the state gained the reputation of being the only agricultural area that attracted outside money but the tung counties in the southern portion of the state also drew funds from across the country.[33] Tung groves and the businesses they attracted elevated the economy of Pearl River County, Mississippi, from one of the worst to performing economies in the state to one of the best. These boons notwithstanding, the climatic requirements of the tung tree necessitated that domestic production be in the Gulf South.

This study follows a largely chronological structure, tracing the Tung Belt from its beginning to its apparent end. In six chapters and a conclusion, this work traces the tung tree from its early domestic plantings through the demise of the national tung oil industry in 1969 to contemporary revival attempts. The first three chapters encompass plant introduction, crop diversification, chemurgic experimentation, federal influence on agriculture during the New Deal and World War II, and increasing farmer agency, especially concerning attempts to weaken Chinese dominance of the world tung oil

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[32] On southern industrialization, see, for example, Cobb, *Industrialization and Southern Society*; James Cobb, *The Selling of the South: The Southern Crusade for Industrial Development, 1936-1980* (Baton Rouge: Louisiana State University Press, 1982); Numan V. Bartley, *The New South, 1945-1980: The Story of the South's Modernization* (Baton Rouge: Louisiana State University Press, 1951); George Tindall, *The Emergence of the New South, 1913-1945* (Baton Rouge: Louisiana State University Press, 1967); Charles S. Aiken, *The Cotton Plantation South since The Civil War* (Baltimore: Johns Hopkins University Press, 1998); Fite, *Cotton Fields No More*; and Charles S. Bullock and Mark J. Rozell, ed. *The New Politics of the Old South: An Introduction to Southern Politics* (New York: Rowman & Littlefield Publishers, 2003).

[33] James C. Cobb, *The Most Southern Place on Earth: The Mississippi Delta and the Roots of Regional Identity* (New York: Oxford University Press, 1992), 96. On the Delta, see also Mikko Saikku, *This Delta, This Land: An Environmental History of the Yazoo-Mississippi Floodplain* (Athens: The University of Georgia Press, 2005); and Jeannie Whayne, *Delta Empire: Lee Wilson and the Transformation of Agriculture in the New South* (Baton Rouge: Louisiana State University Press, 2011).

market by helping to create tung industries in Latin America. The fourth and fifth chapters deal with the post-World War II tung struggles including fluctuating government support, often stemming from grower status as part-time farmers, synthetic competition, rising levels of imports, and climatic challenges culminating in Hurricane Camille, a natural disaster erroneously credited with the demise of domestic production.[34] The only thematic chapter, the sixth, analyzes the efforts growers made to establish an American tung culture. While ending the story with the cessation of domestic production might appear obvious, the conclusion resumes chronology by delving into late twentieth-century and twenty-first century revival attempts.

In less than three-fourths of a century, tung transitioned from curious Chinese tree to pretty Dixie tree to reviled invasive species. With the preponderance of alternative oils created during World War II, the domestic tung oil industry should have ceased or at the least been relegated to a niche market. Instead, growers, unwilling to uproot their orchards, vehemently refused to relinquish tung as a crop and justified their request for government intervention by trying to prove the oil's worth. In many ways these growers bought into their own propaganda to the extent that their laudatory praise of tung became relentless condemnation almost overnight after Camille struck the Gulf Coast. Frustrated with the decades-long struggle to earn a profit with tung, they dismissed the tree as folly and eagerly set about finding new economic ventures. Commodities, commodity historian

[34] Countless vintage and contemporary primary sources contribute the end of tung cultivation to Camille. The rare exception is *Land of Sunshine, State of Dreams: A Social History of Modern Florida* in which social historian Gary R. Mormino attributes the cessation of tung tree farming to acrylics. For the most part, however, Camille has been scapegoated. The real causes lay in confinement to a sub-tropical climate, freezes, alternative oilseeds, synthetic oils, imports, agribusiness, and southern industrialization. For all practical purposes, the domestic tung oil industry ended in 1969 but the hurricane was an excuse not the reason. See, Gary R. Mormino, *Land of Sunshine, State of Dreams: A Social History of Modern Florida* (Gainesville: University Press of Florida, 2005), 188-189.

Sterling Evans notes, offer historians the opportunity to take up the "social and cultural biography-of-things model recently advanced by anthropologists."[35] These biographies of things can reveal much about cultural assumptions and transformations. And, if economic historian W. G. Clarence-Smith rightly noted, "commodities have a life cycle," it is often less clear that a final ending has been reached.[36] Whether or not the tung industry is revived, however, there is no question that it merits the serious scholarly attention of historians. What follows is a beginning of that exploration.

[35] Evans, *Bound in Twine*, 240.

[36] W. G. Clarence-Smith, *Cocoa and Chocolate, 1765-1914* (London: Routledge, 2000), 1.

CHAPTER II

TUNG TAKES ROOT: THE QUEST FOR A DOMESTIC TUNG OIL INDUSTRY, 1902-1928

> If the tung oil industry becomes an established success it will be a splendid example of the way many persons of different abilities, working together over a long period of time, can bring such a thing into existence.[1]
>
> David Fairchild

First introduced to the United States at the dawn of the twentieth century by government officials, the tung tree remained a misunderstood oddity for decades. Its role in the country's future was not immediately discernible largely as interested parties had dissimilar motives. Seeking botanical diversification as a means to aid farmers while achieving botanical diversity and national self-sufficiency, federal proponents viewed tung as merely one of many plant introductions. While not adverse to domestic cultivation, they did not foresee the tree becoming a crop of much significance but their very interest drew the attention of farmers and businessmen alike. Farmers and would-be farmers associated it with effortless profits while manufacturers, appealed by the prospect of producing their own oil, hastily investigated tung and began establishing orchards thus,

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[1] David G. Fairchild, "The Chinese Tung Oil Tree," 13, Manuscripts (presumably unpublished), SB359.F3, David Fairchild Collection, Fairchild Tropical Botanic Garden Archive, Miami, FL [hereafter DFC, FTBGA].

lending further credibility to plantings. The federal government may have brought this obscure tree to the country but industrialists catapulted it into a domestic crop.

The story of the domestic tung oil industry began in Asia. Indigenous to China the t'ung tree, tung-yu shu, tung, or wood-oil tree held an important role in Chinese history. Use of multi-cropping tung trees and using tung oil dated back to the Tang Dynasty (618-907 A.D.), but reference to the tung tree appeared centuries earlier in Confucius's *The Book of Poetry*.[2] Frequently referenced in both words and art for its striking beauty and rumored in fables to be the home of the mythical Funj Hwang or phoenix, the tung tree attracted great respect as its wood, nuts, and oil provided many day-to-day uses.[3] The Chinese used the wood of tung trees to make musical instruments like harps and lutes and even spun the bark into thread.[4] The toxic nuts made excellent rat poison.[5] Used as a preservative in the Hanging Temple of China, tung oil was also employed in lacquers, inks, lamp fuels, waterproofers for clothing and umbrellas, skin salves, and even mortars for the construction of the Great Wall of China.[6] The first known use of tung oil in

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[2] Hui-Lin Li, "The Domestication of Plants in China: Ecogeographical Considerations," in *The Origins of Chinese Civilizations* edited by David N. Keightley (Berkeley: University of California Press, 1983), 50; and Alec J. Jarvis, "Paraguayan Tung (Aleurites fordii Hemsl): An important Small Farmer Crop Diversification Strategy" (master's thesis, Michigan Technological University, 2002), 32.

[3] Tung Chou Kion, "Kung Peng Tah and The Woodcutter," in *Chinese Nights Entertainments: Stories of Old China ed. Brian Brown* (New York: Bretano's Publishers, 1922), 49-72; Charles Gould, *Mythical Monsters* (London: W. H. Allen & Co., 1886), 371; and "Fum," *The Encyclopedia Britannica*, 11th ed., vol. 11 (NY: Encyclopedia Britannica, 1910), 300.

[4] Robert Morrison, *Dictionary of the Chinese Language* (Macao: East India Company Press, 1815), 1:738.

[5] C. C. Concannon, "Tung Oil: Economic and Commercial Factors in Development of a Domestic Tung Oil Industry," no. 133, *U.S. Bureau of Foreign and Domestic Commerce Trade Promotion Series 132-133* (Washington, D.C.: United States Government Printing Office, 1932), 48.

[6] "Tung Oil," Wood Science 101, no. 2 http://gowood.blogspot.com/2011/06/wood-science-1012-tung-oil.html (accessed August 16, 2011); Frank A. Montgomery, Jr., "Tung Oil: Gift

gunpowder took place during the Sung Dynasty (960-1269 A.D.).[7] The tung tree became known to the Western World in the thirteenth century when explorer Marco Polo spoke of Chinese wood-oil and later mentioned it in *The Book of Ser Marco Polo: The Venetian Concerning Kingdoms and Marvels of the East*. Not until 1516, did tung oil reach the West when Portuguese traders purchased it from merchants in the city of Guangzhou.[8] Its ability to drying faster than other varnishes soon made tung oil popular in European markets. While this international trade heightened its status as a key commodity to China, shipments were inconsistent in quality since many varieties of tung trees existed.

A member of the *Euphorbiaceae* family, which includes the rubber and tallow tree as well as the castor and croton plants, the tung tree had several types: *Aleurites fordii*, *Aleurites montana*, *Aleurites trisperma*, and *Aleurites molucanna*.[9] *Aleurites fordii*, the most common type, grew in central and southern China provinces, especially Szechuan. *Aleurites montana*, called mu-yu shu, grew primarily in the southern provinces. Although this variety developed into a larger tree and produced more nuts, it

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of the Orient," Box 10, Folder 10, Camille, American Tung Oil Institute, McCain Library and Archives, The University of Southern Mississippi, Hattiesburg, MS [hereafter ATOI, MLA, USM]; Davenport, 53; Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 51; and Bong How, "Chinese-American Tung Problem of Mutual Interest," Proceedings of the 10th Annual American Tung Oil Association Convention, April 28-29, p.79, 1944, Box 5, Folder 7, Tung History, ATOI, MLA, USM.

[7] Wang Ling, "On the Invention and Use of Gunpowder and Firearms in China," *Isis* 37 no. ¾ (July 1947): 162.

[8] "Key to Great Tung Oil Industry Held by South, Says Government Chemist," *Augusta Chronicle*, November 29, 1935, 2; and M. Ogden Philips, "Tung Oil: Florida's Infant Industry," *Economic Geography* 5, no. 4 (Oct 1929): 348.

[9] On these relatives, see "Tung Belongs to Big Family: Kin to Castor and Croton Plants," *Tung World* 1, no. 5 (Sep 1946): 16.

needed a longer maturation time and proved more susceptible to cold temperatures.[10] *Aleurites trisperma* did not produce as many nuts as the other varieties while *Aleurites molucanna* formed hard nuts extraordinarily difficult to crush.[11] While many confused the various kinds and thought them interchangeable, each proved unique. With its quality of oil, rapid maturation, and heartier nature, *Aleurites fordii*, named for Hong Kong Botanical Garden's Superintendent Charles Ford, became the primary tung oil in China.[12]

Largely uncultivated, *fordii* and to a lesser extent *montana*, *trisperma*, and *moluncanna* grew wild along the hills of the Yangtze River Valley, land surrounding the 3,915 mile Yangtze River which spans much of south-central China. In order to thrive, the trees needed a sub-tropical climate, generous precipitation, well-drained land, and acid based soils. On the rolling hills of the country's interior, these qualities allowed the

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[10] "Pearl River County," *Mississippi Coast Area Monitor*, 1st Edition, 1959-1960, 58; Concannon, "Tung Oil," 58, 2; William T. Bryant, "A Practical Treatise on Animal and Vegetable Fats and Oils," in *Bailey's Industrial Oil and Fat Products*, 3rd ed. (New York: Interscience Publishers, 1964), 269; *Tung Oil* 1, no. 1 (Oct 1930), 12; and Ernest H. Wilson, *A Naturalist in Western China With Vasculum, Camera, and Gun* (New York: Doubleday, Page, 1913), 2:65.

[11] *Tung Oil* 1, no. 3 (Dec 1930): 7; and Earley Vernon Wilcox, *Tropical Agriculture: The Climate, Soils, Cultural Methods, Crops, Live Stock, Commercial Importance and Opportunities of the Tropics* (New York: D. Appleton, 1916), 264-266. See also, "Seeds of Aleurites Fordii and Aleurites Triloba from Hong Kong," *Bulletin of the Imperial Institute* vol. 5 (1907): 134; "Chinese Wood Oil," *Paint, Oil and Drug Review* 55, no. 1 (Jan 1913): 21; "Proceedings of the American Pharmaceutical Association at the Fifty-Fifth Annual Meeting held at New York, N.Y., September 1907" (Baltimore: American Pharmaceutical Association, 1907), 814; and Charles M. Allen, Dawn Allen Newman, and Harry H. Winters, *Trees, Shrubs, and Woody Vines of Louisiana* (Pitkin, LA: Allen's Antive Ventures, LLC, 2002), 276. Another variety of tung tree, *Aleurites cordata*, grew in Japan but its oil was deemed inferior to the others. On *cordata*, see also Concannon, "Tung Oil," 32-35; R. S. McKinney and G. S. Jamieson, "Japanese Tung Oil," *The Journal of American Oil Chemists' Society* 14, no. 1 (Jan 1937): 2-3; United States Tariff Commission, Tariff Information Surveys on the Articles of the Tariff Act of 1913, *Animal and Expressed Vegetable Oils and Fats* (Washington, D.C.: U.S. Tariff Commission, 1921); and E. R. Dickover, "Vegetable Oil Industry of Kobe," *The Oil Miller: Alabama Seed Crusher Association* 9, no. 1 (Sep 1918): 26.

[12] On Ford, see, "Background," Hong Kong Zoological and Botanical Gardens Leisure and Cultural Services Department, http://www.lcsd .gov.hk/parks/hkzbg/en/index.php (accessed November 17, 2012); and Umberto Quattrocchi, *CRC World Dictionary of Plant Names: Common Names, Scientific Names, Eponyms, Synonyms, and Entomology* (Boca Raton: CRC Press, 1999), 86.

trees to grow twenty-five feet high with a trunk of approximately a foot in width. The gray colored branches hung low, often touching the ground. After three or four years, a young tree began to produce and continued to do so until around age forty. In the spring, pink blossoms with hints of yellow and white appeared. Tung fruit, rinds which encased the nuts, resembled fig-shaped green walnuts until mid-to-late September or early October when they ripened to a ruby red. Within lay a nut containing three to five seeds from which a clear to yellowish oil could be pressed. Harvested by hand, the nuts were piled up so the husks would deteriorate and loosen. At mills, millers applied body weight on a rock and used wood wedges to extract the oil. The mills then shipped the oil on junks to Hankow or Shanghai for exportation. While treasured by the Chinese, tung oil proved a little known novelty to the world at large. Only when nineteenth-century European industrialization sharply enhanced demand did it become one of China's top ten commodities.[13]

What made tung oil such a profitable commodity lay in its chemical makeup. An eleostearic acid, it hardened and dried at an exceptionally fast pace. In fact, as explained by *The Fats of Life* author Caroline Pond, tung oil actually created a finish when the "polyunsaturated fatty acids in the oil combined with oxygen in the air and they link[ed] together."[14] Toxicity of nuts barred it from edible market sectors but the oil filled an important niche in manufacturing. Tung oil became a popular choice among European

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[13] A. L. Matthews, "Vegetable Drying Oils," *Tung Oil* 1, no. 2 (Nov 1930), 6. See also, Concannon, "Tung Oil," 41, 2-6, 20; "Growing Varnish on Trees: A New Industry in Florida," *New York Times*, January 20, 1924; Great Britain Foreign Office, "Report on the Trade of Szechuen," *China: A Collection of Correspondence and Papers Relating to Chinese Affairs* no. 1 (1870): 28; Y. B. Li, "The Outlook for Horticulture in China," *The Chinese Students' Monthly* 10, no. 1 (Oct 1914): 22; and "China's Plans," *Tung World* 1, no. 4 (Aug 1946): 6.

[14] Caroline M. Pond, *The Fats of Life* (New York: Cambridge University Press, 1998), 84.

paint and varnish companies that sought a quick drying oil capable of withstanding the elements.[15] This infatuation between businesses and tung oil spread throughout Europe but generated minute attention in the United States.

While the importation of foreign plants by nurseries and individuals ranging from immigrants to tourists frequently took place throughout the nineteenth century, the U.S. had no recorded encounters with tung until December 1859. The first shipment of *fordii* nuts, then referred to as "Chinawood nuts," arrived at the U.S. Patent Office in a package of camphor and tea seeds mailed from Shanghai by Robert Fortune, a Scottish botanist employed by the Horticultural Society of London to find interesting exotic plants.[16] The event caught the attention of *The New York Times* which reported, "Tung produces a valuable oil, largely used by carpenters and varnishers of wood."[17] A batch of oil, 138,635 pounds worth $53,641, arrived ten years later in 1869, but other import batches proved sporadic. In the 1870s, for example, a chemical import office purchased some

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[15] Daniel Swern, "Sources, Utilization, and Classification of Oils and Fats," in *Bailey's Industrial Oil and Fat Products* edited by Daniel Swern, 3rd ed. (New York: Interscience Publishers, 1964), 163. See also, J. Kewkowitsch, *The Laboratory Companion to Fats and Oils Industries* (London: MacMillan, 1901), 42; Peabody, 14-15; Alton E. Bailey, *Industrial Oil and Fat Products* (New York: Interscience Publishers, 1945), 126; Concannon, "Tung Oil," 32-35; and *Tung Oil* 1, no. 1 (Oct 1930): 16. On European consumption of tung, see, for example, *Official Descriptive and Illustrated Catalogue of the Great Exhibition of the Works of Industry of All Nations, Part V Foreign States—Division II, and Index* (London: Spicer Brothers, Wholesale Stationers; W. Clowes & Sons, Printers, 1851), 1420.

[16] Frank A. Montgomery, Jr., "Tung Oil: Gift of the Orient," Box 10, Folder 10, Camille, ATOI, MLA, USM; Donald Jackson and J. C. Eiland, "Tung Old Crop with New Uses," Box 19, Folder 21, Tung Oil, Farm Chemurgic Council, University Archives and Historic Collections, Michigan State University, East Lansing, MI [hereafter FCC, UAHC, MSU]; and "Tung-oil-Yang-mae-Oo-dang," *Cleveland Plain Dealer*, March 1, 1959, 2. Fortune was an explorer seeking Chinese plants to introduce to the West.

[17] "Importation of Chinese Seeds," *New York Times*, March 1, 1859. The same announcement appeared throughout the country. See, for example, "Shipments from China," *Washington Union*, February 26, 1859; "Shipments of Seeds from China," *Massachusetts Spy*, March 16, 1859, 1; and "Untitled," *Augusta Chronicle*, March 2, 1859, 2.

tung oil for experimentation purposes.[18] A probable explanation for the lulls in imports lies in the fact that copals or tree resins like kauri gum dominated the paint and varnish industry.[19] Tung received occasional mention in newspapers, some of which mistakenly reported that the Chinese ate tung nuts.[20] Such claims may have heightened public interests but tung oil remained a curiosity. Even with improved transportation, rising scientific experimentation, and expanding global trade, the U.S. did not start importing tung oil in mass until 1900, and the first inkling of domestic cultivation did not begin until several years later.

When the Section of Systemic Seed and Plant Introduction (SPI) began under the United States Department of Agriculture (USDA) in 1890, tung trees were not among the first selected targets. The organization sought to find new potential crops and useful plants so the country could alleviate import dependence by becoming more self-sufficient. This well-intentioned goal met opposition rooted in nativism, the belief in the superiority of domestic plants over exotics. In fact, the SPI formed in a decade during which nativist sentiment abounded among the masses and even in other branches of the USDA. Appalled by the rapid multiplication of exotic plants, nativists equated them with pests and weeds. Many members of the SPI dubbed this paranoia as many foreign plants had a plethora of uses and attractive appearances. Congress, which gave away seeds, thus

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[18] William Haynes, *Chemical Pioneers: The Founders of the American Chemical Industry* (New York: D. Van Nostrand, 1939), 167; and Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 32.

[19] Pauly, *Biologists and The Promise of American Life*, 74. On kauri gum, see George F. Deasy, "Tung Oil Production and Trade," *Economic Geography* 16, no.3 (July 1940): 261; and "Wood-Oil Tree in The United States," *Drug & Chemical Markets* 3, no. 1 (Sep 1916): 9.

[20] See, for example, "A Chinese Columbus," *Kansas City Review* 9, no. 1 (Aug-Dec 1885): 89.

competing with seed salesmen and nurserymen, seemed to agree. As the decade drew to a close, "cosmopolitan" sentiment supporting plant introduction grew stronger. The SPI attention shifted from Europe to Asia, and in 1897, the Department of Seed Introduction and Dispersal (DSIS) formed. A few years later, in 1900, the Bureau of Plant Industry (BPI) formed with the intent of meshing all of the USDA's plant ventures.[21] Amidst the various foci at the dawn of the twentieth century, tung caught the eye of an important SPI official.

During a 1902 trip to Canton, plant explorer David G. Fairchild admired tung oil varnishes with passing fascination. The son of an abolitionist minister and teacher, he had worked in the Division of Vegetable Pathology, studied German fungi, and married Marian Bell, the daughter of Alexander Graham Bell. Seeking plants to introduce to the U.S., he then embarked on a journey to Java and the Pacific with Barbour Lathrop, a wealthy, fellow exotic plant enthusiast from Virginia. Financed by Barbour, Fairchild introduced thousands of foreign plants to the U.S., and in 1897 he became head of the SPI.[22] Fascinated by China, Fairchild sent a Dutch gardener named Frank N. Meyer on several expeditions to seek out potential plants for introduction. Meyer helped introduce

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[21] Philip J. Pauly, *Fruits and Plains: The Horticultural Transformation of America* (Cambridge: Harvard University Press, 2007), 111, 113, 127; and Philip J. Pauly, "The Beauty and Menace of the Japanese Cherry Trees: Conflicting Visions of American Ecological Independence," *Isis* 87, no. 1 (March 1996): 54. The USDA was formed May 15, 1862.

[22] Pauly, *Biologists and the Promise of American Life*, 88. On Lathrop, see "Barbour Lathrop," *New York Times*, May 18, 1927, p.25. Fairchild named one of his sons Barbour Lathrop Fairchild. See, The Alexander Graham Bell Family Papers: Marian Hubbard Bell Fairchild Family Tree, http://memory.loc.gov/ammem/bellhtml/mhbftree.html (accessed December 11, 2012).

2,500 plants, including the Chinese persimmon tree, and Chinese horse chestnut tree.[23] An avid ecological cosmopolitan, Fairchild said, "But the whole trend of the world is toward greater intercourse, most frequent exchange of commodities, less isolation, and a greater mixture of the plants and plant products over the face of the globe."[24] When it came to introducing plants, the SPI lacked funds so Fairchild relied heavily upon land grant colleges, made possible by the 1862 Morrill Land-Grant College Act, agricultural experiment stations, allowed under the 1887 Hatch Act, orchard owners, nurserymen, and gardeners.[25] In the case of tung, Fairchild later wrote, "I was not able to see the trees from which this interesting oil was secured" so "the idea of its introduction dropped from my mind."[26] The key assist for tung came not from Fairchild, but from a diplomat.

For several years, U.S. Consul General to China L. S. Wilcox had taken an interest in the Chinese tung oil industry. Seeing the potential for U.S. production, he wrote a report on tung oil and submitted it to the United States Department of State (USDS) in 1899. In 1902, 1903, and 1904, he sent hundreds of nuts to a party in the San Joaquin Valley in California but none of the resulting saplings survived. Disappointed but undeterred, he set about investigating how China had made such a success of tung. Hoping to copy their methods, Wilcox handed out questionnaires to Chinese tung

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[23] Pierre Laszlo, *Citrus: A History* (Chicago: University of Chicago Press, 2007), 38-39. On Meyer, see David Fairchild, *The World Was My Garden: Travels of a Plant Explorer* (New York: Charles Scribner's Sons, 1938), 315, 345.

[24] Pauly, *Biologists and the Promise of American Life*, 88. On Fairchild and chemurgy, see also Christy Borth, *Pioneers of Plenty: Modern Chemists and Their Work*, 3rd ed. (New York: New Home Library, 1943); and "Science: Plant Hunter," *TIME Magazine*, October 17, 1938.

[25] Pauly, *Fruits and Plains*, 126-129; and Hurt, *American Agriculture*, 192-193.

[26] Fairchild, "The Chinese Tung Oil Tree,"1.

farmers, buyers, and sellers. Their responses later appeared in his March 15, 1905, *Daily Consular Report* which the United States Department of Commerce and Labor (USDCL) published. Determined, Wilcox sent 200 pounds of tung seeds that spring, this time to the USDS.[27] When the nuts came under possession of the BPI, Fairchild sent them to the Plant Introduction Gardens of the Division of Foreign Plant Introduction at Chico, California and Miami, Florida.[28] While sprouting took months, after it occurred, the saplings grew rapidly. Amazed by their speedy development, the employees of the BPI gardens, with Fairchild's encouragement, set about distributing the trees across the country. In 1906 and 1907, the stations sent 800 trees to interested parties, including individuals, state experiment stations, and gardeners in California, Alabama, Florida, Georgia, Louisiana, Mississippi, Texas, and South Carolina in an attempt to discover in what locations and under what conditions tung could thrive.[29]

Finding an ideal home for a tung oil industry proved challenging. Early interested parties like Fairchild surmised that tung trees might prove suitable for the warmer

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[27] Fairchild, "The Chinese Tung Oil Tree," 1-2; "Seeds and Plants Imported During the Period from December, 1903 to December, 1905," no. 13104, *United States Bureau of Plant Industry Bulletin* 97 (December 1903-December 1905), p.129; Concannon, "Tung Oil," 35,62-64; and *Tung Oil* 1, no. 1 (Oct 1930): 12; and Florida Department of Agriculture, "Tung Oil: One of Florida's Greatest Potential Resources," *State of Florida Department of Agriculture Bulletin* 11 (May 1942): 12; Workers of the Writers' Program of the Works Projects Administration in the State of Florida, "Tung Oil: An essential Defense Industry," *State of Florida Department of Agriculture Bulletin* no 11 (Jan 1942): 5; and Cowdrey, 171. See also, Gardner, *Tung Oil Culture*, 8. Of interest, many people later claimed to have the "first" to introduce tung oil to the U.S. See, for example, Charles C. Chopp, President of Cleveland's Worlds Products Trading Company in Dale Cox, "The Byproduct," *Cleveland Plain Dealer*, October 23, 1934, 9.

[28] Concannon, "Tung Oil," 35, 62-64; and *Tung Oil* 1, no. 1 (Oct 1930): 12.

[29] Fairchild, "The Chinese Tung Oil Tree," 3; Concannon, "Tung Oil," 35, 62-64; *Tung Oil* 1, no. 1 (Oct 1930): 12; "New Varnish Oil," *Miami Herald Record*, August 21, 1913, 8; "Varnish Trees, Free," *Savannah Tribune*, May 16, 1914, 16; and John M. Scott, "Tung Oil: A New Industry in Florida," *State of Florida Department of Agriculture Bulletin* no. 11 (Jan 1929): 4. See also, "Seeds and Plants Imported during the period from July 1906 to December 31, 1907," *Bureau of Plant Industry Bulletin* no. 132 (Washington, D.C.: Government Printing Office, 1908), 132.

climates of California and or the South. Some of the first places to grow tung included Riverside, California; Los Angeles, California; Pasadena, California; Tallahassee, Florida; Fairhope, Alabama; Augusta, Georgia; Pineville, Louisiana; Bolivar, Louisiana; Houston, Texas; and Bennettsville, South Carolina.[30] Even farmers in New York investigated tung but the cold climate deterred them from planting.[31] Having dominated the citrus, plum and apricot industries, California initially appeared the most ideal site.[32] Although lack of care probably contributed to their deaths, the failure of the Chico seedlings to thrive was attributed to a particularly injurious drought. Some farmers in northern and southern California planted tung but their preference for established crops and unwillingness to irrigate resulted in a cessation of efforts.[33] As Fairchild explained, tung trees "were not capable of yielding financial returns which would warrant growing them under irrigation."[34] Declaring the California trial unsuccessful, tung supporters placed all remaining hope in the South.

The southern states struck tung boosters like Fairchild as an appropriate place for new agricultural and industrial experiments. Textile, paper, and lumber mills, all industries which made use of raw materials, dotted the region. Although many southern

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[30] Dr. C. C. Concannon, "Domestic Tung Tree Plantings," *The Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 13.

[31] *Proceedings of The New York Farmers, 1906-1907* (New York: John Ward & Son, 1907), 46.

[32] Donald J. Pisani, *From the Family Farm to Agribusiness: The Irrigation Crusade in California and the West, 1850-1931* (Los Angeles: University of California Press, 1984), 283. On California crops, see also, Fred A. Shannon, *The Farmer's Last Frontier: Agriculture, 1860-1897* (New York: Farrar & Rinehart, 1945), 263.

[33] *Yearbook of the United States Department of Agriculture, 1916* (Washington, D.C.: Government Printing office, 1917), 139; Dr. C. C. Conccannon, "Domestic Tung Tree Plantings," *Tung Oil* 4, no. 10 (Jan 1938): 13; and Gardner, 8.

[34] Fairchild, "The Chinese Tung Oil Tree," 11.

cities grew, the manifestation of each remained little more than, in the words of southern historian David R. Goldfield, an "agricultural marketplace."[35] This mesh of manufacturing and agriculture symbolized New South ideology. Perhaps the most famous promoter Henry Grady, the editor of the *Atlanta Constitution*, once commented that the South had so little industry that in the case of a funeral, it could provide only a body and a grave. Seeking to aid local and state economies, men like Grady sought to give the region an industrial base to lessen reliance upon northern manufacturing.[36] Promotions advertised the South as an ideal location for industries given the access to raw products, inexpensive land, warm climate, and little union activity. Although tung orchards stood to attract paint and varnish companies, a formidable obstacle—mono-crop culture—presented challenges.

Staple crops had established markets so many southern farmers viewed diversification into crops like tung oil as an extremely risky gamble. Multi-cropping advocates strongly believed that cotton farmers needed to plant other crops in order to supplement their diets, fight erosion, and plant grass for cattle. The practice of raising multiple crops, however, required dissimilar planting, fertilizer, machinery, and care. Tiny acreage, lack of funds to purchase seeds, fertilizer, machines, and cattle, and no access to loans meant small farmers barely subsisted and did not have the means to embrace new crops.[37] Nevertheless, diversification by larger farmers had been spreading

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[35] Goldfield, *Cotton Fields and Skyscrapers*, 90.

[36] See also, Joel Chandler Harris, ed., *Life of Henry W. Grady, including his Writings and Speeches* (New York: Cassell Publishing, 1890), 199-207.

[37] Fite, *Cotton Fields No More*, 14, 25, 69, 88.

throughout the South. In fact, according to agricultural historian Gilbert Fite, "By the early twentieth century, it had become little short of a religion."[38] A flurry of endeavors including soybeans, sweet potatoes, pecans, oranges, lemons, peaches, pomegranates, grapefruits, kumquats, bananas, figs, coconuts, guavas, grapes, strawberries, rice, sugarcane, pineapples, peanuts, tomatoes, and Satsuma oranges took place. Many planting these new crops lacked the knowledge on how to care for their needs and lost entire crops to freezes. Despite obstacles, these farmers persevered in the hopes of maximizing both land use and profits. A land boom fueled partly by railroad construction and industrialization also aided in the purchase of farmlands.[39] Not all of this land proved conducive to agriculture but on an unlikely strip unsuited to little but pine, tung took root.

Possessing the capacity to flourish in poor quality soils, tung trees presented an attractive means of using cutover pinelands. The country's longleaf pine belt, spanning from Virginia down through the Gulf South and to southeastern Texas, encompassed 230,000 square miles. The softwood lumber made pines invaluable to construction and industry. The timber boom first came to the southern Pine Belt in the 1880s after the repeal of the 1866 Southern Homestead Act, a law intended to make land more affordable for freedmen and poor farmers. By 1876, the implementation of this law led to massive

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[38] Fite, *Cotton Fields No More*, 68.

[39] Brian Rucker, "Satsumaland! A History of Citrus Culture in West Florida," *Gulf Coast Historical Review* 12, no. 1 (Fall 1996): 61-77; "Satsumas and Tung," *Tung World* 1, no. 5 (Sep 1946): 20; E. G. Nourse, "The Cheapest Source of Increased Food Supplies," *The Scientific Monthly* 6, no. 2 (Feb 1918): 122-123; and Louise K. Frisbie, *Yesterday's Polk County* (Miami: E. A. Seemann Publishing, Inc., 1976), 27. See also, Barry Estabrook, *Tomatoland: How Modern Industrial Agriculture Destroyed Our Most Alluring Fruit* (Kansas City: Andrews McMeel Publishing, 2011), 8; and Louis Ziegler and Herbert S. Wolfe, *Citrus Growing in Florida* (Gainesville: University Press of Florida, 1975), 39. On crop intransigence in the south, see, for example, Arthur F. Raper and Ira De A. Reid, *Sharecroppers All* (Chapel Hill: University of North Carolina Press, 1941), 194.

amounts of land being purchased by northern or Midwestern speculators from New York, Michigan, Indiana, Illinois, and Kansas at $1.25 an acre.[40] By 1908, in place of the impressive pine forests that had once towered over the land, some twenty-two million acres of stumps remained.[41]

In this bleak strip of land riddled with the remnants of one southern industry lay the beginnings of another—tung. Rather than replant, most lumbermen moved west after selling their lands to farmers.[42] Those that remained had to decide what to do with their property and began looking at various crops as potential economic endeavors.[43] In tung, they saw a way to use cutover pinelands, idle lands, and hilly areas as well as a means to control erosion and diversify. Whereas some crops did not grow well on former pinelands, tung seemed to flourish. Erosion of the cutover pinelands worsened without the pines, and the fast growing tung provided a solution. Granted, other plants or trees might have provided the same level of erosion management, but many struggled to grow on subpar soils. Tung also offered a chance to multi-crop by growing crops in orchards, thus gaining maximum land use. For the majority of early tung growers, wealthy

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[40] Clark, 16; and Fickle, 2, 82.

[41] See, "Cut-Over Timber Lands," *Manufacturers' Record* 59, no. 7 (Feb 23, 1911): 43. The "South" referred to in the journal referred to Alabama (1,844,836 acres), Arkansas (100,000 acres), Florida (3,014,553 acres), Georgia (1,428,820 acres), Kentucky (200,000 acres), Louisiana (1,292,000 acres), Maryland (600,000 acres), Mississippi (2,656,672 acres), North Carolina (1,950,000 acres), South Carolina (1,400,000 acres), Tennessee (1,220,000 acres), Texas (3,000,000 acres), Virginia (1,471,800 acres), and West Virginia (1,400,000 acres).

[42] Latimore Smith, "The Legendary Longleaf Pine Forests of the Florida Parishes: Historic Character and Change at the Hand of Man," in Sam C. Hyde, ed. *Fierce and Fractious Frontier: The Curious Development of Louisiana's Florida Parishes, 1699-2000* (Baton Rouge: Louisiana State University Press, 2004), 151.

[43] B. F. Riley, "Fruit, Truck and Tobacco in South Alabama," *Manufacturers' Record* 57, no. 11 (March 24, 1910).

timbermen and other industrialists, diversifying with tung may have been a hobby or an experiment. Either way, tung trees provided a way to supplement income, use subpar lands, and industrialize the South by attracting tung oil mills, paint and varnish companies, and chemical companies.[44] Interested parties also imagined that once cattle tick could be eradicated, tung orchards could be used as pastures.[45] For these reasons, tung slowly became established as a domestic crop.

Very few of the early southern tung trees survived the first few years of life, but plantings spread. In 1906, naturalist Ambrose Bardeau planted one tung tree in Marlow, Alabama; Confederate veteran Aristede Hopkins planted one in Biloxi, Mississippi; and citrus farmer/cattleman S. H. Gaitskill planted several in McIntosh, Florida.[46] Fairchild had several seedlings to cemeteries thinking "they would be given perpetual care" but some trees in a Tallahassee graveyard were trampled by a funeral procession.[47] On November 15, 1906, horticulturalist Captain William H. Raynes transplanted five of these badly injured trees to his land near Tallahassee on Miccosukee Road. When four died shortly thereafter, he struggled to keep the lone survivor alive. Although greatly damaged by a storm to the extent that it had to be cut down, the tree came back from the roots. This

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[44] On diversified farming attracting businesses, see, "Diversified Farming as a Factor in Southern Upbuilding," *Manufacturers' Record* 57, no. 12 (Mar 31, 1910): 45.

[45] On cattle tick, see, "The Agricultural Potentialities of the South," *Manufacturers' Record*, 30th Anniversary Issue, Part 2 (February 22, 1912): 64; and Claire Strom, *Making Catfish Bait out of Government Boys: The Fight Against Cattle Tick and the Transformation of the Yeoman South* (Athens: University of Georgia Press, 2009), 1-20, 41.

[46] On Bardeau, see "Tung Trees Offer New Industry for Country Farmers," *Baldwin Times*, February 2, 1939; and *The Heritage of Baldwin County Alabama* (Clanton, AL: Heritage Publishing Consultants, 2001), 37. On Hopkins, see *Biloxi Daily Herald*, July28, 1933, 1. On McIntosh, see Scott, "Tung Oil: A New Industry in Florida," 4.

[47] Fairchild, "The Chinese Tung Oil Tree," 5.

little tree became known as the 'mother' of the domestic tung oil industry and its first nuts were sold to parties interested in farming and distributing.[48] Random plantings continued to scatter across the Gulf South.

In 1907, John Byron (J. B.) Wight of Cairo, Georgia, a nurseryman instrumental in the emergence of the pecan and Satsuma industries in the state and later president of the National Nut Growers Association, planted a tung tree which became quite famous along the coast. Interestingly, many newspapers later referred to it as the oldest tung tree in the country since trees planted earlier had died of cold weather or lack of care. Taking interest in the peculiar Chinese tree, Gaitskill expanded upon his plantings in 1908. Two years later, Peter H. Rolfs, Director of the University of Florida's Agricultural Experiment Station at Gainesville, planted ten tung trees. Thinking the tree might turn a profit, American Sumatra Tobacco Company owner George B. Perkins planted 100 on his Tallahassee plantation in 1912.[49] As revealed by this sampling, those interested in pursuing tung tended to plant individual trees before expanding into orchards. While

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[48] "Our Tung Oil Industry Started in Cemetery," *Popular Science* 121, no. 5 (Nov 1932): 50; Fairchild, "The Chinese Tung Oil Tree," 7; and "Raynes Tree, once the oldest tree in Florida—Tallahassee, Florida," http://www.floridamemory.com/items/show/26291 (accessed November 24, 2012). After Raynes' death, Fairchild arranged the "lease of a small square of land from his heirs, and built an iron fence around the tree, upon which was hung a sign saying that the tree belonged to the United States Government." See, Fairchild, "The Chinese Tung Oil Tree," 9.

[49] "3 Georgia Farmers Given Recognition," *Augusta Chronicle*, August 15, 1935, 2; "University Honors Three Prominent Georgia Farmers," *Marietta Journal*, August 22, 1935, 7; and W. J. Davie, "South Georgia Tung Oil Farm Influences Belief Experiments Will Prosper," *Augusta Chronicle*, October 29, 1934, Section A, 8. See also, Workers of The Writers' Program of The Work Projects Administration in the State of Georgia, *Georgia: A Guide to Its Towns and Countryside* (Athens: University of Georgia Press, 1940), 64. On Wight, see also, "National Nut Growers," *Manufacturers' Record* 57, no. 6 (Feb 17, 1910): 48. Wight had long been involved with plants, having formed the J. B. Wight Nurseries in 1887. See, Fite, *Cotton Fields No More*, 13; and "Grady County, ca. 1920. John Byron Wight, Senior of J.B. Wight Nurseries, founded in 1887," http://cdm.sos.state.ga.us:8888/cdm4/item_viewer.php?CISOROOT=/vg2&CISOPTR=8109&CISOBOX=1&REC=16 (accessed January 11, 2013). Wight's became the oldest tree in the country because Raynes's mother tree died in 1940 after being transplanted for the sake of a road. See, "Raynes tree, once the oldest tung tree in Florida—Tallahassee, Florida," http://www.floridamemory.com/items/show/26291 (accessed November 24, 2012).

these early trees fueled the drive to create a domestic industry, the tung tree's status as an exotic species jeopardized its future.

While Fairchild's SPI had worked tirelessly for years to investigate foreign plants, the USDA Division of Entomology under Acting Chief Charles L. Marlatt had been subverting these efforts. Thus divided, the USDA's branches fought while Secretary of Agriculture James Wilson, a man adamant about new crops, seemed to side with the SPI. For Marlatt, exotic imports like tung struck him as insect carriers rather than prospective crops. According to environmental historian Philip J. Pauly, both Fairchild and Marlatt supported "ecological independence" or self-sufficiency but functioned in different ways.[50] Whereas Fairchild saw horticultural diversity as the way to increase the country's ability to produce resources and prevent overproduction, Marlatt believed that the country should rely solely upon native species rather than depending upon foreign imports. Thinking isolationism impractical, Marlatt had initially been a supporter of *laissez-faire* but pressure from entomologists and nurserymen led him to change his mind and push an anti-pest movement. His fear of invasive species had grounds in the number of parasites unintentionally imported in the late nineteenth century. Marlatt had further soured on exotics while honeymooning in the Far East in 1901-1902, when his wife Florence contracted an intestinal parasite and died not long after they returned home.[51] This loss cemented his resolve to insist on thorough inspections of imports by the Bureau of

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[50] Pauly, *Biologists and The Promise of American Life*, 73. See also, Pauly, "The Beauty and Menace of the Japanese Cherry Trees," 60. Philip's "ecological independence" expands upon Alfred W. Crosby, Jr.'s "ecological imperialism." See, Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (Cambridge: Cambridge University Press, 1986).

[51] Pauly, *Fruits and Plains*, 129, 144-147, 152-154; Pauly, *Biologists and The Promise of American Life*, 71-73; *New York Times*, January 29, 1910, 1; and Crosby, *Ecological Imperialism*, 312.

Entomology.[52] Over time, he became more interested in the idea of plant quarantines and ways to justify their implementation.

To Marlatt, increased American imperialism in the late nineteenth and early twentieth centuries had opened a floodgate of imports riddled with dangerous insects, fungi, and diseases. A fervent crusader, Marlatt employed a variety of methods to curtail what he perceived as a foreign infestation. One of his favorite means of combatting imports lay in language. While it remained common for Americans to use racial and ethnic prejudices when referring to foreign plants, Marlatt frequently did the same with import related pests. Much as unwanted imports like the Russian thistle and Mexican boll weevil had been associated with their country of origin, he wanted to rename the "San Jose Scale" the "Chinese Scale." Marlatt played upon stereotype and resentment in an attempt to extend hatred of a country and racism towards its people to its plants.[53] While this approach worked, he found the law a stronger means of attaining his dream.

Marlatt's quarantine had legal precedent. In 1881, botanist Lyster Dewey of the USDA pushed for a law to regulate or eliminate the importation of pests. Indeed, Under the Lacey Act of 1900, the USDA had the power to control plant and animal introductions, a right Marlatt eagerly embraced. Perhaps the most symbolic incident took place on January 28, 1910, when Marlatt ordered the burning of newly imported Japanese cherry trees which had been sent in friendship by Japan. The trees had been intended for the grounds of the White House, but Marlatt insisted that they carried scales and gall. In

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[52] Pauly, *Fruits and Plains*, 148.

[53] On American imperialism, see Pauly, "The Beauty and Menace of the Japanese Cherry Trees," 56-59; and Pauly, *Fruits and Plains*, 147.

1911, the Bureau of Entomology sanctioned the quarantine division of the California State Commission of Horticulture which intercepted a variety of imports, including thirty tons sent by Fairchild's explorer Meyer. The plants, including those at Chico, were pruned vigorously to remove their tops and sprayed to kill undesirable insects.[54] The following year, the Plant Quarantine Act of 1912, which prevented exotic plants from being shipped to the U.S, allowed Marlatt to chair the resultant Federal Horticultural Board (FHB). As chair, he had a budget of $25,000 to be used in the inspection of both imports and interstate commerce. While not aimed at government-sponsored plant introduction, the quarantine hurt the Office of Foreign Seed and Plant Introduction by giving it the reputation of an importer of bugs and pestilence.[55] This unforeseen law delayed further tung plantings by limiting access to imported trees.

Unable to import seedlings because of the quarantine, tung growers came to rely almost entirely on pre-existing tung trees like those belonging to Ronalds. During the quarantine, the number of tung growers slowly spread. In 1912, Bailey Finley (B.F.) Williamson of Gainesville, a seed oil enthusiast educated at the Agricultural and Mechanical College of North Carolina and at Wake Forest who had worked as a chemist for Armour & Company, formed the first large tung nursery, one which sold not merely domestically but internationally. The BPI published a bulletin in which then Secretary of

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[54] Lyster H. Dewey, "Legislation against Weeds," *USDA Division of Botany Bulletin* No. 17 (1896); Pauly, *Biologist and The Promise of American Life*, 80; Pauly, *Fruits and Plains*, 149, 152; and Pauly, "The Beauty and Menace of the Japanese Cherry Trees," 51. Japan sent another batch of cherry trees which passed inspection and were planted in 1912. See, Pauly, "The Beauty and Menace of the Japanese Cherry Trees," 67.

[55] Pauly, *Fruits and Plains*, 153; and Pauly, "The Beauty and Menace of the Japanese Cherry Trees," 69. Fairchild became so frustrated with inspection red tape and budget cuts that he retired in 1924. See, Pauly, "The Beauty and Menace of the Japanese Cherry Trees," 69.

Agriculture James Wilson lent his encouragement to the plantings.[56] According to paint and varnish manufacturer and industrial chemist Maximillian Toch, tung oil became the focus of numerous patents.[57] Another noteworthy distinction came in 1913 when Raynes sent his original tree's almost 2,000 nuts to soybean expert L. P. Nemzek of The Paint Manufacturers Association at Gillsboro, New Jersey. From these nuts, Nemzek crushed 2.2 gallons of oil, the first ever produced in the U.S. Raynes also sent seeds to the BPI which distributed them across the South.[58] Real awareness among farmers did not begin until one man worked with the BPI to lend credibility to tung cultivation.

In 1913, Tennant Ronalds, owner of Live Oak Grove Plantation, obtained 100 seedlings from Raynes and planted four acres. Impressed by the trees' hardiness and growth, he later contacted Fairchild for guidance on how best to establish an orchard and by 1915, he had forty acres of tung. Fairchild dubbed this "the first orchard of the tung oil tree in the Western Hemisphere."[59] While Fairchild gave advice when asked, the BPI expended little effort on its own tung experiments, often planting amidst weeds and grass. The trees grew without uniformity to the extent that "on the poorer soils they did nothing

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[56] W. Wilson Kilby, "The American Tung Nut Industry," *Agricultural Science Review* 8, no. 4 (1970): 30. On Williamson, see also, "B. F. Williamson," *The Oil Miller: The Alabama Seed Crusher Association* 9 (July 1919): 17. Williamson later became President of the Producer's Company in Madison, Florida, the Florida Livestock Exchange, and the Southeastern Peanut Crushers Association.

[57] Fairchild, "The Chinese Tung Oil Tree," 9.

[58] G. F. Potter and H.L. Crane, "Tung Production Research: Past, Present, and Future," 1960 Proceedings of Tung Industry Convention, Box 10, Folder 10, Camille, ATOI, MLA, USM. On the first oil, see also Lillian Robinson, "Florida's Tung is Showing," *Ocala Star-Banner*, June 19, 1955; and Haynes, *Southern Horizons*, 99.

[59] Fairchild, "The Chinese Tung Oil Tree"; and "Growers Discover New Wealth in Oil That Grows on Trees," *St. Petersburg Times*, March 24, 1929. Ronalds later committed suicide.

and on the wet, low places they did less than nothing."[60] A bad freeze in 1917 stunted production and even killed some *montana* trees in Tallahassee. Having second thoughts about the suitability of the Gulf Coast for tung, many early growers like Ronalds lost interest.[61] Fairchild came to believe that tung held too many financial risks to make it a safe investment for the average farmer, but encouraged manufacturers to plant the trees and produce domestic oil. He later regretted that he had failed to realize that farmers would emulate such efforts, thinking them profitable.[62] To make matters worse, in November 1918, Marlatt issued Quarantine 37 which broadened earlier legislation that had allowed nursery "seedling, stock, and bulbs" to slip through inspection by effectively prohibiting their importation.[63] American nurseries could attain permits, but this red tape proved an annoyance and deterrent.[64] All the while, tung plantings, derived from native grown nuts rather than imported nuts and seedlings, increased as the recognition of tung oil grew.

While tung trees made headway along the coast, tung oil developed a reputation as the supreme drying oil. Paint and varnish companies in the North and Midwest had begun experimenting on tung oil as early as 1907 and found that tung oil alone or meshed with resin esters and limed rosin made great, non-yellowing, fast drying varnishes that

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[60] Fairchild, "The Chinese Tung Oil Tree," 8.

[61] See, Wilmon Newell, "Preliminary Report on Experiments with the Tung-Oil Tree in Florida," *Florida Agricultural Experiment Station Bulletin* 171 (1924): 200.

[62] Fairchild, "The Chinese Tung Oil Tree," 10.

[63] Pauly, *Fruits and Plains*, 156.

[64] Ibid., 161-164.

had an impressive resistance to mold and fungi.[65] Tung along with linseed, soya, and perilla dried better than cottonseed, corn, and sesame. The more double bonds unsaturated or liquid oils had, the faster they dried.[66] What made tung oil so appealing lay in its chemical makeup. Every one of its eleostearic acid molecules had "three double bonds in conjugated positions with only a single bond connecting the carbon atoms between each double bond."[67] The number and placement of the conjugated double bonds in its fatty acids created immense reactivity which sped oxidation. In essence, some of the fatty acid chains in tung lacked hydrogen atoms so they absorbed oxygen more readily. Tung contained roughly eighty percent eleostearic acid and twenty percent glycerides, so it solidified much more rapidly than other unsaturated oilseeds. Tung hardened at about 62.6 degrees Fahrenheit and dried in four to five hours, much faster than linseed and soybean oil. This quick drying feature, coupled with a glossy shine and ability to withstand dampness, made tung oil immensely popular with paint and varnish companies as well as ink and linoleum companies.[68] While some believed that tung could become a superb waterproofing agent, many doubted that it could replace linseed as the primary

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[65] Robert S. McKinney, "Research Investigations of U.S. Tung Oil Laboratories," Box 19, Folder 22, Tung Oil, FCC, UAHC, MSU. In this article, McKinney does not mention specific companies.

[66] "Tung Oil," *Trenton Evening Times*, October 17, 1937.

[67] Robert S. McKinney, "Research Investigations of U.S. Tung Oil Laboratories," Box 19, Folder 22, Tung Oil, FCC, UAHC, MSU.

[68] Swern, 163; Bailey, *Industrial Oil and Fat Products*, 126; R. S. McKinney and Nelle J. Morris, "Preparation of Tung Oil-Phenolic Resin Varnishes" (speech presented at thirteenth annual convention of American Tung Oil Association, Pensacola, FL, May 13, 1947), 20; Concannon, "Tung Oil," 32-35; and *Tung Oil* 1, no. 1 (Oct 1930): 16.

drying oil.[69] Demand for tung oil grew in the 1910s largely as a result of the duty removal. Under the Payne-Aldrich Act of 1909, a law which lowered many tariffs, tung imports had been "dutiable at 25% ad valorem," but this tariff was removed in 1913, allowing for a flood of Chinese imports.[70] Hoping to keep the idea of a domestic tung industry alive, many early proponents sought the discovery of new uses to increase demand.

Early growers hoped that the federal government's embrace of scientific agriculture might pique interests in tung oil through experimentation. Government interest in science-based agriculture dated back to 1884 when the USDA formed the Association of Official Agricultural Chemists (AOAC) in order to study fertilizers. Firm federal support did not come until the Hatch Act (1887) indicated that the future of farming lay in science. This act provided each state with $15,000 a year for an agricultural experimentation station. In the years that followed, agricultural science, aided by famous advocates, flourished.[71]

Giving encouragement to the aspirations of tung farmers, experimental agricultural finds multiplied in the 1900s and 1910s. Noteworthy practitioners included George Washington Carver, Luther Burbank, and Charles Holmes Herty. Known

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[69] "A Word About our Paints," *Flint Daily Journal* (Michigan), October 6, 1914, 16. See also, Henry Williams, "Cheaper Paints for the Navy," *Journal of the American Society of Naval Engineers* vol. 24 (1912): 289.

[70] Henry Grady, "Tariff and Trade: The New American Schedule in Relation to Pacific Commerce," *Pacific Affairs* 3, no. 8 (Aug 1930): 726. See also, "Tariff Hearings, Chinese Nut Oil," Congressional Record, House Documents vol 132, 62nd Congress, 3rd Session, December 2, 1912-March 4, 1913 (Washington D.C.: Government Printing Office, 1913): 5790.

[71] Alan I. Marcus, *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1887-1890* (Ames: Iowa State University Press, 1985), ix, 57, 217.

primarily for his discovery of peanut uses at the Tuskegee Institute, Carver performed chemical studies on soybeans, sweet potatoes, cow peas, and pecans among other foci in an effort to find uses for bi-products.[72] Horticulturalist Burbank hybridized many plants to create new varieties. A professor at the University of Georgia, Herty looked at pine trees and saw not merely lumber but cellulose, turpentine, and paper. Another wood related development took place in 1909 when Leo Baekeland, a Belgian chemist in New York, meshed phenol, a hydroxyl derivative of benzene, with formaldehyde to make a shapeable resin he dubbed Bakelite, a synthetic plastic. The most significant industrial discovery which forever altered the market for fertilizers and explosives occurred in 1909 when German chemist Fritz Haber discovered a method to make synthetic ammonia from hydrogen and atmospheric nitrogen. Four years later in 1913, German chemist Carl Bosch commercially marketed this find as the Haber-Bosch process which revolutionized the fertilizer and explosive industries.[73] The growing interest in tung oil grew out of this context, as it increasingly attracted notice for its industrial uses and came to play a pivotal role in World War I.

Tung oil received great praise throughout World War I for its scientific potential. During the war, agricultural production and commodity exportation greatly increased. While the government pressured farmers to grow foodstuffs rather than cotton, thus

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[72] See, for example, Mark Hersey, *My Work is That of Conservation: An Environmental Biography of George Washington Carver* (Athens: University of Georgia Press, 2011), 143, 163, 171-172, 219; and Linda O. McMurray, *George Washington Carver: Scientist and Symbol* (New York: Oxford University Press, 1981), 158, 167-168, 189, 235, 238.

[73] Christy Borth, *Pioneers of Plenty: The Story of Chemurgy* (New York: Bobbs-Merrill, 1939), 57.

furthering diversification, it also emphasized scientific uses of plants.[74] Studies on oils, dyes, artificial fibers, plastics, and alternatives for various imports abounded.[75] The government became even more interested in tung as it grew in trendiness among consumers and as its strategic value became more apparent.[76] Tung imports increased substantially during World War I from 39,459,552 to 45,566,008 pounds, but the country exported no tung oil during wartime. While the New York Producers Exchange began performing a heating test to judge the "purity" of shipments, domestic growers, positive of the superiority of "American tung oil," remained convinced that imports contained diluted or dirty oil.[77] Rising demand sparked more interests among businessmen who believed American-grown oil could be produced more efficiently and economically while surpassing Chinese-grown oil in quality.[78] Proponents also spoke of American trees as larger than those in China.[79] Many wanted to erase all things Chinese from the tung tree and make it a 100% "American crop." In 1918, *The Philadelphia Inquirer* even described

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[74] Brooks Blevins, *Cattle in the Cotton Fields: A History of Cattle Raising in Alabama* (Tuscaloosa: University of Alabama Press, 1998), 78.

[75] Borth, *Pioneers of Plenty: Modern Chemists and Their Work*, 150; and Charles Whittle, "South's Opportunity to Build up Great Industry in Vegetable Oil Production," *Manufacturers' Record* 73, no. 13 (March 28, 1918): 57.

[76] Charles Walters, *Unforgiven . . . The American Economic System SOLD for Debt and War* 2nd ed. (Acres USA, 2002), 281.

[77] Philips, "Florida's Infant Industry," 350; and Clifford Dyer Holley, *Analysis of Paint Vehicles, Japans and Varnishes* (New York: John Wiley & Sons, 1920), 89. See also, "China Wood Oil—Its Production and Preparation," *Pacific Marine Review* vol. 16 (July 1919): 74.

[78] George E. Martin, "Wanted—Grower of Varnish," *The Technical World Magazine*, March 1913, 706.

[79] Davenport, 53.

tung in an oxymoronic fashion as "Uncle Sam's Chinese Tree."[80] Convinced of the claims of the superiority of domestic oil, growers saw science as the means of founding a U.S. industry.

The post-war atmosphere hastened such experimentation. When the war ended, the large surplus of basic crops and the loss of export markets created an agricultural depression. Motivated by future profits, many companies built their own laboratories to conduct commodity experimentation. In 1919, Alien Property Custodian Francis Garvan, Attorney General Alexander Mitchell Palmer, and President Woodrow Wilson formed the Chemistry Foundation, Incorporated, even going so far as to spend $271,850 for 6,400 patents the U.S. had confiscated from Germany in 1917 in retaliation for the war.[81] When on February 14, 1918, Wilson, using the Trading with the Enemy Act of 1917, embargoed an array of products and increased experiments so as to lessen reliance on foreign markets, many industrial scientists remained dissatisfied. In 1921, Synthetic Organic Chemical Manufacturers Association President Herty, Director of Organic Chemistry Research at Dow Chemical Company William J. Hale, and the Chemical Foundation of New York City called for an embargo on "all basic organic chemicals."[82] To their relief, on September 21, 1922, when the Trading with the Enemy mandate ended,

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[80] "Uncle Sam's Chinese Tree," *Philadelphia Inquirer*, January 4, 1918, 8.

[81] Borth, *Pioneers of Plenty: Modern Chemists and Their Work*, 150; and Fite, *Cotton Fields No More*, 105.

[82] William J. Hale, *Farmers Victorious: Money, Mart, and Mother Earth* (New York: Coward McCann, 1949), 108.

the Fordney-McCumber Tariff raised duties in order to lower imports, thus providing security to both industrialists and farmers.[83]

World War I provided an impetus but the tung oil industry grew only minimally in the late 1910s and early 1920s. While trees had been planted as far west as California and as far north as New Bern, North Carolina, the majority of trees remained strewn across the Gulf South. In 1922, Williamson, who had started caring for the Raynes orchards, planted 1,600 acres of tung trees in Gainesville. Fairchild regarded this as the first significant tung venture in the country. Having captured the attention of a significant consumer market, tung oil began to strike farmers as a potential cash crop. Expectations proved lofty with many predicting the eventual planting roughly120,000 acres, an amount they believed could fulfill most, if not all, of domestic demand. Experimental plantings continued to take place as imports reached some forty-three million pounds a year. As farmers and manufacturers rushed to plant tung in Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas, the feasibility of a domestic tung oil industry strengthened.[84]

More paint and varnish companies began expressing more interest in tung trees. Both the National Varnish Manufacturers Association (NVMA) and the Paint

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[83] William J. Hale, *The Farm Chemurgic: Farmward The Star of Destiny Lights Our Way* (Boston: Stratford, 1934), 21; and Hurt, *American Agriculture*, 287.

[84] G. F. Potter and H.L. Crane, "Tung Production Research: Past, Present, and Future," 1960 Proceedings of Tung Industry Convention, Box 10, Folder 10, Camille, ATOI, MLA, USM. See also, Concannon, "Tung Oil," 63-64, 35-36; Elizabeth Robinson, "The Birth of an Industry," *Tung Oil* 1, no. 3 (Dec 1930): 6, 18; "Tung Production," *Farmers' Bulletin* no. 2031, U.S. Department of Agriculture, Tung Oil, Vertical File, State Library of Louisiana [hereafter TO, VF, SLL]. On cutover pinelands, see also, "Southern Cut-Over Land Conference TO Vitalize 100,000,000 Acres of Cut-Over Land in South for Agriculture," *Manufacturers' Record*, 71, no. 16 (April 19, 1917): 57.

Manufacturers Association (PMA) sent a representative, Henry A. Gardner, assistant director of the Institute of Industrial Research, to investigate. Impressed by his findings, the American Paint and Varnish Association (APVA) funded the creation of the American Tung Oil Corporation which in 1923 planted 216 acres of tung trees in Gainesville on land purchased from Williamson. Paint operations like Benjamin Moore & Company began buying tung acreage and receiving seeds from agricultural experiment stations like the Alabama Polytechnic Institute at Auburn and Texas A&M Agricultural Experiment Station. Some boosters like Polk City, Florida, founder Isaac van Horn, envisioned that tung might spark an economic empire. Originally from Philadelphia, van Horn, a broker and producer of automobile parts in Boston, settled in Florida with the idea of drilling oil but tung quickly caught his eye. Seeking to industrialize the area, he believed tung trees would bring paint and varnish companies to the South. In 1925, van Horn published the first tung-focused serial, later called *The Tung Oil Chronicle*, and dedicated the paper to the creation of a domestic tung oil industry.[85] He optimistically described tung as "possibly the greatest horticultural and industrial development that has

[85] Dr. C. C. Concannon, "Domestic Tung Tree Plantings," *The Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 14; Gardner; Robert L. Duffus, "America as a Dependent Nation: Imports Play an Increasingly Vital Role in Our Economic Life," *New York Times*, May 9, 1926; Concannon, "Tung Oil," 63-64, 35-36; Harold Mowry, "The Role of Experiment Stations in the Development of a Tung Oil Industry" (Speech presented at Gulf Coast Chemurgic Conference Tung Oil Association of America Joint Meeting, Pensacola, FL, Oct 20-21, 1936), 164; *Tung Oil* 1, no. 1 (Oct. 1930), 12; "Growing Varnish On Trees A New Industry in Florida," *New York Times*, January 20, 1924; "Chinese Tung Oil Produced For First Time in America," *New York Times*, April 14, 1929; Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 53; "Tung Oil in China and the U.S," *Tung Oil* 1, no. 1 (Oct 1930): 18; "Chinese Oils Extracted in Florida," *Springfield Republican* (Massachusetts), March 15, 1929; "Experiment Station Grows New Oil Plant: Tung-Oil Trees Do Well in Alabama as Shown by Growth at Auburn Under Care of State Horticulturalist," *Montgomery Advertiser*, September 28, 1921, 7; and "New Crop for Alabama," *Montgomery Advertiser*, September 28, 1921, 4. On Polk see, "Editorial," *The Tung Oil Chronicle* 8, no. 3 (March 1933): 2. The Smathers Library at the University of Florida is the only one in the country that has this journal and unfortunately, they only have this one edition.

ever come to Florida . . . the base of a great national industry."[86] Tung oil's connection to two established industries fueled its potential.

Those interested in growing tung trees surmised that tung oil would be an addition to if not a replacement of two long established southern businesses. Naval stores had originally been centered in North Carolina, but had moved to northern Florida and southeastern Georgia at the dawn of the twentieth century. It had waned somewhat by the 1920s, leaving its participants in search of a new venture. [87] By the late 1920s, more lumbermen, too, had begun to take notice of tung trees. After the repeal of the 1866 Southern Homestead Act in 1876, lumber companies from northern states like New York, Illinois, and Michigan had formed a number of towns and railroads in the South.[88] Between 1880 and 1910 the amount of "Southern Lumber (board feet cut)" in Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas went from 1,582,453,000 to 11,246,570,000.[89] The southern states provided a haven in pine for businesses.

The amount of pine harvested only increased with years, and by 1925, Mississippi alone had 917 lumber companies employing 39,000 workers. When lumber businesses finished harvesting the pinelands, some moved west, but those that remained had to pursue greater land efficiency. Previous Southern Cutover Land Conferences recommended planting fast growing crop or getting northerners or immigrants to farm the land. Many lumber companies, encumbered with an abundance of cut-over land,

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[86] "Market Statement by the Government," *The Tung Oil Chronicle* 8, no. 3 (March 1933): 3.

[87] John Fraser Hart, *The Rural Landscape* (Baltimore: Johns Hopkins University Press, 1998), 80.

[88] Ibid., 83.

[89] "Increasing Demands Upon the South's Lumber Resources," *Manufacturers' Record* 30th Anniversary Issue, Part 2 (Feb 22, 1912): 41.

experimented with strawberries and satsumas among other crops, but none performed satisfactorily. Fearful of tick fever, many thought it unwise to pursue cattle. Doing the math, some, like affiliates of the Illinois Central Railroad realized that unlike pine trees which took decades to mature, tung trees produced their first crop in three-to-five years and seemed perfectly suited for rolling, sandy soiled pinelands. One of the first lumbermen to pursue tung trees, Goodyear Yellow Pine Company owner L. O. Crosby, Sr., planted fifty acres near Carriere, Mississippi, in 1927. Having harvested most of his pines in southern Mississippi and Louisiana and not wanting to move west, Crosby saw tung as an excellent way in which to continue production in the area.[90] While cut-over pinelands grew green with tung trees, growers fretted over ways to weaken China's hold on the world tung oil market.

The tung oil relationship between the U.S. and China grew in complexity throughout the 1920s. While many Americans supposed the Chinese to be inferior, China had, in fact, made significant strides in mechanization, industrialization, and education. Chinese tung mills began mechanizing, and tung oil studies maintained a place in higher learning. While mission colleges began popping up across China, Nanking Chemistry

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[90] "The American Tung Industry Was First Introduced . . .," Box 23, Folder 3, Crisis in Tung, ATOI, MLA, USM; *Christian Science Monitor*, January 9, 1942; Edward Ayers, *The Promise of the New South* (New York: Oxford University Press), 125-128; Walker, *The Southern Forest: A Chronicle*, 99-101; *Mississippi: America's State of Opportunity* (Jackson: Mississippi State Board of Development, 1944), 33; Clark, 30; Fickle, 82; "U.S. Officer Starts Tung Oil Survey," *Times-Picayune*, February 7, 1930, 8; "New Life Stirs in Lumber Belt," *Times-Picayune*, June 7, 1936, 73; and Gordon G. Whitney, *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate north America 1500 to the Present* (New York: Cambridge University Press, 1994), 182. On cattle tick fever, see Strom, 7-17. On Crosby, see, "Crosby Tells of Costly Errors," *Tung World* 1, no. 1 (April 1946): 13; and Noel Polk, *Outside the Southern Myth* (Jackson: University Press of Mississippi, 1997), 36.

Department founder James Thompson wrote his dissertation on tung oil.[91] Since American production could not meet the growing demand for tung oil, dependence on tung oil imports (overwhelmingly from China) became more pronounced as the years passed. Indeed, after the Tariff Act of 1921 removed the duty on tung, it became the fourth largest chemical import. In 1927, the U.S., in order to insure its trade investment, had its gunboats at Hankow escort Chinese steamers loaded partly with tung oil along the Yangtze River.[92] This dependence proved quite disconcerting for Americans. While consumer markets welcomed less expensive imports, growers feared dropping prices and longed to become independent of China.[93] As revealed by Table 2.1, the tung market fluctuated from month to month and year to year. Espousing economic nationalism, many companies feared dependence on unreliable imports and sought to expedite domestic production of tung oil.

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[91] James Reardon Anderson, *The Study of Change: Chemistry in China, 1840-1949* (New York: Cambridge University Press, 1991), 125, 243.

[92] "China's War and 'Paint Up' Week," *Springfield Republican* [Massachusetts], June 12, 1927; and "Tung Oil Fourth Chemical Import," *The Journal of American Oil Chemists' Society* 6, no. 9 (Sep 1929): 10.

[93] "Tung Oil a Growing Industry Should Have Tariff Protection," *Manufacturers' Record* 95, no. 21 (May 23, 1929): 56; and Senate Committee on Finance, *China Wood Oil Hearings before the Committee on Finance United States Senate on The Proposed Tariff Act of 1921* (H.R. 7456), vol 6 Free List (Washington, D.C.: Government Printing Office, 1922), 4570.

Table 2.1 Tung oil imports, 1922-1928[94]

Year	Tung Oil (lbs)	Price (cents per lb)
1922	79,089,293	12-16
1923	87,291,675	14-40
1924	81,587,854	12-21
1925	101,553,519	13-16
1926	83,003,774	11-19
1927	89,650,411	14-35
1928	107,356,971	14-18

While an array of businessmen sought to establish a U.S. tung oil industry to meet consumer demand, many became captivated with the notion of cheap land and easy money. A 1920s land boom stretching across the South boosted land speculation, and purchasers sought profitable uses for their new property.[95] (Tung trees were even planted outside the Gulf South in Tennessee, North Carolina, and South Carolina.[96]) Tung trees struck many as unique and lucrative considering the demand for tung oil. Unfortunately, these men and women also believed erroneous information reported by newspapers, magazines, and books which claimed that tung trees required virtually no care. Interested parties all too eagerly bought into such rumors and saw tung as a hands-off money maker. In other words, most imagined that all they had to do was plant a tung tree, wait three or four years, harvest the nuts, and reap the profits. [97] This faith proved contagious as proven businessmen like J. C. Penney of the Penney-Gwin Corporation and Thomas

[94] "Markets and Prices," *Tung Oil* 1, no.1 (Oct 1930): 5, 16.

[95] Mormino, 45.

[96] Maximilian Toch, "China Wood Oil," *Journal of Oil and Fat Industries* 3, no. 3 (Mar 1926): 86.

[97] See, "The Chinese Wood-Oil Tree," *San Jose Mercury News*, July 19, 1914, 18; "Wood-Oil Tree in The United States," *Drug & Chemical Markets* 3, no. 1 (Sep 13, 1916): 9; and Wilcox, 264.

Morrison Carnegie, Jr., nephew of famed industrialist Andrew Carnegie, planted tung.[98] But it was Henry Ford who did more than anyone to elevate tung tree farming from mere fad to a serious industry.

So respected was Ford among industrialists, that his mere interest lent the nascent tung industry credibility it had previously lacked. The Model T producer had a history of endorsing new industrial utilizations for agricultural products like soy milk and alcohol-based fuels.[99] In a failed effort, he invested heavily in South American rubber plantations, even buying 17,000 acres on the Tapajos River plateau in Brazil in 1919 and another plantation in 1927, and backed Thomas Edison's experimentation on possible rubber plants like goldenrod and *cryptostegia*. Ford's interest in tung likely derived from its being a member of the *Euphorbia* family which included *Hevea brasiliensis* or the rubber tree. Rather than placing all focus on his foreign plantations, in 1925 Ford purchased almost 70,000 acres in Georgia and Florida, most near Savannah, with the aim of testing plants. Several years later in 1929, he formed a research lab at Ways Station in Georgia. The overarching goal remained consistent: escaping import dependence through self-sufficiency for his company and the nation. Fairchild believed Ford just the man to lead

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[98] "The Penny Farms in Florida," *Augusta Chronicle*, December 19, 1926, 6; and "Tests Out Trees as Oil Producer," *Trenton Evening Times*, November 7, 1928, 19. The Penney-Gwin Corporation land holdings in Collier County, Florida, included sixty acres of tung. On J. C. Penney, see also, Maury Klein, *The Genesis of Industrial America, 1870-1920* (New York: Cambridge University Press, 2007), 120. Carnegie grew tung on his Dungeness Plantation on Cumberland Island, Georgia and leased a tung plantation in Monticello, Florida. On Carnegie, see, Charles Seabrook, *Cumberland Island: Strong Women, Wild Horses* (Winston-Salem, NC: John F. Blair, Publisher, 2004), 160.

[99] On the Model T, see, Klein, 180.

the country in scientific experimentation, mechanization, and proficiency.[100] Thoroughly praised by businessmen and gentleman farmers for his devotion to agricultural utilizations and industrial efficiency, Ford became both a domestic and international icon. Even small farmers liked him for his professed dislike of Wall Street and industry in general.[101] As historian Steven Watts noted, "He seemed to represent everything that was modern, innovative, and vital in this triumphant new society.[102] Ford popularized tung as a domestic crop but even with the endorsement of this famous figure, tung tree farming remained questionable because of the uncertain position of diversification.

By the late 1920s, the South remained deeply entrenched in mono-crop culture and many farmers remained unwilling to branch into crops like tung. Diversification continued to make headway, though, especially during World War I. Some southerners mistakenly credited the boll weevil, a cotton boll devouring insect that had entered the country from Mexico at Brownsville, Texas, in 1892, for spreading multi-cropping.[103] In

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[100] Reynold M. Wik, *Henry Ford and Grass-roots America* (Ann Arbor: University of Michigan Press, 1972), 12, 147; Neil Baldwin, *Edison: Inventing the Century* (New York: Hyperion, 1995), 380; "Ford Plants Tung Oil Trees in Georgia," *Augusta Chronicle*, October 21, 1943, 3; Joseph A. Russell, "Synthetic Products and the Use of Soy Beans," *Economic Geography* 18, no. 1 (Jan 1942): 33; Steven Watts, *The People's Tycoon: Henry Ford and The American Century* (Ann Arbor: University of Michigan Press, 2005), 487-489; "Science: Edisonia," *TIME Magazine*, February 25, 1929; and Walter N. Bangham, "Rubber Returns to Latin America," in *New Crops for the New World* edited by Charles Morrow Wilson (New York: Macmillan, 1945), 84. Ford's rubber venture in Latin America came to naught largely due to plant diseases and labor problems. See, "Rubber: Ersatz & Home Grown," *TIME Magazine*, June 17, 1940; and Greg Grandin, *Fordlandia: The Rise and Fall of Henry Ford's Forgotten Jungle City* (New York: Picador, 2010), 3-26.

[101] Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1970* (Chicago: University of Chicago Press, 2004), 271; and Wik, 124.

[102] Watts, 253.

[103] Jack Temple Kirby, *Rural Worlds Lost: The American South, 1920-1960* (Baton Rouge: Louisiana State University Press, 1987), 20, 44; Fite, *American Farmers*, 23; Tindall, 123; and Hurt, *American Agriculture*, 221. On the boll weevil, see also, W. D. Hunter, "The State of the Cotton Boll Weevil in 1909," *U.S. Bureau of Entomology Circular* no. 122 (Dec 30, 1910): 1-12.

reality, it merely highlighted the South's dependence on mono-crop culture, its racial problems, and its poverty.[104] As agricultural historian Jim Giesen argues, the "idea of the boll weevil" more than the insect itself incited change.[105] At the time of its arrival, farmers condemned it as a scourge on their existence, but over time, other agrarians came to see it as the harbinger of diversification.[106] In reality, diversification had been dabbled with prior to the insect's arrival.[107] Even so, Enterprise, Alabama, built a statue to honor the insect in 1919; however, a few years later, cotton regained its stronghold—a testimony to the South's commitment to cotton.[108] By 1921, the South had more cotton than it had in the 1890s.[109] Risks aside, many farmers thought it simpler and more profitable to grow one crop but diversification grew with the passage of time and tung trees benefitted from the movement. Diversification did grow with the passage of time and tung trees benefitted from the movement.[110]

Tung trees grew in number across the Gulf South but proved only one of a variety of crops and industries adopted by various counties. An array of crop trends took place

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[104] James C. Giesen, *Boll Weevil Blues: Cotton, Myth and Power in the American South* (Chicago: University of Chicago Press, 2011), xii.

[105] Ibid., xi.

[106] "Blessing in Boll-Weevil," *Manufacturers' Record* 66, no. 20 (Nov 19, 1914): 44; and Giesen, 100.

[107] Giesen, 174. See also, Cindy Hahamovitch, *The Fruits of Their Labor: Atlantic Coast Farmworkers and the Making of Migrant Poverty, 1870-1945* (Chapel Hill: University of North Carolina Press, 1997), 86; "Low-Priced Tractor for Farm Work Believed to Have Been Finally Produced," *Manufacturers' Record* 71, no. 22 (May 31, 1917): 57; and Theodore Saloutos, *Farmer Movements in the South, 1865-1933* (Berkeley: University of California Press, 1960), 227.

[108] Ibid., 125.

[109] Strom, 125. See, also, Numan V. Bartley, *The Creation of Modern Georgia*, 2nd ed. (Athens: University of Georgia Press, 1990), 172.

[110] Cowdrey, 111; and Wright, *Old South, New South*, 59, 122.

across the South, especially in Florida with its humid, wet climate. Polk County, Florida, for example, focused on citrus, cotton, peaches, strawberries, pineapples, tomatoes, and other truck crops. On top of these diversification waves, its phosphate, timber, cattle, and naval stores production earned it the mantle "Imperial Polk County," a reputation in which tung came to contribute.[111] While Grady County, Georgia, which had formed in 1906, dealt mainly with naval stores, pine, and cotton, it quickly came to embrace alternative crops like tung, peach, and citrus trees. Prior to tung, Baldwin County, Alabama, had produced timber, turpentine, and satsumas. Around the same time it adopted tung, the county pursued potatoes, pecans, various fruit crops, cattle, and by the 1920s, had begun to replant pine. While tung may have only been one of many new crops planted in the Gulf South, its transition from novelty to industry made it stand out.[112] Growers and companies dubbed tung tree farming an industry but a momentous problem remained—producers had no way to process the oil.

The primary reason tung production had not gained significant standing dealt mainly with the absence of a tung mill. Prohibited from importing tung trees, growers had been forced to rely upon nuts for planting purposes instead of crushing. As a result, there

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[111] Frisbie, 27; and *Polk County: the Heart of Florida* (Fort Lauderdale: Copperfield Publications, 2004), 34. On Florida, see also, Mormino, 189.

[112] On Polk County, see, M. F. Hetherington, *History of Polk County Florida* (1928; repr., Chuluota, FL: The Mickler House Publishers, 1971), 148; and *The Tung Oil Chronicle* 8, no. 3 (Mar 1933): 1. On Grady County, see, Wessie Connell and Barbara Williams, *A Retrospective Festschrift: Henry W. Grady* (Cairo: Roddenbery Memorial Library, 1983), 9, 15. Georgia began producing peaches in the 1870s and by the late 1920s, it had become one of the top two peach producing states in the country. See, Fite, *Cotton Fields No More*, 111. On Baldwin County, see, *The History of Baldwin County, Alabama* (Clanton, AL: Heritage Publishing Consultants, 2001), 35, 36, 37; Dr. Larry Burnette, *Historic Baldwin County: A Bicentennial History* (San Antonio, TX: Historical Publishing Network, 2007), 28, 32; and O. Lawrence Burnette, Jr., *Coastal Kingdom: A History of Baldwin County, Alabama* (Baltimore: Publish America, 2006), 307. See also, John C. Lewis and Harriet Brill Outlaw, *Images of America: Baldwin County* (Charleston: Arcadia Publishing, 2007), 87-97. On tung as a novelty, see, Lynn Crosby Gammill, interview by author, April 3, 2012, tape recording.

had not been enough nuts to support a mill.[113] Some tung farmers shipped nuts to paint companies but this met with grumbles as manufacturers preferred dealing with oil. Others took their harvest to peanut mills but the machinery could not crush the hard shells of the tung nuts. They also tried cottonseed mills which had been forced to crush other crops like castor, copra, soybeans, and peanuts when faced with boll weevil related cotton shortages.[114] The non-specialized machinery damaged the tung kernels, causing them to deteriorate and lessening their oil content.[115] With this in mind, those interested in tung oil realized the need for a mill to process tung nuts. Between 1923 and 1928, the number of its tung trees had multiplied from 14,000 to 400,000, so Florida seemed the most appropriate location.[116] In 1928, the country's first tung oil mill opened in northern Florida to meet the growing demand.

Benjamin Moore & Company, having planted 1,800 acres of tung trees in Alachua County, Florida, in 1924, opened the Alachua Tung Oil Mill on December 14, 1928. In addition to processing their own oil, the company knew that 400 growers with 10,000 acres in and around the county needed servicing. According to manager L. P. Moore, the nephew of paint industrialist Benjamin Moore, the mill processed forty gallons an hour and could crush 70,000 pounds of nuts in a matter of days. The mill also

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[113] J. M. Hughes, "A Southwest Georgia County to Plant 4000 Acres in Tung," *Manufacturers' Record* 97, no. 18 (May 1, 1930): 60; and Henry Betant, "Tung oil in Mississippi," *Manufacturers' Record* 98, no. 20 (Nov 13, 1930): 54.

[114] "Cottonseed Mills and Peanut Oil," *Manufacturers' Record*, 59, no. 25 (June 29, 1911): 55.

[115] Annual Report-1955, USDA Farm Machinery Section, Tung Production and Harvesting Machinery p.5, A81-8, Box 1, Annual Report Tung Machinery Investigations, W. W. Kilby, Southern Miss., Branch Experiment Station, Congressional and Political Research Center, Mitchell Memorial Library, Mississippi State University [hereafter CPRC, MLA, USM].

[116] Scott, "Tung Oil: A New Industry in Florida," 6.

fueled claims that American tung oil ranked superior to Chinese tung oil. An assertion was also made that the mill's press could produce more tung oil than 100 Chinamen or "coolies," a racial slur reflecting the anti-Chinese sentiment permeating the nation. The mill made possible this country's first noteworthy domestic harvest in 1929, even if it only ran for one week.[117] Growers across the Gulf South flocked to the mill but transportation costs inspired the creation of other mills in the years to come. Thus the Alachua Tung Oil Mill ushered in a new era in American tung production, one that saw the oil get a foothold as a potentially significant commodity.

In the words of social historian Gary R. Mormino, tung had been a "curiosity" more than anything else in the first two decades of the twentieth century.[118] As timber companies closed or moved westward, the cutover pinelands provided an opportunity for the growth of a new southern industry. Businessmen, tempted by the prospect of producing their own oil, saw tung as a wise financial investment and laid the foundation for domestic production. Attracted by the promise of diversification, seemingly absence of effort, minute chance of overproduction, and the appeal of harvesting more tung oil per acre than cotton or peanuts, some farmers also started planting tung.[119] Trial and error revealed where the new industry would best thrive. Some trees planted in Little Rock,

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[117] Ibid., 33. See also, Karen Brown and William Keeler, "The History of Tung Oil," *Wildland Weeds* 9, no. 1 (Winter 2005): 4; Scott, "Tung Oil: A New Industry in Florida," 5; "Alachua Tung Oil Mill Oldest in Country," *Tung World* 1, no. 2 (June 1946): 19; "Tung Oil Being Commercially Produced in Florida," *The St. Petersburg Evening Independent*, December 14, 1928, 15; "Chinese Tung Oil Produced for First Time in America," *New York Times*, April 14, 1929; and Francis Cooper, "American Tung Oil Production: First Commercial Unit for Manufacture of This High Grade Varnish Oil Established in Florida," *The Journal of American Oil Chemists' Society* 6, no. 2 (Feb 1929): 27-28. See also, Earle Rauber, "The Tung Oil Industry, Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 54.

[118] Mormino, 188.

[119] Scott, "Tung Oil: A New Industry in Florida," 24, 33.

Arkansas, and Clemson College, South Carolina, died due to freezes while those in California died of drought or lack of irrigation.[120] In roughly thirty years growers learned that tung grew best in areas which received at least thirty inches of rain a year, seldom froze, possessed nitrogen rich soil, and exhibited a well-drained, hilly terrain. Thus, the area best suited for tung production proved a 100 mile wide strip along the Gulf of Mexico, stretching from the Florida panhandle to southeastern Texas, an area which became known as the Tung Belt.[121] As the third decade of the twentieth century approached, it remained to be seen whether tung trees would transform southern agriculture as early boosters predicted or remain an unrealized ideal.

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[120] On Arkansas and South Carolina, see, Concannon, "Tung Oil," 66. On California, see, Scott, "Tung Oil: A New Industry in Florida," 6.

[121] As historian Donald Worster explained, sometimes exotic crops perform well in agroecosystems and sometimes they do not. See, Donald Worster, *The Wealth of Nature: Environmentalism and the Ecological Imagination* (New York: Oxford University Press, 1993), 53.

CHAPTER III

TUNG TIED: TRIAL AND ERROR IN THE DEVELOPMENTAL STAGE, 1929-1936

The tung tree, like the steam yacht and the chorus girl, is a rich man's plaything.[1]

Joseph Lafortune

By 1929, tung had become a pseudo-industry largely due to the efforts of industrialists but it continued to lack substantial credibility. After the creation of the first tung mill, tung cultivation and processing improved as both acreage and the number of mills grew. Perceiving tung as a path to fast cash, growers initially failed to realize that tung trees required intense cultivation to produce satisfactorily. It did not help matters that most planting the Chinese tree knew little about farming and less about tung. Initial failures led some to abandon tung and others to seek instruction from and scientific testing by agricultural experiment stations and USDA labs. Convinced that the federal government had an investment in the success of domestic production, the majority of growers remained intent on securing government support in more substantial ways, namely parity or production costs and a profit, loans, and import controls. Less certain about the viability of tung production, the federal government watched and waited, perhaps to see if growers could transform haphazard plantings into an industry worthy of

[1] Haynes, *Southern Horizons*, 108. LaFortune, who owned tung acreage and a tung mill in Lucedale, Mississippi, was an executive at Warren Petroleum Company in Tulsa, Oklahoma.

such aid. By the mid-1930s, the goals of growers to attain satisfactory government support had not been reached and the fate of the fledgling tung oil industry remained insecure.

With the building of the first tung oil mill, schisms developed among growers. Justifying its feasibility, one sect argued that the domestic tung oil industry had advanced from infancy to maturity. Supporters of this position argued for government protection in the form of a tariff. Others like Williamson protested the concept of a tariff for fear of alienating consumers with higher prices. Aware they needed imports, paint and varnish manufacturers, even those with tung orchards, vehemently objected to the idea of a tariff.[2] To the relief or chagrin of growers, tung nuts remained duty and tariff free. The fractured nature of the budding industry came to be reflected in its boosterish trade journal.

In 1930, the country gained the first tung oil trade journal dubbed *Tung Oil: The Magazine Devoted To The Development of The American Tung Oil Industry*. Based out of Orlando, Florida, the journal offered a mission statement legitimizing tung as a crop.[3] In the words of its editor, chemical engineer A. L. Matthews, "In presenting this magazine to the public, we do so because we believe that the Tung Oil Industry offers probably the

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[2] "Favors Protection for Tung Oil Industry," *Manufacturers' Record* 96, no. 8 (Aug 22, 1929): 50; "Tung Oil Growing Industry Should Have Tariff Protection," *Manufacturers' Record* 95, no. 21 (May 23, 1929): 56; "Tung Oil as Produced in Florida and China," *Manufacturers' Record* 95, no. 24 (June 13, 1929): 58; and "Tung Oil Duty Opposed by Paint and Varnish Interests," *Manufacturers' Record* 96, no. 1 (July 4, 1929): 60.

[3] "Our Policy and Future Features," *Tung Oil: The Magazine Devoted to the Development of The American Tung Oil Industry* 1, no. 1 (Oct 1930): 11.

greatest agricultural opportunity in the country today."[4] The "we" he mentioned included some 100 unnamed businessmen who endorsed the new journal. Firms like the Tung Oil Company of the United States in Philadelphia and the Chipley-Miller Company in Archer, Florida, advertised in the magazine. The latter, owner of 800 acres of tung with 300,000 saplings, offered its service for land selection, clearing, cultivation, instruction, and marketing. In a later edition, Matthews also mentioned that American Chemical Society President Dr. William Peterson had investigated the industry and created a display at the Ohio State University Museum.[5] That same year, on November 8, 1930, Wight, then president of the Cairo Chamber of Commerce, helped form the country's first association of tung growers—The Grady County Tung Growers Association.[6] According to the *Manufacturers' Record*, one Shanghai dispatch reported that the increase in growers and tung acreage across the southern U.S. "caused a shiver in the Chinese industry," but this assessment was likely wishful thinking on the part of domestic tung growers.[7]

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[4] "Presentation," *Tung Oil* 1, no. 1 (Oct 1930), 1. See also, "Salutations," *Tung Oil* 1, no. 1 (Oct 1930): 18. See also, "Advertisement," *Tung Oil* 1, no. 1 (Oct 1930).

[5] *Tung Oil* 1, no. 1 (Oct 1930): 20; "H. W. Bennett to A. L. Matthews, September 15, 1930," *Tung Oil* 1, no. 1 (Oct 1930): 21; "S. H. Bowman to A. L. Matthews, September 22, 1930," *Tung Oil* 1, no. 1 (Oct 1930): 22; "Tung Oil Acreage Increasing," *Tung Oil* 1, no. 2 (Nov 1930): 4-5; *Tung Oil* 1, no. 1 (Oct 1930): 2; "Salutation," *Tung Oil* 1, no. 1 (Oct 1930): 3; "Chipley-Miller Company," *Tung Oil* 1, no. 1 (Oct 1930): 7; and "Development Notes," *Tung Oil* 1, no. 3 (Dec 1930): 8.

[6] Katherine Pope Merritt, "Tung Oil Trees for Georgia," *Atlanta Journal*, Tung Oil, Vertical File, Hargrett Rare Book and Manuscript Library, University of Georgia, Athens, GA [hereafter TO, VF, HRBML, UGA]; J. M. Hughes, "Tung Oil in Grady County Georgia," *Tung Oil* 1, no. 3 (Dec 1930): 17; "Tung Oil Association," *Manufacturers' Record* 98, no. 22 (November 27, 1930): 37; and Gardner, *Tung Oil Culture*, 4. The Grady County tung association began with sixty members.

[7] "China takes Notice of South's Tung Oil Development," *Manufacturers' Record* 97, no. 4 (Jan 23, 1930): 43.

While Chinese growers took notice of the attempt to begin a U.S. industry, they maintained a monopoly and knew their hold on the market would not fade. Indeed, in the late 1920s, China experienced immense scientific modernization and witnessed the creation or rejuvenation of many colleges and laboratories. Similarly, mechanization of U.S. tung, soybean, rapeseed, cottonseed, and peanut mills increased.[8] Even when the Alachua Tung Oil Company mill in Gainesville shipped its first domestically milled tank of oil, roughly 150,000 pounds, in 1932, the U.S. industry remained microscopic compared to that of China.[9] Domestic tung farmers perceived foreign competition in a variety of complex ways.

Some domestic growers studied Chinese cultivation, and a few experts even traveled to Asia to observe methods in the hopes of perfecting methods. Most understood that imports met strategic and manufacturing demands while keeping the price from exponentially escalating. They realized the importance of Chinese imports but begrudged the Chinese dominance of the world tung oil market. The formation of the Chinese Communist Party in 1921 fueled xenophobia and the mini-Red Scare that had followed World War I.[10] As a result, *Tung Oil* described Chinese competition as communist, ogre-like caricatures flooding the market with millions upon millions of pounds of tung oil and

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[8] Anderson, 10, 243.

[9] "Carload of Plantation-Grown Tung oil Shipped," *Manufacturers' Record* 101, no. 20 (May 19, 1932): 15; and Federal Writers' Project of Florida, Tung Oil Industry in Florida (revised), *State of Florida Department of Agriculture Bulletin* no. 11 (Feb 1929): 20.

[10] Anderson, 319.

literally drowning out American growers.[11] These editorials spread the belief that "American tung oil" ranked far above "Oriental tung oil" when it came to quality.

Persisting as a popular view of superiority, this claimed derived from prejudice, not accuracy. A. L. Matthews, editor of *Tung Oil*, stated, "There is no question of the superiority of the Florida oil over the imported Chinese oil, especially from the standpoint of high gravity, high refractive index, low heat test and color." [12] He insisted that Chinese imports were adulterated with other oilseeds whereas domestic production had purity.[13] Quality varied and while some diluted batches may have been shipped, consumers relied heavily on imports but remained open minded towards domestic oil. The formation of the Tung Growers' Organization (TGO) in 1932 and the American Tung Oil Association (ATOA) in 1933 strengthened notions of U.S. cultivation and milling superiority.[14] Perpetuating bias, tung farmers argued that the tractor could do the work of 100 Chinese workers in a large tung orchard. Ironically, the bulk of Chinese oil derived from uncultivated wild trees so this claim was another example of boosterism.

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[11] In January 1938, The Southern Conservationist combined with American Tung Oil to form The Southern Conservationist and American Tung Oil. See, "This Month," T*he Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 1. See also, "Communism in China," *Tung Oil* 1, no. 2 (Nov 1930): 13-14. On the importance of price moderation, see, for example, "Tung Oil as Produced in Florida and China," *Manufacturers' Record* 95, no. 24 (June 13, 1929): 58-59; and "Tung Oil Duty Opposed by Tung Oil and Paint and Varnish Interests," *Manufacturers' Record*, 96, no. 1 (July 4, 1929): 63.

[12] "Tung Oil and Its Uses," *Tung Oil* 1, no. 1 (Oct 1930): 19. See also, "The New Industrial South," *Manufacturers' Record* 97, no. 9 (Feb 27, 1930), 68.

[13] "Tung Oil and Its Uses," *Tung Oil* 1, no. 1 (Oct 1930): 19.

[14] The TGO was comprised of Florida growers. See, "Business & Finance: Florida's Tung," *TIME Magazine*, June 6, 1932. On the ATOA, see "Used by Hundreds of Wholesale Consumers," *Tung Oil Bulletin* no. 12, G. L. Reasor Tung Oil Plantations, Tung Oil Subject Files, Mississippi Department of Archives and History, Jackson, MS [hereafter TO, SF, MDAH]; "Tung Oil Industry Gains Approval," *The Palm Beach Post*, June 11, 1938; and "Offer New Industry to South in Tung Oil," *New York Times*, March 29, 1932.

They also contended that Chinese millers used primitive wedge presses made of stone and rock which harvested perhaps twenty-four percent of oil while U.S. millers attained thirty-one percent. Chinese mills had been mechanizing so this argument, too, was erroneous.[15] Claims of American superiority were not confined to tung growers, for in the early 1930s a "Buy American Movement" surged in popularity. [16]

Tung growers enthusiastically supported the Buy American Movement out of patriotism or personal reward. A response to Great Depression hardships, the movement encouraged the consumption of domestic goods. In 1932 and 1933, its figurehead, newspaper magnate William Randolph Hearst, Jr., headlined the drive in his twenty-seven newspapers. Hearst, echoing the sentiments of most capitalists, voiced his objections to both imports and immigrants. When fifteen million Americans suffered from unemployment, he depicted foreigners as taking "American" jobs.[17] Supporters of this movement firmly believed that U.S. companies should operate domestically and hire "Americans." The members of this crusade argued that domestic commodities merited higher prices than imports.[18] The movement gained momentum as the economy sank and

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[15] Yen Chiang-kwoh, "The Tung Region of China," *Economic Geography* 19, no. 4 (Oct 1943): 425; Deasy, 265; Victor H. Schoffelmayer, "China's Tung Oil Crop Now is Monopoly," *Dallas Morning News*, June 16, 1936, Section II, 13; G. Weidman Groff and T. C. Lau, "Landscaped Kwangsi, China's Province of Pictorial Art," *National Geographic Magazine*, December 1937; and "Cost of Producing Tung Oil in China," *The Southern Conservationist and American Tung Oil* 5, no. 5 (Aug 1938): 22.

[16] "American Industry Belongs at Home," *Manufacturers' Record* 98, no. 22 (Nov 27, 1930); and "Buy American Quality Products," *Manufacturers' Record* 102, no. 2 (Feb 1933).

[17] Dana Frank, *Buy American: The Untold Story of Economic Nationalism* (Boston: Beacon Press, 2000), x, 57.

[18] "American Industry Belongs at Home," *Manufacturers' Record* 98, no. 22 (Nov 27, 1930); and "Buy American Quality Products," *Manufacturers' Record* 102, no. 2 (Feb 1933).

Made in America Clubs spread nationwide, a testament to growing nationalism.[19] Intended to rally all classes against foreigners rather than each other, it proved somewhat successful, even gaining the support of unions.[20] In 1933, the Buy American Act, a bill mandating that the federal government buy only domestic goods, was passed by President Herbert Hoover.[21] While the movement's future seemed assured, newly elected President Franklin D. Roosevelt shattered the quest of tung growers to attain tariffs and quotas.

Roosevelt vigorously endorsed free trade or economic internationalism, a stance tung growers opposed. He feared alienating foreign countries by controlling imports and expected they would impose tariffs in retaliation. Roosevelt's personal magnetism and oratory skills eclipsed the Buy American Movement to the extent that Americans versus foreigners reverted to poor Americans versus rich Americans. As social historian Dana Frank explained, "The New Deal consciously sought to revive the U.S. economy by redistributing income to those at the bottom."[22] Although tung growers thought otherwise, Roosevelt had a staunch passion for agriculture. He and his Iowan Secretary of Agriculture Henry A. Wallace thought farming a noble calling but emphasized the importance of mechanization and efficiency as well as supply and demand.[23] Both

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[19] Frank, 56.

[20] Katie Quan, "Global Strategies for Workers: How Class Analysis Clarifies Us and Them and What We Need to Do," in *What's Class Got to Do with It?: American Society in the Twenty-First Century* ed. Michael Zweig (Ithaca, NY: ILR Press, 2004), 102.

[21] Frank, 57, 65.

[22] Ibid., 87.

[23] See, Jordan Schwartz, *The New Dealers: Power Politics in the Age of Roosevelt* (New York: Alfred A. Knopf, 1993), 269; Jean Edward Smith, *FDR* (New York: Random House, 2008), 292; and John C. Culver and John Hyde, *American Dreamer: A Life of Henry A. Wallace* (2000; repr., New York: W. W. Norton, 2001), 148.

focused primarily on basic crops. For this reason, the New Deal proved a disappointment to tung growers, especially concerning parity.

Parity, in the words of its industrialist originator George Peek, gave farmers the "cost of production plus a profit," but as tung growers discovered, not all farmers benefited.[24] Peek, a farm machinery manufacturer and firm economic nationalist who owned the Moline Plow Company, wanted farmers to receive a decent profit from the difference between expenses and sales. Initially wanting parity based on 1909-1914 prices, Peek later changed his mind and encouraged prices to be based on commodity tariff levels.[25] While Peek called it price control, political foes called parity price rigging Opponents feared production controls, taxpayer expenses, and abuse of the system by large farmers. In 1924, the McNary-Haugen bill might have provided price supports for basic crops. This bill proposed a two-price system under which domestic sales met the market price and surplus sales met the world price as well as an organization to purchase crops so as to impact prices and export surpluses. However, President Calvin Coolidge deemed the legislation price fixing and vetoed the bill.[26] Not until the Agricultural Adjustment Act (1933) did Peek's dream of parity become a reality, but for non-basic crop farmers, it seemed a mirage forever out of reach. The Commodity Credit

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[24] Gilbert C. Fite, *George N. Peek and the Fight for Farm Parity* (Norman: University of Oklahoma Press, 1954), 40. Parity has also been described as the "ratio of farm product to farm import prices (times 100)." See, Bruce L. Gardner, *American Agriculture in the Twentieth Century: How it Flourished and What it Cost* (Cambridge: Harvard University Press, 2002), 167.

[25] Hamilton, *From New Day to New Deal*, 19-20.

[26] Fite, *George N. Peek*, 61,78. On McNary-Haugen Bill, see also, Hurt, *Problems of Plenty*, 59; Stoll, 169; and Pasour, Jr., 85. The McNary-Haugen bill would have, in essence, established a two-price system in which, after domestic demand had been met, any surplus would have sold abroad at world price. Between 1924 and 1928, five different McNary-Haugen bills were introduced to Congress but none became law. See, Fite, *George N. Peek*, 47, 54.

Corporation (CCC)(1933), an organization providing parity-based loans, especially infuriated tung growers because it only served major commodities. Congress surmised that through supporting basic crops, it aided non-basic crops, but this failed to assuage objections.[27] Wanting an assured profit, tung growers persisted in their demands for parity and petitioned the government for planting assistance.

Men and women dabbling with the notion of farming tung sought loans to help with expenses. Even though most possessed wealth, some had been hit by the depression and expected the government to bolster their finances until the first harvest projected to be three to five years after planting. Perceiving themselves as founders of a new agro-industry of national importance, they believed the federal government had a vested interest in increasing acreage and thus, owed aid. Deeming traditional crops less risky, the Farm Credit Administration (FCA)(1933) refused to help. Although a letter writing campaign by state representatives led by several southern Congressmen to urge loans, the FCA remained immovable.[28] Pressured by constituents, Gulf South Congressmen brainstormed and fostered alternative avenues to please or at least appease tung farmers.

Hoping to persuade the president to support the tung industry with funds to build mills and encourage the Federal Land Bank (FLB) to give loans to tung growers, Representative John McDuffie (D-AL) wrote to Marvin H. McIntyre, Assistant Secretary to Roosevelt. McDuffie argued that the FLB should take into account the fact that tung

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[27] Anthony J. Badger, *The New Deal: The Depression Years, 1933-1940* (Chicago: Ivan R. Dee, 2002), 56; and Fite, *Cotton Fields No More*, 129.

[28] "Tung Oil Coming Florida Industry, Economists Say," *St. Petersburg Times*, September 15, 1934; and Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 52.

growers also planted other crops and used their orchards as pastures, thus exemplifying diversified farming. As McDuffie explained,

> I have thought of the subject not as a politician trying to please somebody, but in the firm belief that the tung oil industry is a sound one, and promises much in the future, and furthermore, those engaged in it are as much entitled to it as the cotton planter.[29]

His efforts to arrange a meeting with Congressional representatives and Roosevelt to discuss the tung oil situation never bore fruit, but Congressman William "Bill" Colmer (D-MS), representing the southern Mississippi district which encompassed over fifty percent of the nation's tung acreage, also pressured the Federal Farm Loan Bureau (FFLB) to give farm loans to current and prospective tung farmers. Unimpressed by the tung industry's minimal acreage, uncertain profitability, and absence of sufficient tung mills, the FFLB refused.[30] Undeterred, southern politicians decided justifying tung oil as an industry would persuade Congress to lend financial support to tung tree cultivation. With this in mind, Senator Walter F. George (D-GA), Senator Richard Russell, Jr. (D-GA), and Congressman Edward E. Cox (D-GA), requested that Secretary of Commerce Daniel C. Roper send his Chemical Chief C. C. Concannon to investigate the progress of tung plantings, and Roper complied.[31]

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[29] John McDuffie to Honorable M. H. McIntyre, November 12, 1934, Tung Oil, Subject File, Franklin D. Roosevelt Library, Hyde Park, NY [hereafter SF, FDRL]. See also, "Mills to Extract Tung Oil Planned," *Times-Picayune*, September 28, 1934, 25.

[30] P. L. Gaddis to R. B. Clark, August 18, 1933, Tung Oil (1933), Box 336, Folder 1, M24 Colmer (William M.) Papers, McCain Library and Archives, The University of Southern Mississippi, Hattiesburg, MS [hereafter CWMP, MLA, USM]; and S. E. Castles to R. B. Clark, October 31, 1933, Tung Oil (1933), Box 336, Folder 1, CWMP, MLA, USM.

[31] "Tung Oil Industry Cited as Opportunity for South," TO, VF, HRBML, UGA.

While Roper envisioned tung as a way to industrialize the South, Concannon, already enthralled with the idea of a domestic tung oil industry, needed no persuasion.[32] After all, in 1934, Florida had 16,100 acres of tung; Georgia had 3,500; Alabama had 555; Louisiana had 2,500; Texas had 400; and Mississippi had the most with 21,000, great leaps in acreage in just a short span of years, especially considering that it had taken place amidst the depression.[33] Concannon wanted vigorous expansion, and in April 1935, he toured the South with the idea of planting 100,000 acres of marginal land in tung "under a federal relief project."[34] A vocal supporter of southern industrialization, he seemed the perfect advocate. Concannon believed that if the South produced more tung oil, paint and varnish companies might decentralize from the Midwest and relocate to or form branches along the Gulf Coast and help local and state economies.[35] To his mind, "With the production of tung oil in the South should come a development of local consuming industries," and tung could be just the "magnet to attract factories to the South."[36] His confidence came from precedent businesses like the American Tung Oil

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[32] J.C. Adderley, "Review of American Tung Oil Industry," *The Southern Conservationist and American Tung Oil* 4, no. 11 (Feb 1938): 15; and "The South Stands on the Threshold of a New Era," *The Southern Conservationist and American Tung Oil* 4, no. 11 (Feb 1938): 16.

[33] "Tung Oil Coming Florida Industry, Economists Say," *St. Petersburg Times*, September 15, 1934; "Representatives End Trip Through Tung Oil Section," *Times-Picayune* October 8, 1934, 13; and "Expert to Survey State Tung Oil Industry," 1935, TO, VF, HRBML, UGA.

[34] Francis M. LeMay, "Government May Set 100,000 Acres in Tung Trees," TO, VF, HRBML, UGA.

[35] "New Money Crop Seen for Dixie in Tung Oil," October 28, 1934, TO, VF, HRBML, UGA; "Deep South Urged to Take Advantage of Tung Oil to Build Up Port of Mobile," *Florence Times*, September 29, 1934; "Tung Oil and A New Southern Industry," *Augusta Chronicle*," November 30, 1935, 4; and Victor Schoffelmayer, "Bureau Chief Sees TUNG Oil as Challenge," *Dallas Morning News*, June 11, 1936, Section II, 9.

[36] "Tung Oil and a New Southern Industry," *Augusta Chronicle*, November 30, 1935.

Corporation, consumer markets, and growing demand. While price fluctuations from five to fifteen cents unnerved growers, he theorized that the variance derived from the fact that China remained on the silver standard. The fact that tung oil sold for ten cents a pound and could be made for five cents a pound proved a further incentive for Concannon.[37] In his words, tung had "virtually unlimited" possibilities for those with and without wealth.[38]

Small farmers could not afford to have tung as a primary crop but many planted trees to supplement income as the price of surplus crops fell. The depression environment also provided opportunities for tung to aid the impoverished. In 1934, the federal government created a USDA farm project near Valdosta, Georgia, which included 1,000 acres of tung and a Federal Emergency Relief Administration (FERA) colony in Gainesville where 100 families were given twenty acres for "sustenance" and ten acres of tung trees to provide "financial security for life."[39] Many saw tung as a future pension,

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[37] Dr. C. C. Concannon, "Domestic Tung Plantings," *The Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 14.

[38] Francis M. LeMay, "Government May Set 100,000 Acres in Tung Trees," Tung Oil, VF, HRBML, UGA.

[39] H. W. Bennett, "Tung Oil Industry Expands," *Manufacturers' Record* 103, no. 11 (Nov 1934): 26. See also, Emerson Ross, "Research and Statistical Program of the Federal Emergency Relief Administration," *Journal of the American Statistical Association* 29, no. 187 (Sep 1934): 228-294; "U.S. Studies Tung Oil Possibilities Along Gulf Coast," *Times-Picayune*, October 4, 1934, 15; and "Gulf Coast Area Expanding Tung Oil Experiment," *Times-Picayune*, February 17, 1935, 16. In 1936, the Works Projects Administration (WPA)(1933) planted 2,000 acres of tung in Harrison County, Mississippi, on land set aside by the state for the purpose of financing rural schools. See, "Government Plans Tung Cultivation for Mississippi," *Dallas Morning News*, December 20, 1936, Section V, 1. Of this propitious event, this newspaper commented, "This method of school financing may prove a boon in certain coastal counties which have become more or less impoverished by the cutting out of long-leaf yellow pine timber. On the WPA, see, for example, Frances Fox Piven and Richard A. Cloward, *Regulating the Poor: The Function of Public Welfare* (New York: Vintage Books, 1993), 97; and Sarah Phillips, *This Land, This Nation: Conservation, Rural America, and the New Deal* (New York: Cambridge University Press, 2007).

child college funds, or tax money.[40] Farmers either devoted some acreage to tung or simply used it as a fence row crop. If choosing the former, these men and women, lacking the financial resources of wealthy farmers, needed to be sure about appropriate lands, clay and sandy loams. Some sought the advice of experimental stations, but many, to their detriment, did not bother with cultivating or fertilizing. [41] While small farmers and fencerow growers used tung as a way to make extra money, absentee farmers with large amounts of tung acreage faced their own particular challenges.

Absentee owners or suit-case farmers possessed the financial means to purchase and cultivate large orchards, but residing elsewhere, had to rely on others to care for their trees. According to Mississippi native Dixie Kilby, supervising orchards for absentee landowners provided a way for coastal locals like her father to increase their incomes.[42] In other cases, companies like G. L. Reasor Tung Oil Plantations selected, cleared, and cultivated the land and marketed the crop for its clients. Reasor, a Chicago realtor who had purchased 18,000 acres in Perry and Green Counties in Mississippi, even advertised a chart of potential earnings as shown in Table 3.1.These predictions by Reasor and similar firms attracted numerous clients among businessmen throughout the nation and thus, further illustrated the fact that while some small farmers grew tung, large farmers dominated the industry.

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[40] Evelyn Reid Griffith, "Pink Clouds in Dixie," *Down South*, Mar-Apr 1957, 25; and "Tung Good College Insurance," *Tung World* 6, no. 9 (Feb 1952): 6.

[41] Sherman Briscoe, "Negro Farmers Helping to Create New Agricultural Pattern in Dixie States," *Arkansas State Press*, November 18, 1949, 6. See also, Monroe N. Work, "Racial Factors and Economic Forces in Land Tenure in the South," *Social Forces* 15, no. 2 (Dec 1936): 210.

[42] Dixie Kilby, interview by author, July 12, 2012, tape recording.

Table 3.1 Estimated annual earnings[43]

Year	10 acres	20 acres	40 acres	60 acres	100 acres
3	$216	$432	$864	$1,296	$2,160
4	594	1,184	2,368	3,552	5,940
5	1,206	2,412	4,824	7,236	12,060
6	1,800	3,600	7,200	10,800	18,000
7	2,340	4,680	9,360	14,040	23,400
8	3,060	6,120	12,240	18,360	30,600
9	3,600	7,200	14,400	21,600	36,000
10	4,100	8,200	16,400	24,600	41,000
11	4,500	9,000	18,000	27,000	45,000
12	4,800	9,600	19,200	28,800	48,000
13	5,000	10,000	20,000	30,000	50,000

Those with large land holdings were responsible for the surge in tung acreage between 1930 and 1935. While overseas parties like a British syndicate, the Louisiana Tung Corporation, planted 6,000 acres of tung, the bulk of growers hailed from the northern and Midwestern U.S. Over 200 growers came from Michigan, Colorado, Illinois, Pennsylvania, Ohio, New Jersey, and New York, and planted from 100 acres to 10,000 acres on an individual basis or through syndicates.[44] Motives of these men often fell into four categories.

[43] "Annual Value of Tung Oil from Junior Tung Oil Plantations," *Tung Oil Bulletin* no. 12, G. L. Reasor Tung Oil Plantations, TO, SF, MDAH.

[44] Griffith, "Pink Clouds in Dixie," 7; Victor Schoffelmayer, "Gulf Coast New Empire of Industry," *Dallas Morning News*, February 25, 1945, Section I, 13; J. C. Adderley, "Review of American Tung Oil Industry," *The Southern Conservationist and American Tung Oil* 4, no. 11 (Feb 1938): 15; J. C. Adderley, "What . . . Profit on Tung Oil?" *The Southern Conservationist and American Tung Oil* 5, no. 12 (March 1939): 10; "Proposed Tung Oil Orchard," *The Journal of The American Oil Chemists' Society*, 6, no. 11 (Nov 1929): 10; and "Rapid Development of Tung Oil Plantations," *The Journal of The American Oil Chemists' Society* 8, no. 5 (May 1931): 174.

Table 3.2 Tung Farms, 1930 and 1935[45]

State	Farms		Acreage (1935)	Trees	
	1930	1935		1930	1935
AL	23	104	794	8,687	63,364
FL	85	174	13,478	300,834	1,064,511
GA	7	101	3,076	3,162	215,898
LA	8	41	2,659	4,644	213,009
MS	20	192	20,078	33,451	2,068,119
TX	1	15	81	15	7,460

In the 1930s, Great Southern Lumber Company owner Charles Waterhouse Goodyear, seeking profitable methods of utilizing cutover pinelands, turned his attention entirely to tung. The company had originally formed in 1902 when brothers and Buffalo, New York, natives Franklin and Charles Goodyear created the Great Southern Lumber Company after purchasing 12,000 acres in southern Louisiana near Covington. Entrepreneurs, they already owned 100,000 acres in northern Pennsylvania, iron and ore mines near Lake Superior, and the Buffalo and Susquehanna Railroad. As the lumber lands became scarce in Pennsylvania, they focused on the South and took over the Pearl River Lumber Company in 1905. They formed Bogalusa, named after the Bogue Lusa Creek but soon to be called "Magic City," in 1906, and even built the New Orleans Great Northern Railroad. When Frank died in 1907, Charles took over as president, and in October 1908, operations at the Great Southern Lumber Company commenced.[46]

In the years to come, this company became one of the largest in the South. When Charles died shortly thereafter in 1911, his son Charles took command, and by 1922, the

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[45] "Tung-Oil Trees by States," United States Census of Agriculture: 1935, TO, VF, HRBML, UGA.

[46] Edwin Adams Davis, "Charles W. Goodyear; Charles W. Goodyear, Jr.," *The Story of Louisiana: Biographical* (New Orleans: J. F. Hyer Publishing, 1960), 3:6-11.

Great Southern Lumber Company claimed to be the largest sawmill in the world.[47] The company provided employment opportunities to many locals, primarily blacks, in surrounding counties, but the work was hard and the pay marginal. Nevertheless, according to historian Adam Fairclough, the extra income significantly aided black families.[48] While the company's success helped the community, its achievement decimated the pinelands.

Deforestation left the Goodyears with hundreds of thousands of acres of harvested land. In an attempt to reforest the land, they planted 175,000 acres with pine. This act of conservation so impressed state of Louisiana that it exempted the tax on the land. Knowing it would be years before the pines grew to harvest size, the company shipped redwoods from California to keep the mill running.[49] On lands where Charles did not replant pine, he either pastured cattle or sought orchard stock that could survive the acid soils. Impressed with their speedy growth of a few saplings planted in 1929, he planted 650 acres and created the Bogalusa Tung Oil Corporation in 1935.[50] When the Great Southern Lumber Company processed its last pine tree in 1938 and the Gaylord Container Corporation turned the business into a paper mill/chemical plant, Charles made a decision that would tie his family to tung trees for the next three decades. In one

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[47] Ibid., 6-11.

[48] Horace Mann Bond and Julia Bond, *The Star Creek Papers* ed. Adam Fairclough (Athens: University of Georgia Press, 1997), xxvi; and William Powell Jones, T*he Tribe of Black Ulysses: African American Lumber Workers in the Jim Crow South* (Chicago: University of Illinois Press, 2005), 35.

[49] Jones, 35.

[50] Federal Writers' Project, *Louisiana: A Guide to the State*, 3rd ed. (New York: Hastings House, 1945), 458; and "Interweaving Lumber Manufacture and Reforestation: Reprinted Articles from Issues of the American Lumberman, p.13, 25, 29, 49, Tung Oil, Vertical File, Livingston Parish Library, Livingston, LA [hereafter TO, VF, LPL]. See also, Willie E. Ginn and Albert C. Williams, *Bogalusa: The Magic City: The Birth and Growth of a City* (Bogalusa: Ginn and Williams, 2004), 29), 57-58; and Fickle, 86.

resounding transaction, he purchased land from the company, named it Money Hill Plantation, and planted 6,000 more acres of tung. Money Hill quickly became one of the largest and most famous tung plantations in the country.[51] Its rise had not been unique as many other pine barons saw tung trees as profitable ways to use cutover lands.

Throughout the 1930s, lumberman L. O. Crosby kept incrementally increasing his tung acreage. A native Mississippian from Bogue Chitto, Crosby had built a sawmill in 1905. In 1913, he had purchased 43,000 acres in Pearl River County for about four dollars an acre, and with businessmen and tung enthusiast Lamont Rowlands and Charles and Miles Goodyear, he incorporated the Goodyear Yellow Pine Company in 1917. After buying out the Goodyears and seeing Rowlands retire to his vast tung acreage, Crosby took over the company. As the number of pines reduced in number, he looked to alternative crops like strawberries, satsumas, lemons, truck crops, peaches, and tung. In 1927, he planted fifty acres of tung, but significant acreage, some 10,000 acres, did not begin until the late 1930s when most of the pines had been harvested, and Crosby's operations had dwindled to a planing mill.[52]

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[51] The Goodyears chose the name Money Hill because the land in question was rumored to hold treasure buried by Barataria pirates. See also, and C. W. Goodyear, *Bogalusa Story* (Buffalo: Privately Printed, 1950), 187; Terri Bewig, "Goodyear Clan Has High Hopes for Money Hill," *Times-Picayune*, August 13, 1988; "An Industrial Newcomer Arrives," *Louisiana Tourist*, January 1939, Tung Oil, Vertical Files, State Library of Louisiana, Baton Rouge [hereafter TO, VF, SLL]; John Watts, "The Story of Money Hill," *Tung World* 1, no. 8 (Dec 1946): 5-6; Walker, *The Southern Forest: A Chronicle*, 143; "Untitled," *Times-Picayune*, July 2, 1950; "Tung Oil Seen as Coming Crop," *Times-Picayune*, December 12, 1929, 10; Meigs O. Frost, "Trees Are the Crop," *Times-Picayune*, November 18, 1945, 98; and "A Brief History of Money Hill," http://111.moneyhill.com/history/ (accessed October 12, 2011).

[52] Charles Nutter, "Tung Nut Industry Fading From State," *Clarion-Ledger*, December 10, 1972; Chaddock Goins, "Mississippi's 'Cinderella Child,'" *The Southern Conservationist and American Tung Oil* 5, no. 5 (Aug 1938): 14-15; Dr. C. C. Concannon, "Domestic Tung Tree Plantings," *The Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 15; Winnifred C. Turner, "The Industrial Folly," *The Southern Conservationist and American Tung Oil* 6, no. 1 (Apr 1939): 15; Harold Severson, "Boom in the Tung Belt," *Southern Agriculturalist* 74, no. 7 (July 1944); "This Issue of Tung World

Crosby's tung venture had its share of setbacks. With his enthusiasm, he proved successful in selling tung acreage to northerners and westerners interested in the tree. Picayune businessman C. Hooker Quick remarked, "He [Crosby] sold a lot of Yankees on that."[53] Unbeknownst to Crosby, much of this land was unsuitable for tung. While Crosby's land sales fueled local real estate, his tung plantings failed to thrive. He later regretted not thoroughly investigating whether or not the lands could grow tung and his failure to fertilize, cultivate, or protect the trees from cattle rubbing so he finally hired an expert. Heeding advice, Crosby cut down every single tree and started anew with a tung nursery in 1937. Seven years later, Crosby, in addition to his naval stores business and lumber company, had 5,000 acres of tung in Picayune, and oversaw 35,000 acres belonging to out-of-state owners.[54] He enthusiastically insisted, "Tung oil is going to be the biggest thing that ever came to this section of the country."[55] While growers like Crosby and Goodyear had the means and already owned the lands on which they planted tung, other investors ran into surprising complications.

Dedicated to the Memory of the Late Lamont Rowlands," *Tung World* 17, no. 5 (Nov-Dec 1961): 2; Hancock Bank, *The Coast of Mississippi: Its Past and Progress* (Baton Rouge: Moran Publishing, 1982), 101; and Fickle, 86-87. In 1935, Crosby revived his lumber kingdom by purchasing The Foster Creek Lumber Company and renaming Stephenson, Mississippi, Crosby. His company later expanded to included Crosby Forest Products, Inc. The Crosby Lumber and Manufacturing Company was bought by the St. Regis Paper Company after World War II. See Fickle, 200; and "Million Dollar Plant in Mississippi Sold," *Lumber*, October 6, 1922, 18.

[53] C. Hooker Quick, Interview by Charles Bolton and Steve Walton, April 4, 1995, transcript, The Mississippi Oral History Program of The University of Southern Mississippi vol. 600 (1995), p.19, COHCH, MLA, USM.

[54] "Crosby Tells of Costly Errors," *Tung World* 1, no. 1 (April 1946): 13.

[55] Fred J. Hurst, "Harvest Time Nears in The Tung Belt," *Times-Picayune*, September 24, 1944, 45.

Advertisements from individuals or businesses selling "tung lands" appeared frequently in newspapers throughout the country, and many misled would-be tung farmers. Proving the adage of "buyer beware," these deceptive misrepresentations proved a part of a common trend which also applied to lands intended for oranges, pecans, and avocados. Unscrupulous individuals sold overly priced unsuitable lands along the coast from Florida to Texas. Price ranged considerably from state to state and varied based on status as cleared or un-cleared. In the early 1930s in Florida, for example, good tung land cost $20-30 an acre.[56] Along the coast land could be purchased for between $4-40.[57] On average, former pinelands sold for $4-10 an acre but many advertising "tung lands" overcharged by ten or even twenty dollars.[58] Many growers like Wight warned of such sneak thieves and hoodwink land plots.[59] Between 1933 and 1935, tung acreage actually dropped from 44,182 to 40,162 acres as many growers realized they had purchased unsuitable lands.[60] Crosby, who had sold lands not merely to northern and western businessmen but to local small farmers, returned $300,000 to buyers unhappy with the quality of their purchases.[61] In some cases, the sale of unfit lands and property the seller

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[56] "For Permanent Income Safe and Increasing Yearly Buy Our Tung Oil Groves," *St. Petersburg Evening Independent*, April 8, 1941.

[57] "Copy of reply to inquiry from a prominent INK Manufacturer (Large Users of Tung Oil in Ink Manufacturers)," Tung History 1944-76, Box 5, Folder 17, ATOI, MLA, USM.

[58] Harold Severson, "Boom in the Tung Belt," *Southern Agriculturalist*, 74, no. 7 (July 1944).

[59] "Tung Oil Crop May be Largest One," TO, VF, HRBML, UGA; and "Tung Oil Industry Cited as Opportunity for South," TO, VF, HRBML, UGA.

[60] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 52.

[61] "Editorial," *Tung World* 1, no. 2 (June 1946): 3; and Haynes, 102.

did not own resulted in lawsuits.[62] While newspapers nationwide exposed these scandals, non-southerners, equating tung with profits, were not dissuaded.

Those seeking to become tung farmers frequently bought land sight unseen because they knowingly or unknowingly embraced the capitalist ethos. Viewing nature as a commodity waiting to be exploited, they expected all lands to be productive and profitable. These men and women emphasized money and increasing wealth not man's supposed connection with the land.[63] As noted by chemist Williams Haynes, "It is a favorite delusion of the city man that an orchard is a sort of agricultural savings bank, managed by Mother Nature, where deposits are guaranteed by God."[64] So the notion of planting a tree, ignoring its needs, and effortlessly selling its nuts several years later made perfect sense to these men and women. Many did not travel to see perspective groves even when encouraged by sellers like Boardman Realty. Envisioning beautiful, bountiful trees, these buyers naively believed that one grove "will keep you the rest of your life."[65] These "get rich quick" pitches did as much damage as land schemes by elevating expectations to unrealistic heights.

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[62] "Five Sentenced to Fraud in Tung Oil Deals: Fugitive President of Concern Gives Himself Up," Milwaukee Sentinel, November 4, 1939; "Mastermind Sentenced in $80,000 Fraud," *Rockford* (Illinois) *Register-Republic*, April 13, 1938; and "13 in Tung Oil Case Given Continuance," *Times-Picayune*, September 9, 1943, 36. Land schemes continued for decades. See, for example, "Registration Suspended," *New York Times*, October 1, 1940; "5 Convicted on Fraud Charge," *Rockford* (Illinois) *Morning Star*, July 23, 1943; and "Oil Promoter Gives Self Up, *Rockford* (Illinois) *Morning Star*, June 6, 1953.

[63] Don Worster, *Dust Bowl: The Southern Plains in the 1930s* (New York: Oxford University Press, 2004), 6, 96.

[64] Haynes, 112.

[65] "China Tung Oil," *St. Petersburg Times*, July 28, 1936. See also, "Yes, we are selling our tung oil groves," *St. Petersburg Evening Independent*, March 11, 1941.

Laudatory newspaper articles led many readers to believe that the tung tree required no care whatsoever. As one article in the *Augusta Chronicle* explained, "The trees take care of themselves."[66] A. G. Mundinger, an engineer with Standard Oil in Baton Rouge, said, "Our school of thought was that all you had to do was to plant the tung trees in an old pasture, let them grow, and come back five years later and get rich."[67] This proved far from accurate. To begin with, preparing land for tung cost from $15-30 an acre.[68] Rowlands, who neglected his trees, noticed that neighboring tung growers who spent time and energy caring for their trees, got much better results.[69] While he saw the error in his ways, others got tired of waiting for the trees to produce.[70] In Polk City, Florida, impatience coupled with a depression-fueled "exodus" after the town's saw mill moved, led to a virtual cessation of tung cultivation.[71] By 1935, over two thousand acres

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[66] "In Florida," *Augusta Chronicle*, July 26, 1926, 4. See also, "The Chinese Wood-Oil Tree," *San Jose Mercury*, July 19, 1914, 18.

[67] Lois Jones, "Tung Growers Gird for Normalcy," *Times-Picayune*, Dec 23, 1945, 20.

[68] J. C. Robert and S. R. Greer, "Growing Tung Trees in Southern Mississippi," *Mississippi Agricultural Experiment Station Bulletin* 322 (Aug 1933): 7.

[69] Lamont Rowlands to R. B. Clark, July 31, 1933, Tung Oil (1933), Box 336, Folder 1, CWMP, MLA, USM.

[70] Bobby Smith, "Tung Oil: The South makes Oil from the Trees of China," *Down South* (Feb-March 1951): 13; Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 53; Nathan Mayo, "Tung Oil Industry in America," *The Southern Conservationist and American Tung Oil* 5, no. 2 (May 1938): 15; Chen, 8; and William Killcreas to Marshall Ballard, Jr., June 23, 1945, Box 1, American Tung Oil Association 1945 [2/4], Dantlzer Company, Special Collections, Mitchell Memorial Library, Mississippi State University [hereafter DC, SC, MML, MSU].

[71] Martha F. Sawyer, "Isaac van Horn had Vision for Polk County," *Lakeland Ledger*, December 21, 1981. See also, Cinnamon Blair, "Tung Oil's Fortunes Failed in Florida," *Lakeland Ledger*, February 26, 2006.

of Gulf Coast land intended for tung "had been abandoned" and remaining growers were presented with unforeseen complications by their trees.[72]

Growers came to realize that tung trees needed a certain climate and considerable attention. Sub-tropical, the trees needed warm days and nights, mild winters, moderate rainfall, and hilly, well drained land with clay soil.[73] While heavily dependent on warm weather, the trees required a dormant period or roughly two weeks of 45 degrees Fahrenheit or less. Suffering heavily in times of drought, tung trees demanded 50-55 inches of rain a year, a leap from the previous expectation of thirty, and preferred acid soil, a pH from 5 to 6.8.[74] Some farmers even hoped that tung trees would stop soil erosion. Indeed, the drive for soil preservation, led by the Soil Erosion Service (SES)(1933) and later the Soil Conservation Service (SCS)(1935), actually provided financial incentives to farmers to plant soil protective crops.[75] While SCS head Hugh Hammond Bennett advocated the use of kudzu, an exotic plant introduced in 1876 to stall

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[72] Federal Writers Project of Florida, "Tung Oil Industry in Florida (revised)," *Florida Department of Agriculture* no. 11 (Feb 1939): 1-40.

[73] Frank Montgomery, Jr., Tung Oil: Gift of the Orient," Box 10, Folder 10, Camille, ATOI, MLA, USM.

[74] Duane W. Hadsell, "The Tung Oil Industry in Florida (revised edition)," *State of Florida Department of Agriculture Bulletin* no. 11 (Sep 1955): 4; Dr. C. C. Concannon, "Domestic Tung Tree Plantings," *Southern Conservationist and American Tung Oil* 4, no. 10 (Jan1 938): 15; and Gardner, *Tung Oil Culture*, 21. Good soils for tung included Orangeburg, Greenville, Norfolk, Ruston, Hernando, Tifton, Susquehanna, Fellowship, and Gainesville.

[75] On soil erosion, see Randal S. Beeman and James A. Pritchard, *A Green and Permanent Land: Ecology and Agriculture in the Twentieth Century* (Lawrence: University Press of Kansas, 2001), 13-17; Ted Steinberg, *Down to Earth: Nature's Role in American History* (New York: Oxford University Press, 2002), 95-96; Stanley W. Trimble, "Perspectives on the History of Soil Erosion in the Eastern United States," *Agricultural History* 59, no. 2 (April 1985): 162-180; and George A. Pavelis, Douglas Helms, and Sam Stalcup, "Soil and Water Conservation Expenditures by USDA Agencies, 1935-2010," *Historical Insights* no. 10 (May 2011), http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044447.pdf (accessed March 2, 2013).

or eradicate soil erosion, some farmers preferred tung trees.[76] Kudzu vines grew uncontrollably and farmers found tung more effective and less problematic. Even in places of suitable soil and weather, tung farmers had much to learn about the nature of their chosen crop.

Varieties of tung trees differed in size, appearance, and production. Some Florida farmers tried *montana*, *molucanna*, and *trisperma*, and while each had pros, their cons made *fordii* more appealing. *Montana* grew fast but produced little; *molucanna* had nuts with hard shells difficult to crush; and *trisperma* proved a mediocre producer.[77] As can be seen in Table 3.3, dissimilarities among *fordii* trees existed, as well, namely height, growth, and size of leaves, fruits, and nuts.[78] At first, various traits in trees were defined purely by appearance and parent tree but came to be classified with specific titles.[79] Low hanging branches had to be pruned or else they interfered with tractors and other machinery, and while trimming hurt nut yield, grooming encouraged more nuts on higher branches.[80] Growers tried hybridization to duplicate positive qualities, but breeding posed its own challenges, namely the assumption that the trees were unisexual. In reality, the flower clusters were usually comprised of one sex, but the trees had both stamens and

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[76] On kudzu, see, Juanitta Baldwin, *Kudzu in America* (Suntop, 2003), 9, 15, 22-23. See also, Diane Hoots and Juanitta Baldwin, *Kudzu: The Vine to Love or Hate* (Suntop, 1996); and Mabey, 242.

[77] Harold Mowry, "Tung Oil Experiments," *Tung Oil* 1, no. 3 (Dec 1930): 7.

[78] Harold Mowry, "Variation in the Tung-Oil Tree," *University of Florida Agricultural Experiment Station Bulletin* vol. 247 (1932): 27-28.

[79] See, for example, "Millions of Tung Trees Available," *Manufacturers' Record* 101, no. 7 (February 18, 1932): 24.

[80] "Annual Report Tung Machinery Investigations," Bogalusa, La., 1963, p.39, A81-8 Box 1, W. W. Kilby, Southern Miss. Branch Experiment Station, Congressional and Political Research Center, Mitchell Memorial Library, Mississippi State University, Starkville, MS [hereafter WWK, SMBES, CPRC, MML, MSU].

pistils.[81] As such, production depended upon pollination.[82] Over time, farmers came to prefer the labor intensive process of budding in the hopes of perfecting trees and increasing oil content. With this method, for example, a grower might cut a small limb off a LaCrosse tree, take from it a small shield-shaped shard, slice a flap on a young Folsom, place the LaCrosse bud underneath, and then gently seal the flap with temporary rubber tie. The result possessed the high oil content of LaCrosse and the large fruit size of Folsom.[83] Some idealists hoped that budding would, in fact, duplicate or clone trees, but in reality, results were similar but not identical.[84] At the same time growers became adjusted to tree propagation, they learned to tend nurseries.

Table 3.3 Types of tung trees[85]

Types	High/Low	Fruit Size	Growth Rate	Oil Content
Folsom	Low	Above Average	Average	21 %
Gahl	Low	Average	Fast	20
Isabel	Low	Large	Average	20-21
LaCrosse	High	Average	Fast	21-22
Lampton	Low	Average	Average	22

Many large growers formed nurseries with the intent of selling or even giving away saplings. Early examples included the American Tung Oil Products Corporation of New York which had 1,500,000 seedling nurseries at Picayune and Carriere, Mississippi,

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[81] "Tung Production," *Farmers' Bulletin* no. 2031 (Dec 1951): 5.

[82] A. H. Pering, "Tung Oil Production and The Beekeeper," *American Bee Journal*, 1937, 526-527.

[83] On budding, see, for example, George F. Potter and Samuel Merrill, Jr., "Budding the Tung Tree," *Tung World* 1, no. 4 (Aug 1946), 12-13; and Gardner, *Tung Oil Culture*, 63.

[84] B. F. Williamson, "Tung Oil Yields," *Manufacturers' Record* 101, no. 17 (April 28, 1932): 24.

[85] George F. Potter and Harley L. Crane, "Tung production," *Farmers' Bulletin* no. 2031, p.9-10, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM.

and Rowlands who had a 1,300,000 seedling nursery in Picayune.[86] When planting a nursery, farmers tried to utilize as much space as possible while giving each tree adequate space. On average, the seeds were planted four inches deep and eight-to-twelve inches apart.[87] Growers also tried every precaution to keep the baby trees from being disturbed by animals and human trespassers.[88] Seedlings had delicate roots and had to be uprooted carefully. Initially planting by hand, nursery owners later used a U shaped blade attached to a tractor to help loosen the soil.[89] These seedlings sold for 1-25 cents but most often from 5-10 cents.[90] Nurseries sustained profitability as many growers preferred planting seedlings and saplings to expedite the harvest.

Tung seedlings had a plethora of needs. Although initial plantings were done haphazardly, growers later looked for advice from experiment stations and even businesses specializing in tung. A good example, a Franklinton, Louisiana, firm run by USDA pomologist Dr. Ernest Angelo and tung grower Russell Blackwell, gave instructions on how to plant tung.[91] Advice columns on planting became more prevalent in tung trade journals and the WPA encouraged growers to seek advice from experiment stations. Preparing the orchard, at the least, included a plow to form furrows or ditches

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[86] "Additional Tung Trees for Mississippi," *Manufacturers' Record* 100, no. 5 (July 30, 1931): 31.
[87] Gardner, *Tung Oil Culture*, 44.

[88] "Planting and Caretaking of Seedlings, G. L. Reasor Plantations," *Tung Oil Bulletin* no. 12, G. L. Reasor Tung Oil Plantations, TO, SF, MDAH.

[89] R. E. Jezek and Glenn W. Hillyer, "Increasing Efficiency in Tung Production with Machinery," Annual Report Tung Machinery Investigations, Bogalusa, La., 1954, p.40-41, Box 1, Annual Report Tung Machinery Investigations, 1954, WWK, SMBES, CPRC, MML, MSU; and "Tung Tree Transplanter," *Chemurgic Digest* 10, no. 10 (Oct 1951): 9.

[90] Gardner, *Tung Oil Culture*, 85.

[91] "Firm Offers Tung Growing Services," *Tung World* 1, no. 2 (June 1946): 15.

and, at the most, time and money to uproot stumps.[92] Planting costs depended on location, size of orchard, number of trees, weather, and labor.[93] A 1935 FCA study looked at fifty-three orchards and the averaged planting costs appear in Table 3.4. After readying the land for the trees, farms had to plant seeds or if they could find them, seedlings.

Table 3.4 Planting costs[94]

State	Expense per Acre
FL	$18.87
GA	11.43
AL	11.43
MS	4.45
LA	4.45

Farmers had several options when planting tung. They either planted themselves with the aid of family and employees or hired a company. If choosing the latter, expenses rose tremendously. Planting took place between December and March with growers usually planting 50-60 trees an acre.[95] Using shovels or later augers attached to the back of tractors, they generally planted the trees about thirty feet apart by twelve-to- thirteen

[92] "Annual Report Tung Machinery Investigations, Bogalusa, La., 1954, p.3, A81-8, Box 1, Annual Report Tung Machinery Investigations 1954, WWK, SMBES, CPRC, MML, MSU; and Workers of the Writers' Program of The Works Projects Administration in the State of Florida, *Tung Oil—An Essential Defense Industry* (State of Florida Department of Agriculture, 1942), 17, 26.

[93] Chen, 21-22.

[94] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 57.

[95] W. Wilson Kilby, George F. Potter, "Tung Culture in Southern Mississippi (revised)," *Mississippi Agricultural Experiment Station Bulletin* 464 (June 1949): 17-18.

feet.[96] Much as farmers had to perfect orchard planting, they also addressed the many pests and diseases preying on tung trees.

Press coverage led many growers to expect the trees to be immune to pests.[97] To their dismay, grasshoppers, scales, and even boll weevils consumed tung leaves and fruit. Those dedicated to their orchards tried improvised pesticides like soapy water, vinegar, chlorine, and even arsenic.[98] They used lime sulfur to combat ivy scale (*Aspiodiotus hederae*) and latania scale (*Aspidious lataniae*) and lady bugs to fight cottony cushion scale (*Icerya purchase*).[99] These efforts, however, proved counterproductive. As environmental historian Edmund Russell explains, spraying did not really decrease the number of pests and rather increased "secondary pests."[100] Reducing one insect group only allowed another to take its place. Even so, tung farmers continued their battle against pests, both insect and disease.

Growers soon noticed Leaf Spot (*Psuedomonas alueritidis*), a microscopic fungus which causes black dots on tung leaves and lessened oil content of the nuts.[101] Another common malady came in the form of root rot (*Clitocybe tabescens*), often the result of

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[96] Scott, "Tung Oil: A New Industry in Florida," 11-12.

[97] *Pike County Mississippi 1937* (Summit, MS: Commercial Printers, 1937), 36; and "Growing Tung Oil Trees in Pearl River County, Mississippi," *Manufacturers' Record* 96, no. 1 (July 4, 1929): 65.

[98] Paul K. Conkin, *A Revolution Down on the Farm: The Transformation of American Agriculture Since 1929* (Lexington: University Press of Kentucky, 2008), 112-114.

[99] G. H. Blackmon, "Tung Oil—A Gift of China," *Economic Botany* 1, no. 2 (1947): 172.

[100] Edmund Russell, *Evolutionary History: Uniting History and Biology to Understand Life on Earth* (New York: Cambridge University Press, 2011), xvii.

[101] T. van der Zwet, B. G. Sitton, S. Merrill, Jr., and W. W. Kilby, Angular Leaf Spot of Tung," *Mississippi Agricultural Experiment Station Bulletin* 705 (April 1965): 3-4, 17, 21; and G. F. Potter and H. L. Crane, "Tung Production Research: Past, Present, and Future," 1960 Proceedings of the Tung Industry Convention Box 10, Folder 10, Camille, ATOI, MLA, USM.

poor drainage.[102] Other ailments included Thread Blight (*Corticium stevensii*) which destroyed leaves; Nut Rot (*Botryospheria ribis*) which caused the fruit to fall prematurely; Black Rot Canker (*Physalospora rhodinia*) which killed branches; and Web Blight (*Corticium microsclerotia*) which hurt leaves.[103] Devising ways to solve these problems, growers used manganese and zinc in the hopes of strengthening the tree to strengthen the plants against disease. Just as growers learned of the health problems of tung trees, they realized the need for fertilization.

Most growers did not fertilize their tung orchards until the mid-1930s.[104] Over time, growers discovered that tung trees suffered from zinc, copper, manganese, and iron deficiencies.[105] According to Liebig's Law, "the nutrient that is present in the least amount relative to the amount required determines the yield of a plant or the health of an organism."[106] Nitrogen, the domestic use of which had risen by one million tons between 1924 and 1929, struck tung growers as the most needed nutrient. Second, potash, domestic production going from 45,000 pounds in 1930 to 340,000 pounds in 1940, proved popular. Third, phosphate, the U.S. being the world's largest superphosphate producer, became a favorite. Fertilizer costs varied depending on type but increased over

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[102] Lee Hines, "The Disease Situation in Tung," p.12, M477, Box 5, Folder 16, Tung History, 1936-1966, ATOI, MLA, USM.

[103] George F. Potter and Harley L. Crane, "Tung Production," *Farmers' Bulletin* no. 2031, p.31-32, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM.

[104] Frank C. Allen, "Oil Nut Orchards Full of Promise for Gulf States," *Times-Picayune* October 20, 1929, 27.

[105] Matthew Drosdoff and Felix S. Lagasse, "Minor Elements in Tung Culture," *Tung World* 6, no. 3 (Aug 1951): 6-7.

[106] William H. Brock, *Justus von Liebig: The Chemical Gatekeeper* (New York: Cambridge University Press, 2002), xi.

the years, and eventually rose twenty-one percent during World War II.[107] In the meantime, many growers used moderate amounts of fertilizers purchased from businesses like the Wesley Fertilizers Plant in Poplarville or from tung oil cooperatives, often applying in April or May and then again in June.[108] While they used chicken manure and even potassium-rich tung hulls, growers depended heavily on nitrogen, iron, manganese, zinc, copper sulfate, and borox in an attempt to address deficiencies.[109] If they used too much potassium, it lessened frost damage but decreased yield. Blending potassium with nitrogen increased the number of shoots and nuts, but lessened oil content in kernels.[110] Neither nitrogen nor potassium worked satisfactorily unless used with phosphorous.[111] Growers did not decide upon a preferred fertilizer, anhydrous ammonia, a less expensive and more concentrated form of nitrogen, until the late 1940s when it became widely

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[107] Charles Brand, "Postwar Prospects of the Fertilizer Industry," *The Chemurgic Digest* 4, no. 21 (Nov 1945): 345-49; and Fite, *American Farmers*, 72.

[108] George F. Potter, "The Domestic Tung Industry I. Production and Improvement of the Tung Tree," *Economic Botany* 13, no. 4 (1959): 334; "Oil from the Heart Tree," *Monsanto Magazine*, December 1962, 10; and "Ozone Tung Cooperative,' September 6, 1949, Folder: Tung Oil Production: Louis Chenel 1943-1967, Louis E. Chenel Family Papers, Special Collections, Hill Memorial Library, Louisiana State University, Baton Rouge [hereafter LECFP, SC, HML, LSU].

[109] W. W. Kilby, "Tung Fertilization," *Mississippi State College Agricultural Experiment Station Information Sheet* 379 (Nov 1946); and R. D. Dickey and G. H. Blackmon, "Propagation, Planting and Fertilization Tests with Tung Oil Trees," *Agricultural Experiment Station Annual Report for the Fiscal Year Ending June 30, 1941*, p. 80, University of Florida.

[110] S. R. Greer, "Fertilizers for Young Tung Trees," *Mississippi State College Agricultural Experiment Station Information Sheet* 314 (May 1944); and W. W. Kilby and G. F. Potter, "Estimating Your Tung Yields," 1960 Proceedings of the Tung Industry Convention, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[111] G. F. Potter and H. L. Crane, "Tung Production Research: Past, Present and Future," 1960 Proceedings of the Tung Industry Convention Box 10, Folder 10, Camille, ATOI, MLA, USM.

available.[112] Until then, whatever their fertilizer preference, farmers learned that applications could double an acre's profits and compensate for expenses.[113] The challenge of balancing profit with costs also appeared in growers' relationship with machinery.

Many tung growers sought machines in the hopes of perfecting cultivation techniques. They, much like farmers throughout the country, equated farm machinery with industrialization and modernity.[114] A staple of many tung farms proved the tractor. In 1905, Hart Parr Company used the word tractor to replace "gasoline traction engine," but it was really Ford, helped by the World War I labor shortage, who aided the popularity of the tractor with his 1917 Fordson.[115] Tractor ownership grew by 428,000 between 1925 and 1935.[116] In the case of tung growers, tractors really helped by allowing them to plant as many as fifty trees in one day at a cost of $4-5 an acre.[117] They also used tractors to plow with a disc tiller, to plant with an affixed hole digger, and to control weeds with a tooth cultivator.[118] While the majority of tung farmers could afford to

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[112] J. P. Gaines, "Use of Anhydrous Ammonia Reduces Tung Production Costs," *Mississippi State Agricultural Experiment Station Information Sheet* 462 (Apr 1951). On nitrogen, see G. J. Leigh, *The World's Greatest Fix: A History of Nitrogen and Agriculture* (New York: Oxford University Press, 2004).

[113] "Tung Profits Increased by Fertilizer," *Jackson Daily News*, December 23, 1949.

[114] Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003), 12.

[115] Hurt, *American Agriculture*, 242. See also, Kirby, *Rural World's Lost*, 335-336.

[116] Fite, *American Farmers*, 71.

[117] Gardner, *Tung Oil Culture*, 23.

[118] "Annual Report Tung Machinery Investigations, Bogalusa, La., 1954, p.3, A81-8, Box 1, Annual Report, Tung Machinery Investigations 1954, WWK, SMBES, CPRC, MML, MSU; and "New Installations," Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU.

mechanize, they nevertheless struggled with expenses, especially since most chose diversified farming.[119]

Aware of the climatic risks, namely freezes, most growers did not use tung trees as their only enterprise. While some did have tung as their primary crop, early advertisements pitched tung as the ideal supplementary crop.[120] Thanks to land grant schools, experiment stations, and cooperative extension service diversification had become a common practice by the mid-1930s and tung became one of its poster crops. A 1936 article in the *Manufacturers' Record* even predicted that tung oil and soybeans could be "future usurpers of King Cotton's throne."[121] Motivations to diversify for tung growers varied. First, for many growers, tung offered an avenue away from cotton dependence.[122] Second, tung offered "maximum land utilization" in that land could double as a pasture or garden and an orchard.[123] This proved immensely popular among farmers like Tung-Empire Farm owner J. C. Adderley of Pensacola who grew tung, peaches, pears, plums, figs, persimmons, blackberries, strawberries, and Boysenberries.[124] Orchards also afforded pastures for livestock.

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[119] Hurt, *American Agriculture*, 357; and Wright, *Old South, New South*, 243.

[120] Stoll, 61; and Pierre Livaudais, interview by author, July 10, 2012, tape recording.

[121] "Agricultural Industry Partners in Blazing New Frontiers," *Manufacturers' Record* 105, no. 6 (June 1936): 33.

[122] Victor Schoffelmayer, "Tung Oil Tree as Industrial New Cash Crop," *Dallas Morning News*, June 15, 1935, Section II, p.7.

[123] Phil Stroupe, "Tung Oil Production Brings Five Million Dollar Income to Farmers," *Jackson Daily News*, July 5, 1953; and "Science: For Farm & Factory," *TIME Magazine*, May 20, 1935.

[124] B. T. Abbott, "Farming for Profit—Theme for Tung-Empire Farms," *Gulf States Industry* 5, no. 5 (July 1945): 3-4.

For many growers, tung and animal stock proved immensely compatible and profitable. Some had scrub cattle which free ranged in the woods while many kept cattle in fenced pastures.[125] Cattle seemed an effective way to make the most of land, but fear of cattle tick fever delayed growth in cattle populations along the coast to the mid-1930s when eradication measures had achieved success.[126] Cattle grazing in tung orchards became a common sight along the Gulf Coast. The Tung Ridge Ranch owned by Marshall Ballard, Jr., of New Orleans had 3,000 acres of tung and allowed cattle to graze in tung orchards.[127] Conservationist Herbert Stoddard, who had 125 acres of tung, also had cattle on his Sherwood Plantation near Thomasville, Georgia.[128] On rare occasions cattle consumed tung leaves and developed bloody stool, diarrhea, and lethargy.[129] When in orchards, the cattle often consumed cover crops. Summer cover crops included indigo, crotalaria, beggarweed, and cow peas while winter crops ranged from lupines and

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[125] Daughtry, interview; and Mrs. David Goodyear, interview by author, Covington, LA, September 9, 2011, tape recording.

[126] Strom, 7-19; J. M. Sinclair, "Cattle Augments Tung Farmer's Income," *Tung World* 1, no. 1 (Apr 1946): 8; "What Our Neighbors are Saying," *Times-Picayune*, May 15, 1936, 12; and Cowdrey, 172. See also, Blevins, 118.

[127] Tom Epperson, "Tung; The Compatible Crop," *Mississippi Coast Area Monitor* 7th Edition, 1966-67, 61.

[128] Herbert L. Stoddard to Marshall Ballard, Jr., June 23, 1945, Box 1, American Tung Oil Association 1945 [2/4], Dantzler Company, Special Collections, Mitchell Memorial Library, Mississippi State University, Starkville, MS [hereafter SC, MML, MSU]; and Leon Neel, interview by author, April 5, 2012, tape recording.

[129] A. J. Oakes and James O. Butcher, "Poisonous and Injurious Plants of the U.S. Virgin Islands," *Miscellaneous Publication* no. 882, Agricultural Research Service, United States Department of Agriculture (April 1962), 9; and D. A. Sanders, M. W. Emmel, and L. E. Swanson, "Tung Tree *Aleurites fordii Hemsl* Foliage Poisoning in Cattle," *University of Florida Agricultural Experiment Station Technical Bulletin* 376 (Sep 1942): 4.

crimson clover to hairy vetch and Austrian peas.[130] Such crops not only provided food for livestock but helped enrich soils and controlled weeds, often seen as competitors to the tung trees for water and nutrients.[131] Having cattle also meant some farmers chose not to disc their orchards so as not to disturb the grazing for their livestock.[132] Sheep, to a lesser extent, also proved popular for growers like Chenel who liked that they pulled weeds out by the roots.[133] While time and diligence helped growers improve their tung/husbandry practices, climatic problems persisted.

Growers had initially deemed the southern coast ideally suited for tung trees, but in reality, the trees suffered from hurricanes and cold weather on a yearly basis. Tung trees needed some cold but suffered when temperatures dipped below 20 degrees Fahrenheit.[134] Older trees could feasibly survive 10 degrees Fahrenheit, but young trees proved especially susceptible.[135] Frost wrought havoc on orchards in 1934, 1935, 1936, and 1937 and some years even destroyed the entire crop.[136] Unable to control the weather, growers looked to science and pursued the development of late-blooming tung

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[130] Duane W. Hadsell, "Tung Oil Industry in Florida (revised edition)," *State of Florida Department of Agriculture Bulletin* no. 11 (Sep 1955): 10. 17.

[131] Estabrook, *Tomatoland: How Modern Industrial Agriculture Destroyed Our Most Alluring Fruit* (Kansas City: Andrews McMeel Publishing, 2011), 23.

[132] Livaudais, interview.

[133] Louis Chenel to Peter Lawson, Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU; Marshall Ballard, JR., "Sheep Asset to Tung Farm," *Tung World* 1, no. 2 (June 1946): 20; and 'Pearl River Improves its Sheep Flocks," *Times-Picayune*, July 29, 1945, 40.

[134] "Tung Oil Men Hear Tree Cold Damage Can be Reduced," *Jackson Daily News*, Oct 12, 1950.

[135] G. L. Reasor Plantations, Tung Oil Bulletin, no. 12, G. L. Reasor Tung Oil Plantations, Tung Oil, SF, MDAH.

[136] Annual Report 1955, USDA Farm Machinery Section, Tung Production and Harvesting Machinery, A81-8, Box 1, Annual Report Tung Machinery Investigations, p.4, WWK, SMBES, CPRC, MML, MSU; "South's Tung Oil Outlook," Macon Journal, April 27, 1938; G. E. Hilbert and C. H. Fisher, "Chemurgic History in Florida," *Chemurgic Digest* 17, no. 1 (Jan 1958): 4; and *Biloxi Daily Herald*, July 28, 1933, 1.

trees. The U.S. Field Lab for Tung Investigations found crossing *fordii* with *montana* created a late-blooming tree but their primary focus remained rapid growth so they preferred perfecting pure *fordii* varieties.[137] Freezes frequently wiped out crops to the extent that growers often failed to make back cultivation costs.

The expenses facing tung growers varied across the Tung Belt much as profits differed based on number of trees and pounds of nuts. Growers judged their harvest largely on the previous year's production, the size of the trees, the age of the trees, and the number of fruits per shoot.[138] In 1935, the average cost of planting an acre ranged from $18-56 and even that varied with the number of trees.[139] Many growers aspired for at least one ton of nuts to get their money back on cultivation costs and make an additional profit. In 1939, a grower might have spent per acre $15-50 on saplings, $8-40 clearing, $2-50 plowing, $4-7 planting, $5-10 cultivating, and $4-6 fertilizing.[140] Large growers spent even more on farm machinery and storage facilities. Chenel, for example, eventually spent $2,936.40 building a storage barn for nuts, $600 for three oil tanks, and $9,000 for a storage building for hulls.[141] Perhaps one of the largest expenses went toward harvest labor. Tung provided jobs for thousands of locals across the Gulf South

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[137] Felix S. Lagasse and Harold M. Sell, "U.S. Field Laboratory for Tung Investigations," Agricultural Experiment Station Annual Report for the Fiscal Year Ending June 30, 1941, p.90, University of Florida.

[138] G. F. Potter and H. L. Crane, "Tung Production Research: Past, Present, and Future," 1960 Proceedings of the Tung industry Convention, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[139] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 57.

[140] Federal Writers' Project of Florida, "Tung Oil Industry in Florida (revised)," *Florida Department of Agriculture* no. 11 (Feb 1939): 27 (1-40).

[141] "New Installations," Folder: Tung Oil Production, Louise Chenel, 1943-1967, LECFP, SC, HML, LSU.

for a few weeks each year.[142] One article in the *St. Petersburg Times* estimated that the Florida tung oil industry alone could employ 50,000 people.[143] To the frustration of growers, the availability of pickers proved haphazard and inconstant.[144]

In October or November, growers employed men, women, and even children to gather the nuts. Tung labor consisted primarily of locals, both black and white trying to supplement their family incomes. While blacks had long dominated the agricultural labor pool, many tung growers like the Livaudais family of Folsom, Louisiana, had more white pickers than black due to depression hardship. To attract workers they advertised in newspapers and by word of mouth. Many people looking for work had no way to journey to the orchards except by foot or on horseback.[145] If the number of locals who appeared fell short of the need, growers ordered "tung crews."[146] In such cases, they sent trucks to neighboring towns and even other counties to find pickers. The drivers transported the willing to and from the orchards. While there is little evidence of migrant farm laborers toiling in tung orchards, it may have occurred, particularly as the number of migrant workers swelled during the Great Depression.[147] The Florida citrus industry relied heavily

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[142] See, for example, Janice M. Berfield, *Washington Parish, Louisiana*, 1968, http://files.usgwarchives.net/la/washington/history/history1.txt (accessed August 2, 2012).

[143] Lillian Blackstone, "Tung Oil Industry May Employ 50,000 in State, Lawyer Says," *St. Petersburg Times*, March 23, 1939.

[144] Livaudais, interview.

[145] Ibid. On child labor on farms, see also, Jennifer Ritterhouse, *Growing Up Jim Crow: How Black and White Children Learned Race* (Chapel Hill: University of North Carolina Press, 2006), 196.

[146] Kilby, interview.

[147] Fite, *American Farmers*, 126; and Kirby, *Rural World's Lost*, 44, 284-285; and Tindall, 412. See also, Jeffrey S. Cole, "'Hopeful People on the Move': The Urban South and the Transient Problem in

on migrant labor in the 1930s, and it would hardly be surprising if many of them picked tung nuts.[148] Cotton pickers, too, traveled to work as tung pickers.[149] With this array of supply, it might be tempting to imagine growers had an easy time finding pickers, but in reality, they, much like other farmers in the 1930s, suffered from labor shortages.

Tung growers sometimes had to resort to alternative forms of labor. In Mississippi, the "idle" and "jobless" were actually forced to work in fields or arrested for vagrancy.[150] Even though the convict lease system had ended in the Deep South by the 1930s, some states allowed the use of convicts in orchards. For example, in 1936, Mississippi planned the use of convict labor in some tung orchards in Harrison County.[151] While some growers remained vehemently opposed to child labor, others welcomed any hands. The children of pickers often gathered nuts right alongside their parents to aid the incomes of their families. Sometimes schoolchildren, Boyscouts, or 4-H Club members worked in tung orchards. In many ways, it became a something of a yearly event. Every fall, schools in Covington, Franklinton, Bush, and Folsom, Louisiana, dismissed students

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the Great Depression," in *The New Deal and Beyond: Social Welfare in the South since 1930 ed. Elna Green* (Athens: University of Georgia Press, 2003), 48.

[148] John N. Webb, *The Migratory-Casual Worker, Works progress Division of Southern Regional Research Monograph VII* (Washington: U.S. Government Printing Office, 1937), 37.

[149] Fred J. Hurst, "Harvest Time Nears in the Tung Belt," *Times-Picayune*, September 24, 1944, 45.

[150] "FARMERS: Picker Paucity," *TIME Magazine,* September 21, 1936.

[151] Senate Bill No. 20, As Approved by the Governor, Dec 4, 1936, TO, VF, MDAH. On convict leasing, see also, Vivien M. Miller, "Murder, Convict Flogging Affairs and Debt Peonage: The Roaring Twenties in the American South" in *Reading Southern Poverty Between the Wars, 1918-1939* ed. Richard Godden and Martin Crawford (Athens: University of Georgia Press, 2006), 95, 82.

for a week during tung harvests.[152] Of child pickers, retired Folsom teacher Mrs. Greenwood said, "A lot of them who are grown now, talk to me and say they wish they could have continued their education" but "they had to stay out and gather tung nuts."[153] For the most part, tung farmers relied upon locals of both sexes and all races and ages.[154]

Harvesting had its intricacies. Some growers actually set up nets underneath the trees to catch the nuts, but most farmers simply let the nuts fall to the ground.[155] Despite the early belief that nuts could lie for months and not rot, growers soon discovered ground moisture impacted oil content so harvesting had to be done in a timely manner.[156] Pickers had to bend down incessantly in their quest to collect as many nuts as possible. The only alternative was to crawl around on their hands and knees to find nuts in the leaves and mud.[157] In the orchards, pickers collected the nuts in a baskets or burlap sacks, provided by the orchard owner.[158] Pickers then placed the bags in the limbs of tung trees to lower moisture content in an attempt to prevent oil content deterioration or placed the

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[152] Goodyear, interview. On agricultural child labor, see, for example, Shelley Sallee, *The Whiteness of Child Labor Reform in the New South* (Athens: University of Georgia Press, 2004); and Hugh D. Hindman, *Child Labor: An American History* (Armonk, NY: M. E. Sharpe, 2002).

[153] David A. Bice, The Village of Folsom, Louisiana, TO, VF, LPL. See also, Bob Landry, "Once Great Tung Industry No More," *Clarion-Ledger*, August 23, 1974.

[154] "10,000 Persons are Invited to Witness Tung Nut Harvest in Mississippi Area," *Times-Picayune*, October 16, 1938, 25; and "Help Sought in Harvesting Big Crop," *Tung World* 7, no. 5 (Oct 1952): 10.

[155] Livaudais, interview.

[156] Federal Writers' Project of the Works Projects Administration for the State of Florida, *Florida: A Guide to the Southernmost State*, 8th ed. (New York: Oxford University Press, 1956), 380; and "Picayune, Miss., To Be Center of Tung Oil Output," *Times-Picayune*, Feb 20, 1932, 2.

[157] Charles C. Chopp to Marshall Ballard, Jr., January 16, 1945, Tung History, 1944-76, Box 5, Folder 17, ATOI, MLA, USM.

[158] See, for example, Louis Chenel to Mr. Snider, Dec 2, 1952, Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU.

bags in drying bins.[159] Payment proved fairly comparative to the wages other sorts of pickers received, and growers insisted pickers received far less in China.[160] Cents earned depended on the number of sacks or baskets or on pounds collected, and pickers rarely made more than $1.00 a day. Picker Joseph Garrett of Folsom, Louisiana, received ten cents per hamper and made at best $22.00 a week.[161] While pickers struggled to subsist, some sneaked and filled sacks with leaves in order to get more money.[162] Tung growers disliked the expense of pickers and disdained such misrepresentation, but realized that until the development of a mechanical harvester, they had no choice. Indeed, picker costs weighed heavily on the profits they hoped to gain from milling.

In the 1930s several more mills opened across the Tung Belt so growers took their tree or bin dried nuts to the closest mill. Oftentimes, the distance to the nearest mill meant expensive transportation costs. Growers without the means to form their own mill had no choice. Mills, often owned by large growers, usually operated from January to March. Although some mills only functioned for a matter of weeks, one in Picayune ran from November to April on a twenty-four hour a day basis.[163] For example, between 1930 and 1932, the Alachua Tung Oil Mill increased its output from 20,000 to 130,000 pounds of

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[159] "Drying and Storage of Whole Tung Fruit, Annual Report Tung Machinery Investigations, Bogalusa, La., 1961, p.19, p.25, A81-8, Box 1, Annual Report, Tung Machinery Investigations, WWK, SMBES, CPRC, MML, MSU.

[160] Phillips, "Tung Oil: Florida's Infant Industry," 356.

[161] David A. Bice, The Village of Folsom, Louisiana, TO, VF, LPL.

[162] Livaudais, interview.

[163] "Tung Oil Crop May Hit High," *Jackson Daily News*, July 31, 1946; and "Ozone Tung Co-Op Mill is to be Sold," *American Tung News* 8, no. 8 (Aug 1957), 5; and Federal Writers' Project of Florida, "Tung Oil Industry in Florida (revised)," *State of Florida Department of Agriculture Bulletin* no. 11 (Feb 1939): 15.

oil and altered its schedule from one to four weeks.[164] Mills owners encountered numerous obstacles. First, in freeze years, they resorted to crushing cottonseed, soybeans, and peanuts to make ends meet.[165] Second, tung nuts and tung meal had a tendency to spontaneously ignite. At least one mill even burned to the ground.[166] Third, mills hired ten to fifty employees but were often plagued with labor troubles. Some like the Bogalusa Mill, American Tung Oil Mill, and Alachua Tung Oil Mill had strikes over pay and hours. The American Tung Oil Mill attempted to solve worker discontent by providing on-site housing for its twenty-four employees.[167] Regardless of concessions, labor and consumer problems proliferated at the mills.

Growers had two options when dealing with mills. They could sell their nuts to mills based on market price and later government price support or have the mill process the nuts and store the oil until an appropriate time to sell.[168] With the latter option, the grower received a receipt for the amount his oil added to the pool. Millers dealt with brokers to find buyers but since the number of tung brokers remained small (it held steady at about half a dozen), the domestic tung market proved something of an

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[164] Earle Rauber, "The Tung Oil Industry, Growth and Prospects," *The Farm Chemurgic* 5, no. 2 (Jan 1946): 54.

[165] "Editorials of Note," *Jackson Daily News*, Dec 16, 1948.

[166] John Corley, telephone interview by author, April 3, 2012, tape recording.

[167] "Tung Mills Thriving," *Tung World* 1, no. 1 (Apr 1946): 16.

[168] Duane W. Hadsell, "Tung Oil Industry in Florida (revised edition)," *State of Florida Department of Agricultural Bulletin* no. 11 (Sep 1955): 25. For an example of a mill contract, see, for example, Goodyear Yellow Pine Company Miller and The L. N. Dantlzer Lumber Company Grower, November 9, 1948, Box 17, Dantzler Lumber Company: Tung Oil: Contracts, Storage, Sales [1/2] 1948-1949, SC, MML, MSU.

oligopoly. In other words, one seller had the power to greatly impact the tung market.[169] The oil was kept in liquid form although some talked of solidifying tung through heating so it could be transported in paper sacks.[170] Growers received payment for hulls and meal, which made good fertilizer, but mainly for oil.[171] The price of nuts depended on oil content so payments proved difficult to gauge.

For analyzing and processing, mills throughout the Tung Belt charged different amounts based on the size of the mill, the number of employees, licenses, and taxes.[172] Whereas most nut crops were valued on pounds, tung proved somewhat of an oddity. Processors paid growers based on the oil content of the nuts, not how many pounds of nuts. Owners of mills either gauged oil content or sent oil samples to labs. Millers usually used something called the 'whole fruit method' to analyze oil content. In this process, a sample from 200 nuts was dried at 101 degrees Celsius. To the dried meal, petroleum naptha was added, and the mix soaked for four hours before testing.[173] Unsurprisingly, oil content varied considerably.[174] Deducing oil content proved only one part of a mill's operations.

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[169] Kinabrew, 7-15; and Carter, 669.

[170] "Carload of Plantation-Grown Tung Oil Shipped," *Manufacturers' Record* 101, no. 20 (May 19, 1932): 15.

[171] "Money in Tung Oil," *The Southern Conservationist and American Tung Oil* 5, no. 2 (May 1938): 16; and Charles E. Mullin, "Chemical Development of the South," *Manufacturers' Record* 99, no. 18 (April 30, 1931): 25.

[172] "Processing Costs Vary Greatly in the Tung Belt," *Tung World* 7, no. 7 (Dec 1952): 8.

[173] "Dr. R. S. McKinney, Tung Industry Beings 50 Years Ago," *Tung World* 6, no. 4 (Sep 1951): 19.

[174] Mowry, "Variation in the Tung-Oil Tree."

The various tung mills had three choices when it came to extracting oil. Some millers tried hydraulic presses, machines that had shown proficiency with peanuts and cottonseed, but tung's tendency to congeal made this process problematic. Others used the solvent method in which crushed nuts were placed in a vat and heated to make the oil separate. Most used screw presses, which squeezed the crushed nuts in a "cylinder of steel bars set close together," to force the oil out.[175] For the most part, millers implemented expellers.[176] After passing through a decorticator to remove the fruity hull, the nuts passed through fanning machine which tossed the nuts back and forth to sift away unwanted material and then traveled on a conveyor to the expeller. The expeller press, often an Anderson expeller, made by V. D. Anderson Company in Cleveland, Ohio, consisting of a steel cylinder and several bars, crushed the nuts and squeezed the oil into a receptacle.[177] On average, expellers procured eighty-six percent of the oil.[178] Hoping to reap as much oil as possible, millers then used a solvent process in which they boiled the leftover meal or "tung cake" at 200 degrees Celsius for a half hour to separate

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[175] Robert S. McKinney, "Research Investigations of U.S. Tung Oil Laboratories," Box 19, Folder 22, Tung Oil, FCC, UAHC, MSU. See also, R. L. Holmes et al., "Materials Balance in a Tung Oil Mill," *The Journal of the American Oil Chemists' Society* 32, no. 5 (May 1955), 282-285; and Federal Writers' Project of Florida, "Tung Oil industry in Florida (revised)," *State of Florida Department of Agriculture Bulletin* no. 11 (Feb 1939): 3, 10.

[176] Florida Department of Agriculture, 'Tung Oil: one of Florida's Greatest Potential Resources," *Florida Department of Agriculture Bulletin* 11 (May 1942): 16.

[177] "U.S. 1 Tung Oil Mill," *The Southern Conservationist and American Tung Oil* 5, no. 12 (March 1939): 14.

[178] Chen, 19.

oil.[179] When finished with a year's milling, mills frequently sold to dealers or brokers who sold to consumers.[180] As tung mills multiplied, tung boosters turned their attention to other industries.

Growers realized the importance of these companies but sought new ways to expand industrial uses of tung oil through chemurgy, sometimes called "chemistry at work."[181] This quest to find industrial uses for farm products began amid the growing surplus problem facing farmers in the 1920s. Having grown up on a farm and raised hogs for a while only to see the price plummet as overproduction increased, *Farm and Fireside* Associate Editor Wheeler McMillen believed that discovering new uses for crops and bi-products would decrease the surplus without limiting the output of farmers. He announced this plan to his magazine's readers in an October 1926 editorial titled "Do We Need This Foundation."[182] That same month, another article heralding farm science, "Farming Must Become a Chemical industry," appeared in Henry Ford's newspaper, the *Dearborn Independent*.[183]

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[179] Industrial and Engineering Chemistry (June 1954), 13A, Tung Oil, FCC, UAHC, MSU; and Earle L. Rauber, "The Tung Oil Industry, Growth an Prospects," *Chemurgic Reprint Series* no. 39, Reprinted from *The Chemurgic Digest*, January 31, 1946, Box 20, Folder 2, Tung Oil, FCC, UAHC, MSU.

[180] Chen, 20.

[181] Finlay, "The Industrial Utilizations of Farm Products and By-Products," 42.

[182] Wheeler McMillen, "Do We Need This Foundation?" *Farm and Fireside* 50 (October 1926): 6; Wheeler McMillen, "Wanted: Machines to Eat Up Our Crop Surplus," *Farm and Fireside* 51 (January 1927): 10, 30, 32; and Anne B. W. Effland, "New Riches from the Soil": the Chemurgic Ideas of Wheeler McMillen," *Agricultural History* 69, no. 2 (Spring 1995): 290. See also, David E. Wright, "Agricultural editors Wheeler McMillen and Clifford V. Gregory and the Farm Chemurgic Movement," *Agricultural History* 69, no 2 (Spring 1995): 272-287.

[183] William J. Hale, "Farming Must Become a Chemical Industry" *Dearborn Indepenent*, October 2, 1926, 4-5.

Its author, William J. Hale, the director of Organic Chemistry Research at his father-in-law's Dow Chemical Company, had taught at the University of Michigan and acted as Chair of the Division of Chemistry and Chemical Technology of the National Research Council. In *The Farm Chemurgic: Farmward The Star of Destiny Lights Our Way* he claimed that the country stood at the dawn of a new era of "Chemical Dominance."[184] As he explained, "'Chemurgy' is a word I need to coin to depict that field of chemistry initiated not by man but by Nature . . . it is best defined as the direction of nature's life agencies to the production of chemicals for industry."[185] Such crop studies, once the domain of farmers, had, since the latter part of the nineteenth century, been dominated by business and government scientists. This usurpation robbed farmers of much of their autonomy, leaving them with little choice but to depend upon outside assistance. While slightly resentful of their lack of control, many farmers, including those growing tung, supported such studies on chemical crops in the hope that results would ease the agricultural depression and increase consumerism.[186] While some opponents feared that chemurgic studies would increase the surplus by encouraging more basic crop production, Hale granted that while prices might drop, hurting farmers, this eventuality

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[184] Hale, *The Farm Chemurgic*, 15-16. On his position, see Marcus, *Technology in America*, 224. See also, Effland, 292.

[185] "William J. Hale Papers, Biographical Note," http://archives.msu.edu/findaid/176.html (accessed December 17, 2012).

[186] Edwin T. Layton, "The Invention of the Mustache Cup: James Emerson and Populist Technology, 1870-1900," in *Technical Knowledge in American Culture: Science, Technology, and Medicine Since the Early 1800s* ed. Hamilton Cravens, Alan I. Marcus, and David M. Katzman (Tuscaloosa: University of Alabama Press, 1996), 94.

stood to help consumers. Besides, he equated science and industry with the future.[187] Hale not only fueled the validity of chemurgy as a movement, but he became one of the founding members of the national chemurgy association.

In the wake of Hale's groundbreaking book, automobile manufacturer, tung tree enthusiast, and chemurgist Ford invited roughly 300 scientists, industrialists, and agriculturalists to a meeting on May 7, 1935, in Dearborn, Michigan. Attendees, including McMillen, then editor of *Country Home*, formerly *Farm and Fireside*, and MIT President Karl T. Compton, gave chemurgy new legitimacy by forming the National Farm Chemurgic Council (NFCC) and signing the 'Declaration of Dependence upon the Soil and the Rights of Self-Maintenance.'[188] This organization neither conducted experiments nor funded studies and did no lobbying but encouraged chemurgic research, finding replacements for surplus crops, and published *The Chemurgic Digest*. Under President Garvan, also president of the Chemical Foundation of New York City, and managed by industrial engineer Carl B. Fritsche of Reichhold Chemicals, Inc., of Detroit, this association urged the analyzing of the components which made commodities like tung oil unique and searching for alternatives, both natural and synthetic. The end goal remained freeing the U.S. from its reliance upon foreign importation and ending the agricultural depression, expanding utilizations for surplus crops, protecting industry from

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[187] Hale, *The Farm Chemurgic*, 114, 130-131, 199. See also, Hale, *Chemivision*, 115-116.

[188] Watts, 485. See also, Effland, 291; "Science: For Farm & Factory," *TIME Magazine*, May 20, 1935; "Science: More Chemurgy," *TIME Magazine*, April 8, 1940; "Business & Finance, Chemurgicians," *TIME Magazine*, May 25, 1936; and Alan I. Marcus and Howard P. Segal, *Technology in America: A Brief History*, 2nd ed. (New York: Harcourt Brace College Publishers, 1999), 225.

shortages by growing domestic commodities, and increasing profits for farmers, marketers, and manufacturers.[189]

While it professed to have an apolitical nature, the organization proved anything but neutral. Members, mostly Republicans, were very vocal in their protestations of New Deal expenditures, waste, and apparent embrace of import dependence, all of which they felt damaged the country's agricultural sector. Believing that paying farmers to reduce production seemed the antithesis of what made America prosperous, they also opposed the Agricultural Adjustment Act (AAA). As McMillen explained, "Production built the nation great, and only production can either preserve or advance our country."[190] Consequently, the reception the council received in Washington, D.C., proved lukewarm, if not cool. Roosevelt and Wallace did not look favorably upon replacing imports with domestic production for fear of estranging foreign countries.[191] Even though most tung growers identified with the Republican Party, this position on imports further alienated them from Roosevelt. Many tung growers espoused chemurgy to the extent that they even funded experimentation. In fact, at the Texas Tung Oil Production Conference in Beaumont, Texas, on October 21, 1935, Concannon, Mississippi Commissioner of Agriculture J. C. Holton, ATOA President J. C. Adderly, grower Williamson of

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[189] McMillen, *New Riches from the Soil*, 41, 341.

[190] Wheeler McMillen, "Production and Patriotism: We Want to Keep Our America," in *Vital Speeches of the Day* (New York: Daly, 1941): 440.

[191] McMillen, *New Riches from the Soil*, 41, 341; Carroll W. Pursell, Jr., "The Farm Chemurgic Council and the United States Department of Agriculture, 1935-1939," *Isis* 60, no. 3 (Oct 1969): 307; Marcus, Technology in America, 225; and Finlay, *Growing American Rubber*, 125-126. See also, Hale, *Farmers Victorious*, 114; Burnham Finney, "Industry Fast Resumes Its Stride," *New York Times*, February 21, 1937; and M. F. Taggart, "The Story of Chemurgy," *Chemurgic Digest* 12, no. 4 (April 1953): 7. When Garvan died in 1937, Wheeler McMillen, editor of the Farm Journal & Farmer's Wife, became president of The Farm Chemurgic Council and moved its headquarters to Columbus, Ohio. In 1956, The National Farm Chemurgic Council became The Council for Agricultural and Chemurgic Research.

Gainesville, Florida, and grower Rowlands of Picayune, Mississippi, formed the Tung Oil Committee of the NFCC to promote tung research.[192] Later that year, the NFCC and the National Paint, Varnish, and Lacquer Association created a joint committee on tung oil.[193] Research and acreage growth generated worldwide attention for the domestic tung oil industry.

The young U.S. tung industry had made global news which had resulted in a flurry of plantings abroad. Britain encouraged tung in Australia, New Zealand, South Africa, India, Kenya, Guinea, Fiji, Bermuda, Burma, and the West Indies.[194] The Soviet Union, too, began growing tung in Abkhazia, Georgia, in the Russian Crimea in 1931, formed a Tung Oil Bureau at Batum (now Batumi), sent groups to inspect tung orchards

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[192] Hale, *Farmers Victorious*, 115; Gardner, *American Agriculture in the Twentieth Century*, 182; Will P. Browne, *Cultivating Congress, Constituents, Issues, and Interests in Agricultural Policymaking* (Lawrence: University of Kansas Press, 1995), 90; "Tung Oil Development," *Manufacturers' Record* 104, no. 10 (Oct 1935): 18; and "Texas Council of Chemurgy to be Formed," *Dallas Morning News*, May 13, 1937, Section I, p.17. By 1937, fifteen states, including Florida, Louisiana, Mississippi, and Georgia, had formed state divisions of the Farm Chemurgic Council.

[193] Borth, *Pioneers of Plenty: Modern Chemists and Their Work*, 219, 299, 317, 333; and "Offer New Industry to South in Tung Oil," *New York Times*, March 29, 1932. The Tung Oil Committee formed on October 21, 1935 was dubbed the 3rd National Chemurgic Conference by its orchestrator Peter F. Lawson, New Jersey native and then Secretary of the Chamber of Commerce in Beaumont, Texas. C. C. Concannon was present.

[194] "Britain Seeks Tung Oil Data to Lead World," *Rockford* (Illinois) *Daily Register Gazette*, March 8, 1930; *The Official Gazette of the Colony and Protectorate of Kenya* 35, no. 12 (Mar 7, 1933): 324; Joy Hume, War Hitting American Tung-Oil Interests," *Far Eastern Survey* 8, no. 12 (June 1939): 142-144 ;"Australia Tries Tung Oil," *Augusta Chronicle*, April 11, 1932, 5; "Tung Production Draws Attention," *Times-Picayune*, December 22, 1934; "Tung Oil Study Made by Britain," *Trenton Evening Times*, March 14, 1930; Victor H. Schoffelmayer, "Foreign Lands Buy Tung Seed from America," *Dallas Morning News*, June 25, 1935, Section II, 7; "Tung Production—South Africa," *The Chemurgic Digest* 3, no. 17 (Sep 1944): 256; William A. Hance, "Economic Potentialities of the Central African Federation," *Political Science Quarterly* 69, no. 1 (March 1954): 29-44, p.37; William Nowell, "Supplement: The Agricultural Research Station at Amani," *Journal of the Royal African Society* 33, no. 131 (April 1934): 1-20; and Dorothy M. Doveton, "The Economic Georgraphy of Swaziland," *The Geographical Journal* 88, no. 4 (Oct 1936): 322-331. Other places that grew tung included Madagascar, the Belgian Congo, French Morocco, and Portuguese East Africa. See also, C. C. Chang, *China Tung Oil and Its Future* (Hong Kong: China Vegetable Oil Corporation, 1940), 39-47.

in the U.S. in 1934, 1935, and 1936, and purchased a dozen tons of American seed.[195] Letters of inquiry from countries ranging from Czechoslovakia to Holland to India arrived at the Mississippi Department of Agriculture. Growers like Wight sent 10,000 seeds to overseas parties while others held tours for interested foreigners, and still others like Goodyear actually journeyed to Misiones, Argentina, at the request of the U.S. government to provide guidance and aid plantings.[196] Domestic sentiment remained geared toward fostering the development of tung in Central and South America.

Latin American tung cultivation initially received a warm response in U.S. tung trade journals as some subscribers foresaw a united Western Hemisphere against the "yellow peril" of the Eastern Hemisphere. American dependence on China had been growing, and by 1936, tung oil made up twenty-three percent of Chinese imports.[197] Seeking an alternative to Chinese dependence, the U.S. encouraged Latin American plantings. Teaching foreign countries U.S. farming practices was not without precedent. For example, members of the Tuskegee Institute journeyed to Togo, Africa, in 1900 to spread southern cotton cultivation methods and in 1904, even formed a cotton school but it failed miserably.[198] U.S. investment in Central and South American tung cultivation dated back to the late 1920s. In fact, the first seeds at Misiones, Argentina, in 1928; Sao

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[195] "Tung Oil in Russia," *Savannah Journal*, July 28, 1936; and "Russia is Planning Tung Development in Caucasus Area," *Dallas Morning News*, December 27, 1936, Section IV, 7.

[196] On Argentine tung, see Goodyear, interview.

[197] Joseph Earle Spencer, "Trade and Transshipment in the Yangtze Valley," *Geographical Review* 28, no. 1 (Jan 1938): 116; Walter A. Radius, "United States and the Sino-Japanese War," *Far Eastern Survey* 7, no. 1 (Jan 1938): 1-7; and Hume, 143.

[198] Andrew Zimmerman, *Alabama in Africa: Booker T. Washington, The German Empire, and The Globalization of The New South* (Princeton: Princeton University Press, 2010), 1-4.

Paulo, Brazil, in 1929; Sapucai, Paraguay, in 1929; and the Soto La Marina River Valley in Mexico, in the 1930s, had come from U.S. experiment stations. The U.S. may have sparked the first initiative, but Latin American tung growers quickly realized that *fordii*, which needed some cold weather to thrive did not fare well. They devoted their energies to *montana* which proved much more suited to the Argentine climate.[199] Argentina had been hard hit by the Great Depression and its agricultural sector suffered. Tariffs on imports incited farmers to grow exotic crops like tung.[200] Tung trees also gave South American growers the opportunity to rotate pastures, graze cattle, and use the land more efficiently.[201] Helping along these multinational efforts took on more immediacy in the years to come.

During the late 1920s and early 1930s, tung growers struggled to understand their crop and assure its status as an industry rather than mere experiment. Realizing their

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[199] "Tung Oil Prospects Good for 1945," *The Chemurgic Digest* 4, no. 9 (May 1945): 168; "Brazil to Make Tung Oil," *New York Times*, March 2, 1938; "Paraguay is Potential Garden Spot," *Augusta Chronicle*, November 15, 1942, 10; and Davenport, 53. On U.S. attempts to aid Latin American development, see also Schwartz, 335. On growing oilseed industries in Argentina, see George Wythe, *Industry in Latin America* (New York: Columbia University Press, 1949). On Mexico tung, see, Basil M. Bensin, "Agroecological Exploration in the Soto la Marina Region, Mexico," *Geographical Review* 25, no. 2 (April 1935): 285-297. Brazilian tung was primarily located in Parana, Sao Paulo and in Rio Grande do Sul. See, "Brazil: Tung Oil Industry Expansion," *The Chemurgic Digest* 6, no. 13 (July 1947): 209. Chile started growing tung in 1944. On Chilean tung, See, "Chilean Tung Tree Orchards," *The Chemurgic Digest* 3, no. 19 (Oct 1944): 277. On Argentine plantings of Montana, see also, V. C. Dunlap, "Launching New Crops for the Americas," in *New Crops for the New World* ed. Charles Wilson Morrow (New York: The MacMillan Co., 1945), 279.

[200] Adolfo S. Sturzenegger and Mariana Salazni, "Argentina," in *Distortions To Agricultural Incentives in Latin America* ed. Kim Anderson and Alberto Valdes (Washington, D.C.: World Bank, 2008), 60; and Yair Mundlak, Domingo Cavallo, and Roberto Domenech, "Agriculture and Economic Growth in Argentina, 1913-84," *International Food Policy Research Institute Research Report* no. 76 (Nov 1989): 101.

[201] On farmland rotation, see, for example, Celso Furtado, *Economic Development of Latin America: Historical Background and Contemporary Problems*, 2nd ed. (New York: Cambridge University Press, 1977), 69. On cattle history of Argentina, see, for example, David Bushnell and Neill MacAulay, *The Emergence of Latin America in the Nineteenth Century*, 2nd ed. (New York: Oxford University Press, 1994), 117.

preconceptions had been wrong, they tested soils, fertilizers, and varieties. This expanded knowledge base helped tung farmers to overcome missteps. Having learned more about the needs of the trees, they looked to science to increase the number of chemurgic uses for tung oil. Making the commodity more competitive in the oilseed market encouraged the formation of additional orchards. Through fostering this growth, growers unrealistically sought to become more competitive with Chinese imports and attract financial support from the federal government. This expectation of government aid proved misplaced. The USDA followed tung plantings closely, but Congress remained unmoved by this non-basic, regionally restricted crop. Viewing it as unwise investment for farmers, some original supporters like Fairchild had even come to regret introducing the tree.[202] The federal government may have introduced tung to the U.S. but its stance on domestic production appeared to be one of observance more than overt support during this era. As such, any government espousal of tung existed largely in the minds of growers. As a result, by 1936, the ambitious goals of tung farmers had not fully materialized so at best, the domestic tung oil industry was in its adolescence.

[202] Fairchild, "The Chinese Tung Oil Tree."

CHAPTER IV

"THE AMERICAN TUNG OIL INDUSTRY IS HERE TO STAY"?[1] CHEMURGY AND THE IMPETUS OF WAR, 1937-1952

> Yet a small microscope will reveal wonder a thousand times more thrilling than anything Alice saw behind the looking glass.[2]
>
> David Fairchild

From the late 1930s to the early 1950s, tung acreage increased and while World War II attracted the government notice growers had long desired, it simultaneously proved the teenage industry's undoing. The federal government's commandeering of U.S.-produced tung oil for strategic purposes prevented purchases by manufacturers and resulted in plummeting consumption. Hope for the continuation of an industry remained in chemurgy but as the government took the bulk of domestically produced tung and war impeded imports, consumers had no choice but to purchase alternative oils or synthetics, the number of which steadily increased as companies attempted to escape dependence upon foreign commodities by finding substitutes. While growers took pride in their crop's contribution to the war, they resented the alienation of their traditional customers. As their consumer base declined, transitions in oil reliance; weather problems; an

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[1] "Editorial," *Tung World* 1, no. 1 (Apr 1946): 2.

[2] Fairchild, *The World Was My Garden*, 11.

inability to secure sufficient loans and insurance; and their status as part-time farmers plagued growers. After the war, they lost their status as strategic commodity producers but between 1945 and 1950, tung oil production tripled as the number of tung farms in Florida, Mississippi, and Louisiana multiplied, and trees planted in the late 1920s/early 1930s reached their production zeniths.[3] Convinced of their crop's importance to national defense, tung farmers continued their quest for government recognition in the form of parity, quotas, and tariffs. With the embargo of China, many believed that they would no longer be burdened with foreign competition, but the cessation of imports actually alienated manufacturers because U.S. production met only a fraction of demand. In an ultimate irony to tung growers, war elevated the domestic tung oil industry to maturity by highlighting its value and providing unprecedented publicity while revealing its vulnerability and expendability.

On July 7, 1937, the Second Sino-Japanese War erupted when Japan invaded China, impeding transportation and the trade of commodities, including tung oil. Prior to the war, tung shipments usually traveled down the Yangtze River on junks and then went to Hankow and Shanghai on steamers. During the war, the Chinese resorted to alternative paths like the Hankow-Canton Railroad to British-controlled Hong Kong and the Canton-Kowloon Railroad, but by 1938, these routes, too, proved impassible. Avoiding these obstacles, tung traveled along China's coastal ports and on the Yunnan-IndoChina Railroad. Chinese tung exports dropped from 176 million pounds to 153 million pounds. After the occupation of Shanghai, the price shot up from roughly 10-14 to 22 cents per

[3] See, Appendices D and E.

pound oil.[4] The U.S. attempted to acquire previously purchased tung oil from China and after much pressure, managed to get Japan to relinquish 12,447,680 tons, but this fell far short of consumer demand.[5]

In response to the shortage and consequent high prices, domestic growers increased efforts to the extent that between 1936 and 1938, acreage went from 75,000 to 175,000 acres.[6] Even with this progress, domestic production only made up four percent of domestic consumption.[7] The National Paint, Varnish and Lacquer Association (NPVLA) had passed a resolution to endorse the domestic tung oil industry in 1937 and 1938, but shortages forced its members to look to oticica, soybean, and castor oils.[8]

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[4] "The Future of Tung Oil in China," *Tung Oil* 1, no. 3 (Dec 1930): 13; Robert W. Barnett, "An American Loan to China in Operation," *Far Eastern Survey* 9, no. 6 (March 1940): 68-70; Chiang-kwoh, 426; "Economic Value of Tung Oil—A National Viewpoint," *The Southern Conservationist and American Tung Oil* 6, no. 1 (Apr 1939): 18; Radius, 1-7; Kurt Bloch, "Chinese War Finance," *Far Eastern Survey* 7, no. 10 (May 1938): 113; Hume, 142; "Cutting of Rails to Halt Chinese Tung Oil Export," *Times-Picayune*, October 19, 1938, 13; and V. H. Schoffelmayer, "American Tung Oil Industry Along Gulf Coast to Offset War Embargo," *Dallas Morning News*, July 1, 1940, Section III, 1. See also, "Shanghai Fighting Disrupts Exports of Tung Oil," *Science News Letter* vol. 31-32 (October 2, 1937): 216; "Japanese Capture of Nanning Cuts China's Busiest Back-Door Road," *LIFE*, December 1939, 21; and John Chamberlain, "Foreign Trade Begins at Home," *Harper's Magazine*, September 1939, 352.

[5] "American-Owned Tung Oil Shipments Completed," *Paint, Oil & Chemical Review* 24, no. 101 (Nov 1939): 32.

[6] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 52; "Agriculture and Industry Partners in Blazing New Frontiers," *Manufacturers' Record* 105, no. 6 (June 1936): 33; and "50,000,000 in New Chemurgic Industries," *Manufacturers' Record* 105, no. 7 (July 1936): 27.

[7] Spencer, 116; and Hume, 143.

[8] "National Paint, Varnish and Lacquer Association Encourages Production of Tung Oil and other Drying Oils in America," *The Southern Conservationist and American Tung Oil* 4, no. 11 (Feb 1938): 17; R. Cecil Smith, Jr., "Commercial Tung Oil Development in The South," *The Southern Conservationist and American Tung Oil* 5, no. 1 (Apr 1938): 14; "Reports Tung Substitutes," *New York Times*, November 17, 1939; Kurt Bloch, "Lack of Far East Drying Oils Leads to Substitutions," *Far Eastern Survey* 8, no. 25 (Dec 1939): 297-299; "Tung Oil Prices Soar," *New York Times*, August 10, 1938; "War Lowers Imports of Chinese Tung Oil," *New York Times*, September 19, 1937; "New Varnish-Making Constituents May Make U.S. More Self-Sufficient," *Springfield (Massachusetts) Republican*, November 17, 1939, 15; L. R. Brooks, "Japanese Invasion Drives Tung Oil Price Up, Indicates Value of Industry on Gulf Coast," *Times-Picayune*,

While imports and competitive oils remained paramount, the growers' largest concern remained what they saw as federal recalcitrance to support their industry. Already convinced that his refusal to establish quotas reflected indifference, farmers became doubly suspicious when Roosevelt made a series of tung oil loans to China.

On December 15, 1938, Roosevelt granted China a loan which tung growers perceived as favoritism for foreign exporters over domestic producers. The minutiae of the transaction proved especially distressing, especially since tung farmers had been seeking quotas for years. In the agreement between Treasury Secretary Henry Morganthau and Chinese financier Ch-en Kuang-fu, China received $25 million dollars at 4.5% interest, money it had to repay with earnings made from tung oil sales to the U.S. Intending to pay the loan by "earmarking one-half the proceeds to pay the debt," Ch-en formed the Fooshing Trading Corp. to ship the product to the U.S. and the Universal Trading Corp. in Manhattan to sell the oil.[9] While significant as the "first U.S. wartime assistance of China," this transaction dismayed tung growers.[10]

The following year, on February 8, 1939, Roosevelt made another "Wood-Oil Loan" to China amounting to $20,000,000. This time, half of each tung oil sale went toward repaying the loan. Rather than injure or undermine the domestic tung oil industry

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December 5, 1937, 42; and Bailey, Industrial Oil and Fat Products, 126. In 1937, The National Paint, Varnish and Lacquer Association had sent its resolution to encourage the domestic tung oil industry to President Roosevelt.

[9] "Foreign Trade: Tung Oil Wanted," *TIME Magazine*, April 6, 1942. See also, Agnes Roman Miller, "American Investments in the Far East," *Far Eastern Survey* 19, no. 9 (May 1950): 84; Arthur N. Young, *China's Wartime Finance and Inflation, 1937-1945* (Cambridge: Harvard University Press, 1965), 103-104;; and "National Affairs: Everyday Life," *TIME Magazine*, March 18, 1940. The Chinese Ministry of Finance oversaw The Fooshing Trading Corporation.

[10] John W. Garver, "China's Wartime Diplomacy," in *China's Bitter Victory: The War with Japan, 1937-1945* ed. James C. Hsiung and Steven I. Levine, ed. (Armonk, NY: M. E. Sharpe, 1992), 13. Given that Canton and Wuhan had just fallen, the loan also helped to raise hopes among the Chinese.

as many growers believed, Roosevelt simply wanted to maintain imports and not just tung imports. To this end, he made other loans over the next two years and expected repayment from money made from Chinese sales of tungsten and tin. Believing they deserved government protection from Chinese tung oil, they emphasized that the number of tung farms had increased from 144 to 2,304 between 1930 and 1940. Perceiving domestic tung production as marginal and of far lesser concern than U.S.-Chinese relations, Roosevelt and Secretary of Agriculture Wallace disapproved a proposal to grant subsidies to farmers willing to grow tung, a strategy suggested by Congressman Lex Green (D-FL). While tung growers believed the tung loans undermined the domestic industry, the loan also drew attacks from politicians whose concerns had more to do with diplomacy than the tung industry. Secretary of Treasurer Wayne Taylor, for one, thought it unwise to get involved in the Sino-Japanese dispute by so obviously favoring China.[11] While the Chinese tung loans incited the ire of domestic tung farmers, the onset of World War II only exacerbated concerns about competition.

Tung oil production and consumption steadily increased until World War II when Chinese exports became even more erratic due to Japanese control of the Yangtze River

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[11] Honorable Sumner Welles, March 24, 1942, Tung Oil, SF, FDRL; "22,000,000 to China is Repaid with Wood Oil," *New York Times*, March 25, 1942; Barnett, 68-70; Kurt Bloch, "U.S. Secures More Options on Chinese Raw Materials," *Far Eastern Survey* 9, no. 23 (Nov 1940): 274-275; Frederick C. Adams, "The Road to Pearl Harbor: A Reexamination of American Far Eastern Policy, July 1937-December 1938," *The Journal of American History* 58, no. 1 (Jun 1971): 85; "National Affairs: Everyday Life," *TIME Magazine*, March 18, 1940; Workers of the Writers' Program of the Works Projects Administration in the State of Florida, "Tung Oil: An Essential Defense Industry," *State of Florida Department of Agriculture Bulletin*, no. 11 (Jan 1942): 42; and Dorothy Borg, *The United States and The Far Eastern Crisis of 1933-1938: From The Manchurian Incident Through the Initial Stage of the Undeclared Sino-Japanese War* (Cambridge: Harvard University Press, 1964), 514. On Japanese motivations for expansion, see, for example, Peter Duus, "Introduction: Japan's Wartime Empire: Problems and Issues," in *The Japanese Wartime Empire, 1931-1945* ed. Peter Duus, Ramon H. Myers, and Mark R. Peattie (Princeton: Princeton University Press, 1996), xv. China finally repaid the first tung loan on March 24, 1942.

and occupation of coastal ports. With shipments disrupted, imports from China dwindled to a mere 68,000 pounds a year. Shortages caused the price to skyrocket from 13.75 cents in 1939 to 38.38 cents in 1942 which meant growers made from $95-100 per ton nuts. When the U.S. entered the war, Ch'en's Universal Trading Corporation gave its twenty-six million pounds of tung to the country. On April 15, 1942, domestic production was commandeered by the federal government for military and essential use only under General Preference Order M-57, Part 1034. The order explicitly defined tung oil as "oil pressed from the Tung Nut, frequently referred to as China Wood Oil, whether raw, filtered, blown, or mixed or blended with any other oils, and whether produced or pressed from nuts grown in this country or abroad."[12] In essence, tung oil became a strategic commodity used by the armed forces for waterproofing clothing and tents; lubricating machinery; lining gas tanks; coating steel cans after Japan cornered the market on tin; and insulating wire, radar, and bombs. Moreover, tung oil was used on catheters and as a varnish and paint for airplanes and seafaring vessels. Tung-based paints protected planes and ships from the elements by restricting the absorption of water. Tung based varnishes,

[12] Title 32-National Defense, Chapter IX-Office of Production Management, Subchapter B-Division of Industry Operations, Part 1034-Tung Oil and Oticica Oil, General Preference Order M-57, as Amended April 15, 1942, M56-60, 1941-43: Natural Resins, Tung Oil, Palm Oil, Coconut Oil, United States War Products Board Records, 1941-45, Box 6-19, Hollis no. 5991942, Historical and Special Collections, Harvard Law School University, Harvard University, Cambridge, MA [hereafter HSC, HLSU, HU]. Other strategic materials included resin, glycerin, palm oil, coconut oil, and babassu oil under War Production Board M-59 and M-60. See also, "Tung Industry Emphasizes Need for Import Control," *American Tung News* 4, no. 6 (June 1953): 4; Bong How, "Chinese-American Tung Problems of Mutual Interest," 80, Proceedings of the 10th Annual American Tung Oil Association Convention, April 28-29, 1944, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM; George B. Cressey, "Hongkong, Beachhead for Democracy," *Far Eastern Survey* 20, no. 15 (Aug 1951): 153-155; Dorothy Borg, "European War Brings Important Changes to Hongkong," *Far Eastern Survey* 9, no. 13 (June 1940): 153-155; Tom Epperson and R. O. Austin, "The New Tung Oil Industry," Reprinted from Paint and Varnish Production, January 1961, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM; and J. K. Haken, "The American Tung Oil Industry," *The Australian Paint Journal*, Nov 1963, Box 10, Folder 10, Camille, ATOI, MLA, USM.

when mixed with insecticides made from toxic tung nuts, also proved an effective deterrent against barnacles. Given the plethora of tung oil uses, the *Southern Agriculturalist* observed, "America's booming military might is dependent upon such a seemingly trivial item [tung oil]."[13]

Under War Production Board Order M-57, manufacturers could purchase thirty-five pounds of tung oil a month but if more was desired, companies could seek dispensations. On March 22, 1943, this order became superseded by the USDA's Food Distribution Order Number 38 which mandated documentation of production and consumption. All deliveries needed approval but consumers could purchases up to forty pounds.[14] Beginning in April 1944, the War Food Administration (WFA), a subdivision of the USDA, allowed companies to apply for greater amounts of tung as long as such use was war-related. On September 18, the agency announced the approval of tung oil for non-war related purposes until January of the following year but later rescinded all restrictions.[15] Non-strategic consumption during the war amounted to less than fourteen

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[13] Harold Severson, "Boom in the Tung Belt," *Southern Agriculturalist* 74, no. 7 (July 1944). On medical catheters, "Statement of B. F. Jordan," Tung Oil (June-Dec 1949), Box 337, Folder 4, CWMP, MLA, USM. On tung varnishes on vessels, see also, W. W. Ditto, "Subject: Tung Oil," n.d., Tung Oil (1933), Box 336, Folder 1, CWMP, MLA, USM.

[14] [FDO 39], March 19, 1943, Part 1460—Fats and Oils, Food Distribution Administration United States Department of Agriculture, "Fats and Oils, Restrictions of Use, Processing, Consumption, and Delivery of Tung Oil," GPO-War Board 4509—p.1-3,USDA History Collection, Series III, Secretary's and Agency Memoranda, 1897-1995 Box 3/30 War Food Administration, War Food Orders, FDO (WFO) 39, Tung Oil, 1943-1944, Special Collections, National Agricultural Library, Beltsville, MD [hereafter SC, NAL].

[15] See, "To Allot Larger Use of Tung Oil," *Times-Picayune*, April 25, 1944, 25; "Old War Order Off on Tung Oil Supply," *Times-Picayune*, September 21, 1944, 36; and "Order Allocating Tung Oil Revoked," *Times-Picayune*, January 2, 1945, 9. On the WFA, see, Paul A. C. Koistinen, *Arsenal of World War II: The Political Economy of American Warfare, 1940-1945* (Lawrence: University Press of Kansas, 2004), 248.

million pounds as the majority of domestic production and imports went to defense use.[16] Demand, despite expectations to the contrary, did not bring government assistance.

Seeking government aid and attaining it proved two distinctive factors for tung farmers. Many politicians associated parity with basic crops so tung oil did not benefit until 1942 and then only because of World War II.[17] Once granted, parity came to be seen by tung growers as a right. Feeling entitled, tung farmers cared little that parity carried a negative reputation. Intended to provide farmers with fair earnings and consumers with affordable prices, parity struck many Americans as a financial burden on taxpayers.[18] However, as agricultural economist Willard Cochrane suggests, many farmers proved "unable to rationalize theory and fact, myth and reality."[19] In other words, some farmers either could not or would not see the multiple sides of farmers' issues. Tung growers saw parity purely as an assurance of security in an unpredictable agricultural market. They insisted that producing a strategic crop warranted government assistance. While parity remained a primary concern, these farmers also wanted insurance and loans.

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[16] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 14; Title 32-National Defense, Chapter IX-Office of Production Management, Subchapter B-Division of Industry Operations, Part 1034-Tung Oil and Oticica Oil, General Preference Order M-57, as Amended April 15, 1942; War Production Board, M-57 as Amended, October 6, 1942, M56-60, 1941-43: Natural Resins, Tung Oil, Palm Oil, Coconut Oil, United States War Products Board Records, 1941-45, Box 6-19, Hollis no. 5991942, HSC, HLSU, HU; Bobby Smith, "Tung Oil: The South Makes Oil from the Trees of China," *Down South* (Feb-March 1951), 14; "Southern Tung Oil—War Stresses Its Value," *Manufacturers' Record* 114, no. 5 (May 1945): 46; and "Britain Seeks Tung Oil Data to Lead World," *Rockford (Illinois) Daily Register Gazette*, March 8, 1930.

[17] Frank J. Sherlock to Mr. Macy, June 21, 1957, Box 804, Tung Oil (3), White House Central Files, Dwight D. Eisenhower Presidential Library and Museum, Abilene, KS [hereafter WHCF, DDEPLM]. See also, Fite, *American Farmers*, 82.

[18] Pasour, Jr., 32. On farmer entitlement, see for example, Hathaway, 65.

[19] Willard W. Cochrane, *Farm Prices: Myth and Reality* (Minneapolis: University of Minneapolis Press, 1958), 166.

Desiring freeze and wind insurance, farmers experienced difficulty finding companies willing to extend coverage.[20] Tung growers also wanted bank and disaster loans but often expressed disappointment with the fruits of their labor.[21] In the 1930s, farmers had proved hard-pressed to find organizations willing to give them loans for their tung enterprises, but by the 1940s, they had some avenues. While a FCA study done by Harry Trelogen in 1941 found tung prices too unpredictable to be loan-worthy, some organizations offered loans to tung farmers.[22] The Production Credit Corporation (PCC) in New Orleans and the PCA in Hattiesburg made loans to qualified tung growers.[23] The Regional Agricultural Credit Corporation gave loans to tung growers during the war in the hopes of increasing planting and ultimately production.[24] In May 1943, Land Banks, finally deeming tung cultivation a sound investment, began making loans to growers.[25] A few small growers may have received loans from the FSA, later the Farm Home Administration (FHA), which made loans to poor farmers, but the evidence for such loans is sketchy.[26] The federal government's restriction of emergency loans to full-time

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[20] See, for example, Moss Point Insurance Agency to Mayers Dantzler, August 30, 1944; and R. D. Fitts to Miss Louise Boldt, Aug 28, 1944, Dantzler Company, Box 22, Folder: Morris Hill Farm [4/8]/Tung Orchard: general [See also Dantzler Lumber Company: 1944-1945], Tung oil: General, L. N. Dantzler Lumber Co. Records, Acc. No. 140, Special Collections, Mitchell Memorial Library, Mississippi State University [hereafter SC, MML, MSU].

[21] Kinabrew, 14.

[22] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 57.

[23] Fred J. Hurts, "Harvest Time Nears in the Tung Belt," *Times-Picayune*, Sep 24, 1944, 45; and Jesse B. Hearing, "Cattle and Farmers on Tung Loans," *Tung World* 1, no. 2 (June 1946): 5.

[24] "Loan for Tung Oil Nut Growers," *Times-Picayune*, April 10, 1943, 7.

[25] "Untitled," *Times-Picayune*, May 29, 1943.

[26] Fite, *American Farmers*, 121.

farmers presented a greater problem. If they had other businesses or lived far away from their tung orchards, tung farmers did not qualify.[27] Annoyed with such restrictions, some tung growers joined cooperatives in an attempt to gain some semblance of independence and security.

Cooperatives struck some tung growers as a wise investment. Coops, made legal by the Clayton Antitrust Act of 1914 and Capper-Volstead Act of 1922, were organizations in which farmers pooled their crops and shared the profits.[28] The practice of farmers working together in an alliance had long been embraced by farm organizations like the Grange.[29] By the 1920s, coops had appeared all over the country and served cotton, tobacco, wheat, peanuts, and dairy farmers. The number kept rising as the decades passed, and the most successful ones proved devoted to vegetables, fruits, nuts, and dairy, commodity markets where farmers could coordinate and control production and distribution.[30] In the case of tung oil, the industry had several cooperatives in which to participate during World War II. The Gulf Coast Tung Nut Association had formed in 1933.[31] The Tung-Empire Corp, chartered by the Tung-Empire-Association, and the Ozone Tung Oil Producers' Cooperative Association both formed in 1938.[32] The latter,

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[27] "Credit Assn. Urged for Tung Growers," *Jackson Daily News*, June 25, 1950; and "Coast Tung Nut Producers Seek Emergency Loans," *Jackson Daily News*, April 28, 1955.

[28] Fite, *George N. Peek*, 55; and Hurt, *American Agriculture*, 266.

[29] Klein, 55.

[30] Fite, *American Farmers*, 155.

[31] "All Tung Nut Growers, Greeting," n.d., Tung Oil (1933), Box 336, Folder 1, M24 CWMP, MLA, USM.

[32] On the Tung-Empire Corp, see, R. Cecil Smith, "Commercial Tung Oil Development in the South," *The Southern Conservationist and American Tung Oil* 5, no. 1 (Apr 1938): 17. On the Ozone mill,

initially composed of 20 members, even had a mill in Covington.[33] The Compress Lake Growers Association formed in 1941 with six members and started a tung mill. Assisting in developing and expanding knowledge of tung, the coop advised on planting, harvesting, and marketing.[34] The majority of tung growers preferred to function independently but coops developed a following.[35] While members looked to such organization to energize production, they also saw empowerment in industry.

The Tung Belt profited from the reputation the South had for cheap labor, low taxes, minute union activity compared to the rest of the country, and often generous incentives. It helped that southern states even led extensive industrial drives in the hopes of aiding state economies. In 1936, for example, Mississippi passed the Balance Agriculture with Industry (BAWI) in which the state allowed and oversaw municipal bonds to administer industrialization; ending in 1940, the organization was revived in 1944. In addition, in 1940, Louisiana's Governor Huey P. Long formed a Department of Commerce and Industry to promote industries in an attempt to temper his state's negative reputation for high taxes.[36] These endeavors by southern states to attract businesses with generous economic motivations helped lead various companies to form or build branches

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see, Miscellaneous, Folder: Ozone Tung Cooperative, 1944-1948, Box 10, Tangipahoa Tung Oil Company, Center for Southeast Louisiana Studies, Southeastern Louisiana University, Hammond, LA [hereafter TTOC, CSLS, SLU]; "Covington's Cooperative Mill," *Tung World* 1, no. 4 (Aug 1946): 7; and Jack Flowers, "Tung Oil Refuse Speeds up Cycle of Trees to Nuts," *Times-Picayune*, January 22, 1939, 22.

[33] "Covington's Cooperative Mill," *Tung World* 1, no. 4 (Aug 1946): 7.

[34] Ward W. Fetrow, "Three Tung Oil-Co-ops Help in Emergency," *News for Farmer Cooperatives* 18, no. 3 (June 1951): 7-8. Another coop, the West Florida Tung Mill formed in 1949 with 16 members.

[35] Livaudais, interview.

[36] Cobb, *The Selling of the South*, 5, 25, 27, 36, 48, 157. See also, Mississippi: America's State of Opportunity, 27.

in or near the Tung Belt.[37] This welcoming climate may have played a role in the formation of new tung businesses like the Pearl River Tung Company, an orchard managing firm.[38] Another good example of industry generated by tung occurred when paint and varnish companies like Tung Oil Products and Dixie Paint and Varnish Company, formed or located to the region.[39] Tung also caught the attention of and led to the creation of many fertilizer companies and chemical firms like the American Agricultural Chemical Company and Crosby Forest Products in Picayune.[40] Moreover, naval store, cement, textile, and paper companies proved regular consumers but growers wanted to expand their industrial consumer base through science.

The connection between tung oil and chemurgy intensified during the war. A plan by Senator Theodore Bilbo (D-MS) to establish a USDA cotton research lab in the South or more specifically, Mississippi had an immense impact on tung. In 1937, when Farm Chemurgic Council Manager Fritsche, seeing potential experimentation and the importance of place or location to politics, helped to persuade Bilbo to expand his bill for the formation of a USDA southern research lab into a call for four research labs.[41]

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[37] Rene Fransen to Louis Chenel, Feb 10, 1966, Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU.

[38] "Pearl River Tung Co. Offers Services," *Tung World* 1, no. 2 (June 1946): 21.

[39] "Tung Oil Industry Expanded in Louisiana," *The Chemurgic Digest* 6, no. 18 (Sep 1947): 275; Plaques of Appreciation Awarded to Tung Pioneers," Box 5, Folder 17, Tung History 1944-76, ATOI, MLA, USM; and "Way Down South At Dixie," *The Southern Conservationist and American Tung Oil* 6, no. 1 (Apr 1939): 17.

[40] "Agrico," *Tung World* 7, no. 11 (April 1953): 7; and "Tung Oil Industry Expanded in Louisiana," *The Chemurgic Digest* 6, no. 18 (Sep 1947): 275; and "Picayune," *Times-Picayune*, June 10, 1962.

[41] Hale, *Farmers Victorious*, 115; Gardner, *American Agriculture in the Twentieth Century*, 182; Browne, 90; "Tung Oil Development," *Manufacturers' Record* 104, no. 10 (Oct 1935): 18; and "Texas

Fashioned to benefit the entire country rather than simply the South, Fritsche imagined Bilbo's bill would actually pass. The fruits of Bilbo's efforts finally appeared when the Agricultural Adjustment Act of 1938 established four regional research labs, facilities which opened in the early 1940s in New Orleans, Louisiana; Peoria, Illinois; Albany, California; and Wyndmoor outside of Philadelphia, Pennsylvania. These labs focused on finding industrial uses for agricultural products, but unlike the Farm Chemurgic Council, which primarily emphasized industry, had more concern for the 'farmer's plight.'[42] The Northern Regional Research Lab (NRRL) in Peoria researched corn and wheat, the Western Regional Research Lab (WRRL) in Albany studied alfalfa, fruit vegetables, wheat, and potatoes; the Eastern Regional Research Lab (ERRL) in Wyndmoor researched milk, apples, vegetables, potatoes, and tobacco; and the Southern Regional Research Laboratory (SRRL) in New Orleans experimented on cotton and smaller crops like sweet potatoes, peanuts, and tung.

The goals of the SRRL included freeing the country from import reliance by helping domestic commodity production and finding alternatives. These two aims may have appeared contradictory but were geared toward severing the overwhelming dependence on foreign countries. While perfecting tree varieties in an attempt to increase oil content, the aims of the SRRL included research on deducing oil content,

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Council of Chemurgy to be Formed," *Dallas Morning News*, May 13, 1937, Section I, p.17. On Bilbo's New Deal activism, see for example, Chester M. Morgan, *Redneck Liberal: Theodore G. Bilbo and the New Deal* (Baton Rouge: Louisiana State University Press, 1985). Of interest, Bilbo's youngest brother John A. Bilbo was a tung grower in Pearl River County. See, "Two Leaders Lost by The Tung Industry," *American Tung News* 4, no. 8 (Aug 1953): 7.

[42] Finlay, "The Industrial Utilization of Farm Products and By-Products" 44; McMillen, *New Riches from the Soil*, 301,303; and "Reported From the Field of Science," *New York Times*, March 30, 1941.

hydrogenation, a procedure which changed eleostearin into conjugated linolein and lessened the tendency of tung applications to wrinkle and darken in color, while perfecting tree varieties in an attempt to increase oil content. Derivative projects included alkyd resins, dyes, cosmetic tubes, hairsprays, detergents, styrene rubbers, hormones, epoxy resins, urethane resins, pesticides, and even pharmaceuticals. Scientists also sought ways to detoxify tung nuts to enhance marketability. To prevent tung oil from gelling when heated, they used rosin derived from pine trees to make a zinc resinate. Paint studies, given the fact that the paint and varnish industry consumed eighty percent of domestic production, proved most common. The lab used it in highway paints and on steel structures. Its scientists even worked with the U.S. Army Engineer Research and Development Lab in various attempts to use vegetable oils like tung in fire-retardant paints.[43] Aside from the SRRL, other USDA labs formed in 1939 in Cairo, Georgia; Bogalusa, Louisiana; and Gainesville, Florida. They were later joined by labs in Fairhope, Alabama, and Poplarville, Mississippi. These labs did not own any tung acreage but rather, worked with growers and experiments stations. Headed by Dr. George F. Potter, the U.S. Field Lab of Tung Investigations in Bogalusa focused on cultivation while the U.S. Field Lab for Tung Production in Gainesville, run by Dr. Robert F. McKinney and operated by the Crops Research Division and Agricultural Research

[43] "New Wonders for Tung Oil Found in Lab," *Tung World* 1, no. 1 (April 1946): 9; R. W. Planck and F. C. Pack, "Current Research on Tung Oil at the Southern Regional Research Laboratory" (speech, reprinted from the proceedings of the eighteenth annual convention of the American Tung Oil Association, Buena Vista Hotel, Biloxi, MS, October 11, 1951); and F. G. Dollear and A. M. Altschul, "Scientists Review USDA's Tung Production Research," *Tung World* 6, no. 11 (April 1952): 6. See also, "Rapid Development of Tung Oil Plantations," *The Journal of American Oil Chemists' Society* 8, no. 5 (1931): 174; and B. M. Kopacz, "Tung Oil Research and Development at the Southern Regional Laboratory," *The Journal of American Oil Chemists' Society* 45, no. 4 (April 1968): 286.

Division, looked at utilizations.[44] While experimentation multiplied, domestic acreage did not spread extensively.

Even though demand for tung oil rose during the war, increases in tung acreage proved negligible. While a patriotic drive to diversify and raise tung for Uncle Sam began, aside from some minute South Carolina plantings which came to naught, domestic acreage grew only marginally from 175,000 acres in 1940 to 178,700 acres in 1945 with Pearl River County, Mississippi, alone having 78,000 acres.[45] As Table 4.1 shows, production climbed in some states as cultivation methods improved. Deducing oil content became more of a challenge as many chemists, like those at the Mississippi State College Chemical Lab, had left to serve in the war.[46] This and many other problems plagued tung growers during the war.

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[44] McKinney, "Research Investigations of U.S. Tung Oil Laboratories;" Dr. George F. Potter, "Dr. Potter Traces the History of Wood Oil in Laboratory and Field," *Tung World* 6, no. 4 (Sep 1951): 8; Dr. R. S. McKinney, "Tung Industry Began 50 Years Ago," *Tung World* 6, no. 4 (Sep 1951): 10; W. Wilson Kilby, "History and Literature of The Domestic Tung Industry," *Mississippi State University Technical Bulletin* 56 (Aug 1969): 1; R. S. McKinney, "Southern Tung Oil Laboratories," *Manufacturers' Record* 108, no. 8 (Aug 1939): 54; and "Tung Oil Session Told of Federal Aid for Industry," *Times-Picayune*, March 28, 1939, 9. The field labs in Fairhope and Cairo were led by George Bahrt and John Painters respectively. Dr. Ernest Angelo became a key figure at the Bogalusa lab while Dr. Felix Lagasse became pivotal at the lab in Gainesville. See, "Tung Oil Crops Seen for South," *Augusta Chronicle*, September 8, 1938, 12.

[45] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 52; "WANTED . . . 36 Million Dollars of Southern TUNG OIL! *Dallas Morning News*, March 28, 1944, Section I, 2; and "Major Crops for the South," *The Billboard*, March 27, 1943, 75. See also, Mississippi: America's State of Opportunity, 51; and Victor Schoffelmayer, "Tung Nut Crop Brings Millions to Small Farmers of South's Pine Forest Region," *Dallas Morning News*, October 12, 1942, Section 1, 7. On growing diversification in the south, see also William B. Bankhead, "War and Southern Agriculture," *Southern Agriculturalist* 70, no. 1 (Jan 1940).

[46] W. F. Hand to P. N. Howell, Dec 22, 1944, Box 17, Dantzler Lumber Company [1/2]: Tung Oil: General [See also Morris Hill Tung Farm/Tung Orchard] 1943-1945, L. N. Dantzler Records, SC, MML, MSU.

Table 4.1 Domestic tung fruit production (tons)[47]

State	1939	1940	1941	1942	1943	1944	1945	1946
AL	20	200	350	500	100	700	1,140	1,600
FL	550	4,700	2,250	3,700	700	7,000	8,400	15,000
GA	15	1,200	650	950	200	800	1,100	1,800
LA	150	1,200	1,800	4,000	3,260	7,550	10,750	15,200
MS	425	3,700	3,700	7,200	1,940	10,630	15,690	23,800

Throughout the war tung farmers had difficulties attaining loans. The government took all domestic tung production so the CCC had few dealings with growers. It occasionally purchased tung oil for 36-39 cents a pound and sold it to support the war effort but made no loans in 1944 or 1945.[48] Adding to the frustrations of growers, the Federal Crop Insurance Corporation only insured basic crops like cotton, wheat, tobacco, and corn.[49] Struggling financially from labor shortages, both mill owners and growers suffered. Unable to find enough employees, the Alachua Tung Oil Mill in Gainesville even closed for two years.[50] The war resulted in yet another impact on growers—a shift from local to migrant labor.[51]

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[47] "Tung Production," *Farmers' Bulletin* no. 2031, U.S. Department of Agriculture, TO, VF, SLL.

[48] "U.S. Department of Agriculture Advocates," *American Tung News* 4, no. 6 (June 1953): 10; "The Case for Tung," *American Tung News* 5, no. 4 (April 1954): 6; "New Gain by Chemistry," *New York Times*, October 27, 1944; and "What the Senate Committee Advised," *Tung World* 6, no. 12 (May 1952): 6. See also, Chester Bowles, "Statement of the Considerations Involved in the issuance of Amendment 27 to Maximum Price Regulation No. 53," Box 1, American Tung Oil Association (may-December), 1944 [1/4], Dantzler Company, SC, MML, MSU.

[49] "American Tung Oil Association News Release," Dec 30, 1944, Box 1, American Tung Oil Association (May-December), 1944 [1/4], Dantzler Company, SC, MML, MSU.

[50] "Alachua Tung Mill Oldest in Country," *Tung World* 1, no.2 (June 1946): 19.

[51] "10,000 Persons are Invited to Witness Tung Nut Harvest in Mississippi," *Times-Picayune*, October 16, 1938, 25; and "Help Sought in Harvesting Big Crop," *Tung World* 7, no. 5 (Oct 1952): 10.

Prior to World War II, tung growers depended almost entirely upon local labor, but with the draft sending men abroad, they looked to migrants, aliens, and even prisoners of war. Growers had always relied upon female and child labor, but dependence upon these groups became even stronger during the war. Blacks made up the bulk of migrant laborers, but when, with the backing of the Farm Security Administration's Migratory Camp Program, they organized and demanded certain wages, many farmers opted to hire immigrants. Agricultural labor became so scarce that Secretary of Agriculture Claude Wickard allowed illegal Mexican workers to labor on farms; they often worked in the cotton fields throughout the Mississippi Delta and ventured south to work in tung orchards.[52] The Farm Labor Supply Program provided farmers with foreign workers and prisoners of war. Some like the Goodyears used German POWs, a common practice in agricultural areas.[53] Growers, striving to find pickers, even met with the Farm Machinery and Supplies Branch of the WFA about perfecting machinery for tung orchards so labor would be less of an issue.[54] The primary problem appeared to be that consumers, given the Chinese embargo, the classification as tung oil as a strategic commodity, and the subsequent shortages, looked to alternative or artificial oils, thus greatly weakening the power of tung oil in the market.

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[52] Raper, 45; Hahamovitch, 167; and Timothy Minchin, *Fighting Against the Odds: A History of Southern Labor Since World War II* (Gainesville: University Press of Florida, 2005), 36.

[53] Terri Bewig, "Goodyear Clan Has High Hopes for Money Hill," *Times-Picayune*, August 13, 1988; and Minchin, 36. On POWs, see also, "Farm Head Seeks Foreign Workers," *Times-Picayune*, July 8, 1946, 35; Hahamovitch, 178-179; and Jeremy Pittari, "Reflection on a POW Camp," *Picayune Item*, July 25, 2007. Some tung growers sought to import pickers from the West Indies.

[54] Marshall Ballard, Jr. to Members, July17, 1944, Box 1, American Tung Oil Association (may-December), 1944 [1/4], Dantzler Company, SC, MML, MSU.

While the number of tung growers increased during the World War II, the decades long infatuation between manufacturers and tung oil faded considerably. Cheering over the Chinese embargo, tung growers embraced the anti-Asian sentiment which had grown exponentially although the government tried to differentiate between 'bad' Asians like the Japanese and 'good' Asians like the Chinese.[55] By the end of the war, the number of southern farmers had dropped twenty-two percent while farm income, thanks to increased demand, had swelled from $2 billion to $4.7 billion a year.[56] Tung growers expected the high demand to continue but were mistaken in their faith. The very companies which had consumed the bulk of imports and domestic tung production no longer seemed interested.[57] The inability or difficulty in acquiring a strategic commodity led traditional consumers of tung oil to look elsewhere. This move may have been out of necessity, but as can be seen in Table 4.2, an extra incentive came in the form of availability and attractive prices of alternative oilseeds.

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[55] Thomas Borstelmann, *The Cold War and The Color Line: American Race Relations in the Global Arena* (Cambridge: Harvard University Press, 2001), 30.

[56] David R. Goldfield, *Promised Land: The South Since 1945* (Arlington Heights, IL: Harland Davidson, 1987), 7.

[57] Mary Madison, "The Home in Wartime," *New York Times*, February 7, 1943. On substitutes, see also "Castor Oil Replaces Tung Oil," *New York Times*, April 18, 1942; "New Substitutes Cut Far East Loss," *New York Times*, May 27, 1942; and Harrison E. Howe, "Help Science OUTMODE WAR!" *The Rotarian*, November 1941, 12.

Table 4.2 U.S. World War II oil use (1,000 lbs)(tanks cents per pound)[58]

Year	Tung	Price	Linseed	Price	Soybean	Price	Castor	Price	Oiticica	Price
1939	105,596	21	557,855	8.8	33,353	4.8	11,844	8.8	18,867	15
1940	66,937	26.3	586,585	9	46,260	4.7	24,857	11.4	15,537	18.9
1941	68,515	32.2	803,641	9.7	62,410	8.5	46,295	10.6	26,785	20.2
1942	11,830	39.6	820,253	12.3	33,422	11.6	62,756	12.9	9,196	25.6
1943	12,047	39	757,693	14.4	38,974	11.8	24,991	13	3,602	26.2
1944	10,109	39	688,373	14.3	36,648	11.8	90,037	13	10,741	21.9
1945	22,672	38.4	628,052	14.3	45,757	11.8	66,658	13	19,389	23.7
1946	35,632	38.4	668,230	18.4	66,925	14.6	33,233	18.1	25,245	26.8

Unable to buy domestic tung and given that tung oil imports had been disrupted by war, many businesses took pride in finding oilseed or even synthetic substitutes. Spencer Kellogg and Sons, Inc., formed Kelapol at the request of the Army and Navy due to tung shortages.[59] Some like Sherwin Williams and Spencer Kellogg & Sons sought and found effective replacement in castor/soybean mixtures and linseed/soybean combinations. The Woburn Degreasing Company of Kearny, New Jersey, even claimed to have a dehydrated castor/linseed mix as strong a drying oil as tung. Others like the O'Brien Varnish Company and General Mills chose to supplement tung with soybean oil. Soybean cultivation in the U.S. had begun in 1904 and had followed much the same path as tung. Unlike tung, soybeans were not confined to the Gulf Coast and between 1924

[58] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 15-16. For oticica oil, the U.S. relied upon Brazilian imports. Castor oil was placed under government allocation in 1942 and removed in 1944. Some domestic plantings of castor took place during this time. See, George H. Priest, Jr., "Strong Continuing Demand for Drying Oils," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 40.

[59] Spencer Kellogg and Sons, Inc., "Kelapol," Box 1, American Tung Oil Association (may-December), 1944 [1/4], Dantzler Company, SC, MML, MSU.

and 1941, soybean production went from five to over 105 million bushels.[60] Companies like Montgomery Ward ceased producing tung based paints altogether.[61] As a result, between 1937 and 1944 alone, tung dramatically changed from being 17.3% of "the total weight" of fats and oils consumption for drying purposes to only one percent.[62] In response to these startling statistics, George H. Priest, Jr., Director of Technical Field Service for the NPVLA said, "Tung oil is definitely a war casualty."[63]

Tung proved just one of many crops in which science proved a simultaneous blessing and curse. Labs, both federal and company, had sought domestic substitutes for foreign imports since the war began and by 1946, had accomplished said goal for many commodities like rubber. As early as 1941, a *New York Times* article claimed, "We are demanding substitutes for substitutes" and thus, entering an age of "ersatz."[64] Public

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[60] P. R. Record, "The Soybean Situation," *The Chemurgic Digest* 4, no. 6 (March 1945): 114. See also, See, George Priest, Jr., "Strong Continuing Demand for Drying Oils," *The Chemurgic Digest* 5, no. 1 (Jan 1946): 40.

[61] Baldwin, Edison, 410; Paul Gesner and John Beckley, "Tung Oil Substitutes Ready—Small Business Big Factor in Paint and Lacquer Field," *Toledo Blade*, February 23, 1942; Martin King, "We Beat the Japs with Castor Oil," *Springfield* (Massachusetts) *Republican*, April 25, 1943, 37; Borth, *Pioneers of Plenty: Modern Chemists and Their Work*, 219, 299, 317; M. F. Taggart, "Paints are Chemurgic," *Chemurgic Digest* 11, no. 12 (Dec 1952), 4-5; "Search for Oil is Rewarded," *Cleveland Plain Dealer*, February 24, 1942; "Improvements in Paint," *Dallas Morning News*, July 24, 1945, Section II, 2; "Science Briefs: Soy-tung Oil," *Dallas Morning News*, October 28, 1940, Section I, 10; P. H. Keen to Louis Chenel, August 6, 1947, Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU; S. A. T., Jr., "Across the Financial Desk," *Times-Picayune*, February 25, 1942, 22; and C. A. Myers, "Prospects for Essential Oils in 1945," *The Chemurgic Digest* 4, no. 1 (Jan 1945): 27.

[62] Earle Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 32.

[63] George H. Priest, Jr., "Strong Continuing Demand for Drying Oils," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 39.

[64] "Ersatz for Us, Too," *New York Times*, November 23, 1941. It is of interest to note that in 1942, China also began endeavors to discover more industrial utilizations by establishing seventeen laboratories, ten plants, and four extension stations. Chinese scientists used tung oil to create synthetic rubber and even gasoline. On Chinese chemurgy, see for example, "Products of China Are Put to New Uses," *New York*

interest waned; some chemurgists came to the conclusion that utilized farm products were too expensive to maintain the attention of industries; and farmers frequently disagreed with manufacturers. Postwar government-sponsored research became geared toward consumers rather than producers, focused on maintaining foreign relations instead of nationalistic self-sufficiency, and highlighted ways of decreasing surpluses of crops like wheat, dairy products, and corn.[65] Besides, the U.S. had taken the initiative of helping to establish various types of plantations, including tung, in Central and South America.

Unable to depend on unpredictable Chinese tung imports and even less reliable domestic production, industries began to turn to alternatives or create their own substitutes. Growers had long deemed linseed oil their main competitor, but the threat of other oilseeds, especially soybean oil, and synthetics grew immensely.[66] Synthetics, combinations of natural and artificial chemical compounds like epoxies and polyurethanes, offered not merely convenience, supply regularity, and reasonable prices but freed manufacturers from reliance upon imports. Paint and varnish companies adopted alkyd resins, polyesters meshed with fatty acids, mixtures of poly-functional alcohol and acid, or resorted to more widely produced oilseeds like soybean, linseed,

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Times, May 31, 1942; and D. D. Songstad et al., "Historical Perspective of Biofuels: Learning from the Past to Rediscover the Future," *In Vitro Cell & Developmental Biology—Plant* 45, no. 3 (2009): 192.

[65] Finlay, "The Industrial Utilization of Farm Products and By-Products," 52; Finlay, *Growing American Rubber*, 227-228; R. R. Cole, "Industrial Agriculture," *The Chemurgic Digest* 4, no. 16 (Aug 1946): 270.; and Patrick B. Smith, "Revitalizing Chemurgy: Chemicals from Agricultural Resources," in *Renewable and Sustainable Polymers ACS Symposium Series* 1063ed. Gregory Payne and Patrick B. Smith (Washington, D.C.: American Chemical Society, 2011), 109.

[66] L. O. Crosby to Marshall Ballard, Jr., October 4, 1946, Tung Oil (1933), Box 336, Folder 10, CWMP, MLA, USM.

castor, especially dehydrated castor, and perilla.[67] In essence, the heyday of both tung oil and the chemurgy movement took place during World War II.

As World War II drew to a close, the domestic tung oil industry faced a crossroads. On December 30, 1944, Acting War Food Administrator Gordon B. Hill, believing the growing domestic production could suit the country's needs, ended War Food Order Number 39, thus removing the status of tung as a strategic commodity.[68] Hardly as confident about the productivity of domestic producers, members of the National Security Council (NSC) contemplated stockpiling tung oil. Believing that yearly domestic production would suffice and concerned about storage expenses, the organization ultimately abandoned the plan.[69] Having expected strong demand and high prices to persist, Crosby had promised his mill patrons thirty-eight cents a pound for their nuts, but demand fell while prices plummeted. While his father had lost a great deal of money, L. O. Crosby, Jr., set about lobbying to increase tung oil price supports.[70] The major questions remained whether or not tung growers could provide the country's tung

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[67] "The Tung Oil Industry: Growth and Prospects," *Monthly Review: Federal Reserve Bank of Atlanta* 30, no. 11 (Nov 30, 1945): 122; T. H. Hopper, "Tung Utilization Research," *American Tung News* 8, no. 1 (Jan 1957): 6; "Crosby Laboratory Announces New Uses for Tung Oil," *American Tung News* 7, no. 7 (July 1956): 10; and R. O. Austin, "Basic Developmental Tung Research," *American Tung News*, n.d., p.8, Box 19, Folder 21, FCC, UAHC, MSU. On dehydrated castor oil, see, for example, "Science: More Castor Oil," *TIME Magazine*, December 14, 1942.

[68] [WFO 39, Termination], December 30, 1944, Part 1460—Fats and Oils, "Termination of Restrictions on Use, Processing, and Refining of Tung Oil," GPO—WFA 257—p.1, USDA History Collection, Series III, Secretary's and Agency Memoranda, 1897-1995 Box 3/30 War Food Administration, War Food Orders, FDO (WFO) 39, Tung Oil, 1943-1944, SC, NAL.

[69] A Statement by the American Tung Oil Association in Support of Continuation of a Mandatory Support Price Program for Tung nuts Concurred by The National Tung Oil Marketing Cooperative, Inc., p.5, Box 32, Tung Oil 1950-1954, Boswell Stevens Papers, Special Collections, Mitchell Memorial Library, Mississippi State University, Starkville, MS [hereafter BSP, SC, MML, MSU].

[70] L. O. Crosby, Jr., interview by Dr. Orley B. Caudill, November 5, 1974, transcript, The Mississippi Oral History Program of The University of Southern Mississippi, vol. 155 (1980), p.56-57, COHCH, MLA, USM. See also, Polk, 36.

oil needs and what role tung oil stood to play in the oilseed market. As ATOA President Ed. C. Gay commented, "Demand for our product was practically zero."[71]

Prospects for the tung oil industry dimmed. Tung oil price had dropped, but tung production costs, including fertilizers, machinery, and general cultivation, had risen from roughly $32 an acre to $62 per acre.[72] In 1946, Congress saw market prices as adequate and removed parity support for tung. When the market price dropped the following year, the USDA purchased 7,794,510 pounds of oil for $1,949,945.52.[73] Then, in 1947, when the government lifted import controls, prices plunged.[74] Growers reacted with outrage and appealed to their congressional representatives thus, failing or refusing to realize that tung parity had only been granted to meet wartime needs and that diplomacy trumped domestic production. Further concern stemmed from company labs and colleges like the University of Minnesota which found a way to increase the conjugation or bonds in oilseeds to make them equal in drying power to tung.[75] The quality of imported tung oil also began to challenge superiority claims made by U.S. growers.

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[71] Ed C. Gay, "President's Annual Report" (Presidential report, proceedings of the thirteenth annual Convention of the American Tung Oil Association, May 1-3, 1947), Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM.

[72] "Statement of B. F. Jordan," *Tung Oil* (June-Dec 1949), Box 337, Folder 4, CWMP, MLA, USM.

[73] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 10-11.

[74] On post World War II tung oil imports from China, see Walters, 281.

[75] "Research Offers a New Tung Oil," *New York Times*, May 25, 1941; "Tung Oil Import Curb Lifted," *New York Times*, March 1, 1947; Lois Jones, "Tung Growers Gird for Normalcy," *Times-Picayune*, December 23, 1945; and "Tung Nut Price Support Sought," *Times-Picayune*, March 14, 1947, 3.

By war's end, tung growers worried not only about Chinese imports but those from Latin America. From 1941 onward, China's Foreign Trade Commission and Chinese Bureau of Testing and Inspection of Commercial Commodities had standardized its exports to prevent diluted or subpar shipments.[76] This threatened the stance domestic growers had long held about the "inferiority" of Chinese imports. The wish growers had long expressed to be free from Chinese dependence came true, but the results fell short of expectations. Tung production in South America had increased tenfold thanks to U.S. help in the form of advice, assistance, and experimentation by companies like The United Fruit Company.[77] Domestic growers thought that by helping to establish tung acreage in Latin America they would weaken China's dominance of the market. Ironically, rather than taking away the market from China and stabilizing supply, the U.S. had created more competition. With foreign imports weighing heavily on their minds, growers also stressed when frosts ruined yearly profits. Even in good years many tung growers did well to break even. While roughly one-fourth of U.S. farmers had left the farm by war's end, those remaining along the coast refused to diversify into crops like tung.[78] A post-

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[76] Chiang-kwoh, 417. China had formed a tung lab at Chungking. In the aftermath of World War II, Hong Kong exported a great deal of tung. See, Chen, 33.

[77] "Latin American Crop Idea Would Offset Far East," *Times-Picayune*, July 20, 1942, 25. In addition to Argentina, Brazil, and Paraguay, Uruguay, Costa Rica, Cuba, the Dominican Republic, Haiti, Guatemala, and Honduras began experimenting with tung. See, "Latin America Experiments with Tung Oil," *Times-Picayune*, June 6, 1943. In 1938, the Export-Import Bank had loaned Latin America $200 million. See, for example, John C. Dreier, ed. *The Alliance for Progress: Problems and Perspectives* (Baltimore: Johns Hopkins Press, 1962), 8.

[78] William J. Enright, "Nation Speeds Drive for Self-Sufficiency," *New York Times*, March 15, 1942; Tindall, 704; Numan V. Bartley, *The New South, 1945-1980*, 11; Finlay, *Growing American Rubber*, 227; and Ed C. Gay, "Proceedings of the 14th Annual Convention of the American Tung Oil Association, April 29-30th, 1948, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM. On tax write-offs, see, for example, E. P. Larsh to Claude E. Pepper, Dec 5, 1945, Box 1, American Tung Oil Association, 1945 [2/4], Dantzler Company, SC, MML,MSU.

war lumber revival struck some as a more attractive venture.[79] Even old tung boosters like Concannon, deemed the 'father of the tung industry,' developed doubts.[80] In a letter to China-Tung Oil, Inc., President Harry Bennett, Concannon asked, "Do you think I should continue my interest in tung? That hardly seems like a serious question . . . it is one industry in which I have a host of friends but I sometimes wonder what it is all about."[81] Substitutes allowed the U.S. to escape reliance on both tung imports and its own erratic production. Given the changing scientific, economic, and political climate, why did growers continue pursuing tung as a crop?

In retrospect, maintaining tung production may have seemed futile but growers believed they had sound reasons. While they could not conquer nature, these men and women deemed farming of any sort fraught with risks. Trees proved long term investments, crops not easily replaced and not without significant expense. Many either optimistically or naively expected war-time demand to continue, especially given the suburban housing boom. Besides, between 1939 and 1946, the average price per ton of tung oil had gone from $42.20 to almost $100.[82] Growers maintained that tung oil had no rival as a drying oil and deemed domestic production far superior to imports. Some even

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[79] On the lumber revival, see, Cowdrey, 176.

[80] "Authority Urges Possibilities for Tung Nut Profits," *Times-Picayune*, April 29, 1941, 26.

[81] C. C. Concannon to H. W. Bennett, February 13, 1946, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM. Another example of grower regret or trepidation can be seen in Covington tung plantation owner Louis Chenel. See, Louis Chenel to Peter Lawson, May 25, 1943; and Peter Lawson to Louis Chenel, May 31, 1943, Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU.

[82] "United States Department of Agriculture Bureau of Agricultural Economics Crop Reporting Board," "Table 22.—TUNGNUTS: Season Average Price per ton received by growers, by States and United States, 1935-46," Tung Oil (June-Dec 1949), Box 337, Folder 4, CWMP, MLA, USM.

hoped that alternatives might discourage the country from importing tung oil, thus, helping to free the domestic industry from foreign competition. By 1947, the U.S. had fourteen mechanized tung mills across the Gulf Coast. Assuming inflation would hamper Chinese industrialization, growers hoped for declining imports. In fact, growers preferred thinking of tung as "America's China-born agricultural baby," an industry adopted and perfected by the U.S.[83] Other motivations abounded.

Tung growers saw more incentives than disincentives in continuing their orchards. Expense aside, most expected chemurgy to expand current markets and open new ones. After all, China had already begun making synthetic petroleum with a tung base.[84] Growers also expected new insecticides and fungicides would solve their pest problems.[85] The ATOA wanted to increase tung cultivation among small farmers as a cash crop.[86] Some growers saw tung as a hobby or supplementary crop, smiled when their orchards produced, and looked to the potential of the following year when they did not. They took solace in the fact that important individuals like Ford and John Hay Whitney, founder of the J.H. Whitney & Company venture capital firm and later ambassador to the United Kingdom, had planted extensive tung acreage.[87] Many sincerely thought that the

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[83] Hendrix Chandler, "U.S. Reaping Profits from China Tung Oil," *Memphis Commercial Appeal*, March 30, 1947.

[84] Anderson, 298.

[85] Mark Hamilton Lytle, *The Gentle Subversive: Rachel Carson, Silent Spring, and the Rise of The Environmental Movement* (New York: Oxford University Press, 2007), 137.

[86] Sam H. Jones, Box 1, American Tung Oil Association, 1946 [3/4], Dantzler Company, SC, MML, MSU.

[87] Fite, *American Farmers*, 12; Harold Severson, "Boom in the Tung Belt," *Southern Agriculturalist* 74, no. 7 (July 1944); Rucker, "Satsumaland!, 65-71; "Satsumas and Tung," *Tung World* 1, no. 5 (Sep 1946): 20; Nathan Mayo, "Tung Oil Industry in America," *The Southern Conservationist and American Tung Oil* 5, no. 2 (May 1938): 15; Daughtry, interview; "Amazing New Dixie Bonanza-Tung,"

tung industry could aid the post-war southern economy, an already improving environment given the arrival of chemical, explosive, and other defense industries as well as crude oil discoveries. After all, some paint and varnish companies like Socony Paint Company had either formed in or built branches in the South.[88] According to an article in *The Chemurgic Digest*, "As the output of American tung oil industry increases, the varnish industry that finds in the South a major source of supply of resin may seek this region as its natural home."[89] In other words, tung, coupled with other attractive incentives like pine resin, attracted companies to the South. Years of experience had taught growers to take care of their orchards and with this wisdom came confidence. As Crosby, Jr., deduced, "I find that we can only get out of it what we put in it."[90] It helped that in 1946, the Senate passed a bill to provide $7,000 for the development of tung harvesting machines by the Farm Tillage Lab of the U.S. Bureau of Plant Industry, Soils, and Agricultural Engineering at Auburn, Alabama.[91] For these reasons and in spite of great odds, growers pursued their tung endeavors.

New York Sunday Mirror, April 6, 1947; and "Predicts Bright Future for Tung," *Times-Picayune*, November 26, 1946.

[88] "Tung Growers Meet with The Post-War Economic Development Committee of Louisiana," *The Chemurgic Digest* 3, no. 4 (Feb 1944): 63; "Beaumont Seen as Market for Gulf Tung Oil," *Dallas Morning News*, August 29, 1938, Section I, 11; and *Mississippi: America's State of Opportunity*, 107. Socony Paint Company built a varnish factory in Beaumont in 1938.

[89] Earle L. Rauber, "The Tung Oil Industry: Growth and Prospects," *The Chemurgic Digest* 5, no. 2 (Jan 1946): 58.

[90] L.O. Crosby to A. M. Dantzler, June 11, 1943, Morris Hill Farm/Tung Orchard: General/See also Dantzler Lumber [3/8] (April June) 1943, L. N. Dantzler Lumber Co. Records Acc. No. 140 Box 22, SC, MML, MSU.

[91] Marshall Ballard, Jr. to Dear Member, July 19, 1946, Box 1, ATOA [3/4], Dantzler Company, SC, MML, MSU.

In the aftermath of World War II, tung oil continued to play a role in military defense given the onset of the Cold War but its position in the market remained precarious. The Tariff Commission even announced, "In the production of certain paints and varnishes, tung oil is technically superior to any other oil, but in the production of other kinds of paints and varnishes, it is not."[92] This instability derived partly from the fact that the federal government had, under Roosevelt, taken a significant leap from economic nationalism to economic internationalism or an emphasis on free trade and foreign relations.[93] Such a transition left many politicians disinclined to pass any tariffs or quotas that might threaten alliances with other countries. Another cause lay in the emphasis the government placed on basic crops. Agricultural production had increased twenty-five percent during the war, causing surpluses to rise.[94] As a relatively small crop, confined to a narrow strip along the Gulf Coast, tung oil did not rank high among the foci of the government. Indeed, when they did study the tung oil situation, government officials actually encouraged imports, an action which caused abject dismay among domestic tung farmers. Growers had been immensely discontented under Roosevelt, and their concerns received no alleviation under his successor.

At the dawn of the Truman Administration, the worries of tung farmers mounted. Knowing the interconnectedness of agriculture and politics, Harry S. Truman, much like his predecessor, adhered to agricultural internationalism, deeming tariffs and quotas

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[92] "Fats, Oils, and Oil-Bearing Materials," *Post-War Imports and Domestic Production Letters from the Chairman of The United States Tariff Commission Transmitting a Report of the United States Tariff Commission in Response to Senate Resolution no. 341*, (78th Congress), Senate 79th Congress, 1st Session, Document no. 38 (Washington, D.C.: U.S. Government Printing Office, 1945), 197.

[93] Finlay, Growing *American Rubber*, 221.

[94] Koistinen, 249.

impediments to free trade. Mirroring Roosevelt, he sought to be all things to all people by promising farmers high prices and assuring consumers low prices. Truman blamed the farm problem, low prices stemming from a significant surplus problem, on the federal government which had encouraged production since the beginning of World War I.[95] At the time of his ascendance to the presidency, he laid blame squarely on the Republican-controlled Congress. His solution to the farmer's plight lay in The Fair Deal which along with calls for improved education, federal health insurance, and civil rights, included agricultural reform, commodity surplus monitoring, and aid to foreign countries.[96] Humanitarian assistance stemmed from his desire to prevent the expansion of communism by forming and maintaining alliances with other nations.[97] As for reforming agriculture, Truman, while a fan of free trade, sought to raise price supports, increase crop insurance, spread rural electrification, encourage soil conservation, and endorse the multiplication of farmers' cooperatives.[98] He also believed that rather than decrease agricultural production, consumption of commodities needed to increase.[99] Even though his popularity with farmers quickly faded, Truman received the farm vote in the 1948 election. This success likely derived from the fear farmers had that Republican candidate

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[95] Alonzo L. Hambry, *Man of the People: A Life of Harry S. Truman* (New York: Oxford University Press, 1995), 217.

[96] Hambry, *Man of the People*, 370; and Susan M. Hartmann, *Truman and the 80th Congress* (Columbia: University of Missouri Press, 1971), 216.

[97] Andrew L. Johns, "Preface: The Eisenhower Administration, The Third World, and the Globalization of The Cold War," in *The Eisenhower Administration, the Third World, and the Globalization of the Third World* ed. Kathryn C. Statler and Andrew L. Johns (New York: Rowman & Littlefield Publishers, Inc., 2006), vii; and Hartmann, 206.

[98] Gary W. Reichard, *Politics as Usual: The Age of Truman and Eisenhower* (Arlington Heights, IL: Harlan Davidson, 1988), 86; and Hartmann, 23, 130.

[99] Hartmann, 154.

Thomas Dewey would end or lessen price supports.[100] Due in no small part to his secretaries of agriculture, Truman came to be seen by tung growers as one of the worst foes they had ever encountered.

As tung farmers discovered, Secretary of Agriculture Clinton P. Anderson had even more of a conservative take on farm policy than Truman. In fact, he disdained government involvement in agriculture and this led Democrats to see him as too right.[101] Moreover, tariffs struck a chord of disapproval in Anderson although he did support a duty for wool in 1947.[102] Fearing the surplus, he thought or at least claimed to believe that subsidies hurt production. In reality, subsidies encouraged production and contributed to the ever growing surplus.[103] His agricultural beliefs failed to fit perfectly with either liberals or conservatives. The enigmatic, occasionally indecisive Anderson fit in the middle of those two extremes.[104] Perceptively, he knew a fine line existed between surpluses and shortages.[105] The main point of agricultural policy consisted of making commodities affordable. While he did not approve of price supports, Anderson, realizing that they could not be removed overnight without an uproar from farmers, reluctantly

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[100] Robert J. Donovan, *Tumultuous Years: The Presidency of Harry S. Truman, 1949-1953* (New York: W.W. Norton & Co., 1982), 13; Steve Neal, *Harry and Ike: The Partnership that Remade the Postwar World* (New York: Scribner's, a Lisa Drew Book, 2001), 105; and Zachary Karabell, *The Last Campaign: How Harry Truman Won The 1948 Election* (New York: Vintage Books, 2000), 258.

[101] Alonzo L. Hambry, *Beyond the New Deal: Harry S. Truman and American Liberalism* (New York: Columbia University Press, 1973), 75.

[102] Hartmann, 91.

[103] Matusow, 10, 40.

[104] Ibid., 9.

[105] Robert J. Donovan, *Conflict and Crisis: The Presidency of Harry S. Truman, 1945-1948* (New York: W. W. Norton, 1977), 124.

supported flexible price supports. This allowed the Secretary of Agriculture to use a sliding scale to decide at what level, minimum, maximum, or somewhere in between, support would be given to various crops.[106] When he resigned to run for senator of New Mexico, farmers breathed a sigh of relief, but soon found no solace in the man chosen to fill his shoes.[107]

The new Secretary of Agriculture Charles Brannan (1948-1953) longed to reform agriculture but his agenda unnerved tung growers. His agricultural record included experiences as Undersecretary of Agriculture and a strong affiliation with the National Farm Union (NFU).[108] Unlike politicians who called for production reduction, Brannan urged farmers to produce at the least possible expense. In other words, he thought that if they cut production costs, their profit margin would increase.[109] Not wanting to alienate farmers or consumers, he quested after equilibrium or mutually beneficial methods. Realizing both the need and demand for financial support among farmers and the desire consumers had for reasonable market prices, he formed a plan hoping to satisfy both sides.

Although the resultant 1949 Brannan Plan sounded beneficial in theory, many tung growers feared its effectiveness while others doubted its feasibility. Without dictating market prices, it called for the provision of direct payments to farmers, limitless

[106] Ezra Taft Benson, *Cross Fire: The Eight Years with Eisenhower* (New York: Doubleday, 1962), 165; and Worster, *The Wealth of Nature*, 86.

[107] Hambry, *Beyond the New Deal*, 224.

[108] Ibid., 223.

[109] Robert H. Ferrell, *Harry S. Truman: A Life* (Norwalk, CT: Easton Press, 1994), 289.

price supports, and a new list of basic or key commodities. While historian Robert J. Donovan described the plan as having "generated more passion than comprehension," it included several steps which Brannan thought stood to improve agriculture in the U.S.[110] First, he wanted to lessen production by allowing the government to support more crops.[111] Second, Brannan wanted payments based on income rather than parity, namely an "income standard determined by a ten-year moving average beginning with the years 1938-1947."[112] Third, he wanted to preserve the free market and intended for the government to aid farmers through direct payments, not price supports.[113] Fourth, Brannan sought to prevent large farmers from abusing the system by placing caps.[114] Many supporters of the plan thought this meant farmers would receive full parity while protestors feared government enlargement and market disruption.[115]

In the end, Truman and the USDA supported the plan, but The National Farm Bureau Federation (NFBF), comprised of Republicans representing many large farmers who liked high price supports, did not.[116] Republican congressmen opposed the

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[110] Donovan, *Tumultuous Years*, 122.
[111] Ferrell, 289.

[112] Hurt, *Problems of Plenty*, 107. On the Brannan Plan, see also, Adam Sheingate, *The Rise of The Agricultural Welfare State: Institutions and the Interest Group Power in the United States, France, and Japan* (Princeton: Princeton University Press, 2001), 132. See also, Halcrow, 328.

[113] Donovan, *Tumultuous Years*, 1922.

[114] Robert H. Ferrell, *Harry S. Truman and the Modern American Presidency* (Boston: Little, Brown, 1983), 105-106.

[115] Hurt, *Problems of Plenty*, 108.

[116] Hambry, *Man of the People*, 496.

legislation as did some Democrats for the sake of their large cotton farmer constituents.[117] The Brannan Plan eventually died in Congress in July, but years later, Truman claimed it would have been effective over time.[118] All of Brannan's efforts frightened and angered tung producers who sought maximum parity and realized this subsidy would not soon materialize. According to Crosby, Jr., under Brannan "there was an attitude in the Department [USDA] that registered no regard for the American tung industry and one that would let the industry die."[119] The difficulty growers encountered in their quests for quotas and higher parity did little to change this assessment, and as a consequence, they visualized both Brannan and Truman as formidable enemies.[120]

The Tariff Act of 1930 meant tung had no import duties, but farmers had hoped that Truman might change that fact. To their disappointment, he instead signed the 1947 Geneva Conference under the General Agreement on Tariffs and Trade (GATT) which resulted in tung remaining duty free after January 1, 1948.[121] While tung growers deemed this a betrayal, Truman, rather than attempting to hurt them as some chose to believe, had likely been motivated by shortages caused by low levels of domestic production and diminished imports. No doubt, a greater concern lay with his emphasis on free trade and

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[117] Ibid., 305.

[118] Browne, 25; Cochrane and C. Ford Runge, *Reforming Farm Policy*, 44; and Ralph E. Weber, ed. *Talking with Harry: Candid Conversations with President Harry S. Truman* (Wilmington, DE: Scholarly Resources, 2001), 242.

[119] L. O. Crosby, Jr., to Gabriel Hauge, May 5, 1954, Box 803, Tung Oil (1), WHCF, DDEPLM.

[120] See, for example, "THE ADMINISTRATION: Farm Pharmacy," *TIME Magazine*, April 18, 1949; and "AGRICULTURE: Farming the Farmer," *TIME Magazine*, March 31, 1958.

[121] "U.S. Department of Agriculture Advocates," *American Tung News* 4, no. 6 (June 1953): 10. Treasury Decision 52587 ended this GATT on December 11, 1950. On grower expectations of Truman, see, for example, William D. Hassett to Mr. Anderson, March 1, 1949; and John H. Napier, Jr., to The President, July 7, 1949, Tung Oil, Subject File, Harry S. Truman Library, Independence, MO [hereafter TO, SF, HSTL].

his apprehension about maintaining beneficial foreign relations. Most countries took offense to tariffs so Truman could little afford to jeopardize trade with tung oil tariffs amid a Cold War. Nevertheless, fifty tung farmers, convinced that Truman had sacrificed them for the sake of Chinese "communist" relations, petitioned Representative Pat Sutton (D-TN). In their collective statement, they complained that after World War II, the government lifted tung parity, an action they blamed partly on corrupt importers and dealers but primarily on the federal government.[122] This attempt may have come to naught but growers became more resolved in their quest for tariffs and desire for quotas.

For domestic tung growers, foreign imports, especially from China, continued to spark agitation. Both tung farmers and mill owners sent countless letters to Truman pleading with him to prevent what they deemed floods of Chinese imports. In one, C. B. Carnegie, President of the General Tung Oil Corporation in Lamont, Florida, insisted that if the "administration will continue to condone the irresponsible dumping of Chinese Tung Oil on the domestic market," it would lead to the "destruction of the American industry."[123] While conducting an investigation on Chinese exports to see if violations of the Anti-Dumping Act of 1921 had been made, the Bureau of Customs concluded that no infractions had taken place.[124] The available amount of cheap Chinese imports meant that

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[122] "Tung Growers Ask U.S. Study of 'Trust' Possibility," *Jackson Daily News*, May 26, 1949. See also, Lamont Rowlands to Mr. Hassett, November 4, 1948; Charles W. Strong to The President, November 15, 1948; and Samuel S. Tomlin to The President, January 25, 1947, TO, SF, HSTL.

[123] C. B. Carnegie to William D. Hassett [Sec to President], January 25, 1949, TO, SF, HSTL.

[124] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 13-14; and Ralph W. Planck, "Tung Oil Review, 1951-1952," *The Journal of the American Oil Chemists' Society* 30, no. 12 (Dec 1953): 3.

many domestic growers were unable to find buyers. In the meantime, more revolutionary events in China transformed the world tung oil market.

With the Communist victory in October 1949, China had become the People's Republic of China, and the new government set about perfecting infrastructure, agriculture, and factories.[125] Undeterred by tariffs and quotas while suffering from currency destabilization, its tung exports to the U.S. leaped from 48 to 98 million pounds of oil between 1948 and 1950. Then, in December 1950, the U.S. embargoed trade with China under the Trading with the Enemies Act, and in response, China ceased exporting tung oil, teaseed oil, ramie, and peanuts among other commodities. Resultant tung shortages caused the price to shoot from 25 to 39 cents.[126] Domestic growers breathed a sigh of relief but continued to suspect that embargoed Chinese tung kept arriving through other countries.[127] While the U.S. looked to Argentina and Paraguay to fill the gap left by China, domestic growers lobbied vehemently and petitioned Congress for help.

Any expectations growers invested in hearings and investigations to address import concerns were dashed. Active lobbyists, large growers like Chenel believed members of various government departments, including the USDA, had "dirty" hands.[128] A number of tung hearings took place in the late 1940s, but the results left much skepticism in the minds of tung farmers. For example, in 1949, Tung Belt politicians,

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[125] Anderson, 364.

[126] "All Goods to China Embargoed by U.S.," *New York Times*, December 7, 1950; Planck, "Tung Oil Review, 1951-1952," 3; Assistant Secretary of Universal Trading Corp S. C. Woods, Box 1, ATOA 1946 [3/4], Dantzler Company, SC, MML, MSU; .and Fite, *American Farmers*, 58. On Chinese response, see, Shepherd, 29, 38, 181.

[127] "Convention Told of New Probe," *Tung World* 6, no. 1 (May 1951): 6.

[128] Louis Chenel to Mr. Snider, April 20, 1949, Folder: Tung Oil Production: Louis Chenel, 1943-1967, Louis E. Chenel Family Papers, MSs4631, SC, LECFP, SC, HML, LSU.

including Senators John C. Stennis (D-MS), Russell B. Long (D-LA), Allen J. Ellender (D-LA), James O. Eastland (D-MS), and Claude D. Pepper (D-FL) held a joint committee comprised of members from the Senate Committee on Agriculture and Forestry, Foreign Relations, and Finance as well as members from the House Committee on Agriculture, Foreign Affairs, and Ways and Means. While participants concluded that tung oil remained an important strategic commodity, many members did not believe it warranted heightened protection of tariffs or quotas given the cessation of Chinese imports and the availability of rival oilseeds and synthetics.[129] The level of irritation among tung growers varied, especially given the worsening antagonism between tung oil factions.

Indeed, a central reason why tung growers never achieved their aims fell to their inability to form a united front. Not only did the industry have two organizations, the ATOA and the Tung Growers Council of America (TGCA), but these two groups fought incessantly with rare bouts of armistice. In fact, the TGCA had been formed in 1949 by a faction discontent with the ATOA. The makeup of each group included large and small growers, Democrats and Republicans, so differences were not based on class or political affiliation. The question of how the government should lend assistance proved the crux of disagreement. For instance, while the ATOA disliked the idea of a tariff for fear of hurting consumers, the TGCA wanted a tariff to protect domestic production.[130] The TGCA's views often appeared in *Tung World* (1946-1969) while the ATOA's stances frequented *American Tung News* (1950-1969). The ATOA had a strong history of voicing

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[129] "Investigations of Tung Oil Industry," Congressional Record—Senate, 1949, p.8333, Tung Oil, Subject File, Mississippi Department of Archives and History [hereafter TO, SF, MDAH].

[130] "More ATOA Hot Air, 'They're Against the Tariff,'" *Tung World* 6, no. 7 (Dec 1951): 3.

its positions in conference proceedings and journals like *American Tung Oil News* (1934-35) and *American Tung Oil* (1935-1937).[131] In 1937, the latter had been acquired by the *Southern Conservationist* (1937-1937), the Mississippi Forestry Association journal "dedicated to the restoration and conservation of the South's natural resources," to create *The Southern Conservationist and American Tung Oil* (1938-1939).[132] At first the owners of the *Southern Conservationist* remained unconvinced as to whether tung trees fell under conservation but decided to devote articles to the industry in each issue. The first edition stated,

> If, by the development of the tung industry, this idle land can again be made productive, erosion controlled and local, state, and national economy bettered, and more secure, then surely the American tung industry deserves a conservative rating.[133]

For reasons unknown, the combination journal only lasted one year.[134] Throughout World War II, the ATOA did not expend funds on the publication of a journal and instead, relied on newspaper coverage and advertisements. In the aftermath, its members embraced *Tung World* as much needed publicity for the industry even though it was the mouthpiece of the TGCA. They quickly realized that they wanted their own forum—*American Tung News*.[135] Quarrels, insults, and dismissiveness between the two organizations intensified.

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[131] "Tung Growers Council of America," *Tung World* 6, no. 7 (Dec 1951): 2.

[132] *The Southern Conservationist and American Tung Oil* 5, no. 12 (Mar 1939): 1.

[133] "Conservation and American Tung Oil," *The Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 4.

[134] The Southern Conservationist became The Conservationist (1940-1940). See, *The Conservationist* 6, no. 8 (Nov 1939).

[135] *American Tung News* 4, no. 5 (May 1953).

Both groups claimed to be the national representative of the domestic tung oil industry and each viewed the other as a rival. Members of the TGCA accused the ATOA of ingratiating itself with paint and varnish manufacturers. The TGCA even dubbed the ATOA "Crosby's tung oil association."[136] Granted, Crosby, Jr., remained a great influence on the ATOA but was only one of many of its numerous officers and members. The TGCA, too, had a figurehead in the form of Chenel who energetically petitioned politicians to heed growers' demands, including tariffs. This infrastructure failed to impress the ATOA which, having seniority and possessing more members, deemed the TGCA nothing more than a "dissident group."[137] The differences between these two organizations culminated in a brief truce when Senator Stennis pushed H.R. 5693, a bill to place duties on imported tuna and included an amendment doing the same for tung. The TGCA endorsed the idea of tariffs but unnerved by its allowance of up to 4,999,999 pounds to be imported duty-free, did not extend support to this bill. Opposed by the ATOA and TGCA, Stennis abandoned the amendment.[138] Both relieved and unsatisfied, members of the two groups focused even more on parity.

Tung growers constantly sought a resumption of price supports after World War II and the government repeatedly denied their request.[139] For his part, Truman observed

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[136] "More ATOA Hot Air, 'They're Against the Tariff,'" *Tung World* 6, no. 7 (Dec 1951): 3. On the TGCA's opinion about the ATOA and the CCC, see, "T.G.C.A. Regrets Recent Action of A.T.O.A. President—Misleading Publicity Unfair and Injurious to Growers," *Tung World* 13, no. 8 (Aug 1956): 2.

[137] "More ATOA Hot Air, 'They're Against the Tariff,'" *Tung World* 6, no. 7 (Dec 1951): 3.

[138] "It's Time to Choose the Best Course for Your Industry," *Tung World* 7, no. 1 (June 1952): 3, 12; and "New 'Sell-Out' Nipped in Bud," *Tung World* 7, no. 1 (June 1952): 4.

[139] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 10-11.

that when parity for tung had been granted, the CCC wound up with over half of domestic production. With that in mind, he believed parity would give growers false hopes about demand for tung.[140] Growers persisted in their complaints, objecting vociferously to the formula used to calculate parity. The equation divided the average price of tung over the previous ten years by the "average of the Index of Prices received by Farmers for the same 10 preceding calendar years" to get the "adjusted base price."[141] Multiplying the figure by the Parity Index of a "composite of prices paid by farmers (1910-1914 base period) for commodities, services, interests, taxes, and wage rates" and dividing by 100 resulted in a commodity's parity price.[142] The Agricultural Act of 1948 established a sliding scale of 60-90%, but tung had yet to become a crop in the base period of 1910-1914 so if granted, the level of parity had to be decided by the Secretary of Agriculture. While growers feared Brannan would arbitrarily assign tung parity, they figured any support was better than none.[143]

Heeding constituent pleas, many southern politicians, especially Congressman William Colmer (D-MS), Senator Stennis, Senator Pepper, and Senator Spessard Holland (D-FL) took up the gauntlet and fought for parity for tung. Unsatisfied with talk of sixty

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[140] "U.S.D.A. Tells Stand on Tung," *Tung World* 3, no. 8 (Dec 1948), 11.

[141] Chapter Four, Parity Prices, Parity Ratio, and Feed Price ratios, 4-9, USDA, National Agricultural Statistics Service, http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Prices/Chapter%20Four%20Parity%20and%20Feed%20Price%20Ratios%20v10.pdf (accessed January 19, 2013).

[142] Ibid., 4-5.

[143] "Colmer Expects Action on Tung Oil Measure," *Jackson Daily News*, June 25, 1949; "Tung Nuts and Honey Price Supports and Bill is Passed by House," *Augusta Chronicle*, August 3, 1949, Section A, p.2; "Big News for the Convention," *Tung World Flash*, June 24, 1949, Tung Oil (June-Dec 1949), Box 337, Folder 4, M24 CWMP, MLA, USM; "Tung Oil Production on Upgrade in South with Mississippi Taking Lead," *Jackson Daily News*, October 28, 1949; and Benson, *Cross Fire*, 74, 85. On the Agricultural Act of 1948, see, for example, Pasour, 99.

percent parity, Colmer wanted ninety percent parity, a high figure for a non-basic crop.[144] Non-southern politicians like Congressman Ezekiel Gathings (D-AK) and Senator Guy Gillette (D-IA) also introduced bills for tung parity. A member of the House Agricultural Committee, Gathings introduced a bill similar to Colmer's. He stated that his interest in tung initially stemmed from a constituent who owned tung acreage in Mississippi. After investigating tung oil, he explained, "We don't grow tung in Arkansas but I feel deeply sympathetic with the plight of your industry."[145] Chairman of a committee studying the oilseed situation, Gillette pushed a bill demanding tariffs on tung imports when the market price fell below parity.[146] Not until October 1949 did tung growers receive the support they had long demanded when Congress, attempting to control commodity price fluctuations and surplus levels, delivered relief in the form of another agricultural adjustment act.

Section 201 of the Agricultural Adjustment Act of 1949 reestablished parity for tung at the 60-90% range selected for non-basic crops, including tung nuts, wool, honey, Irish potatoes, milk, and butterfat. Tung farmers received sixty percent parity which meant 24.1 cents per pound oil or sixty dollars per ton nut. This resulted in the CCC acquiring 1,568,000 pounds of oil, the bulk of which went toward the Korean War. Once again, the federal government commandeered domestic production. Growers quickly learned that parity price proved higher than the market price of 40-44 cents per pound.[147]

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[144] "The Battle for Parity Reopens in Congress," *Tung World* 3, no. 8 (Dec 1948), 5.
[145] "New Bill for Tung Parity is Offered," *Tung World* 3, no. 10 (Feb 1949), 8.

[146] "Parity Bills in Senate," *Tung World* 3, no. 12 (Apr 1949), 4.

[147] "Five Year Tung Parity," *Tung World* 4, no. 6 (Oct 1949), 4; "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953), 10-11;

While growers complained about sixty percent parity, the American Farm Bureau Federation did not endorse mandatory price supports for tung and deemed tung growers far too focused on tung oil to see the larger picture of the countless other commodities and their importance to the country.[148] This proved a familiar tune often echoed by insurance companies which preferred dealing with basic crops.[149] For the remainder of the Truman administration, tung growers remained unsatisfied with their president even though he reluctantly set aside part of $58,660,000 from "public debt receipts under the provisions of Section 304 of the Defense Production Act of 1950" for tung growers.[150] Tung farmers continued to blame him for sixty-percent parity and clung to the tenuous hope that circumstances might improve under his successor.

Recognition of tung oil as a crop reached its peak during World War II but almost immediately declined as a flurry of synthetics threatened the domestic industry with obsolescence. Deemed an effective way to put idle lands to use, diversify crops, supplement income, achieve self-sufficiency, and expand industrial uses, the tung tree had become popular among farmers and businessmen nationwide but the war highlighted its many weaknesses. Limited by a confined growing space, cold weather, alternative oilseeds, synthetic oils, imports, government emphasis on basic crops, and rising

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and "Brief Summary of The Tung Industry," October 24, 1967, Box 5, Folder 17, Tung History 1944-76, ATOI, MLA, USM. On market price, see, Jack Greenfield, "Tung Oil," *The Journal of American Oil Chemists' Society* 36, no. 11 (1959): 566; and Planck, "Tung Oil Review, 1951-1952," 590. On the AAA of 1949, see also Dean, 135. See also, U.S. Congress, *Agricultural Adjustment Act of 1949*, H.R. 5345, 81st Congress, 1st sess., *Congressional Record* Chap. 792, 63 Stat. (October 31, 1949): 1051-1062.

[148] Roger Fleming to Boswell Stevens, Oct 16, 1950, Box 32, Tung Oil 1950-1954, Boswell Stevens Papers, Acc. No. 132, SC, MML, MSU.

[149] See, for example, M. Spring to Louis Chenel, July 31, 1951, Folder: Tung Oil Production: Louis Chenel 1944-1967, LECFP, SC, HML, LSU.

[150] STAATS, Hon. Elmer S., Acting Director, Cross Reference Sheet, June 29, 1951,TO, SF, HSTL.

economic internationalism, domestic cultivation seemed doomed and yet, it persisted after the war. Those already invested in acreage refused to uproot their orchards and demanded recompense from the government for alienating their consumers while would-be growers, impressed by the wartime publicity of tung, saw dollar signs and began planting. By the time the tung oil industry had advanced to the mature stage, it had lost government esteem and much of its consumer base given wartime shortages. Despite the challenges and given tung oil's contribution to the war, growers believed, "The American tung-oil industry, make no mistake about it, is here to stay."[151] The ensuing decades would test the accuracy of this prediction.

[151] "Editorial," *Tung World* 1, no. 1 (Apr 1946): 2. See also, "New Paper Issued by Tung Industry," *Times-Picayune*, April 24, 1946, 7.

CHAPTER V

TUNG OIL TURMOIL: AGRICULTURAL POLICY AND THE DECLINE OF AN INDUSTRY, 1953-1961

Our agricultural style is on one hand a miracle and on the other hand a mess.[1]

Orville Freeman

Tung oil producers continued their decades-long pursuit of government assistance in the decades following World War II but expressed dissatisfaction with the results. Given the growth of free trade and the continuing Congressional emphasis on basic crops, their demand for import regulation, higher parity, and federal loans met with disappointment. Tung farmers condemned the very government they trusted for assistance because they believed that agricultural legislation failed to address adequately the concerns and conditions under which divergent farmers grew and marketed their products. While the government had never placed much emphasis on tung production, the surge in alternative oils led many officials to view the domestic industry as unnecessary. Misgivings aside, it often supported tung oil and other non-basic crops at prices well above market but less than basic crops and afforded producers a way in which to profit through CCC loans. Unwilling to jeopardize foreign relations, the government drew the

[1] "Agriculture: A Hard Roe to Hoe," *TIME Magazine*, April 5, 1963.

line at low quotas and high tariffs.[2] Such actions fell short of tung growers' expectations but helped to perpetuate a crop that could not persist without government aid. By extending and withholding parity and subsidies, the federal government prolonged the decline of the domestic tung oil industry.

When Dwight D. Eisenhower became president, *American Tung News* reported the event as "one of the best breaks the American tung industry has had in some time."[3] Equating Republicans with business and industry, tung growers assumed Eisenhower would act favorably toward agro-industrial production. While he claimed to have no objections to parity during the 1952 election, he favored less government intervention and disliked subsidies.[4] Eisenhower did, however, express a willingness to support flexible price supports. At Kasson, Minnesota, he said, "I stand behind the price support laws now on the books" and expressed his intention "to continue through 1954 the price supports on basic commodities at 90% of parity."[5] According to his Democratic opponent Adlai Stevenson, Eisenhower had at best misled and at worst lied simply to get the farm vote.[6] In his defense, Eisenhower only said that parity would continue through 1954, perhaps a hint at his true feelings on the matter—he wanted to gradually wean farmers off

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[2] See, "Highlights of CCC Operation," *American Tung News* 7, no. 5 (May 1956): 8.

[3] "What Eisenhower's Election Means to This Industry," *Tung World* 7, no. 5 (Oct 1952): 3.

[4] Reichard, 73. See also, "The President's Commission for Increased Industrial Uses of Farm Products," *Chemurgic Digest* 15, no. 8 (Sep 1956): 16; "President Salutes Chemurgist," *Chemurgic Digest* 15, no. 12 (Dec 1956): 2; and Fite, *American Farmers*, 102.

[5] Edward L. Schapsmeier and Frederick H. Schapsmeier, *Ezra Taft Benson and The Politics of Agriculture: The Eisenhower Years, 1953-1961* (Danville, IL: Interstate Printers & Publishers, 1975), 7-8.

[6] Adlai Stevenson, *The New America* ed. Seymour E. Harris, John Bartlow, and Arthur Schlesinger, Jr. (New York: Harper & Brothers, 1957), 179. Stevenson advocated 90% parity for basic crops. See, Stevenson, 181.

parity. Believing they could earn successful livings without government involvement, Eisenhower believed in 100% parity but parity derived entirely from the marketplace, not the government's coffers.[7] Whatever faith tung growers initially placed in the new president quickly faded.

As archivist/historian Trudy Huskamp Peterson has argued, Eisenhower had "little more than a cursory knowledge of agricultural issues."[8] While he loved chemurgy, later forming the President's Commission for increased Industrial Uses of Farm Products in 1956 and declaring January 5, George Washington Carver Day, he earnestly believed the government had no business in farming. His primary foci remained foreign relations, the spread of democracy and capitalism, and the containment of communism. Eisenhower's solution to the agricultural surplus problem centered on selling abroad. A firm adherent to free trade, he equated parity and subsidies to handouts and bribes for votes and thought these incentives gave farmers "a false and fleeting prosperity."[9] When parity for basic crops remained at ninety percent, he noted that the economy still

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[7] "AGRICULTURE: Revolution, Not Revolt," *TIME Magazine*, May 7, 1956. See also, Geoffrey Perret, *Eisenhower* (New York: Random House, 1999), 515; Wesley McCune, *Ezra Taft Benson: Man With a Mission* (Washington, D.C.: Public Affairs Press, 1958), 19; Stephen E. Ambrose, *Eisenhower: The President* (New York: Simon & Schuster, 1984), 2:160; and Chester Pach, Jr., and Elmo Richardson, *The Presidency of Dwight D. Eisenhower* (Lawrence: University Press of Kansas, 1991), 55.

[8] Trudy Huskamp Peterson, *Agricultural Exports, Farm Income, and the Eisenhower Administration* (Lincoln: University of Nebraska Press, 1979), 7.

[9] Dwight D. Eisenhower, *Waging Peace, 1956-1961* (New York: Doubleday, 1965), 16. See also, Ambrose, 159; Johns, viii; and Chester J. Pach, Jr., "Introduction: Thinking Globally and Acting Locally" in *The Eisenhower Administration, the Third World, and the Globalization of the Third World* ed. Kathryn C. Statler and Andrew L. Johns (New York: Rowman & Littlefield, 2006), xiii.

suffered.[10] While Eisenhower intended to end parity slowly, tung growers continued to demand 90-100% parity—a figure he was unwilling to support.

His choice in a Secretary of Agriculture did not help matters. When Ezra Taft Benson became the new Secretary of Agriculture on January 21, 1953, tung growers initially thought their fortunes had bettered. Born to a farm family in Whitney, Idaho, in 1899, Benson had been involved with farming all his life. After attending Idaho State Agricultural College but later graduating from Brigham Young University and Iowa State University, he became a county agent and later a marketing specialist for the extension service at the University of Idaho, served as Executive Secretary of the National Council of Farmer Cooperatives (1939-1944), and worked as Director of the Farm Foundation (1946-1950).[11] Intent on rolling back New Deal agricultural interventions, Benson thought the federal government should not control agriculture but believed himself to be a "reformer and a genuine friend of the farmer."[12] He argued that farmers had gotten by quite well before government interference and explained that they "should not be placed in a position of working for Government bounty rather than producing for a free market."[13] Hoping to reduce government involvement, Benson hesitantly granted that allowing the creation of semi-government cooperatives for each crop might result in farmers creating their own price support systems. While publicly labeling parity welfare,

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[10] Ambrose, 159.

[11] Schapsmeier, 14, 20-21; Peterson, 7.; and "The New Administration: Secretary of Agriculture," *TIME Magazine*, December 1, 1952. See also, Perret, 424.

[12] Schapsmeier, xvii.

[13] "National Affairs: Down on the Farm," *TIME Magazine*, February 16, 1953. See also, Reichard, 86; and Pach, Jr., *The Presidency of Dwight D. Eisenhower*, 35.

he reluctantly endorsed flexible price supports.[14] Benson's comparison to welfare did not sit well with tung growers and neither did his statement that "no real American wants to be subsidized."[15]

Benson's insistence that smarts and hard work were all farmers needed to be successful may have reflected a cultural amnesia of sorts insofar as he curiously overlooked the farm crisis of the 1920s and ensuing Depression, but he saw himself as an immensely practical man.[16] Thus, he condoned "discretionary" price supports but preferred their use only in cases of disaster.[17] Moreover, he thought (and not without reason) that parity predominately widened the wallets of large farmers and contributed to the surplus.[18] Benson theorized that higher parity encouraged farmers' to default on CCC loans which resulted in the government's ever expanding commodity stock. In fact, he blamed the current surplus problems on Brannan's unwise encouragement of farmers to overproduce.[19] To tackle the problem, he supported the notion of selling surpluses abroad (overseas dumping as some called the practice) and sought to lower parity for non-basic

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[14] Perret, 514. See also, "AGRICULTURE: Thwarted Farmer," *TIME Magazine*, April 6, 1953; "AGRICULTURE: Ezra's Quandary," *TIME Magazine*, July 13, 1953; "AGRICULTURE: Apostle at Work," *TIME Magazine*, April 13, 1953; Cochrane, *Reforming Farm Policy*, 45; and Wayne D. Rasmussen, "The People's Department: Myth or Reality?" in *The United States Department of Agriculture in Historic Perspective* ed. Alan I. Marcus and Richard Lowitt (Washington, D.C.: Agricultural History Society, 1991), 297.

[15] "AGRICULTURE: Apostle at Work," *TIME Magazine*, April 13, 1953.

[16] Benson, *Cross Fire*, 15.

[17] Ibid., 352. See also, Benson, *Cross Fire*, 68.

[18] Ibid., 179.

[19] Ibid., 57.

crops like tung.[20] This made him less than popular in many quarters. As *TIME Magazine* later commented, "Benson had a talent for making enemies and a genius for keeping them."[21] For the remainder of the Eisenhower administration, tung farmers identified strongly with this assessment but their concerns were not confined to Benson.

Preferring that the government instill quotas rather than tariffs, the ATOA wanted the USDA to embargo imports until all domestic production had been sold.[22] This longing stemmed from the annoyance which inevitably occurred when imports rose during domestic harvest time. The government had attempted to solve this problem with the subtreasury-like CCC. Under Section 104 of The Defense Production Act of 1950, Benson had the power to control the imports of fats and oils if domestic production and price supports seemed disrupted. Though this power was scheduled to end on June 30, 1953, free trade advocates, taking into consideration that the U.S. had encouraged Argentine and Paraguayan tung production, dubbed tung import limitation an absurdity.[23] With the looming deadline, tung growers wanted assurance that their interests would be served.

This provided one issue in which the ATOA and TGCA found common ground and worked together. Their mutual efforts, those of politicians like Colmer, and USDA recommendations led Eisenhower to order the Tariff Commission to investigate fats and

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[20] McCune, 88; and Benson, *Cross Fire*, 255. See also, Schapsmeier, 50; and Reichard, 146.

[21] "National Affairs: Benson Baiters," *TIME Magazine*, November 4, 1957.

[22] Marshall Ballard, Jr., "Our Position on Imported Tung Oil," *American Tung News* 4, no. 5 (May 1953): 5.

[23] "Cold War: Trade with Communists," *TIME Magazine*, June 1, 1953.

oils under Section 22 of the AAA at tung hearings on May 8.[24] While the Tariff Commission afforded protection to linseed oil and peanut oil, it maintained that imports did not threaten domestic production so tung needed no further assistance. As result, Section 104 did not receive an extension.[25]

In the aftermath, *American Tung News* claimed that the Tariff Commission "heeded the arguments of Argentina and those in this country whose only interest is in unlimited quantities of tung oil even though the resultant low price cripples or destroys an essential American industry."[26] The ATOA and TGCA complained that 5,000 tung growers and 15,000 tung workers stood to suffer from the end of Section 104 while Argentina profited. For its part, the Argentine Embassy insisted that a continuation of Section 104 would cause great harm to the relations between the two countries, especially given the comparatively minimal U.S. production.[27] Between 1951 and 1953 domestic tung production went from roughly 14,000,000 to 40,000,000 pounds of oil while Argentine production rose from roughly 29,000,000 to 40,000,000 pounds of oil.[28] The

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[24] Roland Becke, "Tung Case Presented Before Tariff Commission," *American Tung News* 4, no. 5 (May 1953); and "Controls Over Tung Oil Imports Necessary-Colmer," *Jackson Daily News*, April 2, 1953. Under Section 22 of the AAA, the Secretary of Agriculture could suggest to the president that the Tariff Commission hold hearings. See, Marshall Ballard, Jr., "A Continuous Fight for Tung," *American Tung News* 10, no. 10 (Oct 1959): 10-11.

[25] "Tariff Body Ignores Growers' Pleas Findings of USDA," *American Tung News* 4, no. 6 (June 1953): 3. See also, "NPVLA Deplores Limitations on Imports," *American Tung News* 4, no. 6 (June 1953): 18-19; and Anthony Leviero, "Eisenhower Seeks Import Curb," *New York Times*, July 9, 1953.

[26] "Decision of Tariff Commission," *American Tung News* 4, no. 7 (July 1953): 8. On objections to the findings of the Tariff Commission, see also "Tariff Commission Cites Reasons for No Tung Restrictions," *American Tung News* 4, no. 7 (July 1953): 10.

[27] "Argentine Spokesman Objects to Tung Oil Import Restrictions," *American Tung News* 4, no. 6 (June 1953): 9.

[28] Duane W. Hadsell, "Tung Oil Industry in Florida (revised edition*)," State of Florida Department of Agriculture Bulletin* no. 11 (Sep 1955): 25. In that time, Paraguayan production rose from

refusal of the federal government to enact quotas or tariffs left tung farmers frustrated but recalcitrant in their fight for aid.

When the USDA finally acted in 1953, growers, refusing to see the government's position, responded with annoyance rather than relief. The USDA looked with suspicion upon wealthy growers acquiring CCC loans and wanted to prevent further abuse of the system. Between 1949 and 1952, CCC consumption of tung leaped from 1,568,000 to 5,000,000 pounds, and the price jumped from 24.1 to 37 cents a pound.[29] Seeking to lessen CCC purchases, Benson placed a two million pound quota on tung imports to last between April 8 and June 30, 1953.[30] While intended as a concession, growers thought the quota too low. Despite this step, the CCC's mind boggling 39,200,000 pounds of tung oil continued to increase as growers kept defaulting their crops.[31] Refusing to admit culpability in their dependence on the government, growers instead set about improving their industry.

In the early 1950s, tung growers strove to better their industry and attract more attention. First, to address the problem of tung thieves cashing in on nuts, mills started

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3,970,000 to 7,700,000 million pounds of oil. Brazilian production went from 1,830,000 to 2,000,000 million pounds of oil.

[29] "Tung Oil: War Essential, Supreme in Drying Field," *American Tung News* 5, no. 4 (April 1954): 7; "Commodity Purchase," December 29, 1954; and Folder: Tung Oil Production: Louis Chenel, 1943-1967, LECFP, SC, HML, LSU. In 1954, Chenel acquired a CCC loan and in a purchase agreement, received $399.13 for 1,670 lbs. See, Purchase Agreement Settlement," February 8, 1955; and Commodity Purchase, February 8, 1955, LECFP, SC, HML, LSU. In 1956, he got a loan for $13,123.74 for 62,494 lbs. See, Commodity Loan Form B (3-20-56), LECFP, SC, HML, LSU.

[30] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 10-11; and "Tung Imports Limited," *New York Times*, April 8, 1953.

[31] "39,200,000 Pounds of Tung Oil Under CCC," *American Tung News* 5, no. 8 (Aug 1954): 5.

demanding proof of ownership from registered growers.[32] Second, intensified publicity to attract small farmers to the industry renewed. More often than not, these items celebrated those who had made extra money with either fence row trees or an acre or less. In a piece entitled "Nothing on Farm Pays Like Tung," *Tung World* reported that L. Q. Landrum of Picayune earned $120 from one acre.[33] In another one called "Barnyard Trees Bring Cash," the journal reported that Lim Ownes of Carriere, Mississippi, made $75 a year on just one-eighth of an acre of tung trees.[34] With these frequent testaments, growers hoped to strengthen their ranks with small farmers. Vowing to prove the advantage of power in numbers, some growers formed a large cooperative.

Attempting to have better control over their own market, a group of tung growers, including Crosby, Jr., Ballard, Jr., and Pliny E. Daniels of Irvington, Alabama, formed the National Tung Oil Marketing Cooperative (NTOMC) on September 15, 1953. Although tung cooperatives had been in existence for years, the NTOMC proved the first with significant membership. The aims of the organization included marketing tung oil and tung nuts, estimating costs, and stabilizing prices.[35] While its membership grew, its success rate at impacting the market proved mediocre. The NTOMC managed to aid tung growers only when the market price of tung oil surpassed the price support. Often, the

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[32] "Rustle Tung Nuts in La. and Miss.," *Tung World* 7, no. 11 (Apr 1953): 12; and "Turkey Dinners Mark TGCA Meeting," *Tung World* 6, no. 6 (Nov 1951): 14.

[33] "Nothing on Farm Pays Like Tung," *Tung World* 6, no. 8 (Jan 1952): 6.

[34] "Barnyard Trees Bring Cash," *Tung World* 6, no. 8 (Jan 1952): 6.

[35] "Tung Producers Vote for Ceiling on Oil Prices," *Jackson Daily News*, November 28, 1953.

market price dropped below price support level and intensified the coop's efforts to gain higher parity.[36]

Under Eisenhower, parity remained steady at 60% but growers wanted 90%, an unrealistic demand for a non-basic crop. From the government's perspective, it stood to reason that lower price supports lessened production which made market prices rise. For their part, tung growers could not afford to cut production and needed every pound of oil their trees could produce. They had grown to believe that parity, not market prices, provided the most satisfying payments.[37] Indeed, many banks took parity into consideration when making loans to farmers.[38] Unfortunately, figures in Table 5.1 reveal that after 1949, parity had been stagnant. While subsidies remained in the limelight with the Midwest's emphasis on corn and the South's infatuation with basic crops like cotton, tung parity spiraled downward.[39]

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[36] W. Wilson Kilby, "The American Tung Nut Industry," *Agricultural Science Review* 8, no. 4 (1970): 32.

[37] Schampsmeier, 80; and Harold G. Halcrow, *Agricultural Policy of the United States* (New York: Prentice-Hall, Inc., 1953), 283; and H.R. 9680 [Report No. 1927], 83rd Congress, 2nd Session, Union Calendar No. 708; and Agricultural Act of 1954, Report No. 1927, 83rd Congressional, 2nd Session, Box 32, Tung Oil, BSP, SC, MML, MSU.

[38] "A Statement by the American Tung Oil Association in Support of Continuation of a Mandatory Support Price Program for Tung nuts Concurred by the National Tung Oil Marketing Cooperative, Inc.," p.6, Box 32, Tung Oil, BSP, MML, MSU.

[39] Fite, American Farmers, 141.

Table 5.1 Tung oil and nut parity, 1949-1955[40]

Year	Parity	Support (lb oil)	Support (ton nut)	Market (lb oil)
1949	60 %	24.1	$60	
1950	60	25.1	63	
1951	60	26.5	67.20	39.1 cents
1952	62.2	26.5	67.20	28.6
1953	65	23.9	63.38	23.8
1954	60	21.2	54.96	23.3
1955	60	19.9	50.70	24.4

When discussing ideas for farm reform on January 11, 1954, Eisenhower stated, "Tung nuts and honey would be in the same category with other products for which price supports are permissive rather than required" and continued with his opinion that "mandatory price supports for these commodities be discontinued."[41] Shocked, tung growers suspected that without higher parity, cultivation and marketing expenses would exceed market price.[42] They also felt slighted in favor of "political crops" as Eisenhower liked to call basic crops.[43] Plus, banks and the PCA based crop loans partly on support price levels. Their fears realized, most tung growers looked to state politicians to represent their cause.

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[40] "U.S. Department of Agriculture Advocates Import Quotas for Good of Tung Industry," *American Tung News* 4, no. 6 (June 1953): 10-11; "Tung Support Price $63.38 Per Ton, 23.9 Cents Per Pound," *American Tung News* 4, no. 10 (Oct 1953): 3; "Tung Support Price $54.96 Per Ton," *American Tung News* 5, no. 10 (Oct 1954): 3; "Decision of C.C.C. Is Another Stab in The Back," *Tung World* 6, no. 5 (Oct 1951): 3; "New Support Price for Tung Oil," *Tung World* 12, no. 10 (Oct 1955): 3; and United States Tariff Commission, "Tung oil and Tung Nuts, Report to the President on Investigations No. 22-23, Under Section 22 of the Agricultural Adjust Act, as Amended, Oct 1960," p.25, Box 804, Tung Oil (6), WHCF, DDEPLM.

[41] "The President's Farm Message," *American Tung News* 5, no. 1 (Jan 1954): 4.

[42] "Tung Oil: War Essential, Supreme in Drying Field," *American Tung News* 5, no. 4 (April 1954): 7.

[43] Perret, 515.

Colmer, jovially dubbed a "Tung Nut" by *American Tung News*, urged the government to make tung oil a basic commodity. This privileged status stood to boost its parity price from 60-90% to 80-100%.[44] The Mississippi legislature even sent a joint resolution to Congress not only urging the continuation of tung price supports but demanding that tung be given at least ninety percent parity, the same percentage as cotton, peanuts, and soybeans.[45] On April 1, both the House and Senate Agricultural Committee held hearings to discuss the desires of Colmer but committee members remained unconvinced that a small, non-basic crop warranted ninety percent parity.[46] Although the House bill supported the maintenance of support, the Senate adopted the measure after pressure from the Senate Agricultural Committee. In the end, parity for tung continued, albeit on a flexible scale of 60-90% parity under the Agricultural Act of 1954 whereas parity for basic crops like cotton remained at 82.5-90%.[47] Simultaneously

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[44] "Colmer Makes House 'Tung Minded,'" *American Tung News* 5, no. 7 (July 1954): 5. See also, "Colmer, Sikes Seek to Classify Tung as Basic Commodity," *Jackson Daily News*, April 1, 1954. The Eisenhower Administration kept track of all Tung Belt politicians. In 1954, the list included Senators Allen J. Ellender (D-LA), Walter F. George (D-GA), Spessard L. Holland (D-FL), Russell B. Long (D-LA), George A. Smathers (D-FL), and John S. Stennis (D-MS) as well as Representatives Frank W. Boykin (D-AL), Hale Boggs (D-LA), William M. Colmer (D-MS), George M. Grant (D-AL)), F. Ed. Hebert (D-LA), A. S. Herlong, Jr., (D-FL), D.R. Matthews (D-FL), James H. Morrison (D-LA), J.L. Pilcher (D-GA), and Robert L.F. Sikes (D-FL). See, "Tung Oil: Senators-Congressmen Who Correspond w/White House," Box 803, Tung Oil (1), WHCF, DDEPLM.

[45] "Mississippi Legislature Requests Fair Tung Support," *American Tung News* 5, no. 2 (Feb 1954): 5.

[46] "Washington Hearings on Tung April 1," *American Tung News* 5, no. 3 (March 1954): 3.

[47] "Colmer Makes House 'Tung Minded,'" *American Tung News* 5, no. 7 (July 1954): 5; "Eastland Reports on Tung Legislation," *American Tung News* 5, no. 7 (July 1954): 6; and "More on the Farm Problem," *Chemurgic Digest* 13, no. 9 (Oct 1954): 16. See also, "Mandatory Price Support for Tung Apparently Continues in Effect," *American Tung News* 5, no. 8 (Aug 1954): 2. Eisenhower did not see the Agricultural Act of 1954 as a "cure all" but rather "a firm stride toward sanity" according to Benson. See, Benson, *Cross Fire*, 211.In the aftermath, Eisenhower remained unsatisfied because he wanted support for basic crops to be 75-90% rather than 82.5-90%. Support for the Senate bill included 44 Republicans and

relieved that parity would not cease but upset that it would not increase, tung growers looked once more at ways to combat foreign competition.

Unable to achieve satisfactory parity, tung farmers increased their pressure on the government to control imports. Hoping to illicit sympathy from Eisenhower, Crosby, Jr., for one, criticized the various federal departments for their conflicting positions. Mrs. Crosby even sent the president a jar of tung oil as a gift.[48] John Wisdom, attorney for the ATOA, TGCA, and NTOMC, believed in free trade but said, "sometimes I find my philosophy bending . . . we are supporting the Argentine growers at the expense of orderly marketing . . . thereby defeating the purpose of the price control program."[49] In a talk before the Tariff Commission, Wisdom said something had to be done to prevent the majority of domestic production from going into CCC tanks.[50] Before a Tariff Commission meeting on August 19, 1954, a tung representative insisted that imports, primarily Argentine imports, the level of which can be seen in Table 5.2, had been "strangling domestic production."[51] While his argument may have been exaggerated, Argentine imports had doubled in just a few years.

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18 Democrats while opposition consisted of 3 Republicans, 24 Democrats, and 1 Independent. See, "Tung Support Apparently Safe in New Legislation," *American Tung News* 5, no. 8 (Aug 1954): 3.

[48] On Crosby, see, Gabriel Hauge to Mr. Crosby," May 3, 1954, Box 803, Tung Oil (1); True D. Morse to Thomas E. Stephens, April 22, 1954, Box 803, Tung Oil (1); and L.O. Crosby to The President, April 8, 1954, Box 803, Tung Oil (1), WHCF, DDEPLM. On other grower letters to Eisenhower, see, for example, Nettie Dorsett to The President, Nov 2, 1954; Dr. H. H. Parker to The President, Nov 2, 1954; E. M. Bufkin to The President, Nov 2, 1954; and Lamont Rowlands to The President, Oct 27, 1954, Box 803, Tung Oil (1), WHCF, DDEPLM.

[49] John Wisdom to Gabriel Hauge, Aug 27, 1954, Box 803, Tung Oil (1), WHCF, DDEPLM.

[50] Statement on Behalf of the Tung industry before the United States Tariff Commission under Section 22 of the AAA, Box 803, Tung Oil (1), p.6, WHCF, DDEPLM.

[51] "Restrictions on Imports of Tung Oil," *American Tung News* 5, no. 9 (Sep 1954): 6.

Table 5.2 Country of origin of tung oil imports, 1951-1954 (thousands of lbs) [52]

Country of Origin	1951	1952	1953	1954
Argentina	14,398	23,191	20,943	30,464
Brazil	703	1,913	0	1,102
British East Africa	0	336	100	457
Rhodesia/Nigeria	0	66	168	336
China	11,170	8	0	0
Hong Kong	1,702	0	0	0
Indo-China	0	0	218	0
Japan	0	60	0	0

Domestic growers may have blamed declining prices solely on imports, but the main consumers, the NPVLA, objected to quotas.[53] Oscar A. Bugne, an Economic Counselor to the Argentine Embassy, even threatened that a quota would jeopardize future Argentine tung oil shipments.[54] Threats aside, Eisenhower preferred quotas to tariffs and after much thought, decided to establish a quota on tung oil. He soon announced a voluntary agreement in which Argentina and Paraguay could export up to 21.8 million pounds and 2.6 million pounds, respectively, for a total of 24.4 million pounds a year to the U.S. While Eisenhower expressed pride over this tri-national compromise, domestic growers were appalled by the settlement. They much preferred the Tariff Commission's suggestion of limiting Argentine and Paraguayan exports to the U.S. to 10.8 million pounds a year and wanted quotas for all tung producing countries, not simply those two. They took offense to the fact that the exports of other countries had not

[52] Duane W. Hadsell, "Tung Oil Industry in Florida (revised edition)," *State of Florida Department of Agriculture Bulletin* No. 11 (Sep 1955): 26.

[53] "Domestic Producers of Tung Oil Appeal for Import Quotas," *New York Times*, August 11, 1954; and Joseph F. Battley to Gabriel Hauge, April 5, 1954, Box 803, Tung Oil (1), WHCF, DDEPLM.

[54] "Domestic Producers of Tung Oil Appeal for Import Quotas," *New York Times*, August 11, 1954.

been taken into consideration. With such high quota levels, tung farmers feared below parity market prices and lower loans.[55] Ironically, all of these factors made tung oil a surplus crop alongside the likes of tobacco, soybeans, and rice.[56] While the U.S. exported its edible surplus commodities to foreign countries under the Agricultural Trade Development and Assistance Act of 1954, the inedible tung oil continued to be sold domestically and abroad by the CCC.[57] As growers witnessed the tung oil industry pendulum swing from shortage to surplus, they fumed over their seeming inability to instigate desired change in the form of acceptable quotas. To make matters worse, the worst freeze in the industry's history hit the Gulf Coast.

Mother Nature, best friend and worst foe to farmers, had struck the Tung Belt with freezes in 1950, 1951, 1953, and 1954 so it came as little surprise that a frost came the following year.[58] The shock value lay in the destruction of two particularly terrible freezes on March 22-23, 1955, which destroyed the bulk of that year's crop. In the

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[55] "President's Announcement," *American Tung News* 5, no. 12 (Dec 1954): 3; and James P. Mitchell to Honorable Percival F. Brundage, June 26, 1957, Box 23, Tung Oil-Section 22 (2), Phillip Areeda Papers, Dwight D. Eisenhower Presidential Library and Museum, Abilene, KS [hereafter PAP, DDEPLM]. On Eisenhower's interest in maintaining cordial relations with those two countries, see Stephen G. Rabe, *Eisenhower and Latin America: The Foreign Policy of Anti-Communism* (Chapel Hill: University of North Carolina Press, 1988), 76.

[56] "U.S. Farm Supports at New Record High," *New York Times*, April 5, 1955; and James C. Hagerty, Press Secretary to the President, "The White House," Box 803, Tung Oil (1), WHCF, DDEPLM. On the Tariff Commission's recommendations, see United States Tariff Commission, "Tung Nuts and Tung Oil: Report to the President Under Section 22 of the Agricultural Adjustment Act, as Amended, September 1954, Box 803, Tung Oil (1), WHCF, DDEPLM.

[57] On the Agricultural Trade Development and Assistance Act, see Alan I. Marcus and Amy Sue Bix, *The Future is Now: Science and Technology Policy in America Since 1950* (New York: Humanity Books, 2007), 36.

[58] Edmond N. O'Rourke, Jr. and Marshall S. Neff, "Test Trees for Cold Resistance," *Tung World* 6, no. 3 (Aug 1951): 5; and Annual Report 1955, USDA Farm Machinery Section, Tung Production and Harvesting Machinery, A81-8, Box 1, Annual Report Tung Machinery Investigations, p.4, WWK, SMBES, CPRC, MML, MSU.

aftermath, many tung mills had nothing to process and either closed for the year or considered adapting to other crops like soybeans. Growers faced two simultaneous crises, maintaining consumers and acquiring loans. First, with the bulk of domestic production depleted, even the ATOA realized the need for imports and CCC stock in order to meet consumer demand. Its then President Ballard, Jr., and Vice-President Ellen S. Woodward, former member of the Mississippi state legislature, New Deal activist, and owner of tung groves in Pearl River County, even wanted the Commodity Stabilization Service (CSS) to sell any of its tung holdings to consumers.[59] Second, the financially injured tung growers needed loans to compensate for their losses. With the exception of the Gainesville, and Tallahassee, Florida, areas, no part of the coast remained unscathed by this cold wave, but only Mississippi attracted the attention of the federal government.[60]

This special treatment likely derived from Mississippi having the most tung acreage. Occasionally, the FHA awarded disaster relief to tung growers.[61] On April 13, the USDA approved fourteen Mississippi counties for emergency loans. Unfortunately, a technicality passed by the USDA on May 5, limited catastrophe loans to "true farmers,"

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[59] Marshall Ballard, Jr. to H. Romer McPhee, Sep 22, 1955, Box 803, Tung Oil (2); and Marshall Ballard, Jr., to Ezra T. Benson, July 25, 1955, Box 803, Tung Oil (2), WHCF, DDEPLM. See also, R. R. Becke to Boswell Stevens, Oct 18, 1955, Box 16, Folder: American Tung Oil Association, 1955-1958, BSP, MML, MSU. Woodward purchased 320 acres in Pearl River County in the late 1930s and encouraged by Crosby, planted tung. When her husband passed away in 1925, she finished his term in the state legislature. She then served on the Mississippi State Board of Development until 1933 when asked by FERA director Harry L. Hopkins to form a work relief program for women. Impressed with her work, Roosevelt appointed her to a three member Social Security Board in 1938. See, Martha Swain, *Ellen S. Woodward: New Deal Advocate for Women* (Jackson: University Press of Mississippi, 1995), 194-195; and "Mrs. Ellen Woodward, New Washington Aide, Vice President ATOA," *American Tung News* 6, no. 11 (Nov 1955): 14.

[60] "Many Crops Suffered in Wide Area Hit by Late March Freeze" *American Tung News* 6, no. 4 (April 1955): 3.

[61] "Emergency Loans for Tung Farmers," *Tung World* 10, no. 4 (April 1955): 1; and H. C. Smith to Congressman Colmer, April 12, 1955, Tung Oil (1955), Box 338, Folder 4, CWMP, MLA, USM.

only those who primarily farmed for a living. This meant that 50-70% of tung growers were ineligible for disaster loans.[62] While Benson acknowledged the array of family farmers in the country, many politicians confined their sympathy to what they called "the family farmer."[63] This classification had significant faults given that families managed most large farms and neo-plantations. The USDA limitation stood and tung growers panicked.

Convincing the USDA to reverse its decision on disaster loan eligibility posed quite an ordeal for growers. Arguing that the disaster loans contravened the Farm Emergency Loan Act, Gulf South politicians appealed to Undersecretary of Agriculture True D. Morse. While Colmer reiterated that tung remained important to the coastal economy, Senator Holland contended that without loans, many growers might abandon tung, an action which would leave thousands of pickers and mill workers without expected income. Stennis commented, "I don't feel that persons who are farmers but who also engage in other activity should be eliminated if their farming operations are substantial and if they are able to otherwise qualify for a loan."[64] Congressman Donald R. Matthews (D-FL) simply expressed the belief that the federal government should help tung growers because "they are in an industry that has done everything in God's world to

[62] "Emergency Loans for Tung Farmers," *Tung World* 10, no. 4 (April 1955): 1. The Mississippi counties eligible for support included Forrest, George, Greene, Hancock, Harrison, Jackson, Jones, Lamar, Marion, Pearl River, Perry, Stone, Walthall, and Wayne. See, Administrator to Congressman Colmer, April 19, 1955, Tung Oil (1955), Box 338, Folder 4, CWMP, MLA, USM.

[63] Benson, *Cross Fire*, 333.

[64] "USDA Declines to Accede to Request of Growers, Legislatures," *American Tung News* 6, no. 5 (May 1955): 3. The meeting in which southern politicians met with Morse included Colmer, Holland, Stennis, Ellender, Long, and Matthews; Chairman of House Agricultural Committee Harold D. Cooley (D-NC); member of House Agricultural Committee Thos. G. Abernathy (D-OK); Commodity Stabilization Service Administrator Earl M. Hughes; and Commodity Stabilization Service Oils and Peanut Division Director James E. Thigpen.

help themselves."[65] While those present at this meeting presented persuasive arguments, Morse remained unmoved.

That same year, Morse turned down the Tung Act of 1955 (S.2026) and further wrecked the dreams of tung farmers. The bill, intended to raise parity to 80-100%, limit imports, and control domestic marketing, had been co-sponsored by Senators Long, Eastland, John Sparkman (D-AL), and Lister Hill (D-AL) after being introduced by Representative Robert Sikes (D-FL).[66] Morse based his verdict on several reasons. First, the impact of cold weather on a delicate crop made tung futures impossible to estimate. Second, after World War II, especially after the Chinese embargo, the price of tung oil escalated while consumption declined from 100 million to 50 million pounds. Third, ending or even decreasing imports stood to drop consumption levels, skyrocket prices, and lead to market allotments. Fourth, since the AAA of 1949, the government had supported tung at sixty percent parity except in 1952 and 1953 when parity had been sixty-two percent and sixty-five percent, respectively. Fifth, tung oil had been selling below parity price which meant the CCC acquired most of each year's domestic production.[67] This CCC controversy dominated much of the political discourse pertaining to tung.

While responsible for its accumulation, tung growers saw CCC stock as competition for domestic consumers. This was a faulty viewpoint considering that the

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[65] "USDA Declines to Accede to Request of Growers, Legislatures," *American Tung News* 6, no. 5 (May 1955): 3.

[66] "Tung Act Introduced in the Senate," *Tung World* 10, no. 5 (May 1955): 1. See, for example, Gabriel Hauge to Mr. Ballard, Oct 5, 1955, Box 803, Tung Oil (2), WHCF, DDEPLM.

[67] "Agricultural Department Turns Thumbs Down on Tung Proposal," *American Tung News* 6, no. 9 (Sep 1955): 5.

CCC often sold its tung holdings abroad at a loss. With this in mind, Morse deemed it utter lunacy for tung growers to expect 80-100% parity. He believed that the government not only supported tung growers more than it should but had lost taxpayers' money in the process. Noting the frequent freezes along the Gulf Coast, Morse thought the U.S. needed more imports not less.[68]

The double disappointments of freezes and the failed Tung Act placed growers in a precarious quandary. Assuming that increased production would change Eisenhower's mind, growers mulled over combating freezes with smoke generators and wind machines, but these avenues had high prices and heaters alone amounted to eighteen dollars an acre per year. Small domestic production levels sparked Eisenhower refusal to allow the Tariff Commission to investigate future quotas. In fact, he ordered that after November 1, 1955, quotas would no longer be attached to Argentine imports.[69] Even though the CCC still had large tung oil stocks which meant excessive storage costs, the president had deregulated imports.[70] Likely, Eisenhower used the freezes as a convenient way to eliminate quotas he earnestly saw as unnecessary. Whatever the case, tung growers became more and more aware of the complex contradictions in politics, especially given the president's new pet project.

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[68] "Tung Oil Imports Ended by Presidential Order," *American Tung News* 6, no. 11 (Nov 1955): 3; and "Agricultural Department Turns Thumbs Down on Tung Proposal," *American Tung News* 6, no. 9 (Sep 1955): 5.

[69] "Immediate Release James C. Hagerty, Press Secretary to the President, The White House Office, Lowry Air Force Base Denver, Oct 27, 1955, Box 803, Tung Oil (2), WHCF, DDEPLM; "Tung Oil Imports Ended by Presidential Order," *American Tung News* 6, no. 11 (Nov 1955): 3; "Ban on Tung Oil Lifted," *New York Times*, November 9, 1955; and George F. Potter and H. L. Crane, "Practical Frost Protection for Tung Trees," *Tung World* 6, no. 3 (Aug 1951): 9-11.

[70] On CCC storage costs in general, see, for example, Ezra Taft Benson as told to Carlisle Bargeron, *Farmers at the Crossroads* (New York: Devin-Adair, 1956), 29.

The conviction tung growers had that the president cared only about basic crops strengthened with the passage of one of the strangest pieces of agricultural legislation ever passed—S.3183, the Agricultural Act of 1956 or more commonly known as the Soil Bank. Participants in this venture received monetary payments in exchange for idling lands or switching to grass or non-surplus crops. Farmers were paid not to grow so as to lessen surpluses of cotton, corn, wheat, peanuts, rice, and tobacco. Benson thought the plan inane but hoped it might lower the surplus while Eisenhower thought it an expedient if not permanent solution to the surplus problem. While it may have benefitted farmers of basic crops, it did not aid farmers of non-basic crops like tung. Even if it had included non-basic crops, tung, given its confinement to the Gulf Coast, would probably not have been among the crops selected. *American Tung News* dismissed the Soil Bank.[71] Tung growers later felt vindicated when the Soil Bank produced dismal results when most farmers idled subpar lands and often turned from one basic crop to another causing surpluses to rise and market prices to drop.[72] They braced for Eisenhower's reelection, expecting further threats to tung parity.[73] Some solace came from the numerous successes scientists had made to make tung oil processing more efficient and increase the number of tung oil markets.

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[71] "More about Farm Legislation," *American Tung News* 7, no. 2 (Feb 1956): 4; Pach, Jr., *The Presidency of Dwight D. Eisenhower*, 125; and Benson, *Cross Fire*, 291-293.

[72] Schapsmeier, 127; "AGRICULTURE: A Pest-Ridden Harvest," *TIME Magazine*, April 23, 1956; "AGRICULTURE: How to Fight a Hydra," *TIME Magazine*, December 23, 1957; Cochrane, *Reforming Farm Policy*, 45; Hurt, *Problems of Plenty*, 113; Ambrose, 496; and Conkin, 129.

[73] Sean J. Savage, *JFK, LBJ, and the Democratic Party* (Albany: State University of New York Press, 2004), 49. See, Charles A. H. Thomson and Frances M. Shattuck, *The 1956 Presidential Campaign* (Washington, D.C: Brookings Institute, 1960), 95, 255.

In the 1950s, scientists became more acquainted with the risks associated with tung. Tung hulls had a reputation for randomly erupting into flames as they deteriorated while tung oil could do the same during heating. Growers and millers along the coast had long faced tung-related fires as had industrialists so the danger had been substantiated. For years, the O'Brien Corporation of South Bend, Indiana, for example, worked on thermolyzing tung oil. In the words of its representative M. F. Taggart, tung oil, when heated to 650 degrees Fahrenheit, "three times as hot as boiling water, suddenly takes fire, boils over and well, self-defense and discretion prompts one to run away, pulling the fire alarm on the way out."[74] Scientists attempted to solve or at least lessen the fire hazard by mixing the far less volatile soya oil with tung. All tung oil applications required heating so safety precautions proved essential.[75]

If not heated at all, tung oil dried into a foamy or cheesy looking film but if heated properly tung oil produced many positive effects. For example, when used to make enamels, the heated product did not become splotchy after the addition of coloring. When warmed to high levels, it gelled rather quickly. The cause lay in its eleostearic acids meshing with highly reactive glycerides. To prevent this, scientists tried several avenues by combining soya, linseed, or other oilseeds with tung. Mixing zinc resinate with tung also helped, a fact which provided yet another link to the southern pine industry. This

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[74] M. F. Taggart, "The Wonders of Tung Oil," Presented before the Fourth Annual Chemurgic Conference at the Rice Hotel, Houston, Texas, March 4, 1949, 4, Box 19, Folder 1, Tung Oil, FCC, UAHC, MSU.

[75] "Tung Oil Means Riches to South Asserts Morris," *Times-Picayune*, February 4, 1934, 10. On thermolyzation, see also M. F. Taggart, "Fats and Oils as Used in the Paint, Varnish and Lacquer Industry," *Chemugic Papers* 1, no. 539 (1947): 1.

combination gained mass attention from various manufacturers and even state highway departments.[76] While heating tung oil posed many challenges, drying presented few.

Given tung oil's tendency to oxidize, many scientists hoped to shorten drying time and use it to increase the drying times of alternative oils. Soybean oil took a considerable amount of time to dry if used alone but when mixed with tung, dried at an adequate pace. Tall oil, a byproduct of paper manufacturing, had rosin acids and fatty acids which, upon reacting with glycerine, had a subpar drying time. Once refined and distilled, tall oil dried faster, especially when combined with tung. Mixtures containing tung possessed faults, namely proneness to emulsify or separate. For example, tung oil monoglycerides and ammonium eleostearate did not mesh initially but given time, combined. Resultant products were often used in textiles, varnishes, and agricultural sprays.[77] Although these various alternative oils posed threats, growers preferred to think of tung-rival oilseed mixtures as much needed demand in a time where many paint and varnish companies no longer saw tung as a necessity.

By the 1950s, tung oil had only a tiny role in the oilseed market. Paint and varnish companies saw it as expendable. The post-war suburban boom relied more and more on

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[76] Aaron Altschul, "New Uses, New Markets for Tung Oil," *American Tung News* 8, no. 7 (July 1957): 5; "TV Covers Story on Tung Oil," *American Tung News* 10, no. 9 (Sep 1959); "For P.M. Release August 5," Washington, July 23, 1959, United States Department of Agriculture 2020-59, Box 19, Folder 21, Tung Oil, FCC, UAHC, MSU; Taggart, "Fats and Oils Used in the Paint, Varnish, Enamel, and Lacquer Industry," *Chemurgic Papers* 1, no. 539 (1947); "Ways to Prevent Tung Oil Gelling," *Chemurgic Digest* 18, no. 10 (Oct 1959): 10; "'Tung' is Basis for Colored Enamel," *Springfield Republic* (Massachusetts), June 1, 1924; Raiford L. Holmes et al., "The Characteristics of Domestic Tung Oils," *The Journal of American Oil Chemists' Society* 31, no. 10 (1954): 417-418; and Kopacz, 285.

[77] Planck, "Current Research on Tung Oil at the Southern Regional Research Laboratory," Box 19, Folder 21, Tung Oil, FCC, UAHC, MSU; T. H. Hopper, "Tung Utilization Research," *American Tung News* 8, no. 1 (Jan 1957): 6; Jack Greenfield, "Another Outlet: Fortifying Tall Oil with Tung Oil," *American Tung News* 8, no. 7 (July 1957): 7; and "Science: Jack & the Soybean," *TIME Magazine*, September 15, 1941.

brick and concrete rather than wood and this caused tung consumption to fall further. To reverse this trend, scientists tried to make tung oil varnishes second to none in wood protection. As early as 1950, paint companies had adopted alkyd resins, polyesters meshed with fatty acids, or synthetic oils, more often than not poly-functional alcohol and acid. Although alkyd varnishes proved less expensive, they had a significant fault, namely resistance to water and little else whereas tung oil could withstand the elements and countless chemicals. In response, tung scientists began creating tung oil alkyd vehicles. In 1955, Crosby Forest Company in Picayune, for example, sold VarTung Paint made from tung oil alkyd resins. Another good example later came in the form of Tungspar Speed Varnish, made by the C. A. Woolsey Company of New York City, which could endure dampness, salt, exhaust, and detergents.[78] While tung alkyds had faithful consumers, scientists looked for other ways to improve and broadcast the positive qualities of tung oil.

Scientists tried to find ways to increase adhesiveness, lessen wrinkling, and make tung fire proof. They found that tung oil and epoxy resins, known for sticking power and solidness, made great paint. Creating epoxy-resin tung paint proved trying as the two tended to separate when mixed. In time, scientists discovered that the addition of a zinc resinate sparked the needed acidic exchange.[79] A test performed by the David Litter Lab

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[78] T. H. Hopper, "Tung Utilization Research," *American Tung News* 8, no. 1 (Jan 1957): 6; "Crosby Laboratory Announces New Uses for Tung Oil," *American Tung News* 7, no. 7 (July 1956): 10; "Modern Paint Factory, Offices, Laboratory Under Construction," *American Tung News* 6, no. 8 (Aug 1955): 7; and "C. A. Woolsey Company Develops New Coating Utilizing Tung Oil," *American Tung News* 10, no. 9 (Sep 1959): 17. Crosby built a paint factory and lab in 1955.

[79] "Tougher Coating from Tung Oil," *Agricultural Research* (June 1958), USDA, Box 19, Folder 21, Tung Oil, FCC, UAHC, MSU; Aaron Altschul, "New Uses, New Markets for Tung," *American Tung News* (July 1957): 5; and R. O. Austin, "Paint Daubs," *American Tung News* 15, no. 9 (Mar 1964).

in New York City revealed that tung oil in latex emulsion paints had fabulous adhesiveness. A good combination of such a paint included vinyl-acrylic, surfactant, and polyvinyl acetate. To reduce wrinkling, scientists found that pre-polymerizing and heating with disulfides helped. While fine-tuning existing paints and creating new ones, the SRRL and the U.S. Army Engineer Research and Development Lab explored fire retardant paints. Their scientists achieved success with carbonific additives which shielded the paint from heat and fire.[80] Much as synthetic oils utilized and inspired more tests on tung while threatening its status in the market, so did plastics.

Creating tung oil plastics took many years of study by scientists. Plastics had become increasingly popular in the aftermath of World War II but had morphed through numerous developments. Early plastics included celluloid, created in 1869, a phenol and formaldehyde mix called Bakelite in 1907, and polymethyl metharylate or Lucite in 1937. Tung oil plastics first appeared in the 1920s, but in 1926, Joseph G. Davidson, recognizing the fluctuation of tung oil imports and prices, tried to replace tung oil-based plastics with polyvinyl chloride. In the process, he formed Vinylite, a combination of vinyl chloride and vinyl acetate. By the 1950s, the number and kinds of plastics came to include phenolic resin, cellulose acetate, vinyl polmers, acrylic, and polystyrene but tung

[80] "Research Project at North Dakota Nears Completion," Box 20, Folder 3,Tung Oil, FCC, UAHC, MSU; "Tung Oil Article Appears in Journal," Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU; Sidney B. Levinson and Ronald Beers, "Modifiers for Exterior Latex Emulsion Primers," *American Paint Journal* 45, no. 34 (May 1961): 76-85; Planck, "Tung Oil Review, 1951-1952," 588; and Eric T. Rayner, Gerald B. Berburg, David A. Yeadon, Lucian L. Hopper, Jr., and Harold P. Dupuy, "Water-Resistant, Tung Oil Containing Intumescing Fire-Retardant Coatings," Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU. On tung polymerization, see also Rafael L. Quirino and Richard C. Larock, "Bioplastics, Biocomposites, and Biocoatings from Natural Oils," in *Renewable and Sustainable Polymers ACS Symposium Series 1063* ed. Gregory Payne and Patrick B. Smith (Washington, D.C.: American Chemical Society, 2011), 42.

oil plastics remained popular.[81] The Ford Motor Company, for example, used tung oil in plastics. In one study, Dr. R. S. McKinney discovered that adding chlorine to tung oil resulted in a substance which could plasticize polyvinyl chloride copolymers. He also ascertained that acrylonitrile and eleostearic acid esters plasticized chloride-vinyl acetate copolymers. The results had firmness, malleability, and durability. The Degen Oil & Chemical Company in Jersey City, New Jersey, created Polytung Oil, a pure tung oil which made plasticizers stronger. The SRRL also found a way to plasticize tung by exposing it to betapropiolactone. Durez Plastics in North Tonawanda, New York, found that tung alkyds mixed with terpin phenolic resins produced a great protective coat for plastics.[82] Tung oil research on rubber also created interesting results.

The tung tree and the rubber tree were relatives so scientists theorized that tung oil would synthesize to make a good rubber. Ford had funded numerous tung-rubber studies on his property in Ways Station, Georgia, in the 1930s, so the idea did not lack precedent. By the 1950s, scientists knew that tires made from butadiene and styrene made a popular synthetic rubber but they wanted to see if tung oil could create an organic rubber. After all, tung oil made excellent plastics and turned rubbery when exposed to

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[81] Jeffrey I. Meikle, *American Plastic: A Cultural History* (New Brunswick: Rutgers University Press, 1995), 11, 28, 31, 64, 83. See also, Robert D. McMillen, "Chemurgic Plastics," *Manufacturers' Record* 108, no. 12 (Dec 1939): 22-23, 54, 60.

[82] "Durez Plastics Use Tung Oil in Plastics," *American Tung News* 6, no. 2 (Feb 1955): 3; "New Tung Product, Polytung Oil, Made by New Jersey Firm," *American Tung News* 10, no. 5 (May 1959); R. S. McKinney et al., "The Preparation and Some Properties of Chlorinate Tung Oil," *The Journal of American Oil Chemists' Society* vol. 36, 172-173; "New Tung Derivatives Used as Plasticizers," *American Tung News* 8, no. 4 (Apr 1957): 5; "AUTOS: Plastic Ford Unveiled," *TIME Magazine*, August 25, 1941; and "Added Rice Oil Uses Predicted," *Times-Picayune*, April 20, 1955. Soybean oil mixed with formaldehyde and phenolic resins were also used in plastics. See, for example, J. Harry DuBois, *Plastics History U.S.A.* (Boston: Cahners Books, 1972), 35. On tung oil plastics, see also, Joan S. Hoffmann et al., "The Reaction of Beta-Propiolactone with Apha –and Beta-of Derived Esters," *The Journal of The American Oil Chemists' Society* 32, no. 10 (Oct 1955): 533-538.

gamma and beta rays at forty rotgens. Some experiments even revolved around tung oil as a plasticizer for rubber. In 1955, the SRRL worked with the Naugatuck Chemical Division of the U.S. Rubber Company to investigate the use of tung oil in the polyester resins used to make rubber.[83] At the same time scientists tackled the rubber and plastic fields, they also explored older tung oil markets like inks and textiles.

Knowing the reputation tung oil had for inks and waterproofing, scientists tried to expand on current uses. The ink industry applied tung oil in gold and bronze specialty inks. Use even grew to include dyes for textiles. Unfortunately, many companies began to long for inks which would dry in a matter of seconds so they looked for alternatives like a combination of polyvinyl chloride resin, liquid plasticizer, and a binder like thermoplastic resin. Finding new waterproofing outlets also held great appeal to clothing, cardboard, paper, and even cement manufacturers. Although clothing companies frequently used linseed, scientific tests revealed tung oil to be far more effective. Scientists also identified cardboard box manufacturers, amidst a competition with wire box producers, as a possible market. Traditionally, these companies immersed their boxes in wax, but found this method inferior for ridged boxes. A water soluble tung additive provided waterproof protection. A series of tests for waterproofing various types of paper

[83] *American Tung News* 7, no. 1 (Jan 1956): 6; McMillen, New Riches from the Soil, 280; T. H. Hopper, "Tung Utilization Research," *American Tung News* 8, no. 1 (Jan 1956): 6-7; USDA, "Twenty Years of Research, 1935-1955," Box 20, Folder 2, Tung Oil, FCC, UAHC, MSU; and "Tung Oil Being Tested in Tire Formulations," *American Tung News* 13, no. 12 (Dec 1962): 10. See also, Lida L. Placek et al., "Tung Oil Derivatives as Plasticizers for Buna-N Rubber," *The Journal of The American Oil Chemists' Society* 37, no. 6 (June 1960): 307-309; and "The Die is Cast," *TIME Magazine*, July 20, 1942. On Ford and tung, see for example, "Ford Plants Tung Oil Trees in Georgia," *Augusta Chronicle*, October 21, 1943, 3.

also achieved success.[84] This method had a precedent as the Japanese often waterproofed paper raincoats with tung oil.[85] Having found new ways to utilize known qualities of tung, many scientists set about refining their methods and experimentation while others looked for undiscovered attributes to aid the Cold War.

Some scientists wanted to research tung oil as it related to nuclear energy. The non-profit Tung Research Foundation (TRF), created by the NTOMC, worked with Brookhaven National Laboratories in Upton, New York, to study tung oil under atomic radiation. Their observations included alterations in appearance, iodine value, and drying time. Other tests performed by General Electric recorded the effect of 1,000,000 volts on tung oil.[86] Experiments at the Bikini Atoll nuclear laboratory even found that tung oil provided skin protection from gamma rays.[87] Amid this flurry of revolutionary experimentation, many scientists, often in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering (BPISAE), addressed cultivating, storing, milling, and analyzing procedures.

To lessen reliance on manual labor, engineers developed several machines to be utilized by tung growers. Unable to find enough labor locally, some growers had to

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[84] R. O. Austin, "Research is Gaining Momentum," *American Tung News* 12, no. 11 (Nov 1961): 8; "Five; China; Untied States," *Miami Herald Record*, April 1, 1914, 4; "New Wonders for Tung Oil Found in Lab," *Tung World* 1, no. 1 (Apr 1946): 9; E. I. du Pont de Nemours & Company, Wilmington, Delaware, "Printing Composition," United States Patent Office, Patent 2,322,837, June 29, 1943; and Bemis Bro. Bag Company, Minneapolis, Minn., "Heat-Dry Printing Ink Vehicle," United States Patent Office, Patent 3,024,213, March 6, 1962, Box 6, Folder 20, Ink (1938-62), ATOI, MLA,USM.

[85] See, for example, "Paper Raincoats," *Springfield Republic* (Massachusetts), Aug 9, 1936, 5.

[86] "Crowell Resigns; As Co-Op Manager; Tung Research Foundation Proposed," *American Tung News* 6, no. 6 (June 1955): 6; and "Nuclear Energy Effects on Tung," *American Tung News* 7, no. 4 (April 1956): 5.

[87] "Aid for Tung Oil Industry Urged," *Times-Picayune*, July 6, 1948; and Bobby Smith, "Tung Oil: The South Makes Oil from the Trees of China," *Down South*, Feb-March 1951, 24.

transport pickers from other parts of their state or even other states. Developing a mechanical harvester ranked high on the list of goals as early as the 1940s. In the 1950s, efforts by the USDA Agricultural Engineering Branch and the Experimental Tung Farm at the Southern Mississippi Branch Experiment Station in Poplarville created specialized equipment. The resulting machine had two big broom-like devices on either side of the front of the tractor. These swept nuts into the tractor's path, shelled them, and funneled them into a connected trailer. The only drawbacks seemed to be that the device sometimes broke tree limbs and sucked in debris in orchards overgrown with weeds and sticks.[88] For some operations like the Jumpie Run Plantation in Monticello, Florida, these harvesters freed growers from an unreliable and unpredictable labor.[89] Most growers remained unwilling or unable to expend the capital so mechanical harvesters did not become widespread across the Tung Belt until the late 1960s.[90] Machinery to perfect fertilization appeared in 1954 as an anhydrous ammonia applicator created by the USDA Agricultural Research Administration Bureau of the BPISAE. It attached to the back of a tractor and allowed two men to spread two tons in one day.[91] That year, Pearl River

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[88] "Annual Report Tung Machinery Investigations, Bogalusa, La., 1954," p.28-30, 36, 39, A81-8, Box 1, Annual Report Tung Machinery Investigations 1954, WWK, SMBES, CPRC, MML, MSU.

[89] See EIES510 Mechanical Harvesters for Tung Nuts, 1950, Subseries 26f: Projects related to Florida's tung oil industry, 1944-1951, Box 1, Project Files of the University of Florida Engineering and Industrial Experiment Station, Special and Area Studies Collections, George A. Smathers Libraries, University of Florida, Gainesville, Florida [hereafter PFUFEI, SASC, GASL, UF]; and "Florida," *American Tung News* 17, no. 5 (May 1966): 7.

[90] "Statement Pertaining to Research on Tung Oil Presented to the Oilseed, Peanut, and Sugar Crops Research Advisory Committee," January 9, 1968, Washington, D.C. by ATOA, Poplarville, MS, 1968-69, Box 1, B (33), Acc. No. A81-8, South Miss. Branch Experiment Station, Mississippi Agricultural and Forestry Experiment Station, Congressional and Political Research Center, Mitchell Memorial Library, Mississippi State University, Starkville, MS [hereafter SMBES, MAFES, CPRC, MML, MSU].

[91] "Untitled," *Tung World* 6, no. 10 (March 1952): 12. See also, "Annual Report Tung Machinery Investigations, Bogalusa, La., 1954," p.3; and R. E. Jezek and Glenn W. Hillyer, "Increasing Efficiency in

County, Mississippi, used more fertilizer than fourteen surrounding counties.[92] While harvesters and fertilizer applicators remained key foci, scientists looked at ways in which to improve tung storage habits.

A variety of tests revealed under what conditions tung nuts and tung oil could be safely and effectively stored. Farmers and scientists had long known that tung fruit rotted if not stored in a drying bin or hung in the branches of trees. If left in the orchards, the fruit eventually dried to twenty-five percent moisture within several weeks. Those seeking faster drying speeds found early versions of specialized machines performed inconsistently and caused fatty acids to form in seeds. After an array of studies on rotary, continuous, horizontal, solar, and lover dryers, scientists determined the lover performed best. It dried quickly and functioned at temperatures below 200 degrees Fahrenheit. In a lover dryer, warm air passed through seeds piled from twelve to twenty-four inches thick. Once dried, nuts could be stored for months with little chance of accumulating fatty acids. If stockpiled until the following year, tung meal made from these nuts proved inferior. In small tanks open to the elements, tung oil formed a layer of oxidized oil. Strangely, if held in a large tank, tung oil did not form such a coating but did increase in acidity. Only in a tightly sealed tank did tung oil maintain its original characteristics.[93] A more complicated task lay in judging both the moisture and oil content of tung nuts.

Tung Production with Machinery," p.42 A81-8, Box 1, Annual Report Tung Machinery Investigations 1954, WWK, SMBES, CPRC, MML, MSU.

[92] "Mississippi Now Leading in the Tung Oil Industry," *Jackson Daily News*, June 8, 1954.

[93] Robert S. McKinney, "Research Investigations of U.S. Tung Oil Laboratories," Box 19, Folder 22, FCC, UAHC, MSU.

Given the importance of moisture and oil content to price, scientists performed numerous tests in attempts to find the most advantageous methods. While the Subcommittee of the Analysis of Tung Fruit and Meal of the American Oil Chemists' Society blew dry ground tung nuts at 101 degrees Celcius to determine moisture, the USDA had different techniques. The U.S. Tung Oil Lab initially divided the fruit, shells, and kernels before finding the percentage of oil in the kernels. Its scientists took that figure and the number of kernels used to calculate the percent of oil in the fruit. This method proved time consuming so this and other labs preferred 'the whole fruit method.' In this process, the nuts did not have to be hulled or shelled. Instead, they mashed 200 fruit in a Wiley mill which sifted the mash into one of two containers. One holding area revealed moisture content while the other showed oil content. Another option scientists discovered lay in mixing fruit in boiling petroleum naptha for ten minutes, a process in which tung oil separated.[94] Processing never achieved 100% of the oil, but scientists targeted ways to improve yield.

To prevent the loss of oil, scientists devoted countless experiments to finding the most effective way to hull tung fruit without damaging nuts and a to developing a machine to express the most oil. Containing no oil, hulls contained over fifty percent of the moisture. To avoid having to dry nuts at excessive temperatures, millers removed the exterior of the nuts. Hulling carelessly or improperly harmed oil-rich kernels. Millers had

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[94] Raiford L. Holmes, Jacob C. Minor, and R.S. McKinney, "The Determination of Moisture in Tung Fruit," *The Journal of the American Oil Chemists' Society*, 29, no. 10 (Oct 1952): 425-427; McKinney, "Research Investigations of U.S. Tung Oil Laboratories;" F. G. Dollear and A. M. Altschul, "Scientists Review USDA's Tung Products Research," *Tung World* 6, no. 11 (April 1952): 6; and R. S. McKinney and R. L. Holmes, "Oil Content of Tung Products by a Rapid Petroleum Naphtha Method," *Journal of American Oil Chemists' Society* 31 (1954): 172-174. The 'whole fruit method' was based on a sample of 200 tung fruit.

tried water pressure to shell nuts but found hullers worked best. Many mills used stationary disk hullers but they often damaged the kernels thus, causing oil loss.[95] The U.S. Tung Oil Lab in Gainesville along with the U.S. Tillage Machinery Lab in Auburn, Alabama, created a portable drum huller which broke few kernels and allowed mills to salvage more oil.[96] While crushers often missed 3-4% of oil, scientists targeted the creation of an improved machine to harvest 100% of oil. Various machines were designed but none ever proved that effective.[97] While performing test to extrude oil and improve machinery, scientists advanced ways to use meal and hulls.

Tung by-products inspired scientists to launch experiments with fertilizer and carbonization. For additional income, mills sold meal and hulls as potash and fertilizer. Not only did tung meal have two-thirds more nitrogen than cottonseed, it cost less. In 1955, the Gulfport Vegetable Oil Company, owner of the Gulfport Tung Mill, marketed Tungro and Tung Moss. Tung meal had polymerization qualities which incited hardening and adhesiveness, thus making impressive wallboard.[98] Aside from attracting fertilizer companies, hulls generated a number of experiments. Armour & Company in Chicago

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[95] L. A. Goldblatt," The Tung Industry II Processing and Utilization," *Economic Botany* 13, no. 4 (1955): 343-364. See also, "Annual Report-1955, USDA Farm Machinery Section Tung Production and Harvesting Machinery," p.19, A81-8, Box 1, Annual Report Tung Machinery Investigations, WWK, SMBES, CPRC, MLA, USM.

[96] McKinney, "Research Investigations of U.S. Tung Oil Laboratories."

[97] Ibid.

[98] "Tung Research Committee Hears Reports by Scientists," August 28, 1962, Agricultural Research Service, Southern Utilization Research and Development Division, Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU; "Tung Oil By-Product Processed, Marketed by Gulfport Tung Mill," *American Tung News* 6, no. 3 (Mar 1955): 11; R. L. Holmes et al., "Materials Balance in a Tung Oil Mill," *The Journal of The American Oil Chemists' Society*, 32, no. 5 (May 1955): 282-285; Charles E. Mullin, "Chemical Developments of the South," *Manufacturers' Record* 99, no. 18 (Apr 30, 1931): 25; and "Utilization of By-Products," *The Southern Conservationist and American Tung Oil* 5, no. 1 (Apr 1938): 17.

tried to use tung hulls to bleach carbon "or as a source of absorbent carbon for gas or air purification."[99] Finding uses for tung byproducts and improving cultivation garnered some experts national recognition.

Working on a minor crop, many tung scientists craved recognition to strengthen the relevance of their research. In 1951, the SRRL had published a four-volume *Tung Abstract Bibliography* which included 3,000 sources. Not only did it become acknowledged as "the best published document in the field of agriculture and natural science" that year but it received the American Library Association's Oberly Memorial Award in 1953. In 1955, Benson even presented five SRRL tung scientists, Frank G. Dollear, Franck C. Pack, Robert T. O'Connor, Ralph W. Planck, and Dorothy C. Heinzelman, a plaque for excellence. He praised them for finding new uses for a distinctly southern product like tung, noting that their methods had even been adopted by the likes of the American Oil Chemists' Society and American Society for Testing Materials.[100] Convinced that scientific studies provided credence to the domestic tung oil industry, growers also supported non-government funded research.

On June 9, 1956, growers and scientists formed the non-profit Tung Research and Development League (TRDL) in an attempt to fortify the position of tung oil in the market by increasing usage. The League relied on revenue from members who contributed one-fourth of a cent for every pound of tung oil they produced.[101] Having a

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[99] "Profitable Usage Sought for Hulls," *American Tung News* 10, no. 3 (March 1959): 12.

[100] "Five Scientists Receive Honors," *Times-Picayune*, September 21, 1955, 20; and "Mississippi Now Leading In The Tung Oil Industry," *Jackson Daily News*, June 8, 1954.

[101] "These are Your Organizations," *American Tung News* 16, no. 3 (Mar 1965): 3.

comparatively small membership, it faced constant financial trouble. Recruiting efforts, namely advertising in tung trade journals, worked only moderately so the League sought ways in which to attract funding. The TRDL received independent donations and membership dues. The continuation of tests struck growers as a way to prove tung worthy of satisfactory parity.

The lobbying of tung farmers led southern politicians to look to the Farm Bloc for guidance on aid. The NFU endorsed parity; the American Farm Bureau Federation (AFBF) opposed parity; the National Grange wanted parity on a commodity-by-commodity basis; and the National Farmers' Organization (NFO) sought 100% parity for all commodities, both basic and non-basic.[102] Of these various stances, tung growers identified with parity on a crop by crop basis. Realizing that a non-basic crop had little chance to acquire 100% parity, Senator Allen J. Ellender (D-LA) recommended seventy percent parity for tung, but the Senate Committee on Agriculture and Forestry rejected his suggestion.[103] Representatives from the ATOA, NTOMC, and TRDL spoke with the USDA's Fats and Oils Division, CCC, and CSS officials about raising tung support from 65-75% because the former proved below the current market price.[104] Even though parity for tung remained at sixty percent, growers focused even more on import control.

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[102] "National Affairs: THE FARMER'S FOUR VOICES," *TIME Magazine*, May 7, 1956. The National Farmers Union, American Farm Bureau Federation, National Grange, and National Farmers' Organization were based out of Denver, Chicago, Washington, D.C., and Corning, Iowa respectively. The American Farm Bureau Federation had supported parity prior to the Truman Administration but had come to deem subsidies as detrimental to both farmers and the country. See, Hathaway, 66. The Grange began in 1867; the National Farmers Union began in 1902. See, Hathaway, 231. The American Farm Bureau Federation started in 1911. The National Farmers' Organization began in 1955.

[103] "Tung Amendment Fails," *American Tung News* 7, no. 2 (Feb 1956): 4.

[104] "75% Parity Supports Price Sought," *American Tung News* 7, no. 9 (Sep 1956): 4.

When the price of tung oil fell below the price support level in 1957, growers received a boon when the U.S. Tariff Commission advised a three cent per pound tariff.[105] The Department of Labor, Department of Defense, and Department of Commerce agreed with the commission's findings, but the Department of State and Department of Budget disapproved. Voicing the perspective that tariffs would alienate South American allies, the USDA advocated quotas as the diplomatic way to solve the problem.[106] Argentina objected to tariffs and pointedly threatened to restrict trade between the two countries if one was imposed so these concerns had foundation.[107]

Table 5.3 U.S. Tung Oil Imports (world) [108]

Year	Pounds
1951	30,411,000
1952	29,869,000
1953	23,486,000
1954	36,478,000
1955	31,005,000

[105] Memorandum for Governor Adams, Feb 26, 1957, Box 803, Tung Oil (2), WHCF, DDEPLM; and United States Tariff Commission, "Tung Oil: Report to the President on Investigation No. 15 Under Section 22 of the AAA, as Amended, May 1957, Box 804, Tung Oil (3), WHCF, DDEPLM.

[106] Carl D. Corse to Phillip Areeda, June 19, 1957, Box 23, Tung Oil-Section 22 (2), PAP, DDEPLM. See also, Secretary of Labor to Percival F. Brundage, June 26, 1957, Box 804, Tung Oil (3); Thorsten V. Kalijarvi to Percival F. Brundage, June 26, 1957, Box 804, Tung Oil (3); Secretary of Commerce to The Director of Bureau of Budget, June 24, 1957, Box 804 (Tung Oil (3); and True D. Morse to Percival F. Brundage, June 13, 1957, Box 804 , Tung Oil (3); and Memorandum For: Dr. Gabriel Hauge, n.d, Box 804, WHCF, DDEPLM. The International Cooperation Administration deemed it problematic. See, Edwin H. Arnold to Robert M. Macy, June 25, 1957, Box 804, Tung Oil (3), WHCF, DDEPLM.

[107] Fernando J. Teurel to Mr. Secretary, June 19, 1957, Box 804, Tung Oil (3), WHCF, DDEPLM.

[108] *American Tung News* 8, no. 5 (May 1957): 6; and "Tung Oil: Imports into the United States by Months 1952 to Date," Box 23, Tung Oil-Section 22 (3), PAP, DDEPLM. See also, Roland Becke, "Import Quota versus Import Fees," *American Tung News* 8, no. 6 (June 1957): 3. On Eisenhower's decision, Presidential Proclamation 3200, see also, "Immediate Release, James C. Hagerty, Press Secretary to the President," Sep 9, 1957, Box 804, Tung Oil (3); and "Imposing an Import Quota on Tung Oil by the President of the United States of America: A Proclamation 3200," Box 804, Tung Oil (3) WHCF, DDEPLM. This proclamation was announced on Sep 9, 1957.

Another strong protest arose from Assistant Secretary of State for Economic, Energy, and Business Affairs Thorsten V. Kalijarvi who insisted that Argentina, facing inflation and difficulty repaying a $100 million Export-Import Bank loan, could hardly afford such a tariff on one of its largest export commodities.[109] Kalijarvi insisted Paraguay, another country relying heavily on tung exports, should pay an Export-Import Bank loan.[110] Immovable on the issue of tariffs, Eisenhower chose to investigate a quota of the usual twenty-six million pounds, an action he believed might moderate the large influx of tung imports. After being told by Benson that tung imports had been disrupting price supports, Eisenhower instructed the Tariff Commission to conduct further hearings on the subject. Believing the results would alleviate dependence upon the government, growers invested copious attention to these inquiries.

Many growers suspected that the CCC purchased tung oil abroad at thirteen cents a pound and sold it domestically from the support price of roughly 20.5 cents to forty cents. On one hand, millers like Crosby, Jr., liked the idea of the CCC stockpiling tung in the hopes of making the market price rise. Most growers, on the other hand, acknowledged the CCC, not the market, as the way to profit from tung.[111] A few growers

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[109] Thorsten V. Kalijarvi to Percival F. Brundage, n.d., Box 23, Tung Oil-Section 22 (2), PAP, DDEPLM.

[110] Embajada del Paraguay, Memorandum, n.d., Box 804, Tung Oil (3), WHCF, DDEPLM.

[111] Roland R. Becke, "President Asks Tariff Commission Action in Imports; Hearings May 2nd," *American Tung News* 8, no. 3 (March 1957): 4; and *American Tung News* 8, no. 5 (May 1957): 6. On the CCC, see also, Pasour, 238; L. O. Crosby to Our Milling Customers, Oct 31, 1950, Box 17, Dantzler Lumber Company: Tung Oil: Contracts, Storage, Sales [2/2] 1950-1959, Dantzler Lumber Company, SC, MML, MSU; Hurt, American Agriculture, 291; Marshall Ballard to Gabriel Hauge, Feb 5, 1957, Box 803, Tung Oil (2), WHCF, DDEPLM; and Conkin, 69. The CCC tung oil inventory offices moved from Cincinnati, Ohio to Dallas, Texas in September 1959. See, "Tung CCC Operations are Moved to Dallas," *American Tung News* 10, no. 9 (Sep 1959): 17.

like Chenel refused to resort to CCC loans and deemed the organization a threat. At a Congressional hearing, Chenel expressed concern over the CCC selling below the market price.[112] His wife also testified before a Subcommittee on Soybeans and Other Oilseeds and explained that her family had lost substantial amounts of money in tung and declared the low price an insult to farmers.[113] Obviously, the ability to make money from the CCC did not mean tung growers liked this dependence.

Tung growers believed the government's unwillingness to control imports had left them no choice but to turn to the CCC for income. According to *American Tung News*, the government's position on free trade led to the vast CCC stock/surplus which had transformed tung into "a deficit producer."[114] As clarified by the trade journal, "It was not the intent of the support program—nor is it the intent of United States growers-to produce for Government subsidy."[115] This proved one the few cases in which growers agreed with Eisenhower, Benson, and Assistant Secretary of Agriculture Earl Butz.[116] Tung growers certainly did not want to give foundation to Roosevelt's description of the South as "the

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[112] "Statement of Louis Chenel, President, Louisiana Chapter, Tung Growers Council of America, Covington, La.," Price-Support Program, Hearings before Committee on Agriculture and Forestry United States Senate, 84th Congress, 1st Session on Proposed Modification of The General Farm Program, Part 5, November 7-10, 1955 (Washington, D.C.: Government Printing Office, 1956), 2489.

[113] "Statement of Mrs. Louis Chenel, Covington, La.," Study of the Tung Oil Program, Hearing before the Subcommittee on Soybeans and Oilseeds of the Committee on Agriculture House of Representatives, 84th Congress, 2nd Session, July 19, 1956 (Washington, D.C.: Government Printing Office, 1956), 29; and Daughtry, interview.

[114] "ATOA Disproves Benson Contentions," *American Tung News* 9, no. 6 (June 1958): 4. See also, "Text of CCC Letter to TGCA," *Tung World* 6, no. 8 (Jan 1952): 4. Under the Stabilization Act of 1942, the CCC attempted to keep prices from going too low. On role of CCC, see also, Peterson, 3-4.

[115] "The Remedy: Sec. 22 as Intended," *American Tung News* 8, no. 5 (May 1957): 8.

[116] Earl Butz to Gabriel Hauge, March 11, 1957, Box 23, Tung Oil-Section 22 (3), PAP, DDEPLM.

nation's number one economic problem."[117] Nevertheless, they accused the CCC of necessitating their need for government aid.

Such anxieties appeared in another article authored by tung growers Roland Becke and P.H. Sanders who wrote, "The support price was intended to be our protection, but in actuality its main effect was to support the price for the benefit of foreign producers at the expense of taxpayers of Uncle Sam."[118] In addition, Sanders charged the government with deliberately trying to weaken the market price. Many even cleaved to the belief that "U.S. growers of the truest sense are not responsible for pounds of tung oil accumulated or accumulating in CCC stock."[119] They argued that the government's catering to Argentina had caused the surplus which had forced tung farmers to seek financial aid. According to Mississippi tung grower Paul T. Eubanks, "Lord how mercy, how proud I would be the day this industry didn't need a government subsidy."[120] Other tung growers wanted to ease the burden on the government, but even they saw parity as the only hope for the continuation of farming tung.

Facing the ever enlarging CCC tung oil stock as shown in Table 5.4, the federal government decided to act. While tung growers wanted a fifty percent import quota which translated into 13.75 million pounds, half of the usual 27.5 million pounds,

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[117] Bruce J. Schulman, *From Cotton Belt to Sunbelt: Federal Policy, Economic Development and the Transformation of the South, 1938-1980* (New York: Oxford University Press, 1991), 3.

[118] Roland Becke and P.H. Sanders, "What Price: A New Industry," *American Tung News* 8, no. 8 (Aug 1957): 5. The CCC often paid tung mills to store its tung oil holdings. See, "Improved Handling of CCC Oil;" and "Tung Support Price Too Low," *American Tung News* 8, no. 11 (Nov 1957): 3.

[119] "Statement Filed by President Ballard Shows Our Cause is Just," *American Tung News* 9, no. 6 (June 1958): 4.

[120] Ray Cave, "Baltimore Sun Wonders Why," *American Tung News* 10, no. 5 (May 1959): 11.

Eisenhower refused.[121] Under Section 22 of the AAA, a clause which allowed for a decrease in imports if they threatened price supports, he instead established another import quota of 22,100,000 pounds from Argentina, 2,964,000 pounds from Paraguay, and 936,000 pounds from the rest of the world. This combined amount of 2,600,000 was scheduled to last until the year 1960.[122] What Eisenhower deemed a concession, tung growers interpreted as an affront and remained convinced that excessive arrivals of Argentine tung oil imported from European countries violated the set quotas.[123] To placate concerns, Eisenhower reluctantly mandated that all imports needed proof of "direct shipment."[124]

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[121] "The Remedy: Sec 22 as Intended," *American Tung News* 8, no. 5 (May 1957): 8.

[122] "Tung Oil Imports Curbed," *New York Times*, September 11, 1957; "USDA Supports Long-Term Restrictions on Imports," *American Tung News* 8, no. 6 (June 1957): 5, 10; "The President's Decision," *American Tung News* 8, no. 9 (Sep 1957): 4; "Vegetable Oils," *American Paint Journal* 42, no. 2 (Sep 1957): 62; and "Imposing and Import Quota on Tung Oil by The President of the United States of America: A Proclamation," Box 23, Tung Oil-Section 22 (1), PAP, DDEPLM.

[123] *American Tung News* 9, no. 2 (Feb 1958): 3.

[124] "Imported Tung Nuts Placed Under Quotas," *American Tung News* 9, no. 5 (May 1958): 3.

Table 5.4 CCC loans, 1957 ($52.13 ton; 20.5 cents lb) [125]

State	Loans	Pounds	Paid Back (lbs)	Outstanding (lbs)
FL	23	2,312,871	0	2,312,871
LA	94	2,285,540	0	2,285,540
MS	380	10,378,623	636,561	9,742,062
AL	4	60,445	0	60,445

The President's proclamations for evidentiary direct shipments flew in the faces of many GATT adherents. Assistant Secretary of State for Economic Affairs Thomas C. Mann, for one, argued that direct shipments violated paragraph six, article five of GATT which read that parties should treat goods shipped from other participants as if they came directly from their place of origin.[126] Mann believed direct shipments to be not only a breach of GATT, but a sure way to alienate foreign countries and lead to price hikes. Advocates of direct shipments expressed fears that countries like Argentina exceeded quotas by selling to other countries which, in turn, sold to the U.S. This worry seemed enough to satisfy Eisenhower who, on September 9, 1957, imposed Proclamation No. 3200 which called for three more years of quotas on tung oil and of direct shipments.[127] The following year, he did even more when Presidential Proclamation 3236 included the

[125] "Tung: 1957 Crop CCC Price Support Activities," Box 23, Tung Oil-Section 22 (1), PAP, DDEPLM.

[126] Thomas C. Mann to Maurice H. Stans, April 11, 1958, Box 23, Tung Oil-Section 22 (1), PAP, DDEPLM; and Peterson, 112.

[127] "Imposing Import Quotas on Tung Nuts: By The President of the United States of America," Box 23, Tung Oil-Section 22 (1), PAP, DDEPLM. The following year, on April 28, 1958, Eisenhower amended Proclamation 3200 with Proclamation 3326 which included tung nuts in the tung oil quotas. See, J.F. Davis to The President," n.d., Box 23, Tung Oil-Section 22 (1), PAP, DDEPLM.

oil within unprocessed tung nuts in the import quota.[128] This act did not receive a warm welcome from consumers who struggled to acquire tung oil under the quota system.[129] In spite of consumer protests, many tung growers celebrated.

In 1958, tung growers pushed for legislation to afford non-basic crops the same treatment as basic crops or at least narrow the gap. On March 5, the National Conference Commodity Organization (NCCO) proposed modifications to the House Ways and Means Committee. Appealing to Congress to pass agricultural legislation on a "commodity-by-commodity basis," this committee included representatives from twenty minor crops including milk, figs, and tung oil.[130] In their list of demands, non-basic farmers wanted Benson to make decisions on each crop at the beginning of each marketing year, November 1, and to select an import quota based on the "difference between the anticipated demand and the domestic supply, plus an amount not to exceed 25% of the anticipated demand to provide for a safe and reasonable carry-over."[131] When the House Committee dismissed their suggestions, tung growers once more found themselves questioning their relationship with the government.

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[128] See, J.F. Davis to The President," n.d., Box 23, Tung Oil-Section 22 (1), PAP, DDEPLM. The oil content was computed "on the basis of 15.9 pounds for each 100 pounds of whole nuts, and on the basis of 35.8 pounds of oil for each 100 pounds of decorticated nuts." See, "Imposing Import Quotas on Tung Nuts by The President of the United States of America: A Proclamation 3236, Box 804, Tung Oil (5), WHCF, DDEPLM. See also, "United States Tariff Commission, Tung Nuts Report to the President on Investigation No. 20 Under Section 22 of the AAA, as Amended, March1958, Box 804, Tung Oil (4), WHCF, DDEPLM.

[129] "Vegetable Oils," *American Paint Journal* 42, no. 39 (June 1958): 48.

[130] "New Legislation Proposed for Tung," *American Tung News* 9, no. 3 (March 1958): 11.

[131] Ibid.

While the United States Department of Defense (USDD) and countless industries continued to promote tung oil, the USDA began to lose interest. The USDA remained devoted to chemurgic research, especially with the formation of the Agricultural Research Service (ARS) in 1953, but its stance on tung had been contradictory at best.[132] In May 1957, the USDA gave tung scientists the Superior Service Award and one, Dr. R. S. McKinney, received credit for helping to make "tung a permanent crop of major importance through significant research developments."[133] Tung growers took such adulation as the promise of continued federal support, but the following fall, the SRRL underwent reorganization which resulted in the formation of seven labs: Seed Protein Pioneering Research, Plant Fibers Pioneering Research, Food Crops Lab, Industrial Crops Lab, Chemical Lab, Mechanical Lab, and Engineering and Development Lab.[134] During this reformation, tung research became endangered.

The USDA proposed that closing its Laboratories for Tung Investigations in Cairo and Gainesville, placing the Bogalusa lab on standby, and severely cutting funding for the Tung Experimental Field Lab in Picayune would save $116,000 a year. After learning of this suggestion, the ATOA pressed Tung Belt politicians to fight for the maintenance of funding. In April, their efforts were rewarded when the Senate Appropriations Committee ruled that funding for these tung labs continue with modifications. Having

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[132] On the Agricultural Research Service, see Marcus, *The Future is Now*, 34.

[133] T. H. Hopper, "Tung Utilization Research," *American Tung News* 8, no. 1 (Jan 1957): 6-7. Another scientist, Dr. W. G. Bickford, received an award for his research on the chemical makeup of tung oil. In 1959, McKinney and Dr. L. A. Goldblatt of the SRRL even earned an award from The Glycerine Producers' Association for their work on tung monoglycerides. See T. H. Hopper, "Tung Utilization Research," *American Tung News* 8, no. 1 (Jan 1957): 6-7; and "Glycerine Awards Due," *New York Times*, January 21, 1959.

[134] "Southern Regional Research Lab Reorganized," *American Tung News* 9, no. 4 (Apr 1958): 6.

long known that Mississippi and Louisiana produced the most tung, the USDA consolidated its Gainesville tung lab with the one in Bogalusa in January 1959. One of its key scientists, Dr. Felix Lagasse chose to retire rather than move to Bogalusa.[135] While government tung experimentation continued, growers relied more on the TRDL and an unlikely ally—Argentina.

For years, growers, scientists, and tung boosters talked of a partnership between the U.S. and Argentina. Goodyear and Crosby, Jr., had even made several trips to Argentina to discuss the matter with Argentine growers.[136] After all, the tung oil industries of the two countries had connections. The first tung trees in Argentina had been planted in the Misiones Province in 1928 with seeds from the U.S., and during the Chinese embargo, the U.S. depended heavily on Argentine exports. Much like many U.S. tung scientists, Argentine scientists formed the Granja Argentina Consejo Chemurgic (GACC) or the Argentine Farm Chemurgic Council as a part of the Instituto Agrario Argentino (IAA) or the Argentine Agrarian Institute. Argentine tung growers had even formed an equivalent to the TRDL in the form of the Comision Argentina del Tung (CAT), a cooperative research organization. Indeed, Argentina, given its tung orchards in Misiones and to a lesser extent Chaco and Corrientes, held such a pivotal role in world

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[135] "Plans to Abandon USDA Research Are Opposed," *American Tung News* 9, no. 2 (March 1958): 6; "Continued USDA Research is Hope," *American Tung News* 9, no. 5 (May 1958): 6; "Retain USDA Production Research," *American Tung News* 9, no. 6 (June 1958): 9; "Changes Made in USDA's Tung Research Program," *American Tung News* 9, no. 7 (July 1958): 3; and "Dr. Felix Lagasse, Chief Gainesville Tung Oil Laboratory to Retire," *Tung World* 16, no. 6 &7 (June-July 1959): 2.

[136] Gammill, interview.

tung production that it had often been vilified in domestic tung trade journals.[137] Why then did U.S. growers want to form a pact with one of their biggest competitors?

Their contentious history aside, domestic growers had their reasons for seeking this partnership. First, while Argentine exports caused severe fluctuations in the price of tung, the U.S. no longer had to rely solely upon China or suffer from embargoes and unpredictable exports. Second, many like ATOA President Ballard, Jr., wanted Argentina to provide a "fair share of the financial burden necessary to carry on indicated research that would expand the markets for tung oil and keep them healthy."[138] Third, meager crops in 1954, 1955, 1956, and 1957, meant domestic growers had become desperate.[139] They saw research as pivotal to maintenance and scientific studies needed revenue which the TRDL sorely lacked. Needing external funding, U.S. growers started to seriously consider a bi-national contract with Argentina.

On July 5, 1957, U.S. and Argentine representatives attended a meeting in New Orleans. League President Robert M. Newton, Vice-President Goodyear, director Chester Green, manager and director R. R. Becke, ATOA President Ballard, Jr., and NTOMC director George Altbach met with Miguel Roig and Julian Miguel Szychowski,

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[137] Tom Epperson and R. O. Austin, "The New Tung Oil Industry," reprinted from *Paint and Varnish Production* (Jan 1961), Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU; "League Story is Told in Argentine Magazine," *American Tung News* 14, no. 5 (May 1963): 7; J. K. Haken, "The American Tung Oil Industry," Box 10, Folder 10, Camille, ATOI, MLA, USM; "Argentine Farm Chemurgic Council," *The Chemurgic Digest* 5, no. 1 (Jan 1946): 36; and "Latin America Experiments with Tung Oil," *Times-Picayune*, June 6, 1943, 43. About 97% of all Argentine tung production took place in Misiones.

[138] Marshall Ballard, Jr., to Gabriel Hauge, December 19, 1956, Box 803, Tung Oil (2), WHCF, DDEPLM.

[139] "March 21 Freeze Deals Eastern Section of Tung Belt Severe Blow; U.S. Tung Crop Reduced 25 to 30%"; and "Hattiesburg P.C.A. to continue Aid to Tung Growers," *Tung World* 13, no. 4 (April 1956): 2.

representing growers, and Gorge Moreno of the Embassy of Argentina.[140] At the conference, they discussed the pros and cons of forming an organization in which the TRDL and CAT participated. Second only to China in tung production, Argentina had less incentive to join in an international cooperative effort. Why then did Argentine growers want to form a league with U.S. rivals?

Many motives lay behind the decision of Argentine growers to join this bi-national league. First, the resurgence of Chinese exportation threatened the standing of both the U.S. and Argentine tung industries. As a result, some envisioned a united front of two Western Hemisphere countries against the Eastern Hemisphere. Second, tung oil sold for a higher price in the U.S. than Europe so Argentina wanted to maintain the American market. Third, U.S. production almost always found domestic consumers. What little that found its way to export markets, often through the CCC, posed no threat. In fact, the U.S. purchased the bulk of Argentine tung. Fourth, the Argentine harvest took place in April whereas the U.S. harvest occurred in October so the two countries did not flood the market all at once.[141] Fifth, Argentine and U.S. growers shared a mutual fear of rival oilseeds and synthetics. Szychowski believed scientific work essential to the world tung oil market and thought a joint league an amicable way "to situate the discussions of whatever problems on a plane of reciprocal consideration and deferential friendship."[142] In other words, if the CAT and TRDL worked together funding and conducting

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[140] "Progress in Argentine Negotiations," *American Tung News* 8, no. 7 (July 1957): 8.

[141] J. K. Haken, "The American Tung Oil Industry," Box 10, Folder 10, Camille, ATOI, MLA, USM.

[142] Tom Epperson and R. O. Austin, "The New Tung Oil Industry," reprinted from *Paint and Varnish Production* (Jan 1961), Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU.

experiments to make tung oil more scientifically and culturally relevant, both countries would benefit. This willingness of Argentina to form such a pact proved another example of how Latin America, in the words of Latin American historians Steven Topik, Carlos Marichal, and Zephyr Frank, played "enterprising, defining, and controlling roles" when it came to commodities.[143] Support for this bi-national association did not have universal support.

Sentiment toward the creation of a joint association varied considerably across the Tung Belt and Misiones. Emotions ranged from idealistic hope to gross skepticism. Many domestic growers fretted about the decline of tung oil consumption from 100 million pounds a year in 1949 to 50 million pounds a year in 1958. Most U.S. growers accepted the idea of some imports to help satisfy consumers and control prices. In the words of ATOA Ballard, Jr., "By working together and pooling our funds we can greatly expand research and hasten the day when tung oil may resume its rightful place on the American market.[144] Many shared this expectation, but some thought differing cultures and languages would impede the functioning of a TRDL/CAT alliance. Having fought to increase import quotas, others opposed working with a country that could produce twenty-six millions pounds a year. The ATOA had long resented Argentina, especially when magazines like the *Wall Street Journal* referred to Argentine tung oil as superior to U.S. tung oil. While the Argentine Ministry of Commerce supported the creation of a

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[143] Steven Topik, Carlos Marichal, and Zephyr Frank, "Introduction: Commodity Chains in Theory and Latin American History," in *From Silver to Cocaine: Latin American Commodity Chains and the Building of the World Economy, 1500-2000* ed. Steven Topik, Carlos Marichal, and Zephyr Frank (Durham: Duke University Press, 2006), 3.

[144] "Progress in Argentine Negotiations," *American Tung News* 8, no. 7 (July 1957): 8.

union between the two countries, the Federation of Agricultural Cooperatives in Misiones did not because its president deemed the three percent delivery price, a fee to fund research, an unnecessary expense. Reservations aside, in December 1958, representatives from the TRDL and the CAT signed the Pan-American League Charter thus creating the Pan-American Tung Research and Development League (PATRDL).[145]

While not an unprecedented Pan-American organization given the 1930s Pan-American Trade Alliance intended to strengthen ties between the U.S., Argentina, Brazil, and Columbia with "noncompetitive products," PATRDL quickly exceeded expectations.[146] Working cooperatively marked a change, if not in domestic grower mentality toward competitors, in their willingness to work with other countries for the greater good of the world tung oil market.[147] Neither endorsed nor financially supported by the government of either country, PATRDL relied entirely upon member dues and contributions. It backed experiments, endorsed fellowships, paid field technicians, and

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[145] "These are Your Organizations," *American Tung News* 16, no. 3 (Mar 1965): 3; Pan American Tung Research and Development League, Article II, Purposes, Box 23, Folder 3, Crisis in Tung, ATOI, MLA, USM; and Mr. Vaky to Mr. McPhee, July 24, 1956; and Mr. Belton to Mr. McPhee, April 10, 1956, Box 23, Tung Oil-Section 22 (3), PAP, DDEPLM. See also, Marshall Ballard, Jr., to Editor, *Wall Street Journal*, Jan 22, 1946 Box 1, American Tung Oil Association 1946 [3/4], Dantzler Company, SC, MML, MSU; "Tung Interests Form League," *Times-Picayune*, December 17, 1958; and Roland R. Becke, "Tung Farmers Form Pan-Am League," *Chemurgic Digest* 19, no. 12 (Dec 1960): 8. Officers of PATRDL included President Robert M. Newton, Sr., of Wiggins, MS; First Vice-President C. W. Goodyear, Jr., of Bogalusa, LA; Second Vice-President Andre Bugnion of Misiones, Argentina; Secretary Roland R. Becke of Poplarville, MS; Treasurer J. Riley Rankin of Poplarville; and Assistant-Treasurer/Argentine Consul General to New Orleans Carlos A. Guido. Among the many officers were L. O. Crosby, Jr., of Picayune, MS; William B. Reynolds of Bartlesville, Oklahoma; Julian Saphier of Greenwich, CT; Alberto Vertalities, member of the Argentine Embassy in Washington, D.C.; Julian M. Szychowski of Buenos Aires; and Arjen H. Arnold of Buenos Aires. See, Marshall Ballard, Jr., to Editor, *Wall Street Journal*, Jan 22, 1946 Box 1, American Tung Oil Association 1946 [3/4], Dantzler Company, SC, MML, MSU.

[146] Russell C. Jones, "Pan-American Trade Alliance and the South," *Manufacturers' Record* 102, no. 8 (Aug 1933): 23.

[147] Ibid.

even published a monthly magazine called *American Tung Oil Topics*. Located in Picayune, the League lab worked on utilizations while the Comision lab in Buenos Aires researched derivatives. The CAT encouraged the National Institute of Industrial Technology, the Instituto Argentino de Grasas y Aceites (IAGA) or Argentine Institute of Fats and Oils, and the recently created Centro de Investigaciones de Grasas y Aceites (CIGA) or Research Center of Fats and Oils to increase tung studies while the TRDL urged more tung experimentation in USDA labs.[148] While pleased with PATRDL, growers did not renounce government aid.

In 1959, tung growers panicked when Congress and Eisenhower approved a cut in CCC loans to $50,000 per farm in the Annual Agricultural Appropriations Bill. This action had been motivated by the depletion of small farms and rise of agribusiness. In fact, many politicians blamed the growth in number of giant farms on the availability of subsidies. Between 1949 and 1954 alone, the number of large farmers increased by 30,000 while many corporate farms appeared throughout the country. Large tung producers expected devastating profit losses if barred from their usual level of CCC loans. While many politicians wanted this bill to help the small "family" farmer, many tung growers highlighted their family-run operations and accused the CCC of discriminatory practices.[149] Big farmers, however, had rightly gained an unsavory

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[148] Roland R. Becke, "Tung Farmers Form Pan-Am League," *Chemurgic Digest* 19, no. 12 (Dec 1960): 8; "Austin Attends Oil Meet," *American Tung News* 12, no. 2 (Feb 1961): 4; and "League Laboratory will Move to USM," *American Tung News* 14, no. 2 (Feb 1963): 3.

[149] "Proposed Bill Threatens Support Price Program," *American Tung News* 10, no. 6 (June 1959): 3. On agribusiness and subsidies, see, Pete Daniel, *Lost Revolutions: The South in the 1950s* (Chapel Hill: University of North Carolina Press, 2000), 41. On family owned agribusiness firms, see, Kirby, *Rural Worlds Lost*, 349. Large farmers had a bad reputation in that many blamed them for the country's commodity surplus problem. On the 1949-1954 figures, see, Fite, *American Farmers*, 127.

reputation and many Americans blamed them for the country's commodity surplus problem.[150] Even so, *American Tung News* explained, "The larger producers like smaller ones have their financial problems and are forced to market their crops promptly to pay loans just as small producers are."[151] The fact that the bill proved subject to renewal on a yearly basis and allowed for the consideration of bigger loans provided that recipients paid back the initial $50,000 within a year provided some solace.[152] When Benson offered "unlimited non-recourse loans" to growers who cut production by twenty percent or more, they reacted with outrage.[153]

The majority of tung farmers took the Secretary of Agriculture's push for acreage reductions as a threat. Growers stood to bear the cost of uprooting orchards, an expense which outweighed any loans, or letting the nuts rot seemed wasteful. While Benson defined tung as a surplus crop, tung farmers preferred to think of it as a deficit product in that production had always paled compared to demand.[154] They sought to combat negative press like the following excerpt from the *Cleveland Plain Dealer*: "You may not have much money left after the tax collector gets through with you, but you sure got tung oil . . . You, as a taxpayer, are a part owner of four million dollars worth of tung oil

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[150] See, for example, Perret, 513.

[151] "Tung a Surplus Commodity: How Can That Be," *American Tung News* 10, no. 11 (Nov 1959): 3.

[152] "Limitation on Price Support Loans Becomes Law," *American Tung News* 10, no. 7 (July 1959): 3.

[153] "Tung Oil Called Surplus," *American Tung News* 10, no. 11 (Nov 1959): 3; "Memorandum on Loan Limitations," *American Tung News* 11, no. 2 (Feb 1960): 5; and ("Tung a Surplus Commodity: How Can That Be," *American Tung News* 10, no. 11 (Nov 1959): 3.

[154] "Tung Oil Called Surplus," *American Tung News* 10, no. 11 (Nov 1959): 3.

which is in [CCC] storage.[155] This and other articles reflected sentiments clarifying that the intent of price supports had been to help the living standards for "average" small farmers, not milk the taxpayer for the benefit of gentlemen farmers.[156] In a letter to Benson, even Eisenhower asked, "Isn't there something we can do to avoid using federal subsidies to create millionaires under programs ostensibly devised to protect the little farmer?"[157] Tung farmers achieved satisfaction when the USDA finally exempted tung oil from the $50,000 CCC loan limitation. After a meeting with ATOA representatives, Benson even removed tung oil from the list of surplus commodities.[158] While these two steps served as small victories for tung growers, major obstacles remained.

Throughout the late 1950s, parity had been the sourest of conversation topics among tung growers. As can be seen in Table 5.5, many tung farmers continued to ask for 100% parity, but each year they found parity rarely exceeded sixty percent. While bills like S.3381 and S.3382 called for an increase in tung parity to seventy-five percent, Associating higher parity with higher prices, a scenario which stood to hurt consumers and increase already bulging CCC stock, Benson disapproved.[159] Benson had never made a secret of his disdain for subsidies and his conviction that support prices, if issued at all,

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[155] "Have We Got Tung Oil," *Cleveland Plain Dealer*, March 10, 1959, 13.

[156] On the enabling results of agricultural policy, see, for example, Harold F. Breimyer, "The New Deal Farm Policy: Then and Now," in *The New Deal and Public Policy* ed. Byron W. Daynes, William D. Pederson, and Michael P. Riccards (New York: St. Martin's Press, 1998), 21.

[157] Eisenhower, *Waging Peace*, 386.

[158] "Why Fight a Loan Limitation," *American Tung News* 11, no. 3 (March 1960): 3; and "Tung Exempt from Loan Limitations," *American Tung News* 11, no. 3 (March 1960): 4.

[159] "ATOA Disproves Benson Contentions," *American Tung News* 9, no. 6 (June 1958): 4.

should be for "insurance against disaster" only.[160] Consequently, the bulk of tung growers saw Benson as a man who cared more about foreign relations than domestic farmers.[161] On July 25, 1958, Congress defeated H.R. 12954, an Omnibus Farm Bill which, among other things, included a clause raising tung parity to seventy percent. Eventually, on August 17, the Senate finally passed a revised version of the bill which maintained tung parity at 60-65%.[162] Among tung growers, disgust proved the prevailing response to this bill and the Eisenhower administration in general.

Table 5.5 Tung oil parity, 1955-1958[163]

Year	Parity (%)	Price (lb oil)	Price (ton nut)
1955	60	19.9 cents	$50.70
1956	60	22.7	82.70
1957	65	20.5	80.20
1958	65	21	81.60

[160] Fite, *American Farmers*, 102; and Daniel, *Lost Revolutions*, 47.

[161] "'International' Department of Agriculture?'" *Tung World* 7, no. 12 (May 1953): 1. In 1958, Eisenhower had formed an Inter-American Development Bank to make loans to Latin-American countries. See, Stephen Rabe, "Controlling Revolutions: Latin America, The Alliance for Progress, and Cold War Anti-Communism," in *Kennedy's Quest for Victory: American Foreign Policy, 1961-1963* ed. Thomas G. Paterson (New York: Oxford University Press, 1989), 109.

[162] "Modernized Farm Bill Defeated," *American Tung News* 9, no. 7 (July 1958): 3; "65% Parity in New Farm Bill," *American Tung News* 9, no. 8 (Aug 1958): 4; and "Support for 1958 Crop Fixed at 21c Pound Oil," *American Tung News* 9, no. 11 (Nov 1958): 3.

[163] "Support Price Lower Yet is 60% of Parity," *American Tung News* 6, no. 10 (Oct 1953): 3; "Tung Support Price Too Low," *American Tung News* 8, no. 11 (Nov 1957): 3; "ATOA Disproves Benson Contentions," *American Tung News* 9, no. 6 (June 1958): 4; Marshall Ballard, Jr., "ATOA Presents Strong Case," *American Tung News* 9, no. 6 (June 1958): 6-7; "Support for 1958 crop fixed at 21c Pound Oil," *American Tung News* 9, no. 11 (Nov 1958): 3; "Tung Parity Drops Again," *American Tung News* 7, no. 2 (Feb 1956): 4; Roland Becke, "Tung Foots," *American Tung News* 9, no. 2 (Feb 1958): 3; and United States Tariff Commission, Tung oil and Tung Nuts, Report to the President on Investigations No. 22-23, Under Section 22 of the Agricultural Adjust Act, as Amended, Oct 1960, p.25, Box 804, Tung Oil (6), WHCF, DDEPLM.

The President's agricultural record remained mediocre and not just in the minds of tung farmers. One very vocal objector, former Secretary of Agriculture Wickard, accused Eisenhower of breaking countless promises, being indecisive, and flip-flopping "like a man on the flying trapeze."[164] Eisenhower remained undaunted by insults and consistently held to his stance that parity could not solve the farm problem. He wanted farmers to receive a fair price for their labor so in January 1959, he announced his plan for something he called "modern parity."[165] Simply, parity was based on the market price from the preceding year. Eisenhower had long enunciated that parity had "not worked . . ., did little to help the farmers in greatest difficulty," and proved "excessively expensive" while primarily benefitting large farmers.[166] His attempt to improve parity operations complicated the existence of those who relied on government support. Intended to give the farmer decent earnings when market prices dropped, parity had become a cash cow with problematic repercussions for both farmers and the government. When parity went down, low prices encouraged farmers to increase production which caused the market price to drop further.[167] Rather than blame the institution of parity, tung growers continued to hold the federal government and foreign countries responsible. Eisenhower's formation of the Inter-American Development Bank in 1959 only

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[164] "AGRICULTURE: Santa Claus, 1958," *TIME Magazine*, May 19, 1958. Eisenhower's farm record proved problematic given that his legacy included favoritism for large farmers, income inequality, and surplus. See, for example, Peterson, 151.

[165] Schapsmeier, 221.

[166] "THE ADMINISTRATION: Farm Relief?" *TIME Magazine*, February 9, 1959. See also, "FARMERS: Subsidized Size," *TIME Magazine*, May 9, 1959.

[167] "THE NATION: Ezra Benson's Harvest," *TIME Magazine*, November 23, 1959.

strengthened their doubt in the president.[168] Frustrated by their repeated failures to attain satisfactory parity and tariffs, tung growers rallied to achieve higher quotas.

As Eisenhower's second term as president drew to a close, tung growers tried a last ditch efforts to convince him to increase import quotas. If he failed to act by October 31, 1960, the twenty-six million pound import quota would expire. Many growers like Chenel repeatedly lobbied Congress to aid tung farmers. Even the Tariff Commission argued that unless the quota received an extension, price support disruption might ensue.[169] Both the commission and the USDA wanted the quota lessened to fourteen million pounds a year.[170] The Department of State and the Department of Commerce feared the quota would jeopardize U.S. trade by alienating foreign countries.[171] As the deadline approached, Eisenhower, on October 27, mandated that the current quota continue for the next three years.[172] This presidential order coupled with the fact that

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[168] Rabe, "Controlling Revolutions," 109.

[169] Memorandum for Mr. Paarlberg, Subject; Tariff Commission's Report to the President on Tung Oil and Tung Nuts, Box 804, Folder Tung oil (7), WHCF, DDEPLM.

[170] United States Tariff Commission, Tung Oil and Tung Nuts, Report to the President on Investigations NO. 22-23, Under Section 22 of the Agricultural Adjustment Act, as Amended, Box 804, Tung Oil (6), WHCF, DDEPLM.

[171] See, Charles W. Adair, October 22, 1960, Box 803, Tung Oil (7), WHCF, DDEPLM; and Acting Sec of Commerce to The Director, Bureau of the Budget, n.d., Box 804, Tung Oil (7), WHCF, DDEPLM. The Secretary of Commerce was willing to endorse a one year extension.

[172] "Tung Hearing is Slated," *American Tung News* 11, no. 9 (Sep 1960): 4; and "Imports Still Restricted," *American Tung News* 11, no. 11 (Nov 1960), 4. See also, White House Statement Concerning the President's Action on Tung Oil and Tung Nuts, October 27, 1960; and Imposing Import Quotas on Tung oil and Tung Nuts by the President of the United States of America: A Proclamation, Box 804, Folder Tung Oil (7), WHCF, DDEPLM. By 1960, U.S.-Latin American relations continued to be tense. During Vice-President Nixon's 1958 goodwill tour of South America in 1958, his car had almost been flipped by an angry mob in Venezuela and he had been spit upon in Peru. These proved just two of the many examples of Latin American manifestations of rage at the U.S. See, G. Calvin MacKenzie and Robert Weisbrot, *The Liberal Hours: Washington and the Politics of Change in the 1960s* (New York: Penguin Press, 2008), 256-257.

CCC stock had depleted to roughly eight million pounds after sales abroad by the Bunge and North American Continental International trading firms, empowered growers. In a counter-productive move, the CCC resumed selling domestically on January 24, 1960.[173] This action cemented tung growers' perception of the federal government as a rival.

Low market supply led to the CCC's decision to sell surplus stock to domestic buyers, but this logic failed to appease objections from tung producers. While tung growers thought differently, Eisenhower and Benson had not been on personal vendettas against the domestic tung oil industry but had, in many ways, failed to address the farm problem successfully. Between the start and finish of Eisenhower's presidency, 1953 and 1961, the commodity surplus increased, most farmers suffered financially, farm prices dropped, and consumer prices soared.[174] By 1961, the U.S. only consumed about 35.9 million pounds of tung oil and roughly two-thirds went to the paint and varnish industry.[175] Facing unsatisfactory prices, many tung farmers endured economic hardships and had to take out loans or go bankrupt. Chenel, for one, applied for several loans and sold his home in Paris, France, to keep his tung plantation operational.[176] Uncertainty as to whether the tung industry had a future in the U.S. prevailed among growers.

The relationship between the domestic tung oil industry and the federal government proved contentious in the decades following World War II. Navigating the labyrinth of shifting policies, tung growers sought aid from state politicians, men no

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[173] "Factors Affecting the Tung Market," *American Tung News* 12, no. 2 (Feb 1961): 8.

[174] McCune, 118, 122.

[175] "Crambe, Industrial Rapeseed, and Tung Provide Valuable Oils," p.20, http://www.agmrc.org/media/cms/ius6c_5CF3B9B0B69EF.pdf (accessed January 11, 2013).

[176] Daughtry, interview.

doubt seeking to maintain wealthy constituents as much as wanting to help farmers. Their quest for aid at the national level led primarily to disappointment as Presidents Truman and Eisenhower and Secretaries of Agriculture Brannan and Benson prioritized basic crops, foreign relations, and consumers over producers of small domestic crops like tung. The domestic tung oil industry also illustrated the bizarre love/hate relationship between the American farmer and the government. For centuries, farmers had prided themselves on independence.[177] The old saying "we're from the government and we're here to help you" had once been seen as a joke by many farmers who neither felt need nor desire for government help. After the New Deal, reliance on government-funded agricultural aid grew as most farmers reluctantly or eagerly become accustomed to one or more forms of assistance. As time passed, they not only expected but demanded government support. For tung growers to profit, they needed high parity, quotas and/or tariffs, and loans, all of which rested in the power of the federal government. Without these financial protections, they could not or would not have continued their tung enterprises. They may have perceived government assistance as feeble, but tung farmers knew that federal policies buttressed the domestic tung oil industry's flimsy reign.

[177] Layton, 94.

CHAPTER VI

DRIED UP? POLITICAL CLIMATE, HURRICANE CAMILLE, AND THE END OF AN ERA, 1962-1976

The prospects for the future of the tung industry in the U.S. is little or none.[1]

W. Wilson Kilby

With the arrival of the 1960s, climatic conditions and falling consumerism placed the tung oil industry on the verge of collapse. When the USDA decided to stop funding much of its tung research, growers suspected that an end to subsidies would soon follow. In August 1969, frustrations escalated when Hurricane Camille obliterated the bulk of the country's tung acreage. Blocked from obtaining disaster and relief loans, growers sustained a financial blow that led them to at long last abandon tung and pursue other ventures—a step many had long been considering. The federal government also used the hurricane as an excuse to pull the last vestiges of support from a crop it had reluctantly supported for twenty years. After roughly forty decades of butting heads, the majority of growers finally agreed with the government on ending domestic production. Camille may have received credit but in reality, the cessation of the domestic tung oil industry was a decision long in the making.

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[1] W. W. Kilby to Russell Desrosiers, February 19, 1975, D 1970-1975 (53), Box 1, W. W. Kilby, A81-8, MAFES, CPRC, MML, MSU.

The relationship between tung growers and the presidency seemed to improve with the election of John F. Kennedy. The South continued to have the worst economy of any region in the country, and when running for president in 1960, then Senator Kennedy (D-MA) called the farm "'the number 1 domestic problem.'"[2] On the campaign trail, he took a shot at his predecessor's policies, quipping, "Congress did give Mr. Benson's program a chance—but Mr. Benson's program never gave farmers a chance."[3] Kennedy, boasting a "bold, new agricultural initiative," blamed Benson for the surplus and the fact that some three million people had left the farm.[4] Tung growers' confidence in the new president stemmed from the fact that Kennedy had long been a supporter of both parity and price supports for tung.[5] After the election, his position on farm policy wavered.

As a senator, Kennedy had endorsed support for the domestic tung oil industry, but his dedication to agriculture had been anything but solid. While largely uninterested in agriculture, he had come to see its political importance.[6] In the early 1950s, Kennedy had vigorously supported parity cuts, but by the end of the decade had become one of the most vocal Benson bashers in the country.[7] Wanting to please both left-and right-leaning Democrats, Kennedy's main motivation behind this change in stance had been his need

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[2] James N. Giglio, *The Presidency of John F. Kennedy* (Lawrence: University Press of Kansas, 1991), 107. On the South's poor economy in the 1960s, see also Schulman, ix.

[3] Schapsmeier, 256.

[4] Giglio,107. The quote is from W. J. Rorabaugh, *The Real Making of The President: Kennedy, Nixon, and the 1960 Election* (Lawrence: University Press of Kansas, 2009), 49.

[5] See, for example, "Who Represents You Kennedy? Or Lodge? *Springfield Union* (Massachusetts), September 9, 1952, 17.

[6] Arthur M. Schlesinger, *A Thousand Days: John F. Kennedy in the White House* (Boston: Houghton Mifflin, 1965), 119.

[7] Giglio,107; and Rorabaugh, 82.

for southern votes. Even with his running mate Senator Lyndon B. Johnson (D-TX), Kennedy knew his civil rights' sympathies weakened his political prospects in the South.[8] For the most part, as Arthur M. Schlesinger succinctly noted, Kennedy pictured agriculture "with a mixture of distrust and incipient despair."[9]

While tung growers had great expectations of Kennedy, his main agricultural goals lay with addressing food needs, aiding other countries, and increasing exports, not with tariffs and quotas.[10] Dedicated to expanding America's exports, he found a loophole in the Agricultural Act of 1961, a law which prohibited exporting "subsidized agricultural commodities to unfriendly nations," so the U.S. could sell to the Union of Soviet Socialist Republics (USSR).[11] By making them a part of the process, he also sought to aid farmers through acreage reduction and higher parity. Kennedy proposed that each commodity's farmers propose their own ideas about parity and if two-thirds of them passed the figure, it would become the set parity price.[12] While this sounded good in theory, Republicans and some Democrats in Congress objected to the idea of their power

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[8] Winders, 78. See also, Gary A. Donaldson, *The First Modern Campaign: Kennedy, Nixon, and the Election of 1960* (New York: Rowman & Littlefield, 2007), 37. While many southerners remained skeptical, it had long been a haven for Democrats and Kennedy actually won the following southern states: Texas, South Carolina, North Carolina, Louisiana, Georgia, and Arkansas. See, Rorabaugh, 138.

[9] Schlesinger, 119.

[10] Cochrane, 46; and Jim F. Heath, *Decade of Disillusionment: The Kennedy-Johnson Years* (Bloomington: Indiana University Press, 1975), 64.

[11] See, M. Stanton Evans, *The Liberal Establishment* (New York: The Devin-Adair Co., 1965), 117; and Theodore C. Sorensen, *Kennedy* (New York: Harper & Row, 1965), 741.

[12] "The Congress: The Farm Scandal," *TIME Magazine*, May 19, 1961; and Hurt, *Problems of Plenty*, 125. Kennedy believed in both production and marketing controls. See also, Giglio, 107.

being usurped by groups of farmers.[13] To the distress of tung growers who would have loved nothing more than to be able to establish their own parity price, Kennedy's plan never bore fruit. Moreover, the president's main foci remained with the Cold War, foreign relations, labor, and civil rights to name a few.[14] In a short time, tung farmers quickly became disillusioned with their new president and his secretary of agriculture.

Believing anyone would be an improvement over Benson, tung farmers initially endorsed his replacement—Orville Freeman. Highlighting his view on farm issues, Kennedy called the Secretary of Agriculture one of the "'ten-dullest jobs.'"[15] Rumor had it that Freeman's interview lasted about half-a-minute and emphasized either the president's belief in the insignificance of the position or his faith in Freeman. Freeman, a former marine and governor of Minnesota, would have preferred becoming Attorney General or Secretary of the Army but struck Kennedy as the ideal man to lead the USDA.[16] A staunch liberal and populist, Freeman deemed agriculture the "key to economic development" and wanted to help other countries with surplus commodities.[17]

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[13] "The Congress: The Dismemberment of Orville Freeman," *TIME Magazine*, July 7, 1961.

[14] Kennedy was extremely focused on strengthening foreign relations to prevent foreign countries from falling victim to communism. He was a great advocate of aiding the poor and improving infrastructure in other countries, especially third world countries, and formed the Alliance for Progress as a way to achieve these goals. See, Rabe, "Controlling Revolutions," 122, 111.

[15] Herbert S. Parmet, *JFK: The Presidency of John F. Kennedy* (Norwalk, CT: Easton Press, 1983), 62.

[16] Parmet, 62. One of the first tasks assigned to Freeman proved distributing surplus foods to the poor but Benson claimed the Secretary of Agriculture lacked the authority. See, Parmet, 85; and Robert Dallek, *An Unfinished Life: John F. Kennedy, 1917-1963* (Boston: Little, Brown, 2003), 330. See also, Richard Reeves, *President Kennedy: Profile of Power* (New York: A Touchtone Book, 1993), 28; Schlesinger, 119; Harris Wofford, *Of Kennedys and Kings: Making Sense of the Sixties* (Pittsburgh: University of Pittsburgh Press, 1980), 57; and Savage, 63.

[17] Orville Freeman, *World Without Hunger* (New York: Frederick A. Praeger, 1968), 46.

Basing his descriptions on an array of ironies in agricultural policy, he frequently spoke of American agriculture as a successful paradox. He found it an injustice that small and large farmers never received appropriate rewards. For example, in 1960, per capita income for farmers averaged $986 while non-farmers earned over twice as much at $2,282. Production costs soared while market prices floundered. Perceived by the public as having an entitlement mentality, farmers had gained recognition as creators of surpluses, purveyors of higher consumer prices, and instigators of rising taxes.[18] One article in *TIME Magazine* exclaimed, "Price-support programs provide scant help for the neediest farmers; the most bountiful benefits flow to prosperous farmers, who could get along with no Government aid at all."[19] While Freeman emphasized higher parity, he deemed it secondary to diplomacy.[20] Given this political climate, Latin American tung oil imports surged.

Under Kennedy, tung farmers persisted in attempting to get the government to address import complaints and heed ATOA and Tariff Commission recommendations. Both of these organizations supported the continuance of tung quotas but Freeman thought limitations unnecessary. While the Tariff Commission insisted that removing quotas might disturb the price support system for tung oil, the ATOA wanted a more significant role in the selection of parity price. In fact, the ATOA wanted Freeman to create and select members for a Tung Advisory Committee to work in coordination with

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[18] "Freeman Sets Pace for Agriculture," *American Tung News* 12, no. 2 (Feb 1961): 10; and "Freeman Speaks for Agriculture," *American Tung News* 12, no. 7 (July 1961): 8-9. On Freeman's past, see, Giglio, 21; and Parmet, 29.

[19] "Investigations: Decline & Fall," *TIME Magazine*, May 25, 1962.

[20] "Freeman Sets Pace for Agriculture," *American Tung News* 12, no. 2 (Feb 1961): 10; "Freeman Speaks for Agriculture," *American Tung News* 12, no. 7 (July 1961): 8-9; and Schapsmeier, 268.

the USDA in order to pass tung related agricultural policy.[21] ATOA members believed that this committee would improve stagnant tung parity which had been 60-65% for years, 20-24 cents a pound oil, or $60-64 per ton nut. At the least, they wanted to attain seventy-five percent parity but the tung committee never materialized. While upset, growers had to grant that Kennedy frequently followed the advice of the Tariff Commission even though its suggestions did not always meet with their satisfaction.[22]

On December 4, 1961, the Tariff Commission recommended that import quotas for tung end and on May 1, 1962, and Kennedy signed a Presidential Proclamation to that effect. Much like the members of the commission, he had been motivated by 1962 spring freezes which simultaneously destroyed production in the U.S. and Argentina. After this weather-based disaster, Kennedy rightly expected a poor domestic crop, inadequate CCC stock, and the need for imports.[23] Many tung farmers interpreted this as the government punishing them for natural forces outside of their control, but others believed imports necessary to maintain consumers. Whatever their position, tung growers thought the government's refusal to provide at least some protection from imports reflected cool

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[21] "Tariff Report Favorable," *American Tung News* 12, no. 12 (Dec 1961): 3; and Orville Freeman to The President, September 13, 1961, Box 9, Folder: White House Reports September-1961, Orville L. Freeman Papers, John F. Kennedy Presidential Library and Museum, Boston, MA [hereafter OLFP, JFKPLM]; and "Advisory Committee Requested," *American Tung News* 12, no. 12 (Dec 1961): 3.

[22] "Tung Import Quota is Removed," *American Tung News* 13, no. 5 (May1962): 3. On stagnant parity, see, for example, Edgar Poe, "New Support is Big Boost," *American Tung News* 12, no. 6 (June 1961): 3; "Support Price Set at 24 cents," *American Tung News* 13, no. 8 (Aug 1962): 3; "Set 24 cents Support," *American Tung News* 14, no. 5 (May 1963): 4; "Tung Oil Remains Above 30 cents," *American Tung News* 13, no. 3 (March 1962): 9; and Roland R. Becke, "Tung Price Moves to Over 36 Cents," *American Tung News* 13, no. 4 (April 1962): 3.

[23] "Tung Import Quota is Removed," *American Tung News* 13, no. 5 (May 1962): 3; and "Vegetable Oils," *American Paint Journal* 46, no. 41 (May 1962): 60.

indifference. When their appeals came to nothing, they placed the bulk of their hopes on the non-government sponsored PATRDL.[24]

Fed up with the president, congressmen, and the USDA, tung growers looked to PATRDL, but it had started to flounder. In 1961, TRDL Director R. O. Austin met with the Secretary of Agriculture's Committee on Oilseeds and Peanut Research and Marketing in an attempt to increase funding for USDA labs, but his attempt came to naught.[25] To make matters worse, the bond between the U.S.'s TRDL and Argentina's CAT had weakened. By this time, tung oil fetched a higher price in Europe than the U.S., a fact which led the CAT to switch its attention from American to European markets. While greatly attracted to Europe, the CAT opted to fulfill the pact it had made with the TRDL. It encouraged U.S. import quotas to be met, divided them between their mills, and gave one-fourth cent for every pound of oil in dues to PATRDL. When Kennedy did away with import quotas, Argentina felt much less obligated to sell to the U.S. when it could obtain a better price in Europe. While the CAT encouraged seven mills to sell to usual U.S. buyers and called for dues to be paid as if the quotas remained, freezes damaged Argentine production.[26] While CAT wanted to hold its end of the bargain in PATRDL, its Secretary Francisco Cooper explained that while the "circumstances of the

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[24] Kennedy's farm record included the Emergency Feed Grain Bill of 1961, Food and Agricultural Bill of 1962, Rural American Development (1962), renaming Public Law 480 or the Agricultural Trade Development and Assistance Act of 1954 "Food for Peace." On his unpopularity, see Giglio, 108-116.

[25] Roland R. Becke, "Tung Farmers Form Pan-Am League," *Chemurgic Digest* 19, no. 12 (Dec 1960): 8; "Austin Attends Oil Meet," *American Tung News* 12, no. 2 (Feb 1961): 4; and "League Laboratory will Move to USM," *American Tung News* 14, no. 2 (Feb 1963): 3.

[26] Francisco J. Cooper, "The Market Situation and the League," *American Tung News* 13, no. 11 (Nov 1962): 9. On Argentine mills, see also, "League Story is Told in Argentine Magazine," *American Tung News* 14, no. 5 (May 1963): 7.

time led us to think only in terms of the expansion of the American use of tung oil," Argentine attention lay in Europe.[27] Undeterred by this change, PATRDL scientists continued their studies on tung with the intent of branching into coatings, automobiles, dyes, perfumes, pesticides, and pharmaceuticals while exploring new markets like aeronautics.

Growers believed that through scientific experimentation, PATRDL might convince the USDA to continue studying tung trees. The idea that the USDA might cease all tung tests proved a constant worry. When Dr. I. A. Wolff, head of the NRRL in Peoria, Illinois, stated that while the USDA kept seeking new crops for the country, it did not want "new varieties of crops already grown, nor crops of similar type which will compete with these crops," growers thought this attitude threatened tung variety experimentation.[28] In fact, growers feared that the USDA planned to end all tung research, an eventuality they associated with the end of the industry. They believed that the creation of late blooming varieties, new uses, and derivative discoveries could revive the cultural relevance of tung oil.[29] As enthusiasm dwindled, many tung farmers abandoned their groves. The secession of Lyndon B. Johnson to the presidency only added to the uncertainty of remaining growers.

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[27] Francisco J. Cooper, "The Market Situation and the League," *American Tung News* 13, no. 11 (Nov 1962): 9.

[28] "Tung Research Committee Hears Reports by Scientists," August 28, 1962, Agricultural Research Service, Southern Utilization Research and Development Division," Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU.

[29] "Marco Polo's Secret Builds Industry," *Tallahassee Democrat*, Dec 15, 1963, 35.

After the assassination of Kennedy, tung growers found no relief under his successor. Thinking it might incite the formation of more organized farm labor organizations like 1961 United Farm Worker Association (UFW) and lead to rises in workers' pay, Johnson's support of labor unnerved them.[30] Even though he called Benson an 'anvil strapped to the ankle of American agriculture,' Johnson sought to expand both market and voluntary production controls but emphasized selling surpluses abroad.[31] No stranger to the complexity of parity, he knew many recipients had the financial means to subsist without supports and, perhaps, abused the system.[32] His reservations about parity were intensified by continuing pressure to reduce government influence. One example, a scathing admonition of parity by AFBF President Charles Shuman read, "No self-respecting farmer wants to become a member of a permanently subsidized peasantry."[33] Shuman went on to compare dependence upon government subsidies to addiction to narcotics with the government as the supplier or enabler and equated this reliance of farmers on the government to socialism (a particularly searing indictment in the context of the Cold WarFor the most part, Shuman and many others simply thought it unfair to

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[30] On the UFW, see, Mark Hamilton Lytle, *America's Uncivil Wars: The Sixties Era from Elvis to the Fall of Richard Nixon* (New York: Oxford University Press, 2006), 298.

[31] Leonard Baker, *The Johnson Eclipse: A President's Vice Presidency* (New York: Macmillan, 1966), 35. See also, Hurt, *Problems of Plenty*, 131; and Giglio, 116. When it came to agricultural legislation, one of Johnson's early feats proved the 1964 Office of Economic Opportunity or "Poverty Program." Along with affording the USDA the right to organize rural programs, it included grants for farmers. See, Heath, 172.

[32] "Agriculture: The Great Society, Country Style," *TIME Magazine*, February 12, 1965; and "Agriculture: The Rich Get Richer," *TIME Magazine*, June 30, 1967. Freeman preferred working under Kennedy because he claimed Johnson never paid as much attention to the USDA. See, Deborah Hart Strober and Gerald S. Strober, eds. *The Kennedy Presidency: An Oral History of the Era* (Washington, D.C.: Brassey's, 2003), 146.

[33] "Agriculture: The Farm Fix," *TIME Magazine*, December 18, 1964.

use taxpayers' dollars to subsidize wealthy farmers. Many growers, of course, dismissed such talk as exaggerated fear-mongering. While doubts persisted, Johnson and still Secretary of Agriculture Freeman believed ending parity would wreak havoc on farmers.[34] As a result, tung farmers became even more dependent upon price supports under Johnson as prodigious changes took place on farms across the U.S.

The costs of maintaining tung oil farms kept increasing in the latter part of the 1960s. Black migration north and new job opportunities along the coast meant tung growers struggled to find pickers. Some like Chenel turned to Mexican labor.[35] Others hired and paid for the transportation of African-Americans from nearby cities or in the case of some Mississippi growers, the Delta. In addition to labor shortages, farmers faced escalating labor costs, a product, in part, of the new minimum wage legislation in the form of the Fair Standards Amendment of 1966. In fact, H.R. 10518 suggested that part-time and seasonal workers receive at least $1.15 an hour beginning as of July 1, 1966. Tung growers traditionally paid pickers by the bag, not the hour, and objected vociferously. Many feared that paying set wages would bankrupt their tung farms. Minimum wage legislation for farm workers passed, but many farmers found ways to skirt the law and avoided paying the set amount.[36] Obligatory wages provided even more of an incentive for tung growers to mechanize to avoid reliance upon unskilled labor.

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[34] Ibid.

[35] Daughtry, interview.

[36] Piven, 203; L. O. Crosby, Jr., interview by Dr. Orley B. Caudill, October 29, 1974, transcript, The Mississippi Oral History Program of The University of Southern Mississippi vol. 155 (1980), p.15, COHCH, MLA, USM; and Minchin, 103.

The ATOA issued a statement implicitly objecting to the minimum wage law but expressing the organization's hope that it might speed mechanization: "An increase in the wages of the unskilled people working on the farms will force our growers into mechanization at a much faster rate than is presently projected."[37] Between 1945 and 1962, the number of tractors per farm had multiplied from one to two.[38] Machinery received an extra boost in popularity from the Civil Rights Act of 1964 because many farmers did not want to deal with black laborers and tenants.[39] While machines had become more popular in the previous twenty years, the price of a tractor had risen from roughly $1,000 in the late 1940s to about $5,500-6,000 by the late 1960s. Tung growers with small farms could hardly afford employee wages, let alone payments on machines. Only large growers had the finances to spend money on machinery and many funded studies to perfect tung nut harvesting machines.[40] As wage and machinery expenses rose, farm incomes plummeted, the number of small-and-middle-sized farms shrank, and the number of large farms increased.[41]

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[37] "Bill on Minimum Wage for Farm Workers," *American Tung News* 16, no. 9 (Sep 1965): 4.

[38] Piven, 200.

[39] David R. Goldfield, *Black, White, and Southern: Race Relations and Southern Culture 1940 to the Present* (Baton Rouge: Louisiana State University, 1990), 204.

[40] "Bill on Minimum Wage for Farm Workers," *American Tung News* 16, no. 9 (Sep 1965): 4; and "Answers Given to Tung Labor Question," *American Tung News* 18, no. 3 (March 1967): 12. On the changing prices of farm machinery, see, for example, Fite, *Cotton Fields No More*, 182-183. On black labor, see Goldfield, 141.

[41] Orville Freeman, *Agriculture/2000* (Washington, D.C.: USDA, June 1967), 10.

Agribusiness had been growing for years, and according to southern historian Pete Daniel, it had "swallowed up the South."[42] As explained by southern historian Jack Temple Kirby, "Planters and larger farmers collected federal subsidies, reduced their labor costs, mechanized, and expanded their acreage while creating neoplantations specializing in cattle, grains, soybeans, corn, rice, cotton, and even timber."[43] The fact that they had long become dependent upon government assistance greatly fueled this trend. With this new wage legislation, many tung farmers experienced financial difficulties, perhaps a reflection of the nationwide farm debt crisis. For example, in 1966, R. B. Tootell, Governor of the FCA, proclaimed that the farm debt had reached $36 billion. With looming debt, tung growers seemed to encounter more hurdles in acquiring both credit and loans. All of these factors made many farmers' quest to mechanize difficult if not impossible.[44] With these obstacles in mind, many tung growers began reassessing the future or demise of their industry. Given the withering demand, employee expense, and loan problems, the domestic tung oil industry seemed to be fading away and yet, scientists persevered in their tung oil studies.

For decades, studies intended to make trees bloom later and increase oil content in tung nuts had taken place, but such efforts did not begin to bear fruit until the mid-1960s. Scientists had created late blooming trees from *fordii* and *montana* hybrids but the results grew slowly so researchers set about producing late blooming strains of pure *fordii*. They

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[42] Daniel, *Lost Revolutions*, 60.

[43] Kirby, *Rural Worlds Lost*, 348.

[44] "Credit Key to Productivity Growth," *American Tung News* 18, no. 7 (July 1967): 5; and "Agriculture: Poor-Mouthing—or Just Poor?" *TIME Magazine*, March 24, 1967.

believed such a fast growing and late blooming tree could potentially save the domestic tung oil industry. Ideally, scientists also wanted these trees to have a high percentage of oil content. Taken from China and nurseries in Poplarville, Mississippi, and Monticello, Florida, six selections of tung lines had an increased oil content of twenty-two percent as compared to the usual eighteen percent. Wanting to delay blossoming by ten days if not a month, scientists used growth regulators both natural like gibberellen, indoleacetic acid, naphthenic oils, and colchicines or synthetics. While a good anti-flowering hormone, indoleacetic acid was often overridden by natural enzymes in the trees. Given variances of soil and temperature, the greatest uncertainty was the timing for the applications of growth regulators. Scientists found that application one month before expected blooming gave the best results. One germplasm in particular, dubbed Annabella, seemed especially promising as it bloomed some four to six weeks later than usual. Unfortunately, the tree turned out to be sterile. Despite this setback, USDA scientists finally created late blooming trees, and growers began purchasing them from the U.S. Field Lab for Tung Production in Poplarville.[45] While the remaining USDA tung labs focused primarily on trees, PATRDL kept experimenting with tung oil.

Having moved to the University of Southern Mississippi, the PATRDL lab tried to improve tung oil primers by increasing their drying speed and their resistance to the

[45] "Recommend Emphasis on Late Blooming," *American Tung News* 17, no. 2 (Feb 1966): 12; J. Thomas Raese and Bowen S. Crandall, "The Current Case for Growth Regulators," *American Tung News* 18, no. 7-9 (July-Sep 1968): 16; "Late Blooming Seedlings Available," *American Tung News* 19, no. 12 (Dec 1968): 9; Samuel Merrill, "New Tung Varieties Escape March Freeze," *American Tung News* 19, no. 7-9 (July –Sep 1968): 10; W. W. Kilby, "History and Literature of the Domestic Tung Oil Industry," *Mississippi State University Technical Bulletin* 56 (Aug 1969): 1; and Dennis Hayward, "Breakthrough in Tung," *Mississippi Coast Area Monitor*, 9th Edition, 1969, 1. By the late 1960s, scientists had formed the following late blooming varieties: L-266, F-732, M-273, M-296, and F-744. See also, Tim Rinehart, telephone, interview by author, September 13, 2012, tape recording.

elements. Given the rise of brick, concrete, and aluminum, its scientists surmised that such studies might help the position of wood in the construction market.[46] The Oxypol Process allowed scientists to create tung-phenolic coatings by combining tung, phenolic resin, and oxygen at the low temperature of 212 degrees Fahrenheit. Their experiments determined that tung made an excellent paint for structural steel like that used on bridges. Another outcome proved a new coating process dubbed electrodisposition, a technique consisting of an electric current used to coat metal with paint. Its perks included a lack of fire risk due to the water-based solvent and the fact that it covered every nook and cranny of the target, thus saving paint that spray cans might otherwise waste.[47] Among other things, the scientists created a tung oil primer capable of withstanding water emersion without rusting. As PATRDL Director Austin reported, "We were informed by the research department of one of the largest automobile manufacturers in the world that a water-soluble primer based on tung oil is equal in performance to their present solvent type primer."[48] While PATRDL scientists worked to make this tung oil primer superior to conventional primers, their foci multiplied.

Given the tumultuous fluctuations of the market, PATRDL scientists wanted to prove once and for all that tung oil remained the supreme oilseed. They conducted studies

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[46] "League Laboratory Will Move to USM," *American Tung News* 14, no. 2 (Feb 1963): 3.

[47] "New Tung Oil Primer Shows Much Promise," Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU; "Tung Oil Proven Best in Bridge Paint Tests," *American Tung News* 17, no. 3 (March 1966): 6; "New Coating Shown in Detroit," *American Tung News* 12, no. 2 (Feb 1961): 6; and R. O. Austin, "Tung Oil Excels in New Industrial Process," *Mississippi Coast Area Monitor*, 8th Edition, 1968, 49. See also, R. O. Austin, George Pylant, and Ella Kay Harper, "The Oxypol Process," *American Tung Oil Topics* 12, no. 1 (May 1968).

[48] R. O. Austin, "Basic and Developmental Tung Research," Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU.

on tung oil not simply as a plasticizer softener but as a plastic by combining it with styrene monomers. Testing electrical insulation, other experiments attempted to make tung competitive with synthetics like epoxies and polyurethanes. Scientists also experimented on tung oil fuels attracting the likes of National Aeronautics and Space Administration (NASA). In Huntsville, Alabama, the Thiokol Corporation at Redstone Arsenal tested tung oil as a binding agent in rocket fuels.[49] In other inquiries, they managed to produce impressive insecticides. PATRDL, USDA, and Mississippi State College Boll Weevil Research Lab scientists sprayed tung oil and tung meal on cotton and found rain did not remove the applications as it did most pesticides. Deeming their current formulas just as effective, many pesticide manufacturers dismissed this innovation. Besides, results from a 1953 test on tung as an insect repellent had unimpressive results according to the Bureau of Entomology & Plant Quarantine (BEPQ).[50] Thus, a common pattern quickly emerged from these discoveries, expensive products effective enough, but not superior to those in use. All of this experimentation

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[49] "Polyurethanes: Tung Oil Urethane Vehicles," Progress Report, Feb 13, 1964,Box 20, Folder 1, Polyurethanes (1960-67); and "Binding Agent For Solid Rocket Fuels," Report no. 1, August 23, 1960, Box 20, Folder 1,Polyurethanes (1960-1967), ATOI MLA, USM. R. O. Austin, R. R. Becke, and Dr. W. F. Arendale of Thiokol Corp initiated the rocket fuel study.

[50] "Tung Research Committee Hears Reports by Scientists," August 28, 1962, Agricultural Research Service, Southern Utilization Research and Development Division;" and Roland R. Becke, Sec-Man of Farm Chemurgic Council, October 26, 1996, Bo 20, Folder 3, Tung Oil, FCC, UAHC, MSU. See also, "Tung Oil Shows Promise as an Insecticide," *American Tung News* 17, no. 9 (Sep 1966): 4; "Tung Tide by Tom," *American Tung News* 17, no. 5 (Aug 1966): 14; "Boll Weevil Repelled by Tung Meal," *American Tung News* 17, no. 3 (March 1966): 13; "Bogalusa Center of Tung Orchard Research Work," *Bogalusa Sunday News*, March 20, 1966; and A. M. Altschul, L. A. Goldblatt, and R. S. McKinney," Review of Information on Physiological Properties of Tung Oil," Box 5, Folder 17, Tung History 1944-76, ATOI, MLA, USM. Common boll weevil pesticides in the 1910s and 1920s included calcium arsenate, sulfur dust, and nicotine. After becoming commercially available on August 1, 1945, DDT was used. See, for example, Daniel, *Lost Revolutions*, 62.

performed by PATRDL not only failed to dissuade the USDA from decreasing tung oil research but inadvertently provided a convenient excuse to cut all funding.

At a press conference on December 31, 1964, Freeman suggested that all USDA sponsored tung oil research end on July 1, 1965. Under this plan, he explained, the USDA would no longer fund tung studies at the Bogalusa Tung Investigations Office, SRRL in New Orleans, and Cairo Tung Investigations Office in Cairo, Georgia. Seeking ways in which to cut its budget, the USDA decided to target minor crops like rice, sugar, and tung and to close twenty small research stations, including those at Houma, Louisiana; Bogalusa, Louisiana; Meridian, Mississippi; and Mississippi State College. According to Freeman, stopping tung research at Bogalusa and Cairo alone stood to save $154,000 and $32,900 a year, respectively. Only 2,000 farmers grew tung trees then so he saw the crop as having minute importance. Freeman tried to lessen protests by insisting that scientists had done a stellar job of exploring every original goal.[51] Needless to say, objections to this plan abounded among tung organizations.

Tung industry advocates believed a wealth of information remained to be found and feared that the end of government funding meant less competitiveness in the market, less scientific research, the end of domestic production, and economic ruin for tung areas. They spoke of the employment provided by the tung industry in historically impoverished areas. For example, Mississippi's Pearl River County had the lowest per capita income in the state in the 1930s. By 1965 this self-proclaimed tung center of the world had one of the top five county economies in the state thanks to its agricultural machinery businesses,

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[51] "Elimination of USDA Research Proposed; Removing Research Would be Wrong," *American Tung News* 16, no. 1 (Jan 1965): 4; Edgar Poe, "Some Research Will be Ended," *Times-Picayune*, January 1, 1965, 44; and "USDA Decision Ends Research," *Times-Picayune*, February 28, 1965, 7.

chemical and paint plants, furniture factories, and printing and publishing establishments, all industries which consumed tung.[52] *American Tung News* blamed the federal government for its role in the decline of the domestic industry. One editorial stated, "The takeover of all our tung oil by the government during the war caused the industry to lose its traditional customers in industry, beginning a battle for markets which the industry is still fighting."[53] In the face of such mounting criticism, the USDA issued a disclaimer reflecting that utilizations had increased, cultivation had improved, oil extraction had perfected, and higher yields had resulted and that the non-government sponsored PATRDL would no doubt continue research.[54] Unwilling to let government research cease, tung supporters took action.

Growers and organization representatives sent a stream of letters to Freeman and their state politicians arguing for the continuation of research which they deemed imperative to the industry. Given the rising cost of labor and farm supplies, growers knew they needed to find ways to cut production expenses and increase uses to make tung more valuable to consumers and more viable in an increasingly competitive market. The SRRL had coordinated with PATRDL to conduct different kinds of experiments. If studies at the latter stopped, fifty percent of the research sector on tung would vanish. Roland Becke, Executive-Secretary of the ATOA, spoke before The Oilseed, Peanut, and Sugar Crops Research Advisory Committee in New Orleans in January and presented an impressive

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[52] "Removing Research Would be Wrong," *American Tung News* 16, no. 1 (Jan 1965): 4; and "Pearl River County," *Mississippi Coast Area Monitor*, 5th Edition, 1964-1965, 61.

[53] "Removing Research Would be Wrong," *American Tung News* 16, no. 1 (Jan 1965): 4.

[54] "Elimination of Research on Tung . . . New Orleans, La., Bogalusa, La., Cairo, Ga.," February 1965, USDA, Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU.

case. The committee considered the strategic value of tung oil to the national welfare and urged Freeman to reconsider ending tung funding.[55] Politicians also took up the gauntlet.

One of the tung oil industry's key advocates, Senator Stennis, spearheaded an effort to maintain funding, and the Senate Appropriations Committee adopted the Stennis Amendment to the Supplemental Agricultural Appropriations Bill which called for continued financial backing. In the Senate and House, Senator Holland and Congressman James Whitten (D-MS), both chairs of the Subcommittee on Agricultural Appropriations, presided over hearings. On April 9, the hearings resulted in the recommendation that USDA research expenditures continue at no more than $221,300 a year in order to increase domestic tung production and lessen reliance on imports. In late April, Freeman finally declared that the USDA would continue funding tung experimentation indefinitely but with constraints.[56]

Freeman consented that research would continue at the Cairo and Bogalusa labs but he ordered that the former be relocated to the Big Bend Horticultural Lab in Monticello, Florida. While the domestic tung oil industry had begun in Florida, its role in domestic production had been supplanted by Mississippi and Louisiana. As Freeman sought to give the eastern Tung Belt a larger role in the industry, growers in Louisiana begrudged the removal of the lab. Freeman ordered an end to tung experimentation at the SRRL on July 1, 1965. Frightened over the loss of government sponsorship, tung farmers

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[55] "Oilseed Group Backs Tung Industry," *American Tung News* 16, no. 3 (Mar 1965): 10.

[56] "Retaining Research was a Massive Effort," *American Tung News* 16, no. 5 (May 1965): 4; "Tung Production Research is Reinstated," *American Tung News* 16, no. 5 (May 1965): 5; and "Rice, Tung Nut Study Goes on," *Times-Picayune*, April 28, 1965, 1. Of the seven crops posed to have research cut, only three continued to receive funding: rice, sugar, and tung oil.

extrapolated a future without parity, quotas, and tariffs. Two key tung scientists, expecting their jobs to be terminated, had transferred and caused testing to stall. According to L. C. Cochran, Chief of the USDA Fruit and Nut Crop Research Branch, the mere threat of cessation deterred scientists from working with tung.[57] More than ever before, tung growers like the Chase family, owners of Jumpie Run Plantation in Monticello, Florida, Crosby, and Chenel relied on their own laboratories or funded experimentation.[58] While government studies resumed later that year, the status of tung oil as a crop had been irrevocably altered.

On September 9, the domestic tung oil industry suffered another blow when Hurricane Betsy, a Category 3 Storm, trashed coastal Louisiana and Mississippi.[59] While the spring freeze had "beaten Betsy to the punch" by destroying much of that year's harvest, the hurricane's devastation disheartened tung farmers.[60] Parity, quota, and tariff frustrations had led some growers to turn away from tung production. The price had dropped to twenty-five cents per pound oil and CCC stock had swelled to over forty million pounds.[61] As can be seen in Table 6.1, in just nine years, consumption by the

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[57] "Tung Production Research is Reinstated," *American Tung News* 16, no. 5 (May 1965): 5; "League Recommends Emphasis Shift," *American Tung News* 16, no. 8 (Aug 1965): 10; L. C. Cochran to Wilson Kilby, November 15, 1965, Box 1, (42) C 1961-65, WWK, SMBES, CPRC, MML, MSU; and Francisco J. Cooper, "Hold Fast" (speech presented at thirty-second annual Tung Industry Convention, Edgewater Park, MS, Sep 20-23, 1965), 9.

[58] See, for example, Jumpie Run Plantation, Tung Oil Laboratories (1965); and Jumpie Run Plantation, Tung Research (1966-1967), Box 147, Series 4: Subject Files, 1961-1984, Chase Collections, Special and Area Studies Collections, George A. Smathers Libraries, University of Florida, Gainesville, Florida [hereafter CC, SASC, GASL, UF].

[59] Stefan Bechtel, *Roar of the Heavens* (New York: Citadel Press, 2006), 13.

[60] "Vegetable Oils," *American Paint Journal* 50, no. 8 (Sep 1965): 49.

[61] "Vegetable Oils," *American Paint Journal* 50, no. 9 (Sep 1965): 43.

paint and varnish industry fell almost by half. Betsy hastened the departure of many growers from tung production to other crops or cattle but price and demand concerns played significant roles in such decisions. Weighing the odds, a handful of men and women assessed the damage and replanted their orchards with tung.

Table 6.1 Paint, varnish, and lacquer industry tung oil purchases[62]

Year	lbs
1955	42,636,000
1956	43,689,000
1957	39,676,000
1958	31,805,000
1959	31,500,000
1960	29,600,000
1961	28,000,000
1962	25,000,000
1963	22,000,000
1964	23,600,000

The arrival of Hurricane Betsy in August 1965 had damaged some orchards leaving growers in a bind. Disaster money from the Agricultural Stabilization and Conservation Service (ASCS) allowed many growers to clear their land of fallen trees and other debris. While some growers replanted with tung seedlings, others uprooted the orchards and planted other crops or invested in cattle to counter unpredictable shifts in the tung oil market.[63] At this time of disenchantment, mechanical tung harvesters first appeared in 1965 but garnered little attention. W. W. Kilby, head of the Mississippi Branch Experiment Station, theorized harvesters would have made a difference in

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[62] Charles E. Powe and A. D. Seale, Jr., "An Analysis of the Market for Tung Oil," *Mississippi Agricultural Experiment Station Bulletin* 729 (July 1966): 7.

[63] "Hurricane Damage Funds Available," *American Tung News* 16, no. 12 (Dec 1965): 7.

domestic production and lessened concerns about labor had their availability been earlier.[64] Between 1964 and 1969, the number of tung farms in Mississippi selling over $2,500 or more a year dropped from 1,170 to a mere 111.[65] While the bulk of tung growers mistakenly blamed the government, the real reason behind drops in tung oil demand lay in the shift from oil to water-based paints.[66]

Facing a changing market, domestic production dwindled from twenty-five million pounds in 1966 to fifteen million pounds in 1967.[67] Support price for tung oil remained steady at twenty-four cents while the market price had sunk to 12-13.5 cents a pound.[68] Unwilling to sell at such low prices, many large growers with storage capacity simply stored their tung oil hoping that the market price might rise or turned to CCC loans. At one point, CCC stock reached some seventy million pounds of oil.[69] Minute demand, massive levels of CCC holdings, and the low price meant foreign countries had little incentive to sell to the U.S. and, instead, turned their eyes toward Europe.[70] The

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[64] "Harvester Works Besides Wind and Rain," *American Tung News* 16, no. 5 (May 1965): 8; and W. W. Kilby, "History and Literature of the Domestic Tung Oil Industry," *Mississippi State University Agricultural Experiment Station Technical Bulletin* 56 (Aug 1969): 4.

[65] 1964 United States Census of Agriculture vol 1, part 33, Mississippi (Washington, D.C.: U.S. Department of Commerce Bureau of The Census, 1964, p.378-385); and 1969 Census of Agriculture, Part 33, Section 1 Mississippi, Summary Data Volume 1 Area Reports (Washington, D.C.: U.S. Department of Commerce, 1972), p.311.

[66] "Stocks of Tung Oil are Still High," *American Tung News* 19, no. 3 (March 1968): 10.

[67] "World Tung Production Down in 1967-68," *American Tung News* 18, no. 12 (Dec 1967): 9.

[68] "Expect Tung Market to Strengthen," *American Tung News* 19, no. 2 (Feb 1968): 13; and "Brief Summary of The Tung Industry," October 24, 1967, Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM.

[69] "Imports of Tung Oil Below Average," *American Tung News* 19, no. 6 (June 1968): 7.

[70] "Imported Tung Oil Stocks are Low," *American Tung News* 19, no. 6 (June 1968): 7.

number of tung growers had decreased dramatically across the Tung Belt with Georgia and Texas showing the highest drops.[71] In Texas, Tyler, Jasper, and Hardin Counties had long boasted the bulk of the state's tung trees but by the 1960s, their tung production had vanished.[72] Members of the NTOMC realized the market alterations but claimed, "It might be easier to have a rich aunt die . . . but tung growing is still a profitable way to make a living on the farm."[73]

By the late 1960s, grower trepidation climbed as government funding faded. As tung scientists transferred, resigned, retired, or died, USDA experiments became few in number and limited in range. In 1967, worry led ATOA Executive-Secretary Roland Becke to ask Congressman Colmer to investigate when the USDA failed to fill staff vacancies at tung labs. Reasons may have included the unwillingness or disinterest of scientists to work on a declining agricultural crop like tung and anxieties about moving to Bogalusa where civil rights unrest had become prevalent.[74] By 1968, only two scientists worked on tung at the Bogalusa lab, and they worked on cultivation, not oil usage. That

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[71] Georgia's decline in production had been going on since the mid-1930s. On Georgia, see, Willard Range, *A Century of Georgia Agriculture, 1850-1950* (1954; repr., Athens: The University of Georgia Press, 2010), 194. On Texas, see appendices.

[72] Roland Becke, "Becke Reports on Tung in Texas," *American Tung News* 5, no. 1 (Jan 1954): 8. The largest tung plantation in Texas was near Silsbee in Hardin County. It was called Steinhagen Tung Groves by its owner B. A. Steinhagen of Beaumont. Steinhagen later gave the property to the Y.M.C.A. so it became known as the Y.M.C.A. Tung Farm. The Y eventually sold the orchards to Dr. Norman Duren. See, "Texas To Organize Tung Group," *Tung World* 1, no. 5 (Sep 1946): 22; "Name Louisianians On Oil Association," *Times-Picayune* Aug 2, 1939, 4; and Roland Becke, "Becke Reports on Tung in Texas," *American Tung News* 5, no.1 (Jan 1954): 8.

[73] "It Might be Easier to Have a Rich Aunt Die . . .," *American Tung News* 20, no. 1 (Jan 1969): 2.

[74] "Research to Continue," *American Tung News* 18, no.3 (Mar 1967): 4; Wilson Kilby to L. C. Cochran, November 19, 1965, 1961-65, Box 1, C (42), WWK, SMBES, CPRC, MML, MSU; and C. H. Fisher, "Chemurgy in the South," *Chemurgic Digest* 24, no. 3 (April-May 1966): 4.

year, the USDA moved the Bogalusa lab to Poplarville on the grounds of the Mississippi Branch Experiment Station where it could work with the Experimental Tung Field. While small, a lab in Monticello still operated with The University of Florida. The ATOA pressed for the USDA to resume utilization research or at least help PATRDL financially. At this time, PATRDL worked very closely with The University of Southern Mississippi and had expanded its membership by allowing Paraguay to join. Domestic membership, however, had dropped considerably. International members in Argentina and Paraguay quickly tired of shouldering the bulk of funding, and PATRDL verged on dissolving. Research by PATRDL and USDA scientists lessened further with the arrival of Hurricane Camille.[75]

Hurricane Camille, a Category 5 Storm with its 190 miles per hour wind, seven to ten inches of rain, and twenty foot high waves, wrought havoc on the Tung Belt on August 17-18, 1969. Approximately a month before harvest, the winds impacted 35,000-40,000 acres of orchards in coastal Louisiana and Mississippi, as well as 10,000 acres in Mobile and Baldwin County, Alabama. Orchards lay in ruins with trees uprooted or split; $1.42 billion in damages had been caused to personal and business properties, and 258 coastal residents had lost their lives.[76] According to a September edition of *The New York*

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[75] American Tung Oil Association, "Introduction Remarks," Statement Pertaining to Research on Tung Oil Presented to the Oilseed, Peanut, and Sugar Crops Research Advisory Committee, January 9, 1968, Washington, D.C., Box 1, B 1968-69 (33), WWK, SMBES, CPRC, MML, MSU; "New Life for Tung Research," *American Tung News* 19, no. 1 (Jan 1968): 1; and W. Wilson Kilby, "History and Literature of The Domestic Tung Industry," *Mississippi State University Agricultural Experiment Station Technical Bulletin* 56 (Aug 1969): 2.

[76] Roy Reed, "On Gulf Coast, Storm's Scars are Still Vivid," *New York Times*, September 12, 1969. See also, "General Information Pertaining to The Agricultural Economy of Pearl River County," Box 10, Folder 10, Camille; and "ATOA and Mississippi Pecan Growers Association to Richard Sullivan, Box 10, Folder 10, Camille, ATOI, MLA, USM. Also see, Dan Ellis, *All About Camille* (Pass Christian: Dan Ellis, 2000), 3; "Hurricane Camille, 1969," *TIME Magazine*, May 11, 2011, 202; "Tides Begin to Rise,"

Times, "The entire waterfront from Biloxi west to the outskirts of New Orleans, a distance of 70 miles, still looks as if it had been bombed."[77]

With the loss of both the year's crop and the orchards, tung farmers anguished over their plight. Harvest time had been one month away so the blow had been especially injurious. According to grower Sally Goodyear, the prematurely fallen tung nuts "looked like long rows of green golf balls."[78] The following counties suffered immense damage: Washington Parish, Louisiana; and Pearl River, Lamar, Stone, Harrison, Hancock, and Jackson Counties, Mississippi.[79] According to the U.S. Department of Agriculture Statistical Reporting Service, in Mississippi, the loss of tung amounted to roughly $3 million as compared to pecans at $2,500,000, cotton at $1,700,000, corn at $852,000, and soybeans at $2,078,000.[80] Table 6.2 shows that Pearl River County suffered enumerable damage estimated at $35-40 million. This county lost eighty percent of pecan acreage, fifty percent of soybean acreage, and 100% of tung acreage.[81] In essence, the seat of the domestic tung oil industry had been wiped out. For fencerow tung growers, the loss may

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Aug 17, 1969, *The Daily Herald*, *The Story of Hurricane Camille* (Gulfport: Gulf Publishing, 1969); Bechtel, 250; and Ernest Zebrowski and Judith A. Howard, *Category 5: The Story of Camille: Lessons Unlearned from America's Most Violent Hurricane* (Ann Arbor: University of Michigan Press, 2005).

[77] Roy Reed, "On Gulf Coast, Storm's Scars are Still Vivid," *New York Times*, September 12, 1969.

[78] Goodyear, interview.

[79] Charles L. Sullivan, *The Mississippi Gulf Coast: Portrait of a People: An Illustrated History* (Northridge, CA; Windsor Publishing, 1985), 146.

[80] Ray B. Converse to Jim Buck Ross, "Hurricane Damage Assessment—Report #2, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[81] County Supervisor, FHA, Poplarville, Mississippi to State Director, FHA, Jackson, Mississippi, August 27, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM. See also, *Mississippi Agricultural Stabilization and Conservation Service Newsletter* no. 73 (Aug 27, 1969).

not have been that significant to their incomes, but for the owners of large tung oil operations, it was devastating. In the aftermath, many tung growers sought government assistance.

Table 6.2 Pearl River County Crop losses[82]

Crop	Acreage	Estimated Yearly Sales	Crop Loss
Tung	35,000	$2,500,000	$2,500,000
Corn and Sorghum	7,400	592,000	
Pecans	4,000	780,000	780,000
Soybeans	10,000	275,000	290,000
Dairy	4,700	1,032,000	
Timber			10,000,000
Feed Grains			592,000
Forage Crops			375,000

Having destroyed the majority of the country's tung trees, Camille placed the unstable tung oil industry in a precarious position.[83] Earlier that year, a dock strike on the east coast resulted in escalating tung prices so consumer demand shrank.[84] At the time of the hurricane, the support price for tung oil was twenty-four cents a pound as compared to a 16-17 cent market price.[85] As fears of shortages ensued, tung shot to 25-26 cents in the following months.[86] The higher price alienated many consumers even though

[82] County Supervisor, FHA, Poplarville, Mississippi to State Director, FHA, Jackson, Mississippi, August 27, 1969, Box 10, Folder 10, Camille; and "General Information on Hurricane Camille Damage to Agricultural Economy in Pearl River County, Mississippi, Box 10, Folder 10, Camille, ATOI, MLA, USM. See also, Ellis, 9.

[83] "Fats and Oils Situation," *USDA Bureau of Agricultural Economics* (Sep 1969): 20.

[84] "Vegetable Oils," *American Paint Journal* 53, no. 32 (Jan 1969): 44.

[85] "Vegetable Oils," *American Paint Journal* 54, no. 6 (Sep 1969): 36.

[86] "Vegetable Oils," *American Paint Journal* 54, no. 24 (Dec 1969): 40.

45,500,000 pounds of tung oil rested in CCC storage tanks.[87] The *American Paint Journal* expressed the belief that the Tung Belt overemphasized the impact of Camille on the tung oil industry but did grant that the hurricane had a "psychological effect on the market."[88]

In part, high unemployment along the Gulf Coast was attributed to the wasted tung orchards.[89] On top of the monetary loss of that year's crop to tung growers and laborers, farmlands had been strewn with downed tung trees making the land unusable until cleared. Whereas pine could be sold or given away, tung timber had little merit. Growers lacked the needed equipment and had to rely upon bulldozers which cost from $100-125 an acre. If not removed, the trees would slowly rot, choke the land, and pose a fire hazard. Although some tung farmers were helped with disaster relief funds, most were not because assistance agencies saw them as part-time farmers.[90] The majority of growers may have had other incomes, but with the loss of their groves and insufficient emergency funding, many faced bankruptcy.

Tung farmer found little welcome from local banks. The Bank of Commerce in Poplarville did not dabble in agricultural loans; and while the Bank of Picayune and Lumberton State Bank dealt with cattle, they claimed to lack resources to aid agriculture. Expressing the desire to aid both current and future members, the Hattiesburg PCA

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[87] "Vegetable Oils," *American Paint Journal* 54, no. 5 (Aug 1969): 46. See also, "Vegetable Oils," *American Paint Journal* 54, no. 3 (Aug 1969), 50.

[88] Ibid. See also, "Vegetable Oils," *American Paint Journal* 54, no. 9 (Sep 1969): 35.

[89] Mark M. Smith, "Camille 1969: Histories of a Hurricane," Mercer University Lamar Memorial Lectures No. 51 (Athens: University of Georiga Press, 2011), 47-48.

[90] Charles Nutter, "Tung Nut Industry Fading from State," *Clarion-Ledger*, Dec 10, 1972.

admitted it lacked funding to accommodate every farmer who had endured loss.[91] In Mississippi, Governor John Williams created a twelve-member Governor's Emergency Council with $500,000, but it focused primarily on businesses, not farms.[92] Likewise, thirty-three counties received emergency loans from the FHA. While representatives of the FHA attended a meeting of tung and pecan growers that September, the organization did not benefit most tung growers.[93] Similarly, the ASCS gave $2,300,000 to sixteen Mississippi counties to revive farmlands but helped only with clearing not financial injury or revitalization.[94] Undeterred, growers appealed to the government for federal grants to hire bulldozer contractors.[95]

Tung growers had a vested interest in relief talks in Congress. On September 3, Congressman Colmer spoke before the House saying, "It now looks as if a giant blowtorch had passed over, or that a tornado of 100 miles wide had scooped down and destroyed that beautiful area." Congressman Hastings Keith (R-MA) proposed that a national policy be set in place to aid disaster victims.[96] Colmer sought roughly $1 billion

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[91] County Supervisor, FHA, Poplarville, Mississippi to State Director, FHA, Jackson, Mississippi, August 27, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[92] Smith, "Camille 1969," 49.

[93] "Timber Badly Damaged," *New York Times*, August 26, 1969; and "Meeting with Mississippi Tung Nut and Pecan Growers," Box 10, Folder 10, Camille, ATOI, MLA, USM.

[94] "Hurricane Camille: 4 Months of Action," Office of Emergency Preparedness (Dec 1969), Series 33, Box 250, Folder 4861, Senator John C. Stennis Papers, Congressional and Political Research Center, Mitchell Memorial Library, Mississippi State University, Starkville, MS [hereafter SJCSP, CPRC, MML, MSU].

[95] "American Tung Oil Association to Richard Sullivan, "Agricultural Devastation to South Mississippi, Alabama and Louisiana," Box 10, Folder 10, Camille, ATOI, MLA, USM.

[96] "Congressional Record," September 3, 1969, H7437, Box 10, Folder 10, Camille, ATOI, MLA, USM. See also, "Congressional Record," September 3, 1969, H7438, Box 10, Folder 10, Camille, ATOI, MLA, USM.

to help the coast while Senator Eastland tried to obtain more funds for land clearing.[97] Ironically, the bill that came to epitomize help for the coast, HR 6508 or the Disaster Relief Act of 1969 had been directed toward California which had recently endured flooding and storm damage. Even so, Congressman Robert E. Jones (D-AL) and other Tung Belt politicians supported this bill primarily for its Section 14 which gave the President power to use the Director of the Office of Emergency Preparedness to give grants to states after disasters for the clearing of debris. The Senate, in turn, amended the bill to include the President's being able to declare a disaster, for $250,000 to qualified states, and for the Small Business Act of provide loans up to $30,000 for homeowners and up to $100,000 for businesses, regardless of whether they had other sources of assistance.[98] When the resultant legislation passed, the Disaster Relief Act of 1969 did not provide the salvation tung growers expected.

After seeing the wind-wrecked orchards and assessing the damages, USDA representatives saw an opportunity to end domestic cultivation. Taking into account import availability, acrylic paint, and cheaper oilseeds, they concluded that the only sensible course of action lay in diverting farmers away from tung production. Most growers, long fed up with their tung proceeds or lack thereof, had no desire to see another

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[97] Thomas P. O'Neill to Thomas O'Connor, September 4, 1969, Box 10, Folder 10, Camille; and Roland R. Becke to James O. Eastland, September 12, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[98] "Disaster Relief Act of 1969," Conference Report to accompany H.R. 6508, September 17, 1969, 31st Congress, 1st Session, Report No. 91-495, p.8; and "Hurricane Camille, 1969," *TIME Magazine*, May 11, 2011.

tung tree and willingly agreed.[99] For years, many had dabbled in soybeans and simply made a transition.[100] Joseph Rault, Jr., of the Rault Petroleum Corporation wanted the USDA to pass a law which afforded tung growers $75 an acre to clear the land and cultivate another crop. This, he felt, would subsequently aid both farmers and the government.Growers would receive some compensation to help them select another focus and the USDA would no longer have to provide tung subsidies or be forced to accumulate millions upon millions of pounds of CCC stock. At the time, the USDA County and State Disaster Committees had the power to give farmers eighty percent of the clearing costs but limited each grower's payment. Voicing dismay, Rault argued that this clause discriminated against tung growers by favoring small farmers.[101]

Under the USDA County and State Disaster Committees, each county could award up to $2,500 while each state could provide no more than $10,000. To qualify for disaster funds, farmers had to present an estimate of loss. He or she would be assessed based on factors like the kind of crop (basic or non-basic), acreage, plans for the use of funding, and most importantly, the critical question of whether farming was their primary or secondary source of income.[102] Whereas most tung growers had occupations not categorized as farming, they yelled about the unfair treatment and charged the

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[99] "Proceedings of The Thirty-Sixth Annual Tung industry Convention Community Center, Poplarville, Mississippi, Nov 19, 1969," p.3, M477, Box 10, Folder 8, Tung History III, 1946-1970, ATOI, MLA, USM.

[100] Hugh H. Leard, "Tung and Soybeans As a Workable Farm Combination," *American Tung News* 17, no. 8 (Aug 1966): 10.

[101] Joseph M. Rault, Jr., Box 10, Folder 10, Camille, ATOI, MLA, USM.

[102] George V. Hansen, September 25, 1969, Box 10, Folder 10, Camille; and "Maximum Cost-Share Limitation for Emergency Practices," November 26, 1965, Box 10, Folder 10, Camille, ATOI, MLA, USM.

government with prejudice against large and/or absentee farmers.[103] Many tung growers also needed over $10,000, and while the USDA consented to evaluate such applications, they were frequently denied.[104] Tung growers found little relief in the USDA disaster committees but did supplement with other sources of aid.

A resourceful lot, tung growers investigated countless potential organizations in the hopes of gaining disaster funds and requested help from the Public Works Administration (PWA) to clear the debris from their orchards. They solicited the FHA for low interest loans. Under Public Law 875 or the Disaster Act of 1960, growers could receive clearing assistance but any recipient had to "be an owner-operator" and "manage his farming or ranching operation."[105] This legislation restricted the majority of tung growers from qualifying. With the funding deadline expiring in one year, growers believed an extension would be needed.[106] Seeking other alternatives, ATOA Secretary James A. Rawls, Jr., wanted the ASCS to provide loss and clearing expenses and the Office of Emergency Preparedness (OEP) to help with replanting.[107]

Resultant OEP and ASCS assistance assistant registered with most tung growers as insufficient. Under Public Law 91-79, a supplement to Public Law 875 or the Disaster

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[103] Sam Thompson to James A. Rawls, October 1, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[104] James Rawls to Trent Lott, October 1, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[105] Toxie H. Tulles, "Disaster Assistance from Farmers Home Administration," Proceedings of The Thirty-Sixth Annual Tung industry Convention Community Center, Poplarville, Mississippi, Nov 19, 1969," p.30, M477, Box 10, Folder 8, Tung History III, 1946-1970, ATOI, MLA, USM.

[106] George F. Potter to William M. Colmer, June 26, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[107] James A. Rawls, Jr., to Robert B. Britton, October 6, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

Act of 1960, the OEP aided with clearing costs.[108] The ASCS refused to provide any money for loss but helped some by providing $300,000 to aid with the clearing of tung and pecan orchards along the coast. Although the agency supposedly agreed to pay eighty percent of the expense, it only gave $30.00 per acre with a cap of $2,500 per farm. After the Disaster Relief Act of 1969, growers received sixty-five dollars an acre, still an amount far below what the ATOA desired.[109] Of the 2,500 applicants in Pearl River and Hancock Counties alone, 1,000 sought over $2,500 in clearing expenses, not including replanting costs. While the Mississippi ASCS gained an additional $1,000,000 to aid fifteen counties in October, tung farmers continued to feel victimized.[110] County Office Manager R. H. Bloodworth at the Pearl River ASCS addressed these concerns by recommending that the limits of $2,500 at county and $10,000 at state be extended and that farmers be judged by loss suffered, not personal wealth. He felt these two steps would speed recovery, but his requests were not initially heeded by the USDA.[111] In late October, Undersecretary of the USDA Phil Campbell toured coastal Mississippi to see

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[108] George F. Potter to James O. Eastland, July 1, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[109] Rault Petroleum Corporation to Honorable Hale Boggs, Western Union Telegram, August 25, 1969, Box 10, Folder 10, Camille; and Roland R. Becke to Charles P. Carriere, Jr., September 9, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM. See also, ASCS Newsletter, "Emergency Conservation Measures," October 1, 1969, Box 10, Folder 10, Camille; and Statement of the American Tung Oil Association before The Special Committee Subcommittee on Disaster Relief of The Senate Committee on Public Works, Broadwater Beach Hotel, Biloxi, Mississippi, January 7 and 8, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[110] J. Phil Campbell to Jim Buck Rose, October 8, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[111] R. H. Bloodworth to Miss. State ASC Committee, October 23, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

the damage firsthand and hesitantly agreed to raise county relief limits to $10,000.[112] The bulk of tung growers received only a fraction of the compensation they sought and some even used the money to uproot healthy, remaining trees.[113] Even with the financial compensation, tung farmers had mixed emotions about the demolition of their orchards.

Most growers saw Camille as a climax to decades of mounting frustrations. Domestic production, as revealed by Table 6.3, had been inconsistent. The price of tung oil, around forty cents, proved far more expensive than other oilseeds. Thanks to acrylic paint, demand for tung oil had, in the words of a grower, "almost dried up."[114] Tung-based paints were virtually impossible to clean from brushes and consumers preferred the ease of cleaning acrylics.[115] Support price, low as it seemed to tung growers, according to Crosby, Jr., meant "we were able to just make ends meet."[116] In fact, growers in Georgia, Alabama, and Florida had long since turned to other crops, membership in the ATOA had plummeted, and *American Tung News* published its last edition in the spring of 1969 before Camille arrived.[117] While some like Picayune tung farmer and hardware store

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[112] C. W. Sullivan to Director, Southeast Area, October 29, 1969, Box 10, Folder 10, Camille; W. W. Kilby to James Rawls, November 7, 1969, Western Union Telegram, Box 10, Folder 10, Camille; and James A. Rawls to Phil Campbell, November 10, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[113] Blake Hanson, interview by author, July 5, 2012, tape recording.

[114] Livaudais, interview.

[115] Daughtry, interview.

[116] Crosby, Jr., interview, November 5, 1974.

[117] Greg Frost, interview by author, July 18, 2012, tape recording. See also, George F. Potter to All Tung Growers," May 8, 1970, Box 7, Folder 19, Growers Letters (ATOA)(1969-1971), ATOI, MLA, USM; and Statement Pertaining to Research on Tung Oil Presented to the Oilseed, Peanut, and Sugar Crops Research Advisory Committee, January 9, 1968, Washington, D.C. by ATOA, Poplarville, MS, 1968-69, Box 1, B (33), WWK, SMBES, MAFES, CPRC, MML, MSU. On abandoning tung, see for example, Property of Ross J. Beatty, Jr., Lamar County, Mississippi, 1968-69, Box 1, B (33), WWK, SMBES, MAFES, CPRC, MML, MSU.

proprietor S. G. Thigpen, Sr., blamed the hurricane, other tung growers like P. A. Tims, Sr., of Poplarville believed Camille only one of many reasons for giving up tung.[118] The hurricane simply pushed growers over the edge.

Table 6.3 Tung production, 1962-1969 (ton nuts) [119]

State	1962	1963	1964	1965	1966	1967	1968	1969
AL	600	1,400	2,700	1,200	1,600	600	n/a	900
GA	n/a	n/a	n/a	n/a	n/a	0	0	0
FL	8,000	23,000	14,000	24,000	18,500	10,500	12,000	15,000
LA	2,200	66,500	108,700	34,200	93,300	52,800	21,800	2,000
MS	11,000	31,000	68,000	7,000	55,000	33,000	8,000	2,000

A few farmers stubbornly clung to the belief that they could make $52 an acre profit with tung as compared to just $16 with soybeans.[120] Disenchanted or simply disgusted, the majority did not want to replant only to wait three to five years for a crop. The father of Pierre Livaudais, for one, decided he was too old to regrow his orchards and instead, concentrated on cattle at his Tungway Plantation.[121] Of her father, Denise Chenel Daughtry commented, "I don't think he [Louis Chenel] ever wanted to see one [tung tree] again."[122] In fact, most tung growers thought the hurricane had done them a favor by

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[118] Thigpen, Sr., interview, p.28; and P. A. Tims, Sr., interview by Dr. Orley B. Caudill, July 7, 1976, transcript, The Mississippi Oral History Program of The University of Southern Mississippi vol. 387 (1976), p.29, COHCH, MLA, USM.

[119] Based on USDA Crop Production Annual Summaries: Acreage Yield Production by States for 1963-1969.

[120] Roy O. Fowler, "Outlook for the Tung industry," Proceedings of The Thirty-Sixth Annual Tung Industry Convention Community Center, Poplarville, Mississippi, Nov 19, 1969, p.11, M477, Box 10, Folder 8, Tung History III, 1946-1970, ATOI, MLA, USM.

[121] Livaudais, interview.

[122] Daughtry, interview.

uprooting their orchards. After all, the government helped pay for the clearing of the orchards and allowed tax deductions for the losses.[123] Innovations like the development of the late-blooming varieties and a one-man tung harvester failed to revive support for a passé industry.[124] With the economic transformations in the Gulf South, industries like NASA sparked a boom in real estate. Coupled with land prices rising from $30-40 per acre in 1961 to $125-150 per acre in 1969, the freeway system, Interstate 59 to New Orleans, intensified property values in Washington, St. Tammany, and Tangipahoa Parishes. Motivated by spiraling commodity prices and their financial reversals, tung growers planted pine for government subsidy or sold their land to profit from residential housing demands.[125] The few who wanted to replant and those still growing in Florida, Georgia, and Alabama, states which had escaped fairly unscathed from Camille, faced numerous hindrances.

Tung supporters advertised their crop as an ideal way to multi-crop but realized this attribute no longer held as much appeal given the rise in agribusiness.[126] The USDA Mississippi Branch Experiment Station Head Kilby, for one, declared tung "a godsend to farmers in the Gulf Coast states" in that it afforded a way to efficiently use cutover

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[123] Ibid.

[124] *American Tung News* 20, no. 3 (Spring 1969): 7.

[125] *The Heritage of Baldwin County, Alabama*, 38; "Agriculture South Mississippi," James H. Anderson, Box 1, Folder 2 (18), WWK, SMBES, MAFES, CPRC, MML, MSU; and "Picayune," *Times-Picayune*, June 10, 1962.

[126] Consider Tung, Mississippi State University Cooperative Extension Service, M477, Box 10, Folder 8, Tung History III, 1946-1970, ATOI, MLA, USM; and Bruce L. Gardner, *American Agriculture in the Twentieth Century*, 340.

pinelands.[127] After Camille, the costs of forming new orchards and waiting several years for the first crop seemed more burdensome than beneficial. Of all the problems, frosts seemed the most daunting as they frequently destroyed an entire year's crop. Of her father and the impact of one especially bad freeze, Daughtry said, "I thought he [Louis Chenel] was going to have a nervous breakdown . . . he'd pace around the house in the middle of the night worrying about the freezes . . . didn't do a bit of good . . . it still froze anyway."[128] Growers mulled over using chemical sprays, smoke generators, wind machines, and even helicopters to combat cold weather but decided these methods too expensive and ineffective.[129] Knowing the likelihood of freezes and the risk of crop failures, growers dismissed any ideas of moving to central or southern Florida as many of their citrus counterparts had done.[130] Confined to the Gulf Coast, tung trees did not prosper in overly humid and moist climates. Aware of the challenges and risks, devotees fought to maintain what remained of the tung industry.

Insistent on replanting, these men and women had access to late-blooming tung trees. These varieties had the ability to bloom some ten to fifteen days later than the normal tung tree. Remaining tung nurseries advertised these new types in the aftermath of Camille, but the bulk of growers had lost interest.[131] Aside from dwindling ranks, those

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[127] Kilby,"The American Tung Nut industry," 34.

[128] Daughtry, interview.

[129] See, for example, Haynes, 104; and George Potter and H. L. Crane, "Practical Frost Protection for Tung Trees," *Tung World* 6, no. 3 (Aug 1951): 9-11.

[130] Mormino, 362.

[131] J. Thomas Raese, Progress on Blossom Delay of Tung Proceedings of The Thirty-Sixth Annual Tung Industry Convention Community Center, Poplarville, Mississippi, Nov 19, 1969, M477, Box 10, Folder 8, Tung History III, 1946-1970, ATOI, MLA, USM; and Cleveland, Jr., 5.

wanting to continue their tung orchards suffered from negative press which repeatedly credited Camille with destroying practically all tung orchards when it had, in fact, only wrecked those in Louisiana and Mississippi. In fact, *The Progressive Farmer* said that Camille had caused the NTOMC to disband. The NTOMC, ATOA, and PATRDL continued, but their future and that of tung farmers seemed doubtful.[132]

Disappointments multiplied as the year progressed. According to the October edition of *Chemurgic Digest*, the demand for oilseeds like tung by the paint and varnish industry had declined markedly.[133] Growers knew that tung oil and tung trees no longer attracted as much scientific, horticultural, or agricultural experimentation but after December, interest seemed to fade altogether. The Agricultural Research Station in Poplarville planned to focus on pecans, peaches, and other trees. Observing that the hurricane had altered the coast, virtually wiped the slate clean, and provided a chance for new crops, old tung advocates Colmer and Stennis supported this step.[134] At this point, tung had not been entirely dismissed, but the Mississippi Agricultural Experiment Station wanted to diversify horticultural research. Expending extra funds on tung proved an unlikely scenario.[135]

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[132] James A. Rawls to Editor, *The Progressive Farmer*, November 10, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM; and *The Progressive Farmer* (Nov 1969), p.46.

[133] "Chemurgy-For Better Environments and Profits," *Chemurgic Digest* 28, no. 4 (Oct 1970): 11.

[134] Bill Colmer to Jim Rawls, December 5, 1969, Box 10, Folder 10, Camille; John Stennis to James A. Rawls, December 12, 1969, Box 10, Folder 10, Camille; and Bill Colmer to James A. Rawls, December 12, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[135] George W. Irving, Jr., to William M. Colmer, December 15, 1969, Box 10, Folder 10, Camille; and George W. Irving, Jr., to William M. Colmer, December 15, 1969, Box 10, Folder 10, Camille, ATOI, MLA, USM.

By the summer of the following year, the domestic tung oil industry teetered on a precipice. Its predicament reflected larger trends like the drop in American farmers from 15.6 million to 8 million between 1960 and 1970.[136] *The Wall Street Journal* commented that a year after Camille, "not one big industry has left" but that was not quite the case.[137] Although tung oil industry had not disappeared, but the majority of growers and owners of tung related companies prepared for that eventuality. In June 1970 the 36th Annual ATOA Convention pessimistically debated asking the government to transition growers out of tung production. While some members resigned over disagreements, the diehards believed tung the best way to use land unsuited for other crops and thought it the supreme horticultural crop.[138] With the prospect of a harvest in only a few years, they longed to get the industry back on track by replanting late blooming seedlings and persuading the government to extend disaster relief. The aid from the OEP stood to expire in August, a year after Camille, but its assistance had only begun in early 1970. To their relief, this particular aid received an extension in Louisiana until December 31.[139] In Louisiana, the OEP finished before August, but in Mississippi, the deadline of November 13 seemed

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[136] Vogeler, 3.

[137] Tom Herman, "A Year After Camille, Mississippi Gulf Coast Sees a Bright Future," *Wall Street Journal*, Aug 14, 1970.

[138] Bill Colmer to George F. Potter, June 4, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM. See also, George F. Potter to James O. Eastland, July 1, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[139] George F. Potter to Allen J. Ellender; George F. Potter to John R. Rarick; George F. Potter to John C. Stennis, July 1, 1970, Box 10, Folder 10, Camille; and Trent Lott to George F. Potter, July 2, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

ambitious.[140] Mississippi growers took solace in an extension of FHA loans from June 30 to December 31, 1970.[141] When Congress passed $65 million for disaster relief, funding went primarily to urban rather than rural areas so the ATOA failed to celebrate.[142] Setbacks also plagued PATRDL.

In the summer of 1970, PATRDL only had about $65,000, and members had doubts as to whether it would last another year. Its Assistant Secretary-Treasurer George Potter surmised that U.S. growers could at best contribute no more than $7,000. Dues became even more important but only amounted to $75 a year when the 1970 budget, including office and research salaries, fellowships, and supplies, amounted to about $82,645.[143] Argentina planned to provide $70,000 but expected the U.S. to donate $30,000. Members of the TRDL hoped to contribute the said funds, money it intended to get in government appropriations. After all, PATRDL not only helped experimentation and the establishment of a polymer science department at The University of Southern Mississippi but sponsored fellowships, subsidized seven students seeking an M.S. and two earning a PhD.[144] In its twelve-year existence, PATRDL relied upon about

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[140] G. A. Lincoln to Allen J. Ellender, July 22, 1970; and R. H. Bloodworth to John C. Stennis, July 25, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[141] "Camille Loan Deadline Extended to End of 1970," *Times-Picayune*, July 23, 1970.

[142] Allen J. Ellender to George F. Potter, July 8, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[143] George F. Potter to W. F. Warren, June 26, 1970, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[144] George F. Potter to James Lonnie Smith, March 8, 1971, Box 10, Folder 10, Camille, ATOI, MLA, USM.

$1,080,000 from U.S. and Argentine tung growers but now had no choice but to seek government support.

In 1971, Congressman Lonnie Smith (D-MS)(50th district), representing Pearl River and Hancock Counties, proposed House Bill 256 while Senator Martin T. Smith (D-MS)(34th district), representing Pearl River, Hancock, and Stone Counties, sponsored Senate Bill 2116 calling for $30,000 to "defray the cost of research in the field of tung oil utilization."[145] Validating the expenditures, they gave several justifications for support ranging from science to unemployment. Of Mississippi's once 55,000 acres of tung, only 6,000 remained. Pearl River, Lamar, Marion, Stone, Forrest, Hancock, and Harrison counties suffered economically after Camille. From 1966 to 1970, unemployment in Pearl River escalated from 4.4% to 14.3% with the joblessness credited to unemployed tung orchard workers. Ten acres had been planted with late-blooming varieties and Congressman Smith and Senator Smith billed tung as "the best cash crop for the diversified farm in southern Mississippi."[146] Countering the optimism, the USDA stopped including tung in its Annual Crop Production Summaries and ended government funded tung research.[147]

In 1971, Dr. Hugo Graumann, Director of the USDA's Plant Science Research Division in the Agricultural Research Service, reached a pivotal decision based upon

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[145] House Bill No. 256; Senate Bill 2116, Box 10, Folder 10, Camille, ATOI, MLA, USM.

[146] "Brief in Support of House Bill 256 and Senate Bill 2116 Appropriating $30,000 to the Department of Agriculture and Commerce to Finance Tung Utilization Research at the University of Southern Mississippi, Hattiesburg, Mississippi, March 8, 1971," Box 10, Folder 10, Camille, ATOI, MLA, USM.

[147] *Crop Production 1971 Annual Summary: Acreage Yield Production by States* (Washington D.C.: USDA, 1971.

Camille and to a lesser extent, the decline of PATRDL. In his words, "In the light of this it appears advisable for us to phase out our research on tung as quickly as possible."[148] Graumann wanted the South to begin growing new supplemental crops like kenaf, milo, soybeans, pecans, and blueberries. That same year, the tung lab at Poplarville became the Poplarville Research and Extension Center, a plant introduction site. Of the two tung scientists there, only Jim Spiers continued his research, mainly on late blooming trees, while Bowen Crandall chose to retire rather than begin researching another crop. Subsequently, Spiers diverted his attention from tung to kenaf and blueberries. The era of USDA tung experimentation finally came to an end.[149]

That same year, then President Richard M. Nixon lifted the embargo with China opening a flood of tung oil imports and deflating the price.[150] In 1971, tung oil sold for twenty-three cents a pound while growers continued to receive sixty-five percent parity or 25.6 cents a pound oil or $80.92 a ton nut. Many former growers remained disinterested and stopped participating in the ATOA, NTOMC, and PATRDL.[151] While the St. Joe Paper Company blamed its failure to pay dues on low prices and foreign

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[148] H. O. Graumann to James Anderson, December 14, 1971, Anderson, James H., Folder 2 1971 (18), WWK, SMBES, MAFES, CPRC, MML, MSU.

[149] W. W. Kilby to James Anderson, January 3, 1972, Anderson, James H., Folder 1, 1971 (17); Hugo Graumann to J. H. Anderson, May 3, 1971, Anderson, James H., Folder 2, 1971 (18); W. W. Kilby to James H. Anderson, November 5, 1971, Anderson, James H., Folder 2, 1971 (18); and H. O. Graumann to James Anderson, December 14, 1971, Anderson, James H., Folder 2, 1971 (18), WWK, SMBES, MAFES, CPRC, MML, MSU. On blueberries replacing tung, see also, Jan Suszkiw, "Mississippi Blues . . . Blueberries That is," http://www.ars.usda.gov/is/pr/2008/080104.htm (accessed January 11, 2013).

[150] "The Nation: Growing Unrest on The Farm," *TIME*, November 22, 1971.

[151] "History of Tung Industry," Box 23, Folder 3, ATOI, MLA, USM.

imports, Tung Oil Products, Inc., credited its end to freezes.[152] The deciding factor for other tung growers lay with increasing labor and machinery costs.[153] As tung trees became scarce, many farmers either turned to cattle or ryegrass.[154] Tung Belt counties like Baldwin County, Alabama, began focusing on soybeans, peaches, and pecans as well as watermelons, grapes, and plums.[155] According to the *Clarion –Ledger*, "Now it is difficult to find a tung tree in the rolling hills where the blossoms in April once looked like a fresh snow fall for miles on end."[156]

In 1973, an article in *Economic Botany* declared the domestic tung oil industry dead.[157] Newspapers like *The Los Angeles Times* ran articles declaring the tung oil industry a bygone business which had outlived its usefulness and only served to milk taxpayers of their money.[158] Domestic consumption had dropped from 100 million to 30 million between the late 1940s and the early 1970s. Latin American production and the resumption of Chinese tung oil exports fulfilled remaining demand. The South had become dominated by various industries ranging from the old standbys of agriculture, wood, paper, and textiles to newcomers like petrochemicals, electronics, aerospace, and

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[152] Sam Miller, "Bulldozers End the Tung Dynasty at Capps," *Tallahassee Democrat*, Sep 6, 1976, 17; and Kenneth Goodman, "Tung Oil Industry Blossomed," *Gainesville Sun*, July 27, 1975, supplement, 39.

[153] "Tung Oil Produced in Jefferson County," *Tallahassee Democrat*, June 12, 1970, 13); and Tung Nut Industry Vanishes," *Tallahassee Democrat*, April 26, 1976).

[154] Jim Spiers, interview by author, September 20, 2012, tape recording.

[155] "Grand Bay: 'Riviera of South'," *Mobile Register*, Jan 5, 1985, p.39.

[156] Charles Nutter, "Tung Nut Industry Fading From State," *Clarion-Ledger*, December 10, 1972.

[157] "Factors Contributing to the Demise of Tung Production in the United States," *Economic Botany* 27 (Jan-Mar 1973): 131-136.

[158] "Latest Crisis for Taxpayers: Tung Oil Cost," *Los Angeles Times*, March 1, 1973.

tourism.[159] Nixon wanted to get rid of subsidies and acreage limitations saying, "Government is going to get out of the agriculture business."[160] Secretary of Agriculture Earl Butz encouraged farmers to grow and become more efficient or stop farming altogether and threw his support behind corporate farms and the kind of vertical integration that marked the post war triumph of agribusiness. At the same time, some political factions believed government aid should only go to family farmers.[161] Given that many tung neoplantations exemplified family-run farming, this changing political climate might not have presented much of a problem to domestic cultivation except for the fact that other crops had fewer risks and were more profitable.

When the federal government cut off their price support, lingering tung growers responded with a mix of ire and relief. Seeking ways to lower parity and control production of commodities, Congress passed the Agriculture and Consumer Act of 1973, and in June, moved to end support for tung.[162] This was well received by the press and surprisingly enough, by many tung growers. According to the *Times-Picayune*, "The program has produced million-dollar losses and has forced American taxpayers to buy the total U.S. tung nut oil production at more than twice the world price."[163] The *Plain*

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[159] John Egerton, *The Americanization of Dixie: The Southernization of America* (New York: Harper & Row, 1974), 105; and Cobb, *The Selling of the South*, 179-181, 218.

[160] William R. Doemer, "Time Essay: Time to Plant a New Farm Policy," *TIME Magazine*, February 26, 1973.

[161] Bell, 55; and Hurt, *American Agriculture*, 357, 387. On government's tendency to aid large farmers, see also, Pasour, Jr., xx.

[162] Carl C. Craft, "House Crack Down on Nuts," *Times-Picayune*, June 19, 1973, p.2; Cochrane, Reforming Farm Policy, 49; and Hurt, *Problems of Plenty*, 133.

[163] Carl C. Craft, "House Crack Down on Nuts," *Times-Picayune*, June 19, 1973, p.2.

Dealer echoed by equating the support for tung to welfare.[164] House Agriculture Committee Chairman Representative W. R. Page (D-TX) explained that tung price supports stood to save taxpayers about $1.3 million over the following five years. As support would not end until 1976, those still growing tung had the chance to transition to some other venture.[165]

If they had not switched crop foci, tung growers took this opportunity to pursue cattle, pine, other crops, or nurseries.[166] Crosby had abandoned tung continued to produce some tung-based paints at Crosby Forests Products; he purchased oil primarily from Argentina.[167] Others like Chenel had turned their attention to real estate development. David Goodyear, the son of Charles, did the same but transformed part of Money Hill into a campground, lake, and park.[168] As farmers deserted tung as a crop, mills closed leaving remaining growers with no way to process their nuts.[169] Some scattered acreage continued in the center of the Florida Panhandle, and growers there depended on the Chason Tung Oil Mill, Inc., in Marianna, until 1972. The St. Joe Paper Company decided to use the remaining 5,000 acres on its Tungston Plantation in Capps, Florida, for wood

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[164] Howard Preston, "Ankle-Deep in Tung Oil," *Cleveland Plain Dealer*, March 19, 1973).

[165] Carl C. Craft, "House Crack Down on Nuts," *Times-Picayune*, June 19, 1973, p.2; and "One Billion Not Peanuts," *Rockford Morning Star* (Illinois), April 20, 1973.

[166] Mormino, 188.

[167] Crosby, Jr., interview, October 29, 1974, 28.

[168] Daughtry, interview; Bob Landry, "Once Great Tung Industry No More," *Clarion-Ledger*, August 23, 1974, 2B; and "A Brief History of Money Hill," Money Hill Golf & Country Club, http://www.moneyhill.com/history/ (accessed October 12, 2011).

[169] Spiers, interview.

chips and then replanted in pine.[170] The last mill in the country, the Wade Tung Oil Company in Bogalusa, depended primarily on its own tung nut production for a few years and finally shut its doors in 1974.[171] According to Kilby, once a vehement tung supporter who had often heralded tung as having saved the coast from ruin, "This [Gulf Coast] is cow country now."[172] He solemnly added, "The prospects for the future of the tung industry in the U.S. is little or none."[173]

While Hurricane Camille gained the reputation of having single-handedly ended tung cultivation in the U.S., foreign competition, other oilseeds, synthetic alternatives, and freezes had already set the domestic tung oil industry on a course of decline leading, in all probability, to an eventual end. Tung trees, once striking farmers as an effective and profitable way to use land, became an unwanted blight. Tung oil, once hailed as the supreme drying oil by paint and varnish companies was seen as overpriced and non-exceptional. The domestic industry outlived its usefulness and had become a financial burden on grower, consumer, and government alike. The federal government encouraged and supported tung for decades but taking all disincentives into consideration and realizing that any need could easily be met by imports, discontinued aid. Tung cultivation may have lingered for several years but for all practical purposes, the industry died in

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[170] Sev Sunseri, "Paper Company Finds a Use for its Aged Tung Nut Trees," *Florida Times-Union*, Feb 3, 1974; "Tung Nut industry Vanishes," *Tallahassee Democrat*, April 26, 1976; and Sam Miller, "Bulldozers End the Tung Dynasty at Capps," *Tallahassee Democrat*, Sep 6, 1976, 17.

[171] "Tung Nuts Lie Scattered," *Times-Picayune*, August 23, 1974, p.24; Stella Pitts, "Picayune, Miss. Once Capital of Thriving Tung Oil Industry," *Times-Picayune*, February 26, 1978, p.50; and Charles Nutter, "Tung Nut Industry Fading From State," *Clarion-Ledger*, December 10, 1972.

[172] "Once Flourishing Tung Industry Now Abandoned," *Times-Picayune*, August 21, 1974, p.7.

[173] W. W. Kilby to Russell Desrosiers, February 19, 1975, D 1970-1975 (53), Box 1, WWK, SMBES, MAFES, MML, MSU.

1969, the same year in which political writer Kevin Phillips, author of *The Emerging Republican Majority*, devised the words Sun Belt to define the new industrialized identity of the formerly agricultural South.

By 1980, the South was no longer the nation's number one economic problem but the domestic tung oil industry had ended so it did not get to partake of the credit for this transition from Pine Belt to Sun Belt. Associating it with incessant frustration and financial disaster, former growers regretted ever having participated in the tung industry. A mistake from its inception, tung had, nevertheless, led to the creation of countless companies which aided the economies of the coastal states so its financial contributions were largely unknown, ignored, or dismissed.[174] Decorative and volunteer tung trees continued as reminders of a once cherished crop that had been relegated to burdensome weed. Remnant trees dotted the landscape, produced lush green leaves, bloomed bright pink and white blossoms each spring, and produced oil but the nuts fell only to rot. As *Clarion-Ledger* journalist Bob Landry concluded, "Although tung trees are probably here to stay in isolated places as part of home landscaping, as an industry it is gone . . . maybe not forever, but it may be needed again . . . but that's pure conjecture."[175]

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[174] Bartley, *The New South, 1945-1980*, 470. See also, Schulman, 221.

[175] Bob Landry, "Once Great Tung Industry No More," *Clarion-Ledger*, August 23, 1974, 2B.

CHAPTER VII

"PINK CLOUDS IN DIXIE"[1]: TUNG TREES AND TUNG OIL IN POPULAR CULTURE

Tung trees are not 'tongue trees.'[2]

Anonymous

Throughout the era of domestic production, boosters used trade journals, festivals, fairs, beauty pageants, parades, postcards, and newspaper articles as well as in music, radio, and television productions to forge a place for tung in popular culture but achieved only moderate success. They managed to create a small niche for the tung tree as an attractant for coastal and southern tourism but largely failed to establish a place for tung oil in the national mindset. Even though tung-based paints, varnishes, and inks were used nationwide, the average American had never heard of tung so it lacked cultural resonance. Because of its confinement to the Gulf Coast, the inability to sell the poisonous nuts as table fare, and the scientific complexities of many journal and newspaper articles, tung never became a popular culture icon but achieved some recognition at the local, regional, and even national levels.

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[1] Evelyn Reid Griffith, "Pink Clouds in Dixie," *Down South*, March-April 1957, 7.

[2] "Tung Trees are Not 'Tongue' Trees," *Times-Picayune*, March 22, 1971.

The appealing qualities of the tung tree and tung oil provided much for boosters to promote in advertising campaigns.[3] The bark on young trees shone bright lime green while that of older trees developed a gray bark which felt fine, almost smooth to the touch. The leaves resembled hearts, and the fruits or shells encasing the nuts had a gorgeous bright green hue which became bright, apple red when ripe. The brown, pear-shaped nuts grew large, almost as big as baseballs, and easily fit into the palm of the hand. The multi-colored blossoms, while not particularly fragrant, seemed to play tricks on the eye, changing colors from pink to white and yellow.[4] Tung oil ranged in color from clear to rust and growers often dubbed it liquid gold. All of these traits precipitated diverse marketing methods.

Promoting the country's little known Tung Belt became the main priority of tung trade journals. *Tung Oil* (1930-1933), *American Tung Oil* (1935-1937), *American Tung Oil and the Southern Conservationist* (1938-1941), *American Tung Oil News* (1934-1935), *Tung World* (1946-1969), *American Tung News* (1953-1969), and *American Tung Oil Topics* (1954-1968) printed visual aids in the form of photographs of trees, blossoms, and nuts on almost every page. Alongside the images appeared detailed, informative articles on the cultivation of tung trees and usage of tung oil in the hopes of fueling the domestic industry. These writings explored the planting and care of trees and the harvesting, milling, and marketing of oil. Convincing the masses of the tree's importance to everyday life remained of the utmost importance, and contributors never missed a

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[3] A. L. Matthews, "Vegetable Drying Oils," *Tung Oil* 1, no. 2 (Nov. 1930): 6. See also, Concannon, "Tung Oil," 41, 2-6, 20.

[4] Gammill, interview. On the smell of the blossoms, see, for example, "Heavy Bloom Gives Promise of Great Future," *Tung World* 6, no. 10 (March 1952): 4.

chance to mention its many uses in paints, varnishes, inks, and chemicals to name a few. Along with the trade journals, boosters advertised in other forms of media.

Myriad pamphlets, articles, newspapers, and books highlighted the contributions tung made to the country and its citizens. An American Tung Oil Institute (ATOI) pamphlet "Why Should You Use Tung Oil" proved so popular it sold out to members.[5] Tung appeared in both *Webster's Dictionary* and *The World Almanac* and in magazines like *Harper's News Monthly* and *National Geographic*.[6] Newspapers like the *New York Mirror*, *New York Post*, and *New York Times* printed items on tung.[7] Guides to the states by the WPA mentioned tung trees in relation to coastal farming.[8] During World War II, *The Billboard*, an entertainment magazine, *Boys' Life*, the official magazine of the Boy Scouts of America, and *The Kiplinger's Magazine* discussed the importance of tung oil to the war effort.[9] In 1953, the SRRL produced an 825 page, four-volume "Abstract Bibliography of the Chemistry and Technology of Tung Products, 1875-1950" which

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[5] "Tung Oil Booklet Has Telling Story," *News for Farmer Cooperatives* 26, no. 4 (July 1959): 23.

[6] "Dictionary, Almanac Omit Data on Industry," *Tung World* 2, no. 3 (July 1947): 5; Roger Burlingame, "Rainbow Over the Farm," *Harper's Magazine*, December 1939, 50; and "National Geographic Notes Tung Industry," *Tung World* 2, no. 5 (Sep 1947): 12.

[7] See, for example, "N.Y. Mirror Buys Story on Tung Oil," *Tung World* 1, no. 11 (Mar 1947): 15.

[8] Workers of the Writers' Program of the Works Project Administration in the State of Louisiana, *Louisiana: A Guide to the State* (New York: Hastings House, 1941), 458; Workers of The Writers' Program of The Work Projects Administration in the State of Georgia, *Georgia: A Guide to Its Towns and Countryside*, 64; Federal Writers' Project of Works Progress Administration, *Mississippi: The Works Progress Administration Guide to the Magnolia State* (1938; repr., Jackson: University Press of Mississippi, 1988), 111; Federal Writers' Project of the Works Projects Administration for the State of Florida, *Florida: A Guide of the Southernmost State*, 380; and Federal Writers' Project of the Works Projects Administration, *Alabama: A Guide to the Deep South* (New York: Hastings House, 1941), 17, 81, 367.

[9] "Major Crops for the South," *The Billboard*, March 27, 1943, 75; "Food Will Win War; Peace" *The Billboard*, January 3, 1942, 54; Eva Beard, "Your Farm Job," *Boys' Life*, June 1943, 18; and "Your Questions Answered," *Kiplinger's Magazine*, December 1949, 28.

included 3,000 sources. This bibliography incited such demand that it was translated into seven languages and received the Oberly Memorial Award of the American Library Association.[10] According to Sally Goodyear, the ATOA even published a cookbook called "Use Your Tung" which included numerous tasty dishes sans tung given its toxicity.[11] Radio stations across the country covered the domestic tung oil industry.[12] One of the most famous plugs was made by radio persona Florence Pritchard, better known as "Barbara Wells," on station WOR out of New York City in 1948.[13] All of this coverage publicized tung but indirect mentions and asides may have generated some interest.

Tung oil and tung trees often received a small line or two in articles about other subjects. For example, General Motors claimed to use products from every state, including Florida tung.[14] Chicago Cubs pitcher Claude Passeau bragged about his tung farm in Lucedale, Mississippi.[15] More serious examples include a disappearance in 1948 and a notorious lynching in 1959. *The New York Times* reported that on August 11, 1948, the wife of "tung oil industrialist" Rothwell M. Sheriff, Mary Sheriff, vanished from a

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[10] "Mississippi Now Leading in the Tung Oil Industry," *Jackson Daily News*, June 8, 1954.

[11] Goodyear, interview.

[12] See, for example, "The Tung Oil Industry in the South," *Rockford Register-Republic*, July 6, 1938; "Radio Address on Tung Oil," *Dallas Morning News*, November 14, 1937, Section II, p.7; and "Lamont Rowlands," *Tung World* 7, no. 10 (March 1953): 7.

[13] "N.Y. Housewives Learn About Tung," *Tung World* 2, no. 10 (Feb 1948): 15. Tung received some television coverage. See, for example, a WDSU-TV in New Orleans story which took place on August 20, 1959. See, "T.V. Covers Story on Tung Oil," *American Tung News* 10, no. 9 (Sep 1959): 17.

[14] "General Motors," *Springfield* (Massachusetts) *Union*, November 24, 1954, 11.

[15] On Passeau, see, "Bad Arm Almost Shelved 'Mr. Chips,'" *Cleveland Plain Dealer*, October 6, 1945, 12.

ship called the *African Pilgrim*.[16] In 1959, another *New York Times* article mentioned Pearl River County, Mississippi's reputation for tung production when reporting that Mack Charles Parker, a twenty-three year old black truck driver accused of raping a pregnant white woman, was taken from jail by eleven masked men and lynched.[17] Aside from these samples, Americans were exposed to images of tung in museums like the United States National Museum while others saw the tree in paintings, one in particular at a post office.[18]

During the New Deal, the WPA Federal Arts Project enlisted Xavier Gonzalez to paint a mural on the domestic tung oil industry. The nephew of famed artist Jose Arpa, Gonzalez derived from Almeria, Spain, but had moved to Mexico, back to Europe, and eventually to the U.S. in 1921. After attending the Chicago Art Institute and teaching art in Mexico and Texas, he became an instructor at Newcomb College in New Orleans and later at Tulane University.[19] Between 1935 and the dawn of World War II, the WPA and the United States Department of Treasury (USDT) oversaw the creation of 4,500 murals, including several done by Gonzalez.[20] He created a mural for Hammond, Louisiana, on strawberries and one for Huntsville, Alabama, on the Tennessee Valley Authority (TVA). When asked to create a large tung mural for the Covington, Louisiana, post office in

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[16] "Woman Disappears from Vessel at Sea," *New York Times*, August 27, 1948.

[17] Claude Sitton, "Mississippi Hunt for Negro Pushed," *New York Times*, April 27, 1959.

[18] Report on The Progress and Conditions of The United States National Museum for the Year Ending June 30, 1917 (Washington, D.C.: Government Printing Office, 1918), 69.

[19] Richard Megraw, *Confronting Modernity: Art and Society in Louisiana* (Jackson: University Press of Mississippi, 2008), 82-83; and Erika Katayama, "Xavier Gonzalez" (master's thesis, University of California at Santa Cruz, 2009), 1-2, 8.

[20] John R. Kemp, "Survivor of the WPA Era," *New Orleans States-Item*, May 27, 1988.

1939, he eagerly agreed.[21] His initial sketch or study of the tung oil mural went to the Smithsonian while the final product appeared on display at the Covington Post Office.[22] Using real life images, Gonzalez included his wife Ethel Edwards in the center, black neighbors on the far left and far right, a contractor as the spectacled man, a student as the young man on his knees and as the one trimming the tree, and finally, Gonzalez himself as the man with the sack on his shoulder.[23] As noted by cultural historian Richard Megraw, the Tung Oil Mural showed the development of the Gulf Coast from timber to tung while advocating conservation and scientific efficiency. The frieze also illustrated the catastrophe of lumbering, the reclamation of the land with tung, and the ensuing economic boom to the town.[24] Along with promotional imagery, the masses gained a connection to tung through government projects, charities, and education.

Tung trees and groves offered an excellent way to achieve landscape beautification while providing employment for the impoverished and additional incomes for educational institutions. During the New Deal, FERA tung colonies benefitted many southerners suffering from the depression.[25] This idea of making income from tree

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[21] Lillian Galt, "Artist Couple Proves Life Not Stormy," *Times-Picayune*, June 4, 1939, 30.

[22] "Tung Oil Industry (Study for Covington, Louisiana Post Office Mural), http://americanart.si.edu/collections/search/artwork/?id=9280 (accessed July 25, 2012); and Megraw, 77.

[23] John R. Kemp, "Survivor of the WPA Era," *New Orleans States-Item*, May 27, 1988.

[24] Megraw, 88.

[25] H. W. Bennett, "Tung Oil Industry Expands," *Manufacturers' Record* 103, no. 11 (Nov 1934): 26. See also, "Expanding Tung Oil Tests," February 24, 1935, TO, VF, HRBML,UGA; Ross, 228-294; "Mills to Extract Tung Oil Planned," *Times-Picayune*, September 28, 1934, 23; "Tung Oil May Help Support Southerners," *Augusta Chronicle*, October 24, 1934, 1; "American Invasion of Tung Oil Field Perils Chinese Monopoly," *Trenton Evening Times*, February 10, 1935; "Tung Oil Trade Gets Big Boost," TO, VF, HRBML, UGA; "Government Plans Tung Cultivation for Mississippi," *Dallas Morning News*, December 20, 1936, Section V, 1; "U.S. Studies Tung Oil Possibilities Along Gulf Coast," *Times-*

acreage caught the attention of many southern universities who longed to increase their funding, initiate research, and benefit from land bequests. During the 1930s, Crosby and Rowlands donated 1,000 acres of tung, and the Rehabilitation Corporation of Mississippi provided another 8,000 acres of tung to Whitworth College in Brookhaven, Mississippi.[26] This move energized the Mississippi State Board of Education to encourage all of its colleges to solicit other gifts of land.[27] Emphasizing horticultural diversity, southern universities like The University of Florida and Southwestern Louisiana Institute (later The University of Louisiana at Lafayette) adorned their campuses with tung trees.[28] This exoticism took center stage in many tung promotions.

The very name "tung" might have been seen as a liability given its foreignness, but boosters embraced the Asia connection. Items in journals and newspapers frequently mentioned that the trees derived from China while one erroneously claimed the tung tree was the "national tree of China."[29] Countless pieces in tung trade journals and magazines insisted that the word "tung" translated to "heart" in Chinese.[30] In reality, the word

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Picayune, October 4, 1934, 15; and "Gulf Coast Area Expanding Tung Oil Experiment," *Times-Picayune*, February 17, 1935, 16. On FERA colonies, see also, Donald Holley, *Uncle Sam's Farmers: The New Deal Communities in the Lower Mississippi Valley* (Chicago: University of Illinois Press, 1975), ix.

[26] "Mississippians Told of Tung Oil Trees, Valuable New Crop"; and "Tung Tree Culture Spreads," August 17, 1935, TO, VF, HRBML, UGA.

[27] "Tung Tree Tract to be Presented as Endowment," *Times-Picayune*, February 13, 1935, 9.

[28] C. E. Wright, "Florida's Flora: Green Foliage and Flowering Shrubs Catch Winter Visitor by Surprise," *New York Times*, Nov 10, 1963; and Edwin Lewis Stephens, Girard Hall with Tung Trees in Bloom, 1935, The University of Louisiana at Lafayette, http://cdm16313.contentdm.oclc.org/cdm/singleitem/collection/SIP/id/1146/rec/16 (accessed January 22, 2013).

[29] "China's National Tree," *Biloxi Daily Herald*, May, 16, 1910.

[30] See, for example, "The Tung Oil Tree and Grove Development," *Tung Oil* 1, no. 1 (Oct 1930): 6; Dr. Frank Thone, "China's Tung Trees make good in America," *Springfield-Republican*, July 11, 1937,

"tung" meant "tung tree."[31] As Chinese cultural historian Shu-Hui Wu explained, "In the classical Chinese language, people wrote only 'tung' and understood that it referred to a tree."[32] The heart rumor persisted throughout the decades of U.S. production, perhaps as an advertising angle. If farmers and merchants had been displeased with "tung," they could have changed the name. Much like Canadian rapeseed oil producers, having modified it to have less erucic acid and aliphatic glucosinolates, renamed it Canola Oil for marketing purposes because the word "rape" had an unpleasant connotation, tung boosters could have dubbed the tung tree "heart tree" or "love tree."[33] Such symbolism might have been an extremely effective marketing strategy, but for whatever reason, perhaps attraction to the sound of "tung," the name lasted. While some writers may have used the "heart" description for effect, many readers believed the anecdote. According to Industrial Oil Products President Blake Hanson, the heart reference "story got circulated and people liked it and so they kept repeating it."[34] In this way and others, boosters exploited the tie to China.

38; "Florida Newspaper Tells Story of Tung Industry," *American Tung News* 6, no. 7 (July 1955): 5; and "Oil from the Heart Tree," *Monsanto Magazine*, December 1962, 10. This "heart" rumor persists today. See, for example, "History of Tung Oil: The Key to the Waterlox Products of Today, http://www.waterlox.com/uploads/docs/Tung-oil-hotlink-story-REVISED-2.pdf (accessed November 2, 2011); and Sutherland Welles LTD., http://www.sutherlandwelles.com/history-of-tung-oil.html (accessed December 27, 2012).

[31] Hanson, interview.

[32] Dr. Shu-Hui Wu, e-mail message to author, July 6, 2012.

[33] The name "Canola" was formed in Canada and is short for Canadian Oil Low Acid. See, "Lovely Canola Not Just for Oil," *The Huntsville Times*, July 7, 2012. The U.S. Food and Drug Administration declared rapeseed and canola separate species in 1985. See, Fereidoon Shahidi, ed., *Canola and Rapeseed: Production, Chemistry, Nutrition, and Processing Technology* (New York: Van Nostrand Reinhold, 1990), 10.

[34] Hanson, interview.

Many pieces discussing tung trees and tung oil like "Tung Oil: Gift of the Orient" and "China's Tung Trees Make Good in America" included mention of its Chinese origins.[35] By exploring this exotic link, the authors of these articles intended to convey mystery, otherness, and charm. One article insisted that tung trees transplanted "a touch of the soft and gentle beauty of Old China" to the U.S.[36] Tung oil was dubbed "a gift from China" in another commentary.[37] At the same time people sought the different and the strange, they spurned all things foreign.[38] While milking the Chinese relationship, boosters billed the tung tree as pure "American." They preferred to think that the U.S. had appropriated rather than been given the tung tree. Evidently, boosters used the Chinese association only when convenient and never failed to argue that through superior cultivation and utilization methods, the U.S. had made tung its own.

This desire to portray the tung tree as a foreign object conquered, remade, and improved by Americans prevailed in tung publications. Applauding pride and love of country, nationalism deepened with the automobile and improved highways sparked tourism which cultural historian Marguerite Shaffer equated to the "search for national identity."[39] In 1906, the earliest twentieth-century example began in the form of the "See America First Movement," a drive fueled by the good roads movement. Farmers had

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[35] Frank A. Montgomery, Jr., "Tung Oil: Gift of the Orient, Box 10, Folder 10, Camille, ATOI, MLA, USM; and Frank Thone, "China's Tung Trees Make Good in America," *Springfield* (Massachusetts) *Republican*, July 11, 1937, 38.

[36] L. T. Pendarvis, "Tung Orchards of Florida, For Sale, *Want and Exchange Bulletin* 9, no. 8 (March 15, 1960), M477, Box 5, Folder 16, Tung History, 1936-1966, ATOI, MLA, USM.

[37] Davenport, 54.

[38] See, Marguerite Shaffer, *America First: Tourism and National Identity, 1880-1940* (Washington, D.C.: Smithsonian Institution Press, 2001), 280.

[39] Ibid, 5.

been seeking better roads since the Civil War; bicyclists began petitioning in the 1880s; and with the advent of the automobile, vehicle enthusiasts joined suit. Even with these efforts, by 1909, less than nine percent of American roads had any surfacing. Thanks to advocacy by organizations like the National Good Roads Association, American Road Makers' Association, National Association of Automobile Manufacturers, and National Grange, significant road creation took place in the 1910s. The "See America First Movement" primarily benefitted the west, but the goal had been to incite tourists to spend their dollars domestically, aiding local and state economies, rather than abroad.[40] In 1916, with the Federal Aid Road Act and Bureau of Public Roads, more and more cities were connected. Over the next two decades, transcontinental road trips gained in popularity as the car became more prevalent.[41] Years later, WPA travel guides attempted to persuade readers that they could express their patriotism through traveling across the U.S. While tourists became acquainted with their country and educated on American values and historical sites, their dollars aided local and state economies.[42] Boosters hoped that declaring tung American and tracing the history of the development of the domestic tung oil industry would simultaneously draw tourists looking for the exotic and those seeking all things American.[43] This added an extra oomph to tung as many tourists were attracted

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[40] Shaffer, 147, 26, 32; James J. Flink, *The Automobile Age* (Cambridge: The MIT Press, 1988), 4, 168; and William L. Bowers, *The Country Life Movement in America* (Port Washington, NY: Kennikat Press, 1974), 78.

[41] Shaffer, 135; and Brian Black, *Nature and the Environment in Twentieth Century American Life* (Westport, CT: Greenwood Press, 2006), 107.

[42] Shaffer, 202, 203, 214, 219.

[43] On history as an attractant to tourists, see John A. Jackle, *The Tourist Travel in Twentieth Century North America* (Lincoln: University of Nebraska Press, 1985), 286.

to all things alien, atypical, and natural or at least, what they thought was natural.[44] Tourists sought sights and experiences that they could not see at home and tung boosters beckoned them to the Tung Belt, the only area in the country where thousands of acres of tung trees bloomed.

Cities across the Gulf Coast sought to monopolize on tung groves through tourism. Growers believed tung orchards sparked thoughts about land, life, and simpler times to tourists who saw the South as a throwback to the past. Thinking in stereotypes, many visitors associated the region with cotton bolls, belles, and beaches. Aided by the lack of just one southern identity, these beliefs allowed tourists to seek whatever they wanted.[45] The humid climate afforded tourists the next best thing to traveling abroad.[46] By the early 1920s, car ownership grew, and new roads multiplied across the South, displacing the domination of tourism by the wealthy and making car tourism a middle class trend and $200 million a year industry.[47] Tourism suffered during the Great Depression, but gardens, parks, and arboretums multiplied during the New Deal as did tours of farms.[48] After World War II, leisure trips increased significantly as car

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[44] Harvey H. Jackson III, "Developing the Panhandle, Seagrove Beach, Seaside, Watercolor, and the Florida Tourist Tradition," in *Southern Journeys: Tourism, History and Culture in the Modern South* ed. Richard Starnes (Tuscaloosa: University of Alabama Press, 2003), 66.

[45] Ted Ownby, "Nobody Knows the Troubles I've Seen, but Does Anybody Want to Hear About Them When They're on Vacation?" in *Southern Journeys: Tourism, History and Culture in the Modern South* ed. Richard Starnes (Tuscaloosa: University of Alabama Press, 2003), 240, 248; and Jackle, 199.

[46] Jackle, 216.

[47] E. J. Williamson, "South Has Great Tourist Business," *Manufacturers' Record* 96, no. 3 (July 18, 1929): 75; and Black, 7.

[48] Alexander Wilson, *The Culture of Nature: North American Landscapes from Disney to the Exxon Valdez* (Toronto: Between the Lines, 1991), 41-43.

ownership skyrocketed.[49] Tourists had many options given the plethora of roadside attractions like stands, shops, and alligator wrestling. While many southern boosters wanted to sell the "pristine" agrarian past, especially the Old South plantation or Civil War romanticism, tung boosters wanted to sell the industrial present/future.[50] If tung did not appear on a tourist's agenda, boosters hoped to gain his or her attention through roadside plantings. After all, citrus trees played a large role in Florida's tourism, and oranges had developed an enormous iconography so they though tung could become widely known.[51]

Much as oranges had ties to the Florida dream, boosters wanted tourists to think of southern nirvana when they thought of tung. Growers described tung trees as far more beautiful than orange, cherry, peach, and dogwood trees.[52] The pink, white blossoms with bright red centers tinted with yellow proved quite the eye catcher. A Louisiana Forestry Commission Bulletin equated tung groves with "fields of snow."[53] An article in the Jackson Daily News dubbed tung groves a "Million Dollar Bouquet."[54] In *The Southern Conservationist and American Tung Oil*, high school student Nell Robertshaw of Greenville, Mississippi, wrote the following:

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[49] Ibid., 26.

[50] On Civil War based tourism, see, for example, Tara McPherson, *Reconstructing Dixie: Race, Gender, and Nostalgia in the Imagined South* (Durham: Duke University Press, 2003), 40-42.

[51] Laszlo, 79; Ziegler, ix; and Mormino, 195.

[52] "The Tung Oil Tree," *Augusta Chronicle*, April 26, 1925, 4; Frank Thone, "China's Tung Trees Make Good in America," *Springfield* (Massachusetts) *Republican*, July 11, 1937, 38; and North Florida Tung Oil Orchards to Bring More Income to Their Owners," *St. Petersburg Times*, March 18, 1951.

[53] "Tung-oil Tree, China Woodoil Tree," Louisiana Trees and Shrubs, p.155, *Louisiana Forestry Commission Bulletin* no. 1, Baton Rouge: Claitor's Publishing Division, TO, VF, LPL.

[54] "Tung Orchard—Five Million Dollar Bouquet," *Jackson Daily News*, July 5, 1953.

> I am a pioneer of the Tung Oil Trail. It is secluded, untouched, magnificent. I was absolutely unprepared for the breath-taking sight that greeted me. There before us stretched an expanse of pale pink and white tints of ivory—acres and acres of it, as far as the eye could see. The only green was behind us, giving a picture of oceans of pale pink blooms. This was a paradise set off from the world.[55]

Down South magazine referred to tung trees as "pink clouds in Dixie."[56] Perhaps, this, more than any other description best fit tung groves for the purposes of tourism, and postcards donned with blooming tung trees could be purchased throughout the coast.[57] Billing the tung tree as distinctive to the South, local boosters hoped to provide incentive for tourists to visit towns and cities along the coast.

Tung trees and tung towns often appeared in travel guide books in an attempt to attract motorists.[58] Poplarville, Mississippi, proclaimed itself the Tung Center of the World, Picayune claimed Tung Oil Center of America; St. Tammany Parish was known as The Pink Parish; Tallahassee, Florida, boasted of being the Tung Headquarters; and Fairhope, Alabama, had the Baldwin Plantation which claimed to be the Center of the Tung Belt.[59] Every spring, coastal cities flaunted the extensive groves of pink blossoms

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[55] "A School Girl's Description of Tung Tree Blossoms," *The Southern Conservationist and American Tung Oil* 4, no. 10 (Jan 1938): 16.

[56] Evelyn Reid Griffith, "Pink Clouds in Dixie," *Down South* (March-April 1957): 7.

[57] On postcards, see, for example, "A Tung Tree in Full Bloom, Pearl River County, Miss.," and "A Country Road in Tung Blossom Time—Pearl River County, Miss." published in Gulfport, Mississippi by the Gulfport Printers Company, n.d. These two examples are in the author's possession.

[58] Anthony J. Stanonis, *Creating the Big Easy: New Orleans and the Emergence of Modern Tourism, 1918-1945* (Athens: University of Georgia Press, 2006), 54, 60.

[59] Ann Gilbert, Covington: Living History & Covington's Founding Families," *Inside Northside Magazine*, Feb/March 2002, http://www.insidenorthside.com/feb_mar/art6.htm (accessed June 5, 2011); Mormino, 188; and "Highlights and Highways of Baldwin: The 1939 Guide to Baldwin County Alabama:

which flowered from March 21 to April 11.[60] In April 1941, the first guided tung tours took place in St. Tammany Parish, Louisiana, on several orchards like Money Hill. Attendees included representatives from the Ozone Tung Association, Covington Chamber of Commerce, the USDA, the Covington mayor, and various tung growers from other counties. During this tour, future Olympics participant Beatrice "Sally" Core was crowned the first Louisiana Tung Queen.[61] After 1944, Picayune, Mississippi, held yearly tours of a seventy-mile path where booths passed out information on tung oil and tung trees.[62] Poplarville, too, offered an extensive tung tour and accommodations at the Tung Tree Hotel. Tung plantation tours gained so much attention that they received a mention in *The New York Times* under "A Tourist's Calendar of Sun-Belt Events."[63] In this and other advertisements, tung appeared alongside rose and azalea festivals and called out to sightseers to attend "blossomtime down South."[64]

Throughout the Gulf Coast, parades and festivals proliferated. In the 1930s, Gainesville, Florida, held its first tung oil parade, partly across the campus of The University of Florida, to honor the first railroad shipment of tung from the city.[65] Tung

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America's Newest Playground on Mobile Bay and the Gulf of Mexico," p.24, Tung Oil, Vertical File, Foley Public Library, Foley, AL [hereafter TO, VF, FPL].

[60] "Picayune Plans Tung Area Tour to Open Sunday," *Times Picayune*, March 23, 1940, 5.

[61] "First Tung Orchard Tour Attracts Many Visitors Here," *St. Tammany Farmer*, April 18, 1941; and David A. Bice, the Village of Folsom, Louisiana, TO, VF, LPL.

[62] "Tung Trail is Open for Autoists Today," *Memphis Commercial Appeal*, April 13, 1947.

[63] "A Tourist's Calendar of Sun-Belt Events," *New York Times*, December 10, 1950.

[64] Robert Meyer, Jr., "Dixie Hospitality: Tours of Old Homes and Floral Festivals Await Spring Visitors in the South," *New York Times*, March 8, 1953.

[65] "Tung Oil Parade," Alachua County Library District Heritage Collection," http://

queens in fairs like the Louisiana Tung Blossom Festival in Covington, or in the case of Florala, Alabama, Blossom queens and courts with tung maids appeared at festivals and parades each spring and high school football games each fall.[66] In 1943, tung blossoms inspired Mrs. James B. Davis of Poplarville to compose a piano song entitled "Tung Oil Time."[67] According to former grower Pierre Livaudais, the sentiment around tung parades and festivals paralleled that of Mardi Gras. While people came from hundreds, if not thousands of miles, to participate, these events provided a chance for communities to celebrate and reap income from tourist dollars. During these festivals, growers opened their orchards for excursions, and some gave visitors wagon rides. This pseudo hay ride allowed onlookers to see the trees up close and personal and take photographs.[68] These events often advertised nationally and received coverage by newspaper and later television reporters.[69] In the words of one journalist,

> I was invited to a Tung Oil Festival in Picayune, Miss., many years ago and have never forgotten miles and miles of tung trees in full bloom. Nothing like it have I ever seen except in the stage musical "Blossom Time" or the the Jeanette MacDonald-Nelson Eddy movie, "Maytime."[70]

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heritage .acld.lib.fl.us/1101-1150/1134.html (accessed February 7, 2012).

[66] "Ex-Toledoan devoting Florida acres to Growing of Chinese Tung Trees for the Oil of Which Nations are Scrambling," *Cleveland Plain Dealer*, May 2, 1937, 89; and "Florala Beauty Queen of Tung," *Tung World* 1, no. 2 (June 1946): 7. See also, "Louisiana Tung Festival March 14th," *Tung World* 7, no. 9 (Feb 1953): 3; "TGCA President Lauds Festival as Good Public Relations for Tung Industry," *Tung World* 7, no. 10 (March 1953); *Tung World* 7, no. 10 (Mar 1953): i, ii; and Gammill, interview.

[67] Catalog of Copyright Entries part 3 Musical Compositions, New Series, Volume 38, Part 1, First Half of 1943, nos. 1-6 (Washington, D.C.: Library of Congress, 1943).

[68] Livaudais, interview.

[69] See, for example mention of the Covington Tung Blossom Festival in *The Billboard*, February 29, 1960, 77.

[70] "Dogwood Festival in Bogalusa," *Times-Picayune*, March 17, 1974.

Tung festivals had fierce competition from fairs like the Rose Festival in Thomasville, Georgia, Memphis Cotton Carnival in Memphis, Tennessee, and Charleston Azalea Festival, but boosters thought they had no peer.[71] Those who did not attend tung fests enjoyed the blooms from the comfort of their vehicles.

The Highway Department, according to the *Jackson Daily News*, described the tung tree as "an ornamental because of its scenic beauty."[72] *The Clarion-Ledger* said tung orchards provided a "roadside panorama of beauty that fascinates Northern visitors and causes them to ask, 'What are those lovely trees?'"[73] Tourists driving along Louisiana Highway 21 as well as U.S. 19 and U.S. 27 near Tallahassee, Florida, and Capps, Florida, gazed at a "veritable blanket of salmon pink petals."[74] The Tung Trail, miles of trees along the road, stretched from Picayune to McNeill, Mississippi, along Highway 11. Another well-known strip of trees stretched from Picayune to Bogalusa, Louisiana.[75] Travelers to the coast multiplied in the post-World War II years as middle class tourism expanded, but the Federal Highway Act of 1956 damaged roadside tourism.[76] After interstate highways developed, drivers needed sufficient incentive to leave the thoroughfare to see an attraction, and in most cases, small ones like tung orchards

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[71] Robert Meyer, Jr., "Dixie Hospitality: tours of Old Homes and Floral Festivals Await Spring Visitors in the South," *New York Times*, March 8, 1953.

[72] Phil Stroupe, Tung Oil Production Brings Five Million Dollar Income to Farmers," *Jackson Daily News*, July 5, 1953.

[73] "Mississippi Has 60% of Nation's Tung Oil Business," *Clarion-Ledger*, March 26, 1961.

[74] Bob Landry, Once Great Tung Industry No More," *Clarion-Ledger*, August 23, 1974, 2B. See also, Robert Meyer, Jr., "Blossom Trails Through the Deep South," *New York Times*, March 2, 1952.

[75] "Picayune Plans Tung Area Tour to Open Sunday," *Times-Picayune*, March 23, 1940, 5.

[76] Burnette, *Historic Baldwin County*, 34-36; Stanonis, 22; and Jackle, 304.

suffered.[77] Trying to draw travelers from roads, many growers erected placards. Robert Tonner's sign in Poplarville read, "The Fruits of this Tung oil are the Source of Tung Oil . . . The Priceless Ingredient for highest quality Paints and Varnishes . . . 1001 other Superior Products for Home, Farm, and Factory."[78] Little could be seen on the expressways so boosters had to depend more on word of mouth and print to fuel tourism.[79]

Contests and radio stations transmit knowledge about tung trees. Children in 4-H Clubs along the southern coasts grew tung and those with the best results received prizes donated by the ATOA. In 1952, twelve-year-old Tyrone Jones of Lumberton, Mississippi, bought thirty-three pounds of nuts for $2.50 and $2.00 worth of fertilizer to plant 1/10 of an acre and the following year, he won $50 for the best patch.[80] Other contests, like that held by the Pearl River County Livestock Show, held competitions not merely for children but adults.[81] Radios also contributed to the tung craze, and WRJR, the only radio station in Picayune, called itself "The Voice and Choice of the Tung Belt."[82] Tung received additional advertising from schools.

In 1954, new band director Charles S. Newman named the Picayune Memorial High School band the "Pride of the Tung Belt" in an attempt to trigger enthusiasm from

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[77] Tim Hollis, *Before Disney: 100 Years of Roadside Fun* (Jackson: University Press of Mississippi, 1999), 15.

[78] "Roadside Sign Planned for Placement on Tung Farms," *American Tung News* 8, no. 9 (Sep 1957): 5.

[79] Mormino, 244.

[80] "Mississippi Now Leading in the Tung Oil Industry," *Jackson Daily News*, June 8, 1954.

[81] "Tung Harvest Yield Best Crop in Years," *Memphis Commercial Appeal*, Dec 24, 1946.

[82] William (Bill) Newman, interview by author, August 8, 2012, tape recording.

students and the community at large.[83] The uniforms, consisting of maroon coats and maroon striped white pants, had a logo consisting of a tung blossom encircled with the words "Pride of the Tung Belt" on the left arm.[84] According to his son, this association with the tung industry worked magic and the band became a pseudo ambassador for the Tung South. The band won second place in a national championship at the Jaycee Parade of States in 1955. While performing at the Rex Mardi Gras Parade in New Orleans that same year, they were filmed by a Hollywood camera crew and the resultant stock footage found its way into several movies, including one starring Elvis Presley. Thanks to the financial support of Crosby, the band participated in the 1956 Rose Parade where Newman had the pleasure of meeting Hopalong Cassidy and explaining the Tung Belt to his childhood hero.[85] While in California, Walt Disney invited the band to give the first concert at newly opened Disneyland. The band attracted so much attention that thanks to a solicited auditions by NBC, CBS, and ABC, the Pride of the Tung Belt appeared not once, but seven times on nationwide television. In quick succession the band performed at the Orange Bowl, Cotton Bowl, Gator Bowl, Sugar Bowl, and in 1959, gave a concert in the newly created U.S. Senate Office Building and later marched in the Macy's Thanksgiving Day Parade.[86] Although a band tung blossoms on its uniforms appeared

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[83] Charles Nutter, Tung Nut Industry Fading from State," *Clarion-Ledger*, December 10, 1972. See also, Polk, 111.

[84] Charles S. Newman, *I Had it All with Pride: A History of Picayune Memorial High School "Pride of the Tung Belt" Band, 1954-1971* (Clinton, MS: One House Publishing Company, 1992), 6, 8.

[85] Ibid., 37, 58. See also, Newman, interview.

[86] *And the Band Played On: The Life and Imprint of Charlie Newman*, produced and directed by William Newman, 31:21 min., documentary, http://www.prideofthetungbelt.com/videos/ (accessed August 8, 2012).

strange to onlookers, many coastal residents saw tung on par with the likes of cotton when it came to importance and cultural significance.

With growing acreage and multiplying related industries, some advocates saw tung as crop of southern importance. The Dixie Tung Oil Development company in Yeaton, Mississippi, predicted the usurpation King Cotton by King Tung.[87] While the seat of tung cultivation moved from Florida to Mississippi and Louisiana in the 1940s, faith in the economic improvements caused by tung persisted. Even with its turpentine production, Capps, Florida, suffered economically until the St. Joe Paper Company began tung operations. By the 1950s, Florida had six tung oil mills, Louisiana had five, Mississippi had four, Alabama had four, and Georgia had one. These mills employed hundreds and aided city and state economies.[88] During harvest time locals worked in the orchards to supplement their incomes. Pearl River County credited tung for its economic move from one of the worst performing counties to one of best ten counties in the state of Mississippi.[89] Pearl River's most successful company was the Crosby Tung Oil Processing Plant and Paint Factory which produced "World Famous" tung paints.[90] In addition to native companies like Crosby's, northern and western companies dealing with tung had much motivation to relocate to or form branches in the South.

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[87] "Way Down South at Dixie," *The Southern Conservationist and American Tung Oil* 6, no. 1 (Apr 1939): 17.

[88] Mormino, 188. See also, Appendices.

[89] "Advertised Building Character IN much-Troubled Mississippi," *Augusta Chronicle*, October 23, 1955, Section C, p.3. Much credit lay with cattle, but tung production certainly helped. See, "Livestock Ideal Tung Auxiliary," *Tung World* 6, no. 1 (May 1961): 10.

[90] Newman, 58.

Nurseries and bag, fertilizer, harvesting, milling, investment, and oil inspection, insurance, marketing, and paint and varnish companies flocked to the South to be closer to tung acreage. After World War II, an assortment of plants relocated to benefit from cheap labor, tax incentives, and the absence of unions but over time, their very presence helped narrow the gap between regions when it came to management, wages, and work conditions.[91] By the mid-1960s, Alabama, Mississippi, and Louisiana tantalized manufacturers with the promise of no state or local taxes for an entire decade.[92] Businesses offering land purchase guidance; cultivation, harvest, and storage instruction; and materials on refining and marketing dotted the South and the country at large. As the number of tung oil companies grew, Alabama had four, Florida had seventeen, Mississippi had twenty-three, and Louisiana had twenty-three.[93] A few of the non-coastal tung businesses included the Dixie Tung Empire Corporation in Jackson, Mississippi; Mississippi Tung Groves, Inc., in Wilmington, Delaware; the National Tung Grove Corporation in Rock Island, Illinois; Southern Tung Oil Company in Pittsburgh, Pennsylvania; and U.S. Tung Oil Company, Inc., in New York City, New York.[94] While tung manufacturers, tourism, festivals, and publications fanned the reputation of tung, the tree continued to suffer from a lack of mass recognition for one reason—poison.

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[91] Schulman, 108; and Cobb, *The Selling of the South*, 47, 50, 64.

[92] Cobb, *The Selling of the South*, 5, 25-27, 36, 48, 157.

[93] See Appendices.

[94] See "Dixie Tung Empire Corp., https://business.sos.state.ms.us/corp/soskb/Corp.asp?107220 (accessed January 11, 2013); "Mississippi Tung Groves, Inc.," https://business.sos.state.ms.us/corp/soskb/Corp.asp?112420 (accessed January 11, 2013); "National Tung Grove Corp.," https://business.sos.state .ms.us/corp/soskb/Corp.asp?104338 (January 11, 2013); and "Southern Tung Oil Co.," https://business .sos.state.ms.us/corp/soskb/Corp.asp?78329 (January 11, 2013).

While tung trees presented a lovely image, the toxicity of their nuts limited their marketing potential.[95] In the words of *Down South* magazine, "About the only thing the tung isn't good for is eating."[96] The *Tallahassee Democrat* commented, "Many a Northern visitor has learned this the hard way . . . we'd have them staying in motels around here two and three days too sick to go anywhere."[97] Unsuspecting GIs stationed at southern military bases often fell victim to the allure of the nuts.[98] The *Chemurgic Digest* noted that tung nuts resulted in a "distressing illness" but this diagnosis understated the medical outcomes.[99] Eating tung nuts caused swelling of the mouth and lips as well as intestinal pain and vomiting. Extreme cases reported hypertension, delirium, convulsions, and anaphylactic shock.[100] Despite this hazard, many either disbelieved or dismissed the risk given the visual appeal of the large tung nuts which strongly resembled walnuts. While the nut smelled strongly of kerosene or as one source claimed, ham fat, its appearance prevailed.[101] The appeal of the tung nut was enhanced with reports that fresh

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[95] Davis, *Where There Are Mountains*, 196.

[96] Bobby Smith, "Tung Oil: The South Makes Oil from the Trees of China," *Down South* (Feb-March 1951): 24.

[97] Sam Miller, "Bulldozers End the Tung Dynasty at Capps," *Tallahassee Democrat*, September 6, 1976, 17.

[98] Haynes, 95.

[99] George Priest, Jr., "Strong Continuing Demand for Drying Oils," *The Chemurgic Digest* 5, no. 1 (Jan 1946): 37.

[100] Edward Balthrop, "Tung Nut Poisoning," *Southern Medical Journal* 45, no. 9 (Sep 1952); and Edward Balthrop et al., "Tung Nut Poisoning," *The Journal of Florida Medical Association* 40 (May 1954): 813-820; and K. R. Langdon, "Tung oil Tree, aleurites fordii," *Nematology (botany) Circular* no. 45 (Nov 1978).

[101] *One Thousand More Paint Questions Answered* (New York: The Painters Magazine, 1908), 170. Some early accounts commented that tung oil had no smell at all but the author, detecting a powerful

ones tasted like chestnuts while those retrieved from the ground tasted like almonds. In one *Louisiana Forestry Bulletin*, an author noted that the very name "tung nut" beckoned onlookers to eat and that "there are still skeptical individuals who believe the warning not to consume is a trick to deprive them of something edible."[102]

Those residents of tung producing areas knew the poisonous truth behind the beautiful tree. Children were taught at an early age to steer clear of tung nuts. Of growing up on a tung plantation, Pierre Livaudais explained, "My parents always told me, 'don't eat that it's poisonous' . . . they harped on that to the point that I was afraid to even touch one."[103] Gulf Coast residents even joked about the nuts. According to Roy M. Moffitt of Roy M. Moffitt & Company, "Don't feed tung nuts to your visitors unless . . .."[104] Most victims mistook tung for other nuts or simply thought the large, pear-shaped nuts looked tasty. Countless cases of consumption took place from the early days of plantings onward, but several examples highlight the inherent dangers. In one case, a college student ate five nuts, began to feel sick, wobbly, and incredibly thirsty but found drinking increased the pain. Consistent with food poisoning, his vomit appeared white and his stool yellow and runny. The following morning, the young man felt no stomach

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odor, disagrees. See, "The Chemistry of Building Materials," *The Builder*, July 1902, 452; and John Stuart Thomson, *The Chinese* (Indianapolis: Bobbs-Merrill, 1909), 309.

[102] Clair A. Brown, Louisiana Trees and Shrubs, p.155, *Louisiana Forestry Commission Bulletin*, No. 1 Baton Rouge: Claitor's Publishing Division, Tung Oil, VF, LPL. See also, J. Edward Balthrop and William B. Gallagher, "Further Observations on Tung Nut Poisoning," *Bulletin of The Staff of City Hospital Mobile, Alabama*, 21, no. 2 (Oct 1952): 19.

[103] Livaudais, interview.

[104] Roy M. Moffitt & Company to Dear Association, July 16, 1945, Box 1, American Tung Oil Association 1945 [2/4], Dantzler Company, SC, MML, MSU.

discomfort but had a headache reminiscent to that of a hangover.[105] Another case took place when five small children in Mobile, Alabama, mistook tung nuts for Brazil nuts and became nauseated, vomited, and developed diarrhea, severe headaches, dilated pupils, high blood pressure, and risky levels of dehydration. Low oxygen levels resulted in cyanosis where their skin turned blue around the lips and ears. At the Emergency Room at the Mobile City Hospital, they received enemas and saturated sodium chloride to incite vomiting and eventually recovered.[106] Lawsuits sometimes ensued from such incidents.

Those who ate tung nuts occasionally argued that growers and shippers needed to warn others about the danger. In one such case, three stevedores on a dock in Brooklyn, New York, ate tung nuts intended for Argentina. Upon becoming ill, the men sued the shipping company, Irving R. Boody & Company, Incorporated, for $150,000 claiming it should have marked the twenty-five bags containing the nuts "poisonous and not edible."[107] The company, in turn, named the Southern Mississippi Branch Experiment Station as co-defendant but the station disclaimed liability saying its responsibility ended when Boody & Company accepted the shipment.[108] Victims recovered with the help of

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[105] J. Edward Balthrop, "Tung Nut Poisoning: A Report of Ten Cases," *City Hospital Bulletin* 21, no. 2 (Oct 1952): 4, Box 10, Folder 10, Camille, ATOI, MLA, USM; and "Tung Oil Trees Can Poison but only A Part is Eaten," *The Evening Independent* [St. Petersburg, Florida], September 19, 1968.

[106] Balthrop, "Tung Nut Poisoning: A Report of Ten Cases," 6.

[107] Irving R. Boody & Co., Inc., to South MS Branch Station, October 19, 1962, Box 11, Folder 1, Tung Nut Poisoning (1952-1962), ATOI, MLA, USM.

[108] Irving R. Boody to W. W. Kilby, Oct 19, 1962, Box 1, B (30), 1962, acc. No. A81-8, South Miss. Branch Experiment Station, CPRC, MML, MSU; and W. W. Kilby to Thomas E. Kelley, Oct 24, 1962, 1962, Box 1, B (30), 1962, WWK, SMBES, MAFES, CPRC, MML, MSU.

Epsom Salt and "fluid and electrolyte replacement therapy."[109] As the negative reputation of the nuts persisted, the quest continued to detoxify tung.

Placing tung nuts on every kitchen table in the country, and consequently, raising its value, remained high on the list on the goals of growers and scientists. Tung growers looked at their pecan, walnut, and peanut contemporaries and longed for access to edible market sectors. They believed that if detoxified, tung oil would rival the likes of linseed and soybean oil in foodstuffs. Rich in protein, tung nuts and tung oil, if ridden of toxins, stood to make a good source of nourishment for livestock and people. After all, tung oil and tung meal consisted of twenty-two percent and twenty-seven percent protein, respectively.[110] The fact that tung oil was comprised of roughly eight percent eleostearic acid made it immensely dangerous to ingest. When this acid reacted with Ph acid in intestinal tracts, immense sickness ensued.[111] Detoxification proved extremely difficult so scientists did not achieve much success. In the 1940s, USDA scientists found that tung nuts had at least two unknown, unstable toxic components. They called the poisons, containing varying amounts of carbon, hydrogen, and oxygen, Toxin I and Toxin II. The scientists imagined that after deducing the identity of these toxins, tung meal could be made safe by mixing it with other oilseeds. The first they extracted with solvents like

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[109] Edward Balthrop, "Tung Nut Poisoning," Box 11, Folder 1, Tung Nut Poisoning (1952-1962), ATOI, MLA, USM. See also, Edward Balthrop, "Tung Nut Poisoning," *Southern Medical Journal* 45, no. 9 (Sep 1952).

[110] R. L. Holmes and E. T. Rayner, "Isolation of Two Nitrogen-Free Toxins from Tung Kernels," *The Journal of The American Tung Oil Chemists' Society* 35, no. 11 (Nov 1958): 586. On detoxification, see, for example, G. E. Mann, W. H. Hoffman, Jr., and A. M. Ambrose, "Oilseed Processing: Detoxification and Toxicological Studies of Tung Meal," *Journal of Agricultural Food Chemistry* 2 (1953): 258-263; and Balthrop, "Two Outbreaks of Acute Tung Nut (Aleurites fordii) Poisoning," 813-820. See also, "Regional Lab to Up Tung Research," *American Tung News* 5, no. 3 (March 1954): 12; and "Detoxified Products of Tung Evaluated," *American Tung News* 5, no. 7(July 1954): 3.

[111] Jay Shockey, telephone interview by author, July 30, 2012, tape recording.

ether or ethanol and benzene. When thus exposed, the toxin, soon to be identified as sapolin, separated and could be easily divided from tung meal. The second, later found to be the alcohol soluble toxalbumin, they either detoxified with ethyl acetate or by warming tung to 230 degrees Celcius for two hours and then adding petroleum naptha.[112] Having identified the toxins, scientists tested on live subjects and immediately set about experimenting with different animals.

Scientists studied the fruits of their labors by feeding the tung meal to a variety of subjects including rats, rabbits, chicks, dogs, and pigs. Hoping to find what percentages of various mixtures lessened the toxins in both the oil and kernels, they recorded the reactions. Rats tested tended to weaken and die when fed tung meal while rabbits only developed diarrhea. Dogs experienced diarrhea and vomiting. Pigs refused to eat a tung/soybean mash mix let alone plain tung meal. A small catastrophe took place in initial tests on chicks when forty milligrams of tung meal led to mass deaths. Not until the dosage lowered to ten milligrams did the number of fatalities in smaller animals decrease, but results only seemed to validate the original premise of tung oil being poisonous and inedible. Experimenting on big animals like pigs and cattle revealed worse side effects. These types of animals experienced not simply diarrhea but damage to the liver, kidneys, stomach, and intestines to the extent that death might be a possibility. In many cases, the animals became incapacitated. Not until 1946 did scientists finally succeeded in separating sapolin, making tung meal less dangerous to eat. With this

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[112] Mann, 258-263; Holmes and E. T. Rayner, "Isolation of Two Nitrogen-Free Toxins from Tung Kernels," 587; Balthrop, "Tung Nut Poisoning: A Report of Ten Cases," 5; Reavis C. Sproull, "Chemurgic Research in S.R.I. Laboratories," *Chemurgic Digest* 8, no. 6 (June 1949): 16; and "Problem: Upgrade Oilseed Meals," *Chemurgic Digest* 15, no. 8 (Sep 1956): 6.

victory, they continued their quest knowing success could alter the status of tung oil in consumer markets. After all, non-edible tung meal sold for seven to ten dollars a ton in 1954 but if made edible, stood to sell for $35 a ton. As research persisted, the outcomes remained unpredictable and even devastating when great numbers of lab animals died. In a series of tests, scientists tried to detoxify tung with phosphoric acid, sodium carbonate, urea, and benzene extraction but nothing worked. They made some progress lowering the toxicity by heating but tung meal never did become consistently safe enough for animals, let alone people, to eat. Even so, detoxification efforts at the University of Mississippi received mention in *The U.S. News and World Report* in 1966.[113] Studies to make tung nuts and tung meal edible may never have borne fruit, but scientists took solace in pharmaceutical advances.

The tie between tung oil and medicines dated back centuries. The Chinese used it as a salve and ointment and folklore held that small doses had the power to cure metallic poisoning, insanity, and masturbation. In the U.S., the first medicinal connection may

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[113] "Combinations of detoxified tung nut meal and soybean oilmeal as sources of supplementary protein for swine," http://ufdc.ufl.edu//UF00072846/00001 (accessed November 2, 2012); G. K. David, N.R. Mehrhof, and R. S. McKinney, "Tung Meal in Rations for Growing Chicks," *Poultry Science* 25 (1945): 74-9; "De-Poisoning Tung," *Tung World* 1, no. 2 (June 1946); "Begin Project to Detoxify Tung Meal," *American Tung News* 17, no. 1 (Jan 1966): 6; "Tung Oil Studies at The University of Mississippi," *American Tung News* 18, no. 4 (April 1967): 8; "Methods Found to Detoxify Tung Meal," *American Tung News* 18, no. 6 (June 1967): 4; "Ad on Tung Meal Study Placed in U.S. News by Utilities System," *American Tung News* 17, no. 5 (May 1966): 11; "Tung Research Committee Hears Reports by Scientists," August 28, 1962, Agricultural Research Service, Southern Utilization Research and Development Division," Box 20, Folder 3, Tung Oil, FCC, UAHC, MSU; Balthrop, "Tung Nut Poisoning: A Report of Ten Cases," 5; "Problem: Upgrade Oilseed Meals," *Chemurgic Digest* 15, no. 8 (Sep 1956): 6; Brown, "The History of Tung Oil," 5; and Kopacz, 288. See also, C. L. Huang, "The Utilization of Tung Meal" (speech presented at thirty-fourth annual Tung Industry Convention, Edgewater Park, MS, September 25-28, 1967), 30. On chickens and tung, see also, G. F. Heuser, *Feeding Poultry: The Classic Guide to Poultry Nutrition for Chickens, Turkeys, Ducks, Geese, Gamebirds, and Pigeons*, 2nd ed. (Norton Creek Press, 2003), 212, 236.

have been tung based catheters during World War II.[114] By the 1950s, tung oil had become a key ingredient in a handful of medicines. In 1903 Germany, tests on tung as an ingredient in salves only created skin dermatitis. *Webster's Dictionary* defined tung as a "poisonous pungent substance."[115] Eager to overcome such notorious labeling, scientists wanted to make tung a trusted medical necessity. Some supposed tung oil to have had a nice taste as during the Taiping Rebellion, some soldiers mistook a vat of tung oil for pork fat but others imagined it tasted much the same as castor, an extremely bitter remedy for constipation.[116] One source insisted that heated oil tasted badly but cold oil did not.[117] Advocates of medicinal tung billed their products as painless solutions for any number of ailments.

In the 1950s, *Tung World* editors and former journalists John and Edith Watts saw the toxicity of tung as a challenge, not a barrier. Experimenting on pets and themselves, they soon claimed that tung oil could reduce body odor and ward off mosquitoes while curing ailments ranging from acne and rashes to skin cancer. The Wattses first got the idea to create medicinal tung while varnishing their furniture. Suffering from a hangnail injury, Mrs. Watts healed quickly after exposure to a tung varnish. Curious, she applied it

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[114] "Investigations of the Tung Oil Industry," Congressional Record-Senate, 1949, 8333, TO, SF, MDAH; and Holmes and E. T. Rayner," Isolation of Two Nitrogen-Free Toxins from Tung Kernels," 587; and Goldblatt, 348. See also, Robley Dunglison, *Dictionary of Medical Science: Containing a Full Explanation . . .* (Philadelphia: Lea Brothers, 1893), 37; and William Lockhart, *The Medical Missionary in China: A Narrative of Twenty Years' Experience* (London: Hurst & Blackett, 1861), 236. On masturbation, see James A. Duke, *Handbook of Nuts* (Baton Rouge: CRC Press, 1989), 8.

[115] "TGCA Sponsors Research Work; Renames Entire Slate of Officers," *Tung World* 6, no. 9 (Feb 1952): 4.

[116] Samuel Pollard, *In Unknown China: A Record of Observations, Adventures . . .* (Philadelphia: J. B. Lippincott, 1921), 235.

[117] Edward Richard Bolton and Cecil Revis, *Fatty Foods, Their Practical Examination* (Philadelphia: P. Blakiston's Son & Co., 1913, 250.

to her face and found improvements in her complexion. Both she and her husband noticed positive effects on their hands, as well, namely newfound smoothness. Suddenly, the two wondered why tung had never been used in medicines.[118] In reality, the Chinese and Hawaiians had used tung oil for acne, eczema, psoriasis, and sunburns, and as baby oil for centuries.[119] While the Wattses wanted to establish medical usage in the domestic market, they doubled their efforts to counter the toxic reputation of tung.

While two early experiments by government scientists had resulted in rashes, the Wattses endeavored to prove their hypothesis of medicinal tung. They began their quest on a pound dog named Lucky who had mange, worms, and bloody injuries all over his body. After a month of being rubbed down with tung oil, he was a happy pooch in the Wattses' home. With this newfound confidence, they applied tung oil to their own bodies and were thrilled by the results. The only problem seemed to be that tung hardened when exposed to light and when heated by sunlight. Mr. Watts found a way to stabilize or at least create predictable behavior of his tung oil ointment but would not reveal the secret. In 1951, the Wattses began selling stock in their company, incorporated as Tungolin Company, Inc. While their main branch was located in Gulfport, Mississippi, they had branch offices in Mobile, Alabama, and DeFuniak Springs, Florida. They soon sold almost 30,000 bottles of Tungolin from Florida to Arkansas.[120] Sales proved so

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[118] Preston W. Darling, "Tung Enters Medical Field," *Tung World* 7, no. 4 (Sep 1952): 4.

[119] On Hawaiian usage, see, for example, Anthony Dweck, *Formulating Natural Cosmetics* (Carol Stream, IL: Allured Pub Corp., 2010), 2.

[120] Elliot Hebert, "Is Tung Oil A Healer, Too?" *Times-Picayune*, October 11, 1953; "Tung Oil Medicant?" *Times-Picayune*, October 16, 1953; John Watts to Louis Chenel, December 20, 1951, Folder: Tung Oil Production: Louis Chenel, 1944-1967, LECFP, SC, HML, LSU; and "Tung Oil Industry Has Own Magazine," *Jackson Daily News*, April 24, 1946.

successful that in 1953, they gave up editing *Tung World* so they could focus completely on Tungolin.[121] Aside from exterior successes, the Wattses also claimed that tung oil proved a faster and more effective solution for constipation than castor oil if taken orally. While not advertised as cure-alls, descriptions glorified tung applications.

The Wattses heralded Tungolin Doctor Oil and Tungolex First Aid Oil primarily as healing salves for blisters, scalds, rashes, chapped hands, cold sores, cuts, insect bites, hemorrhoids, Athletes' foot, mouth sores, and bleeding gums. They also sold Tungolin Topicream to diminish acne and blackheads.[122] Eyeing this medicinal train, growers either intensified their research or funded labs. Chenel, for example, hired a chemist who created a salve to apply on burns but the concoction never had success with the public.[123] While it might be tempting to dismiss these as "snake oil" efforts, medicinal tung oil patents were filed and granted.[124]

Innumerable universities and colleges across the country lent credibility to the idea of pharmaceutical tung oil. The Tulane School of Medicine, Emory University, the University of Tennessee, the University of Mississippi, and the University of Texas had scientists seeking ways in which to apply tung oil in medicines. According to a study done in 1945 by Dr. Arthur Grollman of the University of Texas, tung oil had the ability

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[121] See, "40 New Uses for Tung Oil? It's Possible. And Soon!" *Tung World* 7, no. 4 (Sep 1952): 8; and "Congratulations Are in Order," *Tung World* 8, no. 1 (Jan 1953): 4.

[122] Preston W. Darling, "Tung Enters Medical Field," *Tung World* 7, no. 4 (Sep 1952): 4; and Elliott Hebert, "Is Tung Oil A Healer, Too?" *Times-Picayune*, October 11, 1953; and "Lamont Rowlands," *Tung World* 7, no. 10 (March 1953): 8. On medicinal uses of tung oil, see also Donald G. Barceloux, *Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals* (New York: Wiley, 2008), 663-664.

[123] Livaudais, interview.

[124] A. Walker Bingham, *The Snake-oil Syndrome: Patent Medicine Advertising* (Hanover, MA: Chrisopher Publishing House, 1994.

to lessen hypertension and other heart ailments. Further endorsement came when the National Heart Institute gave a $3,910 grant to the University of Mississippi to study tung oil as a combatant for heart disease. Later studies centered on tung oil as a cancer preventative due to eleostearic acid's anti-tumor qualities.[125] This cancer claim frequently appeared in studies relating to skin. Scientists found tung as a way to ease wound infections and skin inflammation. Dr. M. M. Snelling, a fellow of the American College of Surgeons and resident of Gulfport, used tung to treat cuts contusions, ulcers, and scalds/burns on 682 patients. Finding the results satisfactory, he viewed tung oil-based salves as legitimate. Snelling experimented with tung oil as a cure for skin cancer and eventually came to argue that "healthy tissues grow 50 percent faster than with any other treatment."[126] Evidently, the poisonous tung nut held a benign pharmaceutical wonder in the form of oil. Tung salves failed to gain nationwide dissemination and distribution remained in the South.

By the late 1960s, tung oil had yet to achieve mass recognition. According to the *Bogalusa Sunday News*, mention of tung evoked "blank stares or sniggers from the

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[125] "National Heart Institute Grant Made for Research Using Tung Oil for Heart Ailments," *Tung World* 12, no. 10 (Oct 1955): 7; "Medicinal Tung Oil," *Tung World* 13, no. 8 (Aug 1956): 7; Walter Goodstein, "Tung Oil as Heart Disease Treatment to be Studied," *Times-Picayune* October 30, 1955, 2; Richard P. Creagan to James H. Anderson, January 17, 1975, James H. Anderson, Box 1, Folder 1 (25), 1975, WWK, SMBES, MAFES, CPRC, MML, MSU; J.S. Long, "To Improve the Agricultural Economy of the American Continent: A Request to the U.S. Federal Government to Help us to Help Ourselves and Some of Our South American Governments by Research to Make New Derivatives from Tung Oil and to Find New Places where These New Compounds will Improve the Functions and Properties of Existing Products," 1968, Box 23, Folder 3 Crisis in Tung, ATOI, MLA, USM; and Phil Stroupe, "Tung Oil Production Brings Five Million Dollar Income to Farmers," *Jackson Daily News*, July 5, 1953.

[126] "Mississippi Now Leading in The Tung Oil Industry," *Jackson Daily News*, June 8, 1954. See also, M. Murph Snelling, "The Multiple Uses of Processed Tung Oil in Industrial Surgery," The Mississippi Doctor (May 1953): 397-402. Skin related tung patents included the following salves: Zuhl and Eisemann, DRP 124,874; and H. Alexander, DRP 137,340. See A. M. Altshcul, L. A. Goldblatt, and R.S. McKinney, "Review of information on Physiological Properties on Tung Oil," Box 5, Folder 17, Tung History, 1944-76, ATOI, MLA, USM.

average citizen who has never lived along the Gulf Coast area."[127] Knowing little about the tree, many misspelled it as "tongue."[128] While tours of the country had grown in popularity in the early 1960s, the role in tung in tourism had also declined. Southern historian Samuel C. Hyde, Jr., equated the Gulf South with "paradise amid hell" as the civil rights movement's violence no doubt deterred some visitors.[129] The primary reason lay in interstates and highway beautification movements which decreased the number of billboard advertisements.[130] Roadside attractions had been replaced with hotels, casinos, and gardens like Busch Gardens, Cypress Gardens, and Bok Sanctuary.[131] As tourists searched for more interactive vacations, theme parks like Six Flags (1961) became all the rage. Had Hurricane Camille not devastated the orchards in 1969, the opening of Disneyworld in Orlando, Florida, in 1971, would have greatly detracted from the charm of tung much as it did other natural attractions throughout the South.[132] The term "natural" proved relative. Karl Marx defined first nature as untouched by humans and second nature as that resulting from the altering and manipulation of nature by humans.[133] Environmental historian William Cronon believed the "boundary between human and

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[127] "Bogalusa Center of Tung Orchard Research Work," *Bogalusa Sunday News*, March 20, 1966.

[128] "Tung Trees are Not 'Tongue' Trees," *Times-Picayune*, March 22, 1971.

[129] Samuel C. Hyde, Jr., "Introduction: The Challenges and Expectations of Social Change in the Gulf South, 1866-2000," in *Sunbelt Revolution: The Historical Progression of the Civil Rights Struggles in the Gulf South, 1866-2000* ed. Samuel C. Hyde, Jr. (Gainesville: University Press of Florida, 2003), 1.

[130] Hollis, 15.

[131] *Polk County*, 45, 92; Frisbie, 105, 108; Wilson, 45; and Mormino, 110, 249.

[132] Mormino, 62.

[133] M. Postone, "Necessity, Labor, and Time: A Reinterpretation of the Marxian Critique of Capitalism," in *Karl Marx's Economic Critical Assessements*, Section 3: Marxian Economic Analysis ed. John Cunningham Wood (New York: Routledge, 1998), 564.

nonhuman, natural and unnatural" to be "profoundly problematic."[134] Using the Marxian descriptions, many tourists preferred second nature to first nature or mistook the two.[135] Ironically, tourists traveled hundreds if not thousands of miles to see man-made creations rather than first nature.[136] In 1973, tourists could even purchase "nature" from the Nature Company which manufactured "scientific and naturalistic gadgets."[137] As tourism transformed, the domestic tung oil industry shriveled.

By the late 1970s, the days of tung queens had ended. Tung tours had ceased as had the ATOA and TGCA "Man of the Year" award to growers or scientists who had contributed to the industry. The Pride of the Tung Belt band had replaced their tung blossom logo with Saturn Rockets.[138] Tung newspaper coverage, what little took place, no longer spoke of the tree or oil in glorifying terms. Instead, the tone frequently proved either detached or nostalgic. In 1977, an article in the *Times-Picayune* simply described tung as "over."[139] The following year, the *Times-Picayune* ran an article commenting that Picayune had finally taken down its sign "Tung Oil Capital of the World." One of its journalists said somewhat regretfully that the tung industry had "simply faded away" and been replaced by other, more productive Sunbelt industries like chemicals, steel, paints,

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[134] William Cronon, *Nature's Metropolis: Chicago and The Great West* (New York: W. W. Norton & Company, 1992), xix.

[135] Mormino, 112, 119; and Wilson, 22-24.

[136] Mormino, 119, 95.

[137] Black,163.

[138] Newman, 211.

[139] "Something Old and Something New in Covington," *Times-Picayune*, July 24, 1977.

forest products, fertilizers, farm machinery, tourism, and space and military defense.[140] Agriculture had become dominated by agribusiness and the number and size of farms in the country had gone from 5.7 million farms of about 178 acres in 1900 to 2.5 million farms of 415 acres in 1978.[141] A combination of freezes, hurricanes, imports, cheaper oilseeds, and acrylic paint had ended domestic production and while the industry had gone out with a whisper rather than a bang, its absence created a void in many lives.

The relationship between dwellers of the southern coasts and the tung industry had depended upon individual, local, and regional identity. While individuals, towns, and cities embraced tung as a consciousness, the relationship between the Gulf Coast region and tung proved far more complex. While most historians contend that there are multiple Souths, they disagree on how to categorize. Although descriptions of class and race are frequently proposed, crops and industries are also beneficial in distinguishing characteristics.[142] At most, the Tung Belt became one of many Gulf South identities like pine, cotton, oil, and tourism. For his part, political historian Bruce Schulman chose to study the Cotton Belt and Sunbelt not necessarily because he deemed them dominant identities but because Americans associated white fields and sandy beaches with their conception of "the" South.[143] The name Tung Belt, however, represented an agricultural, industrial, and cultural way of life.

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[140] Stella Pitts, Picayune, Miss., Once Capital of Thriving Tung Oil Industry," *Times-Picayune*, February 26, 1978. See also, *Mississippi Monitor*, 11 edition (Sep 1973): 69-71.

[141] Worster, *The Wealth of Nature*, 89-90.

[142] Edward L. Ayers, "W. J. Cash, the New South, and the Rhetoric of History," in *The Mind of the South: Fifty Years Later* ed. Charles W. Eagles (Jackson: University Press of Mississippi, 1992), 123.

[143] Schulman, x.

Occupants of the Tung Belt saw the strip of land as unique, a South all their own and a contribution to the country's overall view of Dixie. In newspaper, journal, and magazine articles as well as speech, they connected tung trees and tung oil to southern agriculture, economics, industry, politics, and culture. As southern economic/cultural historian James Cobb explained, southern identity depended on both internal and external influences or how southerners wanted to be seen and how others viewed them.[144] Most growers derived from the North, Midwest, and West, so the "southerness" of the Tung Belt might be questionable. Regardless of origin, many of these individuals made their homes in the southern states and all associated tung with the South. Tung boosters proved so intent on cementing this relationship that these men and women, many of whom supported the region's becoming more mainstream through industry, saw the South as a "cultural commodity" and embraced stereotypes like the pastoral South, the planter, and the belle in order to attract tourists.[145] Hoping to temper or gloss over the reputation southern states had for racial violence, they billed the Tung Belt as the best possible mix of the Old and New Souths.[146] Their efforts to solidify the tung region as an identity proved largely unsuccessful at the national level as most Americans failed to think of the South in terms of tung. Efforts proved far more fruitful among tung producing communities.

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[144] James C. Cobb, *Away Down South: A History of Southern Identity* (New York: Oxford University Press, 2005), 338-339.

[145] Karen L. Cox, *Dreaming of Dixie: How the South Was Created in American Popular Culture* (Chapel Hill: University of North Carolina Press, 2011), 135. On southerners embracing stereotype, see John Shelton Reed, *Southern Folks, Plain & Fancy: Native White Social Types*, Mercer University, Lamar Memorial Lectures no. 29 (Athens: University of Georgia Press, 1986), 81.

[146] Cox, 153, 160.

The disappearance of the tung industry proved not only economically but culturally transformative for many Gulf Coast areas. When it came to self-perception, the city of Picayune served as an excellent example of the identity crisis that took place among coastal southerners when the tung industry collapsed. Having to adjust to civil rights legislation and the Vietnam War, these men, women, and children found themselves deprived of a distinctiveness they had clung to for decades.[147] Amidst roughly forty years of political chaos, they had been "unified" around the tung industry and when that ended, many experienced a massive sense of loss. Without a significant replacement, this void left a "big hole in the culture of the town."[148] The town tried to morph its reputation into "The Space Frontier" given that NASA had built a test site just outside the city limits but to no avail. Whereas Picayune had substantiated its claim as Tung Oil Center of the World, the city grappled to establish such an association with the space industry. Former tung growers and non-growers alike suffered with self-image while the city wrestled with a lack of exceptionality. According to Picayune native Bill Newman,

> There was that great sense of cohesiveness, that we were all part of the Tung Belt, we were unique, we had this special thing we gave the world, and there was nothing to replace it . . . the vast majority that have moved in or been born since don't have that sense of what it meant to the community.[149]

The Tung Belt no longer existed so locals could no longer call themselves Tung Beltians. Children, especially, struggled to comprehend by asking, "If we're no longer the Center

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[147] On the impact of civil rights legislation on southern identity, see James C. Cobb, *Redefining Southern Culture: Mind and Identity in the Modern South* (Athens: University of Georgia Press, 1999), 141, 127; and Cobb, *Away Down South*, 212.

[148] Newman, interview.

[149] Ibid.

of the Tung Belt, what are we?"[150] In other words, townsfolk, having lost more than a logo, wanted to become extraordinary again. Many employees at the space center were outsiders so the community changed along with the city's character. Once an industrial hub, Picayune, much like Poplarville, Covington, and Bogalusa, became a bedroom community for New Orleans and never found another identity that incited the character, color, and zest of tung.

When the Tung Belt disappeared, many coastal people, especially the poor, either failed to register the Sunbelt as a new identity or felt no deep connection. One problem no doubt derived from "shadows on the Sunbelt" which included poverty, racial discrimination, and education lags, all of which blotted industrial transformations.[151] Another problem may have derived from the ambiguous geographic definition of Sunbelt. As political historian Randall M. Miller commented, that the "Sunbelt is not wholly southern, and it might not be southern at all."[152] For one thing, the Sunbelt spans from the Atlantic to Pacific Oceans, thus encompassing the southern part of the country, not simply the South.[153] While the name Sunbelt meant more to the South than the West due to the southern states' reputation for rural intransigence, many southerners felt it

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[150] Ibid.

[151] Schulman, 220.

[152] Randall M. Miller, "The Development of the Modern Urban South: An Historical Overview," in *Shades of The Sunbelt: Essays on Ethnicity, Race, and the Urban South* edited by Randall M. Miller and George E. Pozzetta (New York: Greenwood Press, 1988), 15. On Sunbelt definitions, see also, Bradley R. Rice, "Searching for the Sunbelt," in *Searching for the Sunbelt: Historical Perceptions on a Region*, ed. Raymond A. Mohl (Knoxville: University of Tennessee Press, 1990), 212.

[153] Blaine A. Brownell, "Introduction," in *Searching for the Sunbelt: Historical Perspectives on a Region* ed. Raymond A. Mohl (Knoxville: University of Tennessee Press, 1990), 4.

invalidated their distinctiveness and threatened their perception of home.[154] In addition, an urban South seemed an oxymoron and the antithesis of southern since the South had long been associated with rural and agricultural life. Other historians differ on how the South changed and to what extent it became more like the rest of the country. Cobb argued that the South had a "simultaneous desire for and resistance to the Americanization of its culture."[155] According to journalist/civil rights historian John Egerton, the South became Americanized, and the North became Southernized in the late 1960s/early 1970s. To his mind, the exchange had more negative consequences like race difficulties, pollution problems, and "erosion of the sense of place, of community, of belonging."[156] Labor historian Timothy Minchin agreed that the South "Americanized" but believes it maintained differences like conservatism, religion, and anti-union sentiment.[157] Southern cultural historian Joel Williamson described the Sunbelt as the "Southernization of national business as it operates in the South rather than a nationalization of Southern culture by way of business."[158] Whatever their view on the industrial changes, many denizens of the former tung producing states witnessed the changes in a reflective, despondent manner.

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[154] Carl Abbott, "New West, New South, New Region: The Discovery of the Sunbelt," in *Searching for the Sunbelt: Historical Perspectives on a Region* ed. Raymond A. Mohl (Knoxville: University of Tennessee Press, 1990), 17.

[155] Cobb, *Redefining Southern Culture*, 210.

[156] Egerton, *The Americanization of Dixie*, xx.

[157] Minchin, 7.

[158] Joel Williamson, *A Rage for Order: Black/White Relations in the American South Since Emancipation* (New York: Oxford University Press, 1986), 285.

Reminders of the tung oil industry continued primarily in the minds of former growers, their children, and grandchildren. After domestic production ceased, many like Chenel had nothing but disparaging opinions of tung trees. According to his daughter Denise Chenel Daughtry, "So the end of the story is my father whining and complaining about how the tung industry was horrible and terrible" and that "he wasted twenty years of his life on this."[159] For her part, Daughtry said, "I planted one in New Orleans and I thought it was a beautiful tree . . . it reminded me of the good old days even though my father went, 'Aghh, be gone Satan'" whenever he visited.[160] He was joking, of course, but the tree did remind him of a part of his life—tung farming—which he would have preferred to forget. For their part, Money Hill owners David and Sally Goodyear mulled over a comeback but thought better of it considering the rise in taxes. In Sally's words, "We had a consultant come down and we asked what should we grow and he said houses."[161] They took his advice and turned their focus to real estate development but never forgot the "happy memories" of their tung past.[162] Similarly, the Crosby family maintained good memories of tung trees or as one son-in-law called them, 'pink centered dogwoods.'[163] For many, tung proved "emotionally impactful."[164] Mementos of the industry could also be seen in newspapers, magazines, and manufacturing.

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[159] Daughtry, interview.

[160] Ibid.

[161] Goodyear, interview. See also, "Goodyear Clan Has High Hopes for Money Hill," *Times-Picayune*, Aug 13, 1988, p.82.

[162] Goodyear, interview. Their real estate subdivisions included Great Southern, Whippoorwill Grove, and eventually, in 1998, The Money Hill Golf and Country Club.

[163] Gammill, interview.

As early as 1974, the *Mobile Register* answered a reader's request to identify a leaf from a tree he did not recognize and the newspaper columnist identified it as tung.[165] In 1980, the same paper published a poem called "Tremendous Gifts of God" which mentioned tung.[166] In 1985, *Kiplinger's Magazine* described tung oil as a furniture varnish.[167] Tung oil occasionally received attention in advertisements in magazine. Paint and varnish, linoleum, and ink manufacturers among others kept purchasing tung oil from China, Argentina, Paraguay, Brazil, Africa, and India.[168] Many coastal companies like Var Tung Coatings, Inc., in Picayune, and Tung Oil, LLC in Ocala, Florida, and Hammond Tung Oil Partnership, in Hammond, Louisiana, depended heavily on tung oil.[169] Non-southern businesses like Formby's Company in Upper Saddle River, New Jersey, maintained significant interest but high costs led them to mix tung oil with alkyds, phenolic resins, or other oilseeds.[170] The ink industry became a more important consumer

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[164] Rinehart, interview.

[165] "Grow A Bloomin' Thing by Bob Green," *Mobile Register*, September 26, 1974), 56.

[166] Bettye H. Brown, "Tremendous Gifts of God!" *Mobile Register*, June 8, 1980, 118.

[167] "At Home: The Natural Beauty of Tung Oil," *The Kiplinger Magazine: Changing Times* 39, no. 1 (Jan 1985): 12.

[168] On India, see, Rashtra Vardhana, *Floristic Plants of the World* (New Delhi: Sarup & Sons, 2006), 1:46. On Brazil, see, for example, Ellen Bromfield Geld, *View from Fazenda: Tale of Brazilian Heartlands* (Athens: Ohio University Press, 2003), 8.

[169] On Var Tung Coatings, Inc., see, https://business.sos.state.ms.us/corp/soskb/Corp.asp?127686 (accessed January 11, 2013); and https://business.sos.state.ms.us/corp/soskb/ Corp.asp?20682 (accessed January 11, 2013). On Tung Oil, LLC, see http://www.sunbiz.org/scripts/cordet.exe?action =DETFIL&inq_doc_number=L05000117989&inq_came_from=NAMFWD&cor_web_names_seq_number =0000&names_name_ind=N&names_cor_number=S63482&names_name_seq=0000&names_name_ind =N&names_comp_name=TUNGINTERNATIONAL&names_filing_type= (accessed January 11, 2013). On Hammond Tung Oil Partnership, LTD, see http://www.secstates.com/ LA_Louisiana_Secretary_of_State_ Corporation_Search/ (accessed January 11, 2013).

[170] A. J. Hand, "An Expert's Guide," *Popular Science* 227, no. 2 (Aug 1985): 94.

market for tung as paint and varnish interest reduced.[171] After the banning of DDT (dichloro-diphenyl-trichloro-ethane) in 1972, U.S. pesticide companies searched for effective replacements less harmful to the environment and studied tung oil with enthusiasm.[172] While many such businesses deemed the eleostearic acid in tung oil too unpredictable and the inflammable oil too dangerous to be the base of a pesticide, Bio-System Research, Inc., in Colorado wanted to market tung oil as a boll weevil deterrent.[173] Tung oil had also been instrumental in the 1972 establishment of the Department of Polymer Science at the University of Southern Mississippi and continued to be a scientific focus.[174] Though competition from alkyds, cellulose, phenol-formaldehyde resins, and other oilseeds abounded, tung uses expanded and tung oil maintained a small niche in the oilseed market.

While tung oil remained in demand, many coastal residents considered the abundance of volunteer trees dotting roadsides, fields, and fences nothing but pests. The

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[171] James A. Duke and Judith L. duCellier, *CRC Handbook of Alternative Cash Crops* (CRC Press, 1993), 264.

[172] On DDT, see, for example, Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 2002), 20-30.

[173] Earl Aronson, "The Weeders Guide," *Mobile Register*, April 10, 1983, 30; and M. Jacobson and M. M. Crystal, "Effectiveness of Several Polyunsaturated Seed Oils as Boll Weevil Feeding Deterrents," *The Journal of American Oil Chemists' Society* 58, no. 11 (Nov 1981): 982-983. Tung oil was also seen as a potential pesticide for termites. See, Rachel A. Hutchins, "Evaluation of the Natural Antitermitic Properties of Aleurites fordii (Tung Tree)," http://www.msacad.org/journal/julyjournal/rachel.html (accessed January 10, 2013). On the tendency of tung oil to spontaneously ignite, see, for example, Robert Burke, *Hazardous Materials Chemistry for Emergency Responders*, 2nd ed. (CRC Press, 2002), 409. See also, Earl Aronson, "Get Those Fragile Seedlings Off to a Good Start," *Trenton Evening Times,* April 24, 1983, 104.

[174] "The Bayer Lecture Series," School of Polymers and High Performance Materials, University of Southern Mississippi, http://www.usm.edu/polymer/bayer-lecture-series (accessed January 3, 2013).

tung tree was considered "a plant out of place."[175] The U.S. government even labeled it a weed. During the 1970s, several pieces of environmental legislation altered the status of the tung tree. The 1974 Noxious Weed Act let the USDA control exotic plants and allowed the Animal and Plant Health Inspection Center (APHIS) to monitor forbidden or unwanted plants. In 1977, President Jimmy Carter passed Executive Order 11987 for the purposes of supervising foreign plants, but funding problems prevented it from becoming particularly efficient.[176] During the 1990s climate of political correctness, plants perceived as pests were rarely ever referred to with racial or ethnic connections. At this juncture, the Chinese tung tree became simply tung tree but still carried an exotic reputation and came under the scrutiny of President Bill Clinton's National Invasive Species Council (NISIC) in 1999.[177] By the mid-2000s, for example, tung had become a Florida Exotic Pest Plant Council (FLEPPC) Category II invasive species meaning it had increased in number but had not yet caused any ecological damage.[178] Unlike kudzu, often referred to as the 'vine that ate the South,' tung trees did not harm the environment

[175] John Corley, telephone interview by author, April 26, 2011, transcript. On tung still seen in ditches and along roadsides, see, for example, Smith, "The Legendary Longleaf Pine Forests of the Florida Parishes," 151.

[176] Pauly, *Fruits and Plains*, 240.

[177] Ibid., 243, 246.

[178] Brown, "The History of Tung Oil," 6.

and helped prevent erosion.[179] While some saw the tung tree as a "novelty," others saw no redeeming value.[180]

Spreading wildly, tung trees moved on the plant spectrum from profitable and beloved to useless and pesky. According to Dr. Tim Rinehart, a geneticist at the Southern Horticultural Laboratory in Poplarville, people feared tung when "it really doesn't displace natural populations."[181] Some landscapers recommended tung for their beauty.[182] Others saw them as blights.[183] One Tallahassee woman commented, "they pop up everywhere."[184] Wild tung proved extremely common in Gainesville, Marianna, and especially, Tallahassee, Florida, but the aesthetic value of tung did little to dissuade coastal residents from removing it from their property. As a matter of fact, between 1993 and 1995, about 900 tung trees were eradicated from the Lake Jackson Mounds State Archeological Site near Tallahassee.[185] Aside from simply cutting down the trees, some

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[179] Megan Friedman, "Kudzu," *TIME Magazine*, February 2, 2010. See also, Ceri Au, "Planting Trouble in Your Garden," *TIME Magazine*, July 13, 2007; Laura Fitzpatrick, "Brief History: Invasive Species," *TIME Magazine*, February 22, 2010; and Carter, 667.

[180] George H. Dukes, Jr., *Trees of Mississippi and Other Woody Plants* (Brandon, MS: Poplar Petal Publishing Company, 1997), 184.

[181] Rinehart, interview.

[182] *Trees for Louisiana Landscapes: A Handbook* (Baton Rouge: Louisiana State Agricultural Center, 1996), 58.

[183] Neil Odenwald and James Turner, *Identification Selection and Use of Southern Plants for Landscape Design* (Baton Rouge: Claitor's Publishing Division, 1987), 22.

[184] "Don't Let the Cat Get Your Tung!" http://our-nature.blogspot.com/2011/04/dont-let-cat-get-your-tung.html (accessed December 16, 2012).

[185] K. A. Langeland et al., *Identification and Biology of Nonnative Plants in Florida's Natural Areas*, 2nd ed. (Tallahassee: University of Florida Press, 2008), 69.

hoped insects like the flea beetle (*Aphthona nigriscutis*) could be used to combat tung.[186] Concerned about the expense of tree removal, Georgian Leon Neel, former forestry assistant for conservationist Herbert Stoddard, when asked if he found tung attractive, responded, "Well, they are but a rattlesnake is pretty if you just see his skin but he'll kill the hell out of you if he bites you."[187] Discussions of toxicity expedited attempts to control the growth of volunteer tung trees.

Inaccurate reporting and ill-informed comments gave tung an undeservedly deadly reputation. One of the worst instances of disdain sparked by the name appeared on a website in the form of the following question: "Is it just me, or does Tung Oil sound dirty?"[188] References to tung trees almost always mentioned toxicity. A book entitled *Edible and Useful Plants of Texas and the Southwest* erroneously insisted that tung oil caused dermatitis when applied to the skin when, in fact, it had been used as a salve to heal skin inflammation and infection in the past.[189] Other articles warned that touching tung oil can cause eye and skin problems and potentially kill individuals with nut allergies. An issue of *Louisiana Wildlife News* reported "tung-oil has no wildlife value and should even be eradicated where cattle and other livestock are grazed . . ." and "the

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[186] "Tung Oil Tree," http://plants.ifas.ufl.edu/node/31 (accessed January 1, 2013).

[187] Neel, interview.

[188] "China Builds Tung Tree Oil Biodiesel Plants," The Truth About Cars, http://www.thetruthaboutcars.com/2008/07/ china-builds-tung-tree-oil-biodiesel-plants/ (accessed December 25, 2013).

[189] Delena Tull, *Edible and Useful Plants of Texas and the Southwest*, 2nd ed. (University of Texas, 2003), 285.

ingestion of a single seed by humans can be fatal."[190] Quite the contrary, it proved quite common for tung growers to have livestock in their orchards to maximize land use and provide shade. Sources report no evidence of any deaths from tung oil, tung nuts, or tung leaves but doubts persisted. Gardener Harriet Daggett wrote upon discovering this potentially dangerous side to tung, "I am not as enamored with this tree as I once was and may condemn it to the trash heap . . . better to be safe than sorry."[191] Poisonous plants like oleander, angel trumpets, mountain laurels, and azaleas abounded in gardens and homes so this aversion seemed unfounded. The occasional sterile tung tree grew large and lush and did not produce nuts so it posed less of a concern.[192] For the most part, tung became a pariah but received some positive advertising.

Many varieties of fiction and non-fiction books referenced tung trees. Gaye Gompers mentioned the former profitability of domestic tung in her 2006 biography *The Laughing Grandmother!: (Princess Moonfeather—Cherokee Indian)* and Jeanette Dyess Ryan talked of tung nut gathering in *Dreams of a Farmer's Wife*, published in 2011.[193] Novels like Ken Hall, Jr.'s *The Old Man Down the Road*, which came out that same year, and Darryl Wimberley's 2007 *A Tinker's Damn: A Novel* mentioned the uses of tung oil,

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[190] "Plant Species Profile: Tung-oil Tree (Aleurites foridd)," *Louisiana Wildlife News* 5, no. 3 (May 2010): 4.

[191] Harriet Daggett, "Tung Tree—beautiful but dangerous," *The Seedling: Newsletter of the Northwest Louisiana Master Gardeners Association* 13, no. 5 (Sep/Oct 2010): 4.

[192] T. A. Rinehart, N. C. Edwards, Jr., A. L. Witcher, "Lack of Tung Nut Production in a Potentially Sterile, Late-Flowering Ornamental Tung Oil Tree (Aleurites fordii)," Southern Region American Society for Horticultural Science, Feb 6-8, 2010, Orlando, Florida.

[193] Gaye Gompers, *The Laughing Grandmother!: (Princess Moonfeather—Cherokee Indian)* (Author House, 2006), 433; and Jeanette Dyess Ryan, *Dreams of a Farmer's Wife* (Bloomington, IN: iUniverse, 2011), 101, 112.

the beauty of tung blossoms, and the decline of the domestic industry.[194] Others like Julie Hecht's 1998 book *Do The Windows Open* talked vividly of modern tung oil usage in houses.[195] John Saintsbury's 2007 biography *A Man in Many Streets*, Herbert L. Way's 1912 work *Round the World for Gold: A Search for Minerals from Kansas to Cathay*, Norman Kerr's 2009 novel *The Gunsmith: A Novel*, and the 2011 historical fiction work *Vestal Virgin: Suspense in Ancient Rome* by Suzanne Tyrpak mentioned tung in other countries.[196] Literature became only one of many ways in which tung continued to touch the lives of Americans.

Residents of the Gulf Coast saw reminders of tung on a daily basis. There observed numerous street and road names with the word tung.[197] Picayune, Mississippi held a yearly Tung Blossom Festival and 5-K Blossom Run.[198] The new director of The Picayune Memorial High School Band, hoping to revive community excitement, dubbed the 2012 year theme "The Pride is Back."[199] Some people lined driveways with tung

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[194] Ken Hall, Jr., *The Old Man Down the Road* (Bloomington, IN: Author House, 2011), 39; and Darryl Wimberley, *A Tinker's Damn* (Toby Press, 2007), 54.

[195] Julie Hecht, *Do The Windows Open?* (New York: Penguin, 1998), 202-211.

[196] John Saintsbury, *A Man in Many Streets* (Bloomington, IN: Author House, 2007), 58-63; Herbert L. Way, *Round the World for Gold: A Search for Minerals from Kansas to Cathay* (London: Sampson Low, Marston & Company, LTD, 1912), 282; Norman Kerr, *The Gunsmith: A Novel* (Trafford, 2009), 52, 53, 108, 110; and Suzanne Tyrpak, *Vestal Virgin: Suspense in Ancient Rome* (Create Space, 2011), 190-191, 299.

[197] Tung Oil Road, Leakesville, Mississippi,; Tung Tree Drive, Picayune, Mississippi; Tung Tree Drive, Lumberton, Mississippi; Tung Street, Richton, Mississippi; Tung Oil Grove Road, Bogalusa, Louisiana; Tung Road, Bogalusa, Louisiana; Tung Oil Road, Florala, Alabama; Tung Avenue North, Theodore, Alabama; Tung Avenue West, Theodore, Alabama; Tung Grove Road, Tallahassee, Florida; and Tung Hill Drive, Tallahassee, Florida. Based on Google Maps.

[198] "Picayune Main Street," http://www.picayunemainstreet.com/fair.htm (accessed January 7, 2013).

[199] Newman, interview.

trees. Former tung plantations included the Money Hill Golf and Country Club in Covington, Louisiana, and the Normandy Plantation, now Merrywood Estates housing development and Normandy House Bed & Breakfast, in Folsom, Louisiana. The WPA Tung Oil Mural appeared on display in the old Covington Post Office (now the St. Tammany Parish School Board District Annex) while a copy could be seen in the Money Hill Golf and Country Club. Tung appeared as a yard decoration and in hedgerows.[200] Although few nurseries carried tung, interested parties purchased the trees online or from private vendors specializing in exotic plants. Some wild tung trees were spotted in the Smoky Mountain National Park in Tennessee in 2008, but the cold climate causes the trees to die back each year to the extent that they remained under six feet tall.[201] Tung may have been largely forgotten but evidence of its contributions to the past and significance to the present remained.

Used to line tin cans; as glue in marine plywood; in inks, in magazine gloss, paints and varnishes for furniture, houses, seagoing vessels, and caskets; and in brake pads and circuit boards, tung oil continued to play a small role in American life. Synthetic lacquers came to dominate the paint and varnish industry, but tung oil had a faithful consumer base and many companies still swore by its superiority to other oilseeds.[202] Tung oil like Formby's Tung Oil and Waterlox Original Tung Oil could be found from Lowe's and Home Depot to Amazon and Ebay. Trying to entice consumers,

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[200] Osage orange trees, honey locusts, and roses have all been tried as hedgerows but for whatever reason, usually weather, none worked satisfactorily. See, for example, Hart, 172-173.

[201] Langeland, 69; and Rinehart, interview.

[202] Fred Cottrell, *Energy and Society: The Relation Between Energy, Social Change, and Economic Development* (Bloomington, IN: Author House, 2009), 405; and Hanson, interview.

some varnish companies included tung oil in their titles when their products primarily consisted of linseed oil.[203] The United States Bureau of Engraving and Printing (USBEP) used tung oil in paper-wipe currency presses until 1997 when new equipment was acquired but continues to use tung oil in specialty inks on paper currency.[204] In this way, perhaps more than any other, every single American became unknowingly connected to tung oil.

While many businesses spoke out against the environmental movement for fear of regulation and profit concerns, others like the manufacturers of tung varnishes started to emphasize their organic product as a green choice.[205] Critics accused environmentalists of opposing science in the 1970s, but in reality, environmentalists embraced experimentation in the hopes of fueling the creation of natural products like biofuels.[206] Bioethanol had been used as early as 1826 when Sam Morey tried a mixture in an early

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[203] Corley, interview, April 26, 2011; and Ching T. Hou and Jei-Fu Shaw, eds., *Biocatalysis and Agricultural Biotechnology* (Boca Raton: CRC Press, 2009), 21.

[204] Bureau of Printing and Engraving, www.Moneyfactory.gov (accessed September 4, 2012). The author sent a letter of inquiry to the following address: moneyfactory.info@bep.gov and received a response attesting that the BEP still uses some tung oil in inks. See also, Hanson, interview; "History of Tung Oil: The Key to the Waterlox Products of Today" http://www.waterlox.com/uploads/docs/Tung-oil-hotlink -story-REVISED-2.pdf (accessed November 2, 2011); and "Tung Oil as Hardwood Floor Finish: Introduction," http://lesstoxicstuff.com/2011/07/hardwood-floor-finish-tung-oil-and-my-personal-experience-with-it/ (accessed November 18, 2012).

[205] See, for example, "How Sustainable are Reclaimed Building Materials?" greenBuilder360.com (accessed January 13, 2013). Historians contend that instead of one united front or movement, environmentalism is comprised of a diverse array of factions with their own agendas. See, Robert Gottlieb, *Forcing The Spring: The Transformation of the American Environmental Movement* revised and updated edition (Washington: Island Press, 2005), 217. On anti-environmentalist sentiment from businesses, see, for example, Russell W. Peterson, "The Environmental Movement in the United States," in *Foundations of Environmental Sustainability: The Coevolution of Science and Policy* ed. Larry L. Rockwood, Ronald E. Stewart, and Thomas Dietz (Oxford: Oxford University Press, 2008), 33.

[206] Samuel P. Hays in collaboration with Barbara D. Hays, *Beauty, Health, and Permanence: Environmental Policies in the United States, 1955-1985* (1987; repr., Cambridge; Cambridge University Press, 1993), 528.

model of an internal combustion engine but not until the 1970s oil crisis did biofuels begin to attract major attention from scientists. In fact, in 1978, the Energy Tax Act freed producers of gasoline/bioethanol makers of tax. Corn ethanol proved most successful but attracted criticism for causing corn prices and livestock feed to skyrocket.[207] This led scientists to explore non-edible alternatives like tung oil. Louisiana State University and Mississippi State University recently started conducting a variety of tests on tung oil as a biodiesel.[208] Its fatty acids made it an excellent candidate for such research. Its acidity and tendency to ignite prevented tung oil from faring well alone but it performed satisfactorily in biodiesel mixtures.[209] To sustainable energy, tung oil has many other possibilities.

Scientists discovered an array of ways in which tung oil can expand its consumer base. Largely responsible for the establishment of the Mississippi Polymer Institute in 1993, tung based polymers were used in electronics, plastics, and cosmetics.[210] Some

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[207] Edgard Gnansounou, "Fuel Ethanol: Current Status and Outlook," in *Handbook of Plant-Based Biofuels* ed. Ashok Pandey (New York: CRC Press, 2009), 58-59; and Massoud J. Miri et al., "Copolyester Synthesis Using Glycerol from Biodiesel Production," in *Renewable and Sustainable Polymers* ACS Symposium Series 1063 ed. Gregory Payne and Patrick B. Smith (Washington, D.C.: American Chemical Society, 2011), 12.

[208] On Louisiana, see http://www.lsuagcenter.com/NR/rdonlyres/78689161-0E15-406F-B605-B827B7D06ABE/62115/BioenergyResearchin20092.pdf (accessed on August 2, 2012). On tung oil as a biodiesel, see also, Ahindra Nag, *Biofuels Refining and Performance* (McGraw-Hill Professional, 2007), 137-140.

[209] On tung as a biofuel, see, for example, Sylvain-Didier Kouame, *Biodiesel* (CreateSpace, 2010), 11-12. See also, Park, 110, 117.

[210] Shelby Thames, e-mail message to author, May 14, 2012; and "Mississippi Polymer Institute: Growing-High Tech Polymer Industry," http://www.thepolymerinstitute.com/who-we-are/ (accessed January 10, 2013).

cosmetic companies used tung oil-based polymers in skin creams and lip balms.[211] Pharmaceutical advances included discoveries that the conjugated fatty acids in tung oil aid the immune system and might be used as a cancer preventative.[212] However, some scientists claimed that tung can actually cause rather than cure cancer. For example, it has been argued that breathing remnants of dried tung leaves causes Epstein-Barr Virus (EBV) which can lead to lymphoma and nasopharyngeal carcinoma.[213] Some scientists attempted to duplicate tung oil qualities in non-toxic, cheaper, and more productive crops like soybeans through biogenetics.[214] The USDA's Southern Horticultural Lab in Poplarville produced late blooming trees.[215] Modern technology fell short of making tung oil edible. USDA scientist Dr. Jay Shockey explained, "It's probably not likely that we could effectively detoxify tung trees or the tissues in the tree without eliminating the component [eleostearic acid] of the tung tree that makes it a valuable agricultural

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[211] Robert Y. Lochhead, "The Role of Polymers in Cosmetics: Recent Trends," in *Cosmetic Nanotechnology: Polymers and Colloids in Cosmetics* ACS Symposium Series 961 ed. Sarah E. Morgan, Kathleen O. Havelka, and Robert Y. Lochhead (Washington, D.C.: American Chemical Society, 2007), 3.

[212] Fuquiang Tang et al., "Nucleotide Sequence of a cDNA Clone for Omega-3 Fatty Acid Desaturase (Accession no. A061027) from Aleurites fordii Seeds" *Plant Physiology* 119, p.364. People allergic to nuts might be affected by tung oil varnishes. See, "Frequently Asked Questions," http://www.waterlox.com/project-help/faqshow.aspx?faqid=20 (accessed December 18, 2012).

[213] See, for example, Hirota Fujiki, Erich HEcker, Richard E. Moore, Takashi Sugimura, and I. Bernard Weinstein, ed. *Cellular Interactions by Environmental Tumor Promoters, Proceedings of the 14th International Symposium of The Princess Takamatsu Cancer Research Fund, Tokyo, 1983* (Tokyo: Japan Scientific Societies Press, 1984), 131; and A. W. Norhanom and M. Yadav, "Tumour Promoter Activity in Malaysian Euphorbiaceae," *British Journal of Cancer* 71 (1995): 776-779.

[214] "Tung Twister: Powerful Enzymes from Tung Trees Could Turn Plants into Oil-Producing Marvels," http://www.ars.usda.gov/is/AR/archive/aug07/tung0807.htm?pf=1 (accessed January 3, 2013) ; and John M. Dyer and Robert T. Mullen, "Engineering Plant Oils as High-Value Industrial Feedstock for Biorefining: The Need for Underpinning Cell Biology Research," *Physiologia Plantarum* 132 (2008): 14.

[215] Livaudais, interview.

commodity."[216] Nevertheless, given all of the feasible avenues, tung oil remained an attractive experimental subject to bioengineers.

From the inception of domestic production, tung oil achieved only nominal recognition at the national level but more substantial acknowledgment at the regional and especially local levels. Despite the plethora of advertising efforts by boosters, tung did not become a fixture in American popular culture. Any symbolism it may have held existed largely in the minds of Gulf Coast residents and they were likely motivated by economic incentives, namely tourism. The negligible reputation notwithstanding, tung oil maintained cultural relevance through inks and varnishes even when the domestic production ceased and tung-based pesticides, biofuels, and pharmaceuticals appear posed to play an enhanced role in the future. While no longer farmed, tung trees proliferated and even spread to some northern counties of southern states.[217] Most people condemned the tung tree as an invasive species but in its defense, Hanson remarked, "Europeans are an invasive species in the Americas."[218] Along the same lines, *TIME Magazine* reported that in a globalized world, the very notion of 'nativeness' might be "becoming an

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[216] Shockey, interview.

[217] Gulf South counties in which tung trees are still found are as follows: Walker, Montgomery, and Hardin, Texas; Caddo, DeSoto, Calcasieu, Beauregard, Allen, Iberia, Lafayette, Jefferson, Vernon, Rapides, Grant, Natchitoches, Winn, Bienville, Lincoln, Ouachita, Caldwell, West Carroll, Catahoula, Pointe Coupee, West Feliciana, East Feliciana, East Baton Rouge, Livingston, St. Helena, Tangipahoa, Washington, St. Tammany, and Jefferson, Louisiana; Franklin, Amite, Choctaw, Simpson, Jasper, Jones, Walthall, Marion, Lamar, Forrest, Perry, Greene, Pearl River, Stone, George, Hancock, Harrison, and Jackson, Mississippi; Washington, Mobile, Baldwin, Conecuh, Butler, Covington, Crenshaw, Pike, Houston, and Lee, Alabama; Clay, Dougherty, Baker, Mitchell, Decatur, Grady, Tift, Brooks, Lowndes, Wayne, Charlton, and Camden, Georgia; and Escambia, Santa Rosa, Okaloosa, Walton, Bay, Jackson, Calhoun, Liberty, Franklin, Gadsden, Leon, Jefferson, Madison, Suwannee, Columbia, Bradford, Alachua, Marion, and Citrus, Florida. See, "Tung Oil Tree," http://www.invasiveplantatlas.org/subject.html?sub=6592#maps (accessed January 7, 2013).

[218] Hanson, interview.

oxymoron."[219] Whether seen as an exotic beauty or a foreign bane, the tung tree bloomed on and will no doubt remain a common sight along the Gulf Coast in the years to come.

[219] Bryan Walsh, "In a Globalized World, Are Invasive Species a Thing of the Past? *TIME Magazine*, June 14, 2011.

CHAPTER VIII

"THE CROP THAT WAS"[1]?: A CONCLUSION

While we had some loss years in tung oil, we had some good years, too.[2]

L. O. Crosby, Jr.

In the years following Hurricane Camille, tung oil transitioned from respected commodity to passé folly but the industry deserves to be taken seriously and recollected. A unique specialty crop, tung helped move the region from agriculture to industry, tourism, and real estate. The forty-year era of domestic production transitioned the landscape from timber; stimulated land development; attracted travelers; and sparked the creation of paint and varnish, ink, chemical, nursery, and farm supply ventures along the Gulf Coast. Among these transformations the tung era witnessed a reduction in the number of farm residents from one in three Americans to one in twenty-eight and changes in the work force. Moreover, tung growers encountered mechanization, minimum wage laws, synthetics, interstate development, southern industrialization, and the surge in "federal power over the nation's economic life."[3] Given this economic and cultural impact, the country's tung oil past has led some Americans to question whether an industry lost can be found.

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[1] Davenport, 53.

[2] Crosby, Jr., interview, November 5, 1974, 61.

[3] Schulman, vii. On the farm percentages, see Vogeler, 3.

In 1990, an attempt to re-establish the domestic tung oil industry began when tung importer Blake Hanson, President of Industrial Oil Products in Woodbury, New York, initiated a revival. No stranger to tung oil, Hanson knew the challenges. In 1973, his father purchased this company, a business that had long been affiliated with the ATOA and TGCA. Although the domestic tung oil industry verged on cessation at the time, the company still handled tung oil imports. With the death of his father in 1990, Hanson studied old files and found countless references to the tung oil industry, and that piqued his interests. In an attempt to investigate tung oil production, he tried to contact key growers and scientists but experienced only disappointment. As Hanson explained, "I started calling . . . no answer or a lady would answer and say, 'Oh, he passed away thirty years ago'" or "'he passed away two years ago.'"[4] Finally, he "called another number and the voice said, 'This is Kilby'."[5] After a little discussion, Hanson headed for Pearl River County.

Once in Mississippi, Hanson went on tour of the Pearl River/Lamar County area with Kilby as a guide. Having long regretted the demise of domestic production, Kilby expressed excitement at the prospect of a revival and delighted regaling him with tales of tung trees.[6] While traveling around the area, Hanson enjoyed viewing the former tung orchards, especially those in the Lumberton/Gum Pond Community. In fact, he purchased over six hundred acres of the former Tung Ridge Ranch and planted 100 acres of tung. Hanson also spoke with locals whose parents had been tung farmers so as to learn

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[4] Hanson, interview.

[5] Ibid.

[6] Kilby, interview.

methods of cultivation. In his words, "So I found all these people that had knowledge of tung farming and couldn't pass up the opportunity to use them and start the industry up again."[7]

Firmly convinced, Hanson saw several reasons for bringing back tung cultivation. He believed that U.S. production could help to stabilize the fluctuating price of tung. Even though Chinese and Argentine import levels had decreased, the price of tung oil hovered at sixty cents a pound, an amount still twice as much or more than that of other oilseeds. Additionally, Chinese and Latin American tung production was hampered by farm labor issues and fertilizer costs. In South America, tung orchards had aged and neared the forty-year growth cycle; in Argentina, only one of its eight tung mills still ran. With the U.S. facing the loss of tung imports, Hanson set out to resurrect the industry.[8] The Clean Air Act Amendment of 1990 (CAAA) prohibited Volatile Organic Compounds (VOC) so Hanson saw tung as an environmentally safe alternative to

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[7] Hanson, interview.

[8] Carter, 669-670; and Nita Chilton McCann, "N.Y. Investor sees $20 Million in Pearl River Tung Oil Business," *Mississippi Business Journal* 15, no. 4 (1993). On price, see also, "Tung Oil Moves Outdoors," *Popular Science* 237, no. 4 (Oct 1990): 52. On examples of oilseed prices, see also Duke, *CRC Handbook of Alternative Cash Crops*, 52.

competitors which released VOCs because it dried chemically.[9] With these factors in mind, Hanson believed a likely market existed for "the Rolls-Royce of vegetable oils."[10]

While U.S. consumption of tung oil had fallen to roughly ten million pounds per year, Hanson expected to profit from his plantings. He based this expectation on a wide consumer base ranging from ink, construction, electronic, and paint and varnish industries to government mints and miscellaneous markets. In the word of Hanson,

> Tung oil production can be an agricultural industry for the 21st century. There is already a well-established market for tung oil, and the growers in the area will not be competing with farmers anywhere else in the United States. The key to its success will be efficiency and that means there is a need for research in the areas of higher yielding varieties and mechanical harvesting.[11]

While the price of oil stabilized around sixty cents, he doubted the price would decline.[12] Hanson predicted growers earning from 60-70 cents a pound and making $200 an acre per year.[13] In addition, he thought that improved cultivation practices and specialized farm machinery would modernize the tung oil industry and cement its role as a domestic

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[9] Carter, 670; and "Crambe, Industrial Rapeseed, and Tung Provide Valuable Oils," http:// www.agmrc.org/ media/cms/ius6c_5CF3B9B0B69EF.pdf (accessed January 11, 2013), p.20. There had been Clean Air Act Amendments in 1963, 1967, and 1970. See, Hays, 52; Gottlieb, 179, 216; Walter A. Rosenbaum, "The Bureaucracy of Environmental Policy," in *Environmental Politics and Policy: Theories and Evidence* ed. James P. Lester, 2nd ed. (Durham: Duke University Press, 1995, 2nd edition), 210; and Michael E. Kraft, "U.S. Environmental Policy and Politics: From the 1960s to 1990s," in *Environmental Politics and Policy, 1960s-1990s* ed. Otis L. Graham, Jr. (University Park, PA: The Pennsylvania State University Press, 2000), 23.

[10] Hanson, interview. See also, Patrick Peterson, "Company in the Market for New Tung Oil Orchards in Mississippi," *Biloxi Sun Herald*, November 3, 1998; and "Tung Oil Demand May Restore State Industry," *Clarion-Ledger*, December 1, 1996.

[11] "Stage Set for Revival of Mississippi Industry," *MAFES Research Highlights* 59, no. 5 (Fall 1996): 13.

[12] Patrick Peterson, "Company in Market for New Tung Oil Orchards in Mississippi," *Biloxi Sun Herald*, November 3, 1998.

[13] Ibid.

crop. Ideally, Hanson projected that U.S. production would reach approximately two million pounds of tung oil within five years. With its hilly, well-drained, clay soil, warm climate, and temperate seasons, the Gulf Coast was again identified as the best place to grow tung trees although tourism and real estate encompassed much of the former Tung Belt. On November 18, 1992, Hanson formed the American Tung Oil Corporation in Lumberton, Mississippi.[14]

On November 3, 1993, Hanson made a trip to Pearl River College in Poplarville to discuss his plan for roughly 5,000-10,000 acres in southern Mississippi. With the recruitment of other growers and the establishment of enough acres to support a tung oil mill, he aspired to milling 100,000 pounds of tung oil a year.[15] Some locals called him a "Tung Nut," but Hanson knew markets still existed for tung oil.[16] He determined that of the 9.3 million pounds of imported tung oil in 1994, the bulk was used in resins, inks, and plastics. Hanson and American Tung Oil Corporation Vice-President John Corley of Lumberton recognized that only thirteen percent of tung oil went into paints and varnishes, but believed that tung oil's numerous applications would maintain a customer

[14] "American Tung Oil Corporation," https://business.sos.state.ms.us/corp/soskb/Corp.asp?194774 (accessed January 9, 2013); "Crambe, Industrial Rapeseed, and Tung Provide Valuable Oils," http://www.agmrc.org/media/cms/ius6c_5CF3B9B0B69EF.pdf (accessed January 11, 2013), p.20; and Hanson, Interview.

[15] Corley, interview, April 3, 2012; Hanson, interview; "Tung Oil Potential Returns to Mississippi," *Waycross Journal-Herald*, December 20, 1993; and Patrick Peterson, "Company in market for New Tung Oil Orchards in Mississippi," *Biloxi Sun Herald*, November 3, 1998.

[16] Hanson, interview.

base.[17] In just a few years, this company advised, planned, and milled for roughly fifteen growers in Lumberton.

Having 1,000 acres of tung, these men formed the American Tung Growers Association (ATGA) but had problems attracting members. In a niche market like that of shitake mushrooms, peaches, and black raspberries, tung held appeal both as a fence row crop and as a method of intercropping.[18] The ATGA president, Bernard DeSantis of New Jersey saw tung as a great crop. DeSantis, a retired FBI agent who had twenty-five acres of tung in Poplarville, said, "My motivation is doing something meaningful . . . It's a healthier form of retirement," "less harrowing and less stressful than raising cows or row crops," and "I'm a conservationist at heart."[19] With environmental concerns and more stringent regulations, Hanson knew many manufacturers wanted to replace petrochemicals, synthetics, and other questionable ingredients in varnishes and inks to protect the ozone layer.[20] Tung did not dry through evaporation so it did not release pollutants into the environment.[21] The eco-friendly push for biodegradables also provided

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[17] "Crambe, Industrial Rapeseed, and Tung Provide Valuable Oils," http://www.agmrc.org/media/cms/ius6c_5CF3B9B0B69EF.pdf (accessed January 11, 2013), p.20.

[18] On niche farming, see, for example, Jager, 231. On planting trees in pastures and fields, see, for example, Richard J. Hobbs and Viki A. Cramer, "Why Old Fields? Socioeconomics and Ecological Causes and Consequences of Land Abandonment," in *Old Fields: Dynamic and Restoration of Abandoned Farmland* ed. Viki A. Cramer and Richard J. Hobbs (Washington: Island Press, 2007), 1. On diversification, see, for example, Helena Norbert-Hodge, Peter Goering, and John Page, *From the Ground Up: Rethinking Industrial Agriculture*, 2nd ed. (New York: Zed Books, 2001), 55; and Paul A. Wojtkowski, *Agroecological Economies: Sustainability and Biodiversity* (New York: Elsevier, 2008), 18.

[19] Patrick Peterson, "Company in Market for New Tung Oil Orchards in Mississippi," *Biloxi Sun Herald*, November 3, 1998.

[20] "Tung Oil Demand May Restore State Industry," *Clarion-Ledger*, December 1, 1996.

[21] Jarvis, 35.

a potential avenue for tung in plastics.[22] Tung growers also had the blessing of some former tung industry figureheads like Kilby who said, "The tung industry may never be as important economically as it was in its heyday, but it sure could be a boost."[23] Enthusiasm aside, setting up an industry proved fraught with problems.

Hanson and Corley had difficulty getting sufficient support for their new tung enterprise. Hampered by labor shortages, USDA indifference, and oilseed competition, they also found coastal land prices had skyrocketed. Many consumers scoffed in disbelief at the supposed superiority of tung varnishes which required up to six layers to acquire smoothness and scraped easily.[24] Moreover, the refusal of local farmers to adopt tung as a crop crippled advancements. With calamitous memories of tung, farmers deferred to other crops while members of the younger generation did not even recognize the tree and thought "tung oil is mutilating animals' tongues."[25] Those that did know of tung equated it with poison or the pains of harvesting.[26] These individuals had many negative memories:

> Dr. White who was President of the Pearl River Community College said that when he would go out recruiting for the college . . . seniors would say, 'Well, if the tung oil balloon didn't get froze off this year, then I'm going to school in Wisconsin . . . but if the late freeze catches

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[22] E. S. Stevens, *Green Plastics: An Introduction to the New Science of Biodegradable Plastics* (Princeton: Princeton University Press, 2001), 97.

[23] "Tung Oil Demand May Restore State Industry," *Clarion Ledger*, December 1, 1996.

[24] Bob Flexner, "Oil Finishes: Four Different Types with Different Characteristics," *American Woodworker*, October 1992, 48; and "Oil Finishes: Myths and Misunderstandings," *American Woodworker*, October 1992, 51.

[25] Corley, interview, April 3, 2012.

[26] On poison fears, see, for example, W. R. Horne, "Tung Nuts are Toxic," *American Woodworker*, August 1994, 4.

> tung oil it would mean they wouldn't have a crop . . . then I'm going to Pearl River.'[27]

Most of those that did embrace the fledgling industry had no background in farming. Worse, the mill at the old Tung Ridge Ranch near Poplarville, Mississippi, needed 5,000-8,000 acres to function while the sum of total of acreage amounted to a mere 1,000 acres. Mechanical harvesters borrowed from the walnut and pistachio industries frequently picked up rocks. Nevertheless, the first crushing took place in 1998. Operating only one month per year, the mill's small output was purchased mainly by resin companies on the Gulf Coast and to large manufacturers in Chicago and Japan.[28]

Hanson and Corley continued operating their American Tung Oil Corporation until August 29, 2005, when Hurricane Katrina, a Category 5, the worst hurricane since Camille, reached the Mississippi coast. Orchard damage to about 40,000 trees warranted replanting, but Hanson and Corley did not want to expend funds on a new nursery and wait three to five years for a harvest when more profitable avenues existed. To this day, the company possesses around 3,500 tung trees, but no longer harvests the nuts. The brief run of the new domestic tung oil industry had been welcomed by both consumers and foreign competitors alike. Having no desire to pay higher prices, consumers approved the idea of "buying American." While Chinese and Latin American producers did not perceive any threat in the handful of U.S. farmers, some hoped expansion would help to steady global production. Granting that his tung oil venture proved insignificant, Hanson

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[27] Corley, interview, April 3, 2012.

[28] Corley, interview, April 3, 2012; and "Crambe, Industrial Rapeseed, and Tung Provide Valuable Oils," http://www.agmrc.org/media/cms/ius6c_5CF3B9B0B69EF.pdf (accessed January 11, 2013). p.20.

thought it "important to our knowledge of tung oil and our position in the industry."[29] Despite expectations, the revival ended, and its absence did little to impact the world tung oil market.[30]

Dominated by China and to a lesser extent by Argentina and Paraguay, the twenty-first century global tung oil market remained small but important. Compared to the billion-dollar soybean and corn oil markets, the tung oil industry continued as a $100-150 million market with about 40,000 tons, far lower than other oilseed productions. As Hanson phrased the situation, "If you buy it right and you sell it right it's profitable . . . if you don't it's not."[31] While one ton of tung oil sold for roughly $2,500 in 2012, price continues to be volatile. On the plus side, merchants appreciated being able to store tung oil for several years in order to get a better price.[32] Argentina considered tung one of the key cash crops; the country is having economic difficulties and cattle are diminishing in number so tung tree cultivation might increase.[33] In the U.S., tung oil consumption declined to a mere three million pounds a year, but countless industries remain loyal. With the existing market, Hanson expressed interest in the idea of a revival but believes having to wait several years for a tung crop when soybeans can produce in four-to-five

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[29] Hanson, interview.

[30] Ibid.

[31] Ibid.

[32] Ibid.

[33] On the importance of tung oil to Misiones, see, Larry Sawers, "Income Distribution and Environmental Degradation in the Argentine Interior," *Latin American Research Review* 35, no. 2 (2000): 22. On Argentina's poor economy, see, Christopher Pelleteir, *Future Harvests: The Next Agricultural Revolution* (Create Space, 2010), 177, 134.

months is a disincentive to farmers.[34] Corley, too, stated that tung trees would make great shade trees for cattle but does not foresee the creation of a new domestic tung oil industry. As he explained, "Any time an industry completely leaves a country it is extremely difficult to bring that industry back."[35] Aware of the obstacles, one Florida couple disagreed and began planting tung trees.

In 2010, Gregory A. Frost, Executive Services Director of the Tallahassee, Florida, Police Department, and his wife Maureen decided to grow tung. After years of watching their children play ball with the nuts of a tung tree in their yard, they wanted to see if they could actually produce their own tung oil for furniture varnishes. The two did some investigating and quickly discovered the rich history of domestic tung tree production, wondered about modern feasibility, and outlined four reasons for initiating plantings. First, the original domestic tung oil industry began in Tallahassee so the tree had local roots. Second, they saw tung oil as a green product that would mesh nicely with the environmental movement. Third, they believed consumption of domestic tung oil fit nicely with the "Made in America" movement. Fourth, countless companies applied tung oil in an array of products while other uses remained undiscovered.[36] The Frosts rested their hopes on the realm of scientific experimentation and innovation.

The Frosts realized that tung oil remained a fairly small commodity market but thought scientific discovery strengthened current consumers and attracted new ones. Tung oil remained popular in varnishes and had produced self-healing paints which, if

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[34] Hanson, interview.

[35] Corley, interview, April 3, 2012.

[36] Frost, interview.

scraped, heal at a molecular level. It contributed to high quality inks, rust preventatives, and cosmetics like Arbonne's facial and body creams.[37] In spite of its toxicity, Afterglow Cosmetics even used tung oil in lip gloss and balms.[38] Frost believed that through biochemical engineering, other uses could be found. With gene splicing, he imagined that scientists could replicate some aspects of tung trees, namely their oil production, in other plants.[39] After meeting with USDA scientists at the SRRL and the Southern Horticultural Laboratory in Poplarville, Frost started planting.

In July 2011, the Frosts formed their own company, the Gulf Coast Tung Oil, LLC, in Tallahassee, to coordinate tung plantings.[40] Unable to find domestically grown nuts, they did not want to plant the offspring of the wild trees which grow along the roadside ditches. Instead, they managed to import *Aluerites fordii* seed from China, planted them in a nursery, and set the seedlings out in orchards shortly thereafter. By 2012, they had 4,000 tung trees on thirty-five acres but hope to have 100 acres from which they can expand and build a tung oil mill by the end of 2013. While his application for a USDA grant to help fund this project was rejected, Frost set about disproving

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[37] Frost, interview. Plants used in cosmetics can be referred to as 'cosmeceuticals.' See, for example, Susan L. P. Jordan, Ashish Batra, Michael Meerbote, Xiaodong Zhang, Linda Kosensky, and Jennifer Ames, "Oil Absorption and Delivery System Polymer Technology for Skin and Hair Care," in *Polymeric Delivery of Therapeutics ACS Symposium Series* 1053, ed. Sarah E. Morris and Robert Y. Lochhead (Washington, D.C.: American Chemical Society, 2010), 195.

[38] See, "Don't Gloss Over Details," Organically Beautiful Life, http:// organicallybeautifullife .com/organic-lip-gloss (accessed January 2, 2013).

[39] Ibid. See also, "Tung Twister: Powerful Enzymes from Tung Trees Could Turn Plants into Oil-Producing Marvels," http://www.ars.usda.gov/is/AR/archive/aug07/tung0807.htm?pf=1 (accessed January 3, 2013).

[40] Dave Hodges, "Startups Making the Most of Training Series," *Tallahassee Democrat* Aug 21, 2011, A09; and Frost, interview.

skeptics and building credibility.[41] He predicted that if others began planting tung, there might be several thousand acres around Leon County alone in a decade.[42] Rather than depend upon farm labor, he explained that he intends on using modified mechanical pecan harvesters.[43] As to future oil production, Sutherland Welles, a wood finish company in Hyde Park, Vermont, agreed to buy the Frosts' domestically produced tung oil.[44] Frost imagined that most of the initial production will probably go to Sutherland Welles which embraces the green movement and describes tung oil as the "sustainable, natural, earth-friendly choice for all your finishing needs."[45] In fact, this varnish company is such a devotee to environmentalism that it makes polymerized tung oil with electricity derived from cow manure methane.[46] Frost also got an offer to buy his home-grown tung oil from Nuechem, Inc., an import company in San Francisco, California.[47] With such consumers lined up, he expressed the hope that Panhandle farmers will accept tung trees as a viable crop. To his disappointment, the stance of the government with regard to a revival continued to be largely pessimistic.

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[41] Leon County Research and Development Authority Board of Governors Regular Public Meeting Agenda, June 7, 2012, http://www.innovation-park.com/agendas/2012/2012JuneBOGAgenda.pdf (accessed August 1, 2012).

[42] Frost, interview; and Capital Region Manufacturers Roundtable Meeting, February 14, 2012, https://cpp.tcc.fl.edu/Manufacturing_Board/Test/Manufacturing%20Advisory%20Board%20Minutes/February%202012%20Minutes.pdf (accessed August 1, 2012).

[43] Frost, interview.

[44] Ibid.

[45] Sutherland Welles, LTD., http://www.sutherlandwelles.com/ (accessed January 11, 2013).

[46] Sutherland Welles, LTD., http://www.sutherlandwelles.com/about/our-green-commitment.html (accessed January 11, 2013).

[47] Frost, interview.

While the USDA extended no support to revival efforts, its scientists had mixed views. Dr. Tim Rinehart of the Southern Horticultural Lab in Poplarville, a horticulturalist who has produced a sterile tung tree more attractive to landscapers, argued that given cheap Chinese imports and the absence of subsidies, "it doesn't make sense to grow it here."[48] He stated that while the USDA is working with Frost on an individual basis it has utterly no interest in a revival as shown by the grant denial. In Rinehart's words, "It would be very hard to justify putting money into or working on a crop that is really for one person . . . We think it's a beautiful plant but outside of landscaping, I don't think it will make a comeback."[49] Dr. Jim Spiers, who retired from the Poplarville Lab, insisted that a revival has possibility but expressed reservations. He commented that "they can grow them but I don't think it will ever be as big as it was simply because the demand is not as great as it used to be."[50] More encouraging, Dr. Jay Shockey, a SRRL scientist studying biofuels and experimenting on the replication of tung qualities in other oilseeds, suggested that his research may aid the place of tung oil in the country's future. According to Shockey,

> Even though my work on its face sounds like we would be trying to compete with domestic tung oil, trying to replace it, I would very much like to see a revival in the South. So I can appreciate and am rooting for people like Mr. Frost. Maybe over time there can be at least a modest revival of domestic production. There's a sector of the agricultural labor base that could benefit from that and it would benefit the national economy.[51]

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[48] Rinehart, interview.

[49] Ibid.

[50] Spiers, interview.

[51] Shockey, interview.

Regardless of the position taken by the USDA, the organization had an undeniable investment in tung trees. While more interested in grafting sterile trees, the Poplarville Lab possessed an extensive array of tung germplasms, "probably the most complete collection of breeding materials and cultivars in the U.S. if not the world."[52] Even Rinehart ceded that historically speaking, "It's [tung] the most studied agronomic crop in the U.S."[53]

"The crop that was" description of tung in *Alabama Heritage* once encapsulated the rise and fall of the former industry in four words, but recent events beg the question "or was it?"[54] With this revival attempt, tung oil may become "the crop that is." Growing environmentalism and buy-America sentiment coupled with the potential discovery of new uses, means tung oil could feasibly reemerge as a niche crop. However, lacking government support while faced with imports, alternative oilseeds, synthetic oils, freezes, and hurricanes, tung oil is exceedingly unlikely to resume its former status as a domestic industry.[55]

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[52] Rinehart, interview.

[53] Ibid.

[54] Davenport, 53.

[55] "Startups Making the Most of Training Series," *Tallahassee Democrat*, August 21, 2011.

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Kansas City Review

Lakeland (FL) *Ledger*

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APPENDIX A

IMAGES

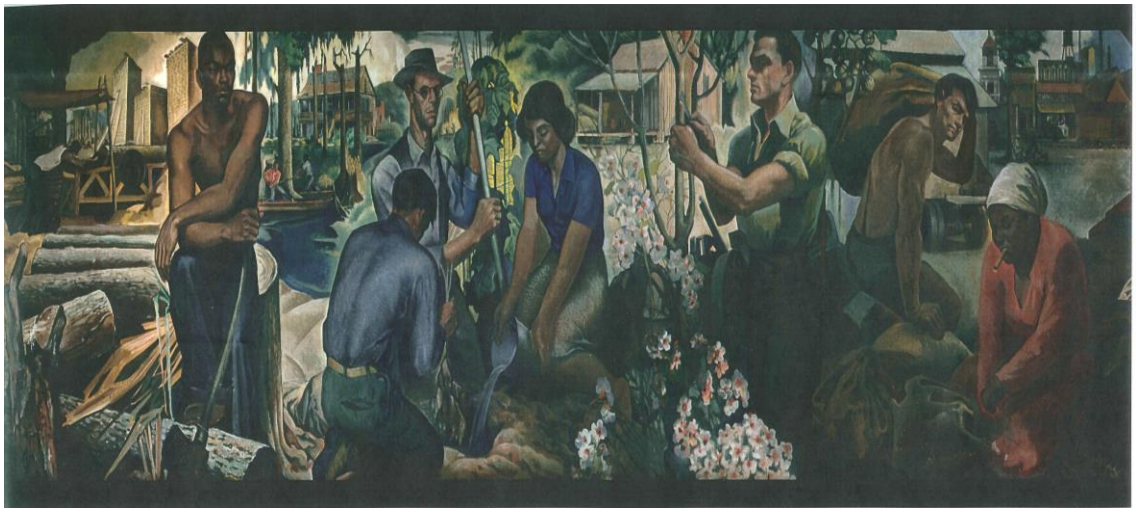

Figure A.1 Tung Oil Mural

Xavier Gonzalez, Tung Oil Mural, 1939. Note the depiction of the transition from deforestation to agricultural efficiency. St. Tammany Parish School Board District Annex. Public Access.

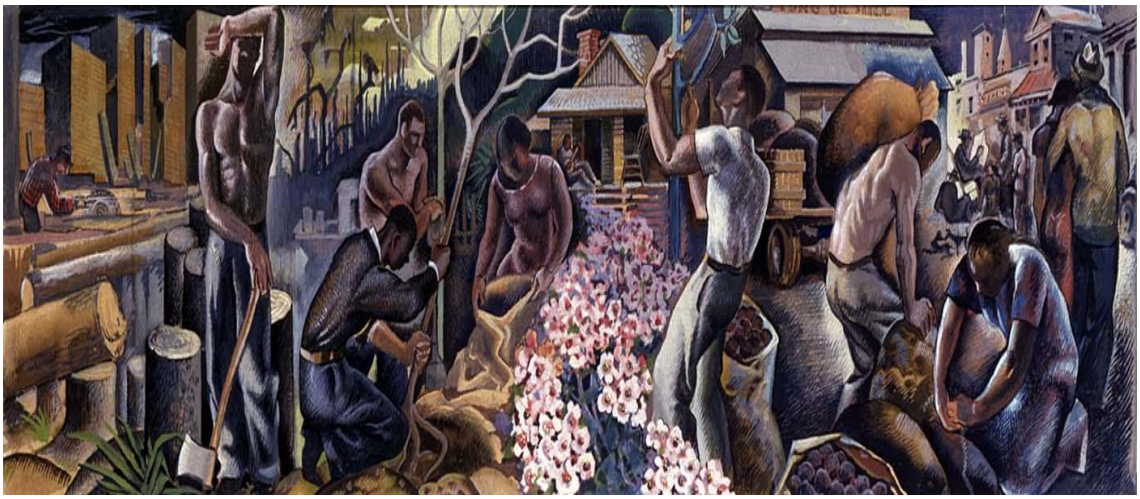

Figure A.2 Tung oil industry study

Xavier Gonzalez, Tung Oil Industry (Study for Covington, Louisiana Post Office Mural), 1939. This was an earlier version of the Tung Oil Mural. Note the subtle differences. Courtesy of the Smithsonian Art Museum.

Figure A.3 First tank of American-produced tung oil, 1932

Note that the Alachua Tung Oil Company mill in Gainesville made a celebration of this event. Courtesy of The University of Florida.

Figure A.4 Tung tree without cultivation

Works Progress Administration, Effect of lack of cultivation and fertilization on Tung trees near New Orleans in the 1930s, Tung Orchard Estates, Inc., 1936. Note that the sign says, "No Fert, No Cultivation, 19# [pounds of whole fruit] Per Acre, 1936. Courtesy of The State Library of Louisiana.

Figure A.5 Tung planting crew, late 1930s

Most of the workers in this particular photo are white. Courtesy of Mrs. David Goodyear.

Figure A.6 Tung trees by Dorothea Lange

Tung trees near Mossy Head Florida, July 1937. Tung trees became so iconic that they attracted FSA along with WPA photographers. Library of Congress, Prints & Photographs Division, FSA/OWI Collection, [LC-USF34-017742-E]. Public Access.

Figure A.7 Cattle in tung orchard, early 1940s

Although tung was prized as a convenient method of intercropping, growers also used their groves as pastures. Courtesy of Mrs. David Goodyear.

Figure A.8 Tractors on the Money Hill Plantation, 1946

Courtesy of Mrs. David Goodyear.

Figure A.9 Black tung pickers, circa late 1930s/early 1940s

Note the sacks of nuts in the wagon. Courtesy of Mrs. David Goodyear.

Figure A.10 White tung pickers

In some areas schools let out for a week to allow children to contribute to the tung harvest. Taken by Standard Photo Company of Jackson, Mississippi, for the Mississippi Advertising Commission on February 28, 1940. Dixie Press Collection, Gulf Coast Community College. Courtesy of Jefferson Davis Library, Gulf Coast Community College.

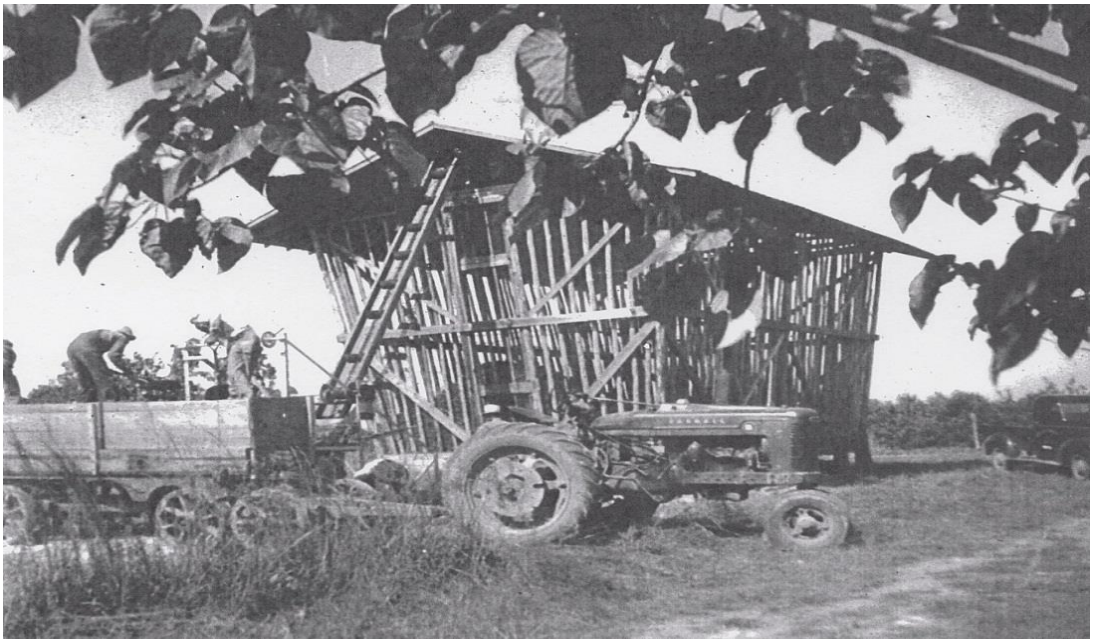

Figure A.11 Tung nut drying shed

The gaps in the structure were intentional to aid the drying process. Courtesy of Mrs. David Goodyear.

Figure A.12 Tung oil mill with storage tanks, 1942

Note the industrial environment in an otherwise rural setting. Courtesy of Mrs. David Goodyear.

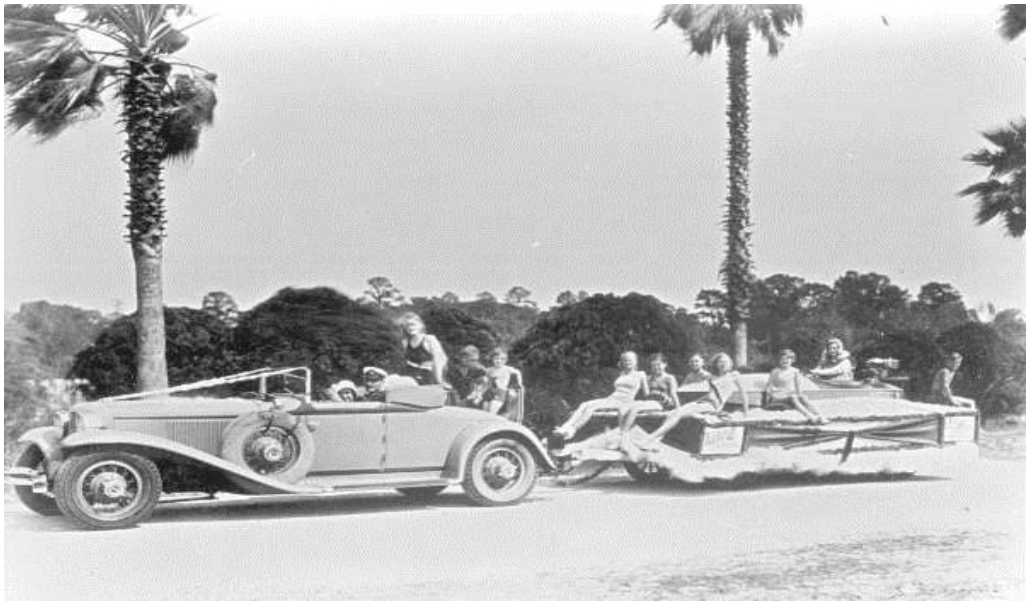

Figure A.13 Tung oil festival in Gainesville, Florida

Tung oil festival-Gainesville, Florida, State Archives of Florida, Florida Memory Project, http://floridamemory.com/items/show/29194 Courtesy of The State Archives of Florida.

Figure A.14 Tung blossom queen and court

Charles Goodyear, Sr., with Tung Blossom Queen Beatrice "Sally" Core and Court, 1941. Courtesy of Mrs. David Goodyear.

Figure A.15 Postcard, Gulfport Printing Company

An example of souvenirs generated for the tourist trade. Courtesy of John Corley.

Figure A.16 East Louisiana Chapter of the Tung Growers Council of America picnic

Held at Fountainbleau Park near Covington, Louisiana, 1950. Louis Chenel is on the left and Louisiana Senator Russell B. Long is third from left. Courtesy of Denise Chenel Daughtry.

Figure A.17 The Pride of the Tung Belt

Note the tung blossom logo. Director Charles S. Newman is on the left. Courtesy of William Newman.

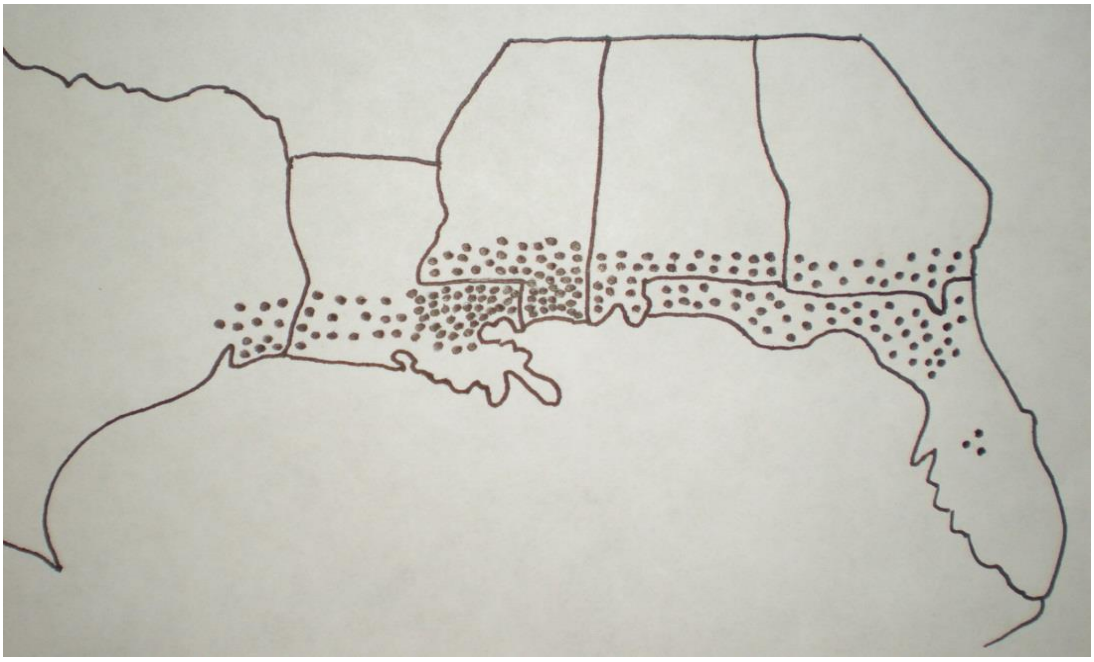

Figure A.18 The Tung Belt

Map by author.

APPENDIX B

TUNG OIL MILLS

Table B.1 List of mills

Name	Location	Opened/Closed	Owner(s)
Alachua Tung Oil Co.	Gainesville, FL	1928/n/a	Benjamin MOore
Alabama Tung Mills, Inc.	Florala, AL	n/a sold 1948	Earl Wallis Michael Lisanti/Merle B. Sweet
American Tung Oil Mills, Inc. (became Gulfport Vegetable Oil Mills, Inc.	Gulfport, MS	1937/n/a 1949/1958	Earl Wallis George H. Altbach/ Julian Saphire
Brooker Mill	Brooker, FL	1938/n/a	Albertus Miller
Bogalusa Tung Oil, Inc.	Bogalusa, LA	1936/1985	Goodyear Family
Chason Tung Oil Mills, Inc.	Marianna, FL	1961/1972	Gortemoller Family
Citronelle Mill Ice	Cirtronelle, AL	1939 1949/n/a	Cirtonelle Light, Ice, and Power Co. (later owned by Gulfcoast Oil Processing, Inc.)
Compass Lake Growers Ass.	Marianna, FL	1967/1973	Cooperative
Daniels Tung Mill	Irvington, AL	1955/n/a	P. E. Daniels
Green & Reedy Mill	Franklinton, LA	1936/1971	Walter Green/Frank Reedy
General Tung Corp.	Lamont, FL	1948/late 1960s	n/a
Jumpie Run Plantation, Inc.	Monticello, FL	1953/n/a	Randall Chase
LaFortune Mill	Lucedale, MS	1938/n/a	J. A. LaFortune
LaRow Investment Firm	Carriere, MS	n/a/burned 1948	Lamont Rowlands
Leon Milling Co.	Lloyd, FL	1948/1954	E. V. Dunbar
L. O. Crosby & Sons	Picayune, MS	1941/1971	Crosby Family
Louisiana Tung Mill, Inc.	Bogalusa, LA	1947/1948	n/a
Ozone Tung Producers Coop.	Covington, LA	1938/1957	Cooperative
Richton Mill	Richton, MS	n/a	J. H. Wade
Rowlands Mill	Picayune, MS	1934/n/a	Lamont Rowlands
Tungston Plantation	Capps, FL	1955/1961	E. P. Larsh
Wade Tung Oil Co., Inc.	Bogalusa, LA	1948/1974	Cullis Wade
West Florida Tung Mill, Inc.	Compass Lake, FL	1949/1974	n/a
Wight Mill	Cairo, GA	1936/n/a	Slater Wight

Assembled by author. Largely based on corporation searches on each state's secretary of state website; *Tung World*; *American Tung News*; *Clairon-Ledger*; *Times-Picayune*; *Tallahassee Democrat*; and *News for Farm Cooperatives*.

APPENDIX C

TUNG OIL COMPANIES

Table C.1 Alabama

Name	Location	Opened	Closed
Alabama Tung Co.	Citronelle	1939	1947
Alabama Tung Mills	Florala	1956	n/a
American Tung Mills, Inc.	Florala	1947	n/a
Daniels Tung Mill, Inc.	Irvington	1955	1978
Florala Nut Oil Co.	Florala	n/a	n/a
Gulf Tung Corp.	Florala	1959	1961
Irvington Land and Tung Orchards, Inc.	Mobile	1933	1934
Tung Oil, Inc.	Mobile	1936	1937

Based largely on Alabama Secretary of State Corporation and Business Entity Search.

Table C.2 Florida

Name	Location	Opened	Closed
B. F. Williamson & Co.	Gainesville	n/a	n/a
Chase Oil Co.	Monticello	n/a	n/a
China Imperial	Gainesville	n/a	n/a
China-Tung Oil, Inc.	Alachua	Circa 1930	n/a
China Wood Oil Co.	Alachua	Circa 1930	n/a
Chipley-Miller Co.	Archer	Circa 1930	n/a
C. M. Munson Florida Industrial Co.	Lake Placid	n/a	n/a
General Tung Oil Corp.	Lamont	1939	1965
Gulf Coast Highlands Estates	Crestview	Circa 1930	n/a
The Monteocha Tung Oil Corp.	Gainesville	1940	1954
Nutec Paint, Inc.	Gainesville	1947	n/a
Polk County Tung Oil Co.	Lakeland	Circa 1930	n/a
Tungacres, Inc.	n/a	1930	1936
Tunghill Ranches, inc.	n/a	1946	1953
Tung Industries, Inc.	n/a	1948	1952
Tungland Development Co.	n/a	1934	1942
Tung Land Investment Corp.	n/a	1937	1942
Tung Nut Oil Syndicates, Inc.	n/a	1932	1936
Tung Oil Associates, Inc.	n/a	1937	1942
Tung Oil Colonization Corp.	n/a	1931	1936
Tung Oil Corp. of America	n/a	1938	1943
Tung Oil Development Co.	n/a	1926	1936
Tung Oil Holding Corp.	n/a	1930	1936
Tung Oil Industries, Inc.	n/a	1933	1940
Tung Oil Land Co.	n/a	1930	1936
Tung Oil Plantation Co.	n/a	1930	1936
Tung Oil Products Corp.	n/a	1937	1941
Tung Oil & Subsistance Farms, Inc.	n/a	1935	1945
Tung Oil & Turpentine Corp.	n/a	1931	1936
Tungston Corp.	Capps	n/a	1971
Tungsylvania Management Co.	Marianna	1949	1973
U.S. Tung Oil Co.	Quincy	1942	n/a
Valpariso Tung Planters, Inc.	Valpariso	1937	1951
The Wallis Tung Corp.	Valpariso	1941	1946

Assembled by author. Based primarily on Florida Department of State Division of Corporations Business Search.

Table C.3 Louisiana

Name	Location	Opened	Closed
Bogalusa Tung Oil, Inc.	Covington	1936	1985
Bogalusa Tung Oil Processing Co., Inc.	Bogalusa	1947	1964
Dixie Tung Oil, Inc.	New Orleans	1938	1952
Gulf Coast Tung Oil Groves, Inc.	New Orleans	1938	1940
Gulf Tung Corp.	New Orleans	1939	n/a
Gulf Tung Corp.	New Orleans	1964	1990
Hammond Tung Oil Co.	New Orleans	1938	1980
La-Miss Tung Groves, Inc.	New Orleans	1944	1952
Louisiana Tung Blossom Festival, Inc.	Covington	1956	n/a
Louisiana Tung Corp.	New Orleans	1964	1982
Louisiana Tung Mill, Inc.	Bogalusa	1947	1949
Louisiana Tung Oil Corp.	Lafayette	1938	1941
McGregor Tung Oil Corp.	Covington	1978	1985
Ozone Tung Oil Producers Coop. Ass.	Covington	1938	1959
St. Tammany Tung Land Realty Co., Inc.	Covington	1941	1974
Tangipahoa Tung Oil Co., Inc.	Husser	1944	1960
Texas Tung Oil Co., Inc.	Singer	1936	1960
Texas Tung Oil Corp. of Louisiana	Singer	1936	1960
The Tung Co., Inc.	Baton Rouge	1977	1985
Tung Oil Corp.	Amite City	1933	1985
Tung Oil Lands Corp.	New Orleans	1932	1985
Tung Oil Planting and Milling Co., Inc.	New Orleans	1937	1982
Wade Tung Oil Co., Inc.	Bogalusa	1949	n/a

Assembled by author. Based on Louisiana Secretary of State Corporations Search.

Table C.4 Mississippi

Name	Location	Opened	Closed
American Tung Grove Developments, Inc.	Lyman	1939	1989
American Tung Oil Co., Inc.	Ocean Springs	1939	1942
American Tung Oil Exchange	Gulfport	1948	n/a
DeSoto Tung Tree Farms, Inc.	Richton	1944	1949
Dixie Tung Empire Corp.	Jackson	1938	1946
Dixie Tung Oil Development Co.	Jackson	1938	1989
Harrison County Tung Oil Development Co.	Gulfport	1935	n/a
Magnolia Tung Growers, Inc.	n/a	1946	1975
Mississippi Tung Oil Corp.	Poplarville	1939	1989
Mississippi Tung Tree Orchards	n/a	n/a	n/a
National Tung Oil Products Corp.	Gulfport	1929	1929
The Pearl River Tung Co.	Poplarville	1944	1989
Pearl River Tung Co., Inc.	Picayune	1937	n/a
Southern China Wood Oil Co.	Moss Point	n/a	n/a
Southern Tung Oil Co.	Lyman	1934	1989
Southern Tung Corp.	n/	1946	1971
The Tungolin Co.	Picayune	1951	1989
Tung Corp. of America	Wiggins	1939	1942
Tung Groves, Inc.	Wiggins	1939	1989
Tung Harvest Corp.	Picayune	1956	1989
Tung Implement Co.	Picayune	n/a	n/a
Tung Orchard Estates, Inc.	Gulfport	1937	1989
Tung Realty Co.	Picayune	1958	n/a
Tung Empire Corp.	Jackson	1938	1946
United Tung Growers Coop. Ass.	Picayune	1942	n/a
Vickers and Todd Tung Farms	Hattiesburg	1952	1955

Assembled by author. Based largely on Mississippi Secretary of State Corporations Search.

Table C.5 Other

Name	Location	Opened	Closed
Mississippi Tung Groves, Inc.	Wilmington, DE	1940	n/a
Mississippi Tung Oil Corp.	Wilmington, DE	1930	1938
National Tung Grove Corp.	Rock Island, IL	1940	n/a
Reasor Tung Plantations, Inc.	Chicago, IL	1942	1949
Southern Tung Oil Co.	Pittsburgh, PA	1933	n/a
Standard Tung Grove Development Co., Inc.	Chicago, IL	1938	n/a
Tung Groves Sales, Ass.	n/a/MO	1935	n/a
Tung Industries, Inc.	Wilmington, DE	1937	1989
Tung Oil Co. of the United States	Philadelphia, PA	1930s	n/a
Tung Ridge Ranch, Inc.	Wilmington, DE	1950	1969
Universal Tung Oil Corp.	n/a/IN	1934	1970
U.S. Tung Oil Co., Inc.	n/a/NY	1931	n/a

Assembled by author. Based largely on Secretary of State Corporations Searches.

APPENDIX D

STATE PRODUCTION

Table D.1 Alabama, 1930-1964

Year	Farms	Trees	Harvest (lbs nuts)	Value (dollars)
1930	23	8,687	5,550	278
1935	104	63,364	n/a	n/a
1940	207	103,072	22,302	332
1945	634	317,530	1,137,186	54,575
1950	539	356,497	2,316,300	69,491
1954	182	382,445	4,394,155	131,825
1959	117	466,396	4,559,332	136,780
1964	43	149,924	2,787,280	83,618

1964 United States Census of Agriculture vol. 1, part 32, Alabama (Washington, D.C.: U.S. Department of Commerce Bureau of the Census, 1964), 18.

Table D.2 Georgia, 1930-1964

Year	Farms	Trees	Harvest (lbs nuts)	Value (dollars)
1930	7	3,162	2,930	120
1935	101	215,898	n/a	n/a
1940	283	80,360	33,025	561
1945	642	180,479	1,324,678	62,121
1950	454	131,140	993,519	29,806
1954	59	38,758	348,650	10,460
1959	38	27,320	272,233	8,167
1964	4	16,129	5,000	150

1964 United States Census of Agriculture vol. 1, part 28, Georgia (Washington, D.C.: U.S. Department of Commerce Bureau of the Census, 1964), 18.

Table D.3 Florida, 1930-1964

Year	Farms	Trees	Harvest (lbs nuts)	Value (dollars)
1930	85	300,834	111,220	5,563
1935	174	1,064,511	n/a	n/a
1940	367	1,208,764	1,112,115	33,365
1945	575	2,291,232	11,796,572	566,236
1950	800	3,187,934	29,323,927	879,717
1954	302	3,391,909	49,444,938	1,483,346
1959	216	2,164,025	60,310,489	1,809,315
1964	116	1,668,212	35,297,159	1,64,806

1964 United States Census of Agriculture vol. 1, part 28, Georgia (Washington, D.C.: U.S. Department of Commerce Bureau of the Census, 1964), 18.

Table D.4 Louisiana, 1930-1964

Year	Farms	Trees	Harvest (lbs nuts)	Value (dollars)
1930	8	4,644	n/a	n/a
1935	41	213,009	n/a	n/a
1940	373	1,758,819	301,761	5,431
1945	666	2,066,531	13,963,541	698,171
1950	874	3,273,581	41,000,050	1,230,001
1954	331	2,285,831	16,455,533	493,665
1959	348	1,262,444	35,826,388	1,074,794
1964	191	1,322,932	36,762,135	1,102,864

1964 United States Census of Agriculture vol. 1, part 35, Louisiana. Washington, D.C.: U.S. Department of Commerce Bureau of The Census, 1964), 18.

Table D.5 Mississippi, 1930-1964

Year	Farms	Trees	Harvest (lbs nuts)	Value (dollars)
1930	20	33,451	150	8
1935	192	2,068,119	n/a	n/a
1940	831	9,481,143	843,606	12,684
1945	1,599	4,717,873	34,463,077	1,748,678
1950	2,811	6,026,850	83,927,918	2,517,836
1954	2,340	7,005,773	44,136,373	1,324,092
1959	1,619	6,444,778	122,161,371	3,664,841
1964	1,170	4,631,203	117,693,070	3,526,794

1964 United States Census of Agriculture vol. 1, part 33, Mississippi (Washington, D.C.: U.S. Department of Commerce Bureau of The Census, 1964), 18.

APPENDIX E

COUNTRY AND WORLD TUNG PRODUCTION

Table E.1 U.S. tung production, 1942-1952

Year	Nuts (tons)	Oil (millions lbs)
1942	16,350	5,193
1943	6,200	1,864
1944	26,680	8,767
1945	37,080	9,129
1946	57,400	14,400
1947	53,200	16,012
1948	58,500	17,031
1949	87,900	26,773
1950	36,500	12,285
1951	49,060	14,728
1952	132,100	43,358

"Domestic Tung Nuts and Tung oil and Domestic Disappearance, Imports and Prices of Tung oil, Calendar Years, 1939-42, Crop Years Beginning November 1, 1942-1952," Box 803, Tung Oil (1), WHCF, DDEPLM.

Table E.2 World tung production, 1946-1959 (thousands of pounds)(*estimate)

Year	Argentina	Brazil	Paraguay	China	U.S.	Other
1946	4,860	642	510	200,000	14,400	n/a
1947	3,120	450	160	231,500	16,012	4,340
1948	8,020	790	560	253,600	17,031	9,999
1949	13,300	1,620	2,600	176,400	26,773	9,307
1950	20,400	1,320	2,870	200,000	12,285	9,125
1951	29,000	1,830	3,970	200,000	14,058	7,142
1952	9,900	2,600	3,400	188,000	43,358	6,000
1953	39,600	1,520	7,700	154,000	39,649	4,600
1954	29,650	3,000	6,400	154,000	15,188	5,800
1955	33,860	1,280	6,600	*154,000	2,230	4,000
1956	48,530	1,780	7,300	*194,000	31,972	6,000
1957	50,700	1,800	9,020	*210,000	25,463	3,800
1958	31,526	1,520	5,694	*194,000	44,798	5,000
1959	39,370	1,760	7,740	*180,000	34,000	7,200

"Estimated World Production and Estimated Production in Principal Producing Countries," M477, Box 10, Folder 8, Tung History III, 1946-1970, ATOI, MLA, MSU.

APPENDIX F

COMMODITY CREDIT CORPORATION LOANS, 1957-1959

Table F.1 Tung oil, 1957

State	Number of Loans	Pounds	Amount Repaid
Alabama	4	60,445	0
Florida	27	2,320,539	0
Louisiana	99	2,382,744	0
Mississippi	387	10,399,384	636,561
Georgia	1	3,004	0

"Tung: 1957 Crop CCC Price Support Activities," Box 804, Tung Oil (5), WHCF, DDEPLM.

Table F.2 Tung oil, 1958

State	Number of Loans	Pounds	Amount Repaid
Alabama	9	207,732	0
Florida	264	7,830,676	0
Georgia	1	4,113	0
Louisiana	119	3,373,322	0
Mississippi	587	18,519,036	60,198
Texas	1	9,142	0

"Tung: 1958 Crop CCC Price Support Activities as of April 30, 1959," Box 804, Tung Oil (5), WHCF, DDEPLM.

Table F.3 Tung oil, 1959

State	Number of Loans	Pounds	Loans Repaid (lbs)	Turned over to CCC (lbs)
Alabama	13	189,000	17,700	171,300
Florida	277	7,172,700	255,700	6,917,000
Georgia	2	4,000	0	4,000
Louisiana	81	2,539,200	470,000	2,069,200
Mississippi	466	13,132,500	6,196,200	6,936,300
Texas	0	0	0	0

"Oils and Peanut Division, CSS Program Analysis Branch, November 23, 1960, Tung Oil: 1959 Crop CCC Price Support Activities as of October 31, 1960," Box 803, Tung Oil (7), WHCF, DDELPM. The 1959 price support for nuts was $53.50 per ton nut; 20.9 cents per pound oil. The loans repaid are "partially estimated."

APPENDIX G

TUNG FARMS WITH SALES OF $2,500 OR MORE, 1969[1]

[1] There is no mention of tung production in Alabama, Georgia, or Texas in the 1969 Agricultural Census.

Table G.1 Florida tung farms, 1969

County	Farms	Acres	Trees
Calhoun	1	1,953	172,580
Jackson	10	1,929	185,430
Jefferson	11	6,668	469,734
Leon	6	2,700	260,600
Other	4	711	60,931
Total	42	13,961	1,149,275

1969 United States Census of Agriculture vol 1, part 29, Florida (Washington, D.C.: U.S. Department of Commerce, 1969), 373.

Table G.2 Louisiana tung farms, 1969

County	Farms	Acres	Trees
St. Tammany	6	3,860	339,650
Washington	7	1,292	111,350
Other	2	123	10,458
Total	15	5,275	461,555

1969 United States Census of Agriculture vol 1, part 35, Louisiana (Washington, D.C.: U.S. Department of Commerce, 1969), 308.

Table G.3 Mississippi tung farms, 1969

County	Farms	Acres	Trees
Hancock	9	1,233	111,500
Harrison	4	169	18,210
Lamar	3	386	36,340
Pearl River	74	12,106	1,073,490
Pike	3	305	30,450
Stone	8	758	70,602
Walthall	4	33	2,070
Other	6	483	42,274

1969 United States Census of Agriculture part 33, section 1, Mississippi, Summary Data Volume 1 Area Reports (Washington, D.C.: U.S. Department of Commerce, 1969), 311.

APPENDIX H

UNITED STATES OILSEED IMPORTS

Table H.1 Tung oil imports, 1989-1995 (kilograms)(thousands)

Country	1989	1990	1991	1992	1993	1994	1995
Argentina	1,492	2,432	2,380	3,454	2,137	1,627	2,797
Paraguay	4,614	1,149	3,085	823	1,557	2,526	1,235
China	353	463	179	318	546	1,206	379
Brazil	0	0	0	400	0	0	0
Other	14,825	0	0	400	30	42	16

Assembled by author.[1]

Table H.2 Oilseed imports, 1987-2004 (metric tons)

Year	Tung	Soybeans	Linseed	Castor
1987	5,895	10,930	159	42,528
1988	6,406	59,828	169	30,365
1989	6,474	89,713	4	37,874
1990	4,045	63,583	7	31,032
1991	5,645	121,476	95	34,524
1992	4,996	69,519	351	34,017
1993	4,270	97,630	160	42,215
1994	5,401	179,270	426	44,093
1995	4,427	130,141	1,744	41,417
1996	3,943	86,981	2,699	39,938
1997	6,265	258,602	3,102	41,005
1998	3,879	148,780	4,306	48,477
1999	5,822	84,266	5,661	46,675
2000	3,554	49,042	6,102	40,739
2001	11,430	49,072	4,478	45,395
2002	4,165	46,299	5,809	32,339
2003	4,288	162,415	7,020	26,702
2004	2,974	113,064	3,881	40,674

Assembled by author.[2]

[1] Based on "Table 14-Tung Oil, Imports, by country, 1989-92," http://www.ers.usda/gov/publications/IUS2/ius2j.pdf (accessed June 7, 2012); and "Crambe, Industrial Rapeseed, and Tung Provide Valuable Oils," http://www.agmrc.org/media/cms/ius6c_5CF3B(B0B69EF.pdf (accessed January 11, 2013).

[2] "Table 3-52—Oilseeds, oils, and oilseed cake and meal: Imports of Selected Items, United States, 1987-96," http://www.nass.usda.govPublications/Ag_Statistics/1998/98_ch3.pdf (accessed January 11,2013), 27; "Table 3-54—Oilseeds, oils, and oilseed cake and meal: Imports of Selected Items, United States, 1989-98," http://www.nass.usda.gov/Publications/Ag_Statistics/2000/00_ch3.pdf (accessed May 15, 2012), 27; "Table 3-54—Oilseeds, oils, and oilseed cake and meal: Imports of Selected Items, United States, 1991-2000," http://www.nass.usda.gov/Publications/Ag_Statistics/2002/02_ch3.pdf (accessed May 15, 2012), 27; and "Table 3-53—Oilseeds, oils, and oilseed cake and Meal: Imports of Selected Items, United States, 1996-2005," http://www.nass.usda/gov/Publications/Ag_Statistics/2007/CHAP03.PDF (accessed May 15, 2012), 27.

Table H.3 Oilseed wholesale prices, 1989-2007 (cents per lb)

Year	Tung	Linseed	Soybean	Castor
1989	41	40-41	20-21	50-51
1990	55	40-41	23-24	48-49
1991	62	34-35	20-21	36-37
1992	106.8	30-31	19-20	35-36
1996	60-64	32-37	21-27	41-44
1997	74-110	36-37	21-25	41-42
1998	100-110	36-37	24-29	41-48
1999	74-100	36	15-23	48
2000	59	35-36	13-18	47-48
2001	60-62	32-39	12-17	48
2002	40-61	31-41	14-23	47-48
2003	45-85	41-44	20-30	47-48
2004	85-90	40-59	21-35	47-48
2005	92-105	42-75	20-25	45-50
2006	89-95	42-44	21-28	43-45
2007	84-101	44-75	28-43	46-61

Assembled by author.[3]

[3] "Table 42—Prices: farm wholesale, and index numbers of wholesale prices, by month, 1996 to date," *USDA Oil Crops Situation and Outlook Yearbook* (USDA: Economic Research Service, Oct 2001), 67, 68, 69, 70, 71, 72; "Table 190.—Fats and oils: Wholesale Price per pound , 1989-93," National Agricultural Statistics Service, Agricultural Statistics 1994 (Washington: U.S. Government Printing Office, 1994),123; and "Appendix 33—Prices, Farm wholesale , and index numbers of wholesale prices, by month, 2002-2007," http://usda.mannlib.cornell.edu/usda/ers/OCS-yearbook/2000s/2008/OCS-yearbook-06-18-2008_Special_Report.pdf (accessed May 15, 2012), 67-73.