Pecan Planting Trends in Georgia

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Summary. **Georgia is the largest pecan (*Carya illinoinensis*) producing state in the United States, accounting for ≈30% of national production. Georgia's pecan acreage has undergone at least three significant expansions since the industry's establishment in the early 1900s. The most recent expansion was likely a result of recent price increases driven by the export market for pecans. This stimulus also led to the planting of additional pecan acreage throughout the pecan growing regions of the United States. A survey of pecan producers throughout Georgia was conducted from Jan. through Mar. 2010, 2012, 2013, and 2014 regarding the planting of pecan trees. The current survey documents the planting of 391,488 pecan trees and 15,328 additional pecan acres since 2010 in Georgia. New orchard plantings averaged 40, 35, 42, and 62 acres in size for 2010, 2012, 2013, and 2014, respectively. The state's pecan producers planted 14 to 30 different pecan cultivars, depending on the survey year. Aside from nongrafted seedling trees planted in 2010, 'Desirable' and 'Pawnee' accounted for the highest percentage of trees planted annually until 2014, both in percentage of total trees planted and percentage of producers planting trees. The survey also indicates a shift toward the planting of pecan trees at higher density by Georgia pecan producers since 2010.**

Georgia is the largest pecan-producing state in the United States, accounting for ≈30% of the nation's production [U.S. Department of Agriculture (USDA), 2012]. The state's commercial pecan acreage, however, is difficult to ascertain as a result of frequent orchard turnover, new plantings, unclear distinctions between commercial and hobby plantings, and the difficulty in obtaining precise acreage numbers from producers. The 2012 U.S. Census of Agriculture indicates a total Georgia pecan acreage of 123,415 acres, an increase of 9189 acres over that of the 2007 census (USDA, 2014). About 11% of this acreage was nonbearing in 2012 and 10% was nonbearing in 2007. The 2012 Georgia Farm Gate Value Report generated by University of Georgia Cooperative Extension places the state's total pecan acreage at 163,933 acres (University of Georgia, 2013).

Georgia's pecan acreage has undergone at least three significant expansions since the industry's establishment in the early 1900s. The first began about 1900, and developed as a result of low land prices due to a combination of depressed economics of cotton (*Gossypium hirsutum*) production and exaggerated reports of income from growing pecans (Wood et al., 1990). The result was an era of speculation, in which orchards were planted and quickly sold to gullible investors. Thus, thousands of acres were planted as a real estate enterprise rather than a commercial agriculture venture. This resulted in many unproductive orchards and a subsequent initial decline in the popularity of the crop until production practices improved (Wood et al., 1990). Before this era, the region of primary production had been eastern Texas, Louisiana, and southern Mississippi. As a result of this initial planting boom, GA's production increased to an average of over 15.5 million pounds from 1930 to 1940. By 1950, Georgia was leading the nation in pecan production and remains in this position today, producing an average of 95 million pounds of pecans per year valued at over $188 million (USDA, 2012).

Another era of acreage expansion began throughout the current U.S. pecan-producing belt in the late 1960s and continued into the early 1980s. During this era, additional pecan orchards were established in Georgia, Texas, and Oklahoma, and in the arid southwestern United States, far removed from the natural range of the species. Many thousands of acres of trees (mostly 'Western Schley') were planted in western Texas, New Mexico, Arizona, and California. This expansion was primarily because of the recognition that the domestic demand for pecans had not been satisfied; however, the availability of highly precocious and prolific new cultivars from the USDA pecan breeding program stimulated interest, particularly in the southeastern United States. Production from these relatively young trees and an increase in production from existing mature trees in the southeastern United States (because of greater attention to sound horticultural practices, especially those practices that minimize alternate bearing) were considered major factors in catapulting pecan production and value to today's relatively high level and has elevated pecan to that of being a valuable and unique contributor to the U.S. agricultural economy (Wood et al., 1990).

Since 1980, U.S. pecan exports have grown by nearly 2000% (Lillywhite et al., 2014). The most significant increase began in 2009 when nearly one quarter of the entire U.S. pecan crop, over 80 million in-shell pounds, was exported to Asian markets, primarily China. Five years earlier, only 2 million pounds of pecans were exported from the United States to China. This phenomenon was fueled by the rapidly growing Chinese middle class. As a result, pecan prices reached record highs, rising from an average of $1.43/lb to $2.30/lb in-shell from 2009 to 2010 and again to $2.43/lb in 2011 (USDA, 2012).

These recent export driven price increases have renewed interest in the crop and led to the planting of additional pecan acreage throughout the U.S. pecan belt. The objective of this study is to document characteristics of the recent pecan planting trends in Georgia, a key pecan-producing region of the United States.

Materials and methods

A survey of pecan producers throughout Georgia was conducted

Units

To convert U.S. to SI, multiply by	U.S unit	SI unit	To convert SI to U.S., multiply by
0.4047	acre(s)	ha	2.4711
0.4536	lb	kg	2.2046

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from Jan. through Mar. 2010, 2012, 2013, and 2014 regarding the planting of pecan trees. The survey was conducted via a paper survey form distributed to pecan producers at county production meetings held in 15 counties throughout the pecan-producing region of Georgia. Survey participants were active pecan producers established in the industry as well as those new to pecan production. Only producers with 20 acres of pecans or more were included in the survey. Producers were asked to complete only one survey per season to avoid duplication of data. Multiple counties were represented at each meeting and account for the majority of Georgia's commercial pecan acreage. A total of 712, 1031, 795, and 808 surveys were distributed in 2010, 2012, 2013, and 2014, respectively. Only those surveys reporting tree planting or abandoned orchard renovation were included in the data set. Information was collected on the following: 1) number of trees of each cultivar planted, 2) number of trees planted to new orchard acreage or as interplants in existing orchards, 3) acreage planted, 4) new acreage established by transplanting mature trees with a tree spade, and 5) acreage of abandoned orchards brought back into production.

Data from survey forms were entered into an Excel (Microsoft, Redmond, WA) spreadsheet. Simple descriptive statistical analyses (e.g., frequency tables, means) were performed using SigmaPlot statistical software (Systat Software, San Jose, CA).

Results and discussion

Survey results identified the planting of 391,488 pecan trees to commercial orchards in Georgia during 2010 and 2012–14. There was a dramatic increase in the number of pecan trees planted following 2010, with almost twice as many trees planted in 2014 as in 2010 (Table 1). Eight percent of producers surveyed planted pecan trees in 2010, while 14%, 11%, and 10% of producers surveyed planted pecan trees in 2012, 2013, and 2014. There was also a shift in the use of pecan trees transplanted from nurseries following 2010, when the percentage of trees planted to new orchards was only 47%. From 2012–14, the percentage of trees being used to establish new

Table 1. Survey results for pecan cultivars planted in Georgia during the 2010 and 2012–14 planting seasons.

Yr	Cultivar	Trees (no.)	Proportion of total trees planted (%)	Proportion of producers planting (%)
2010	Byrd	2,040	3.1	8.9
	Caddo	3,338	5	16
	Cape Fear	944	1.4	14.3
	Creek	4,256	6.4	10.7
	Desirable	10,585	16	33.9
	Excel	1,978	3	10.7
	Elliott	3,129	4.8	16
	Forkert	1,850	2.8	5.4
	Kiowa	1,570	2.4	7.1
	Oconee	2,786	4.3	21.4
	Pawnee	7,756	11.8	30.4
	Seedling	21,500	32.8	7.1
	Sumner	3,771	5.8	30.4
	Stuart	50	<1	1.7
	Total	65,553		
2012	Byrd	4,315	4.2	6.2
	Caddo	5,288	5.1	10.2
	Cape Fear	9,141	8.9	15
	Creek	3,221	3.1	8.2
	Cunard	1,010	<1	4.8
	Desirable	27,993	27.3	30.8
	Elliott	2,135	2.1	10.3
	Ellis	1,500	1.5	<1
	Excel	7,340	7.1	18.4
	Gloria Grande	251	<1	3.4
	Kanza	70	<1	<1
	Kiowa	1,436	1.4	4.1
	Lakota	1,428	1.4	3.4
	Mandan	850	<1	2.7
	Moreland	900	<1	<1
	Morrill	3,250	3.2	3.4
	Oconee	6,609	6.4	11.6
	Pawnee	16,150	15.7	24.7
	Huffman	725	<1	1.3
	Treadwell	345	<1	1.3
	Sparks 98	430	<1	1.3
	Sparks 112	60	<1	<1
	Tom	100	<1	<1
	Sumner	8,404	8.2	22.6
	Total	102,951		
2013	Byrd	1,200	1.2	1.2
	Caddo	5,366	5.4	12.8
	Cape Fear	8,351	8.4	23.3
	Cherryle	100	<1	1.2
	Creek	5,169	5.2	14
	Cunard	1,172	1.2	1.2
	Desirable	21,667	21.8	28
	Eclipse	1,740	1.8	4.7
	Elliott	1,946	2	16.2
	Ellis	550	<1	1.2
	Excel	4,356	4.4	16.2
	Forkert	1,075	1.1	7
	Huffman	246	<1	1.2
	Kiowa	2,125	2.1	5.8

(*Continued on next page*)

Table 1. (*Continued*) Survey results for pecan cultivars planted in Georgia during the 2010 and 2012–14 planting seasons.

Yr	Cultivar	Trees (no.)	Proportion of total trees planted (%)	Proportion of producers planting (%)
	Lakota	636	<1	4.7
	Lipan	100	<1	1.2
	Mandan	75	<1	1.2
	Morrill	7,632	7.7	5.8
	Nacono	100	<1	1.2
	Oconee	9,886	10	25.6
	Pawnee	16,732	17	28
	Schley	300	<1	1.2
	Seedling	500	<1	2.3
	Stuart	186	<1	7
	Sumner	7,049	7.1	23.3
	Tom	92	<1	1.2
	Treadwell	668	<1	1.2
	Sparks 112	260	<1	1.2
	UGA 16	34	<1	1.2
	Sparks 98	80	<1	1.2
	Total	99,393		
2014	Byrd	710	<1	2.5
	Caddo	6,470	5.3	7.6
	Cape Fear	949	<1	14
	Cherryle	907	<1	1.3
	Creek	14,876	12	15.2
	Cunard	2,836	2.3	1.3
	Desirable	10,060	8.1	33
	Eclipse	6,781	5.5	8.9
	Elliott	3,992	3.2	14
	Ellis	6,653	5.4	3.8
	Excel	3,417	2.8	12.7
	Forkert	2,000	1.6	1.3
	Huffman	2,215	1.8	2.5
	Kiowa	2,648	2.1	6.3
	Lakota	1,299	1.1	3.8
	McMillan	280	<1	1.3
	Moreland	1,283	1	1.3
	Morrill	5,108	4.1	6.3
	Oconee	10,077	8.2	28
	Pawnee	27,316	22.1	46
	Seedling	100	<1	1.3
	Stuart	1,176	<1	7.6
	Sumner	8,787	7.1	24
	Tom	96	<1	1.3
	Treadwell	775	<1	1.3
	Sparks 112	753	<1	1.3
	UGA 16	756	<1	1.3
	UGA numbered	174	<1	1.3
	Zinner	1,057	<1	3.8
	Total	123,551		

orchards ranged from ≈90% to 95% (Table 2).

This survey accounts for 1270, 3594, 3222, and 3514 acres of newly established pecan orchards planted using nursery-grown trees for 2010, 2012, 2013, and 2014, respectively, in Georgia (Table 3). Because surveys are limited and can only be expected to provide a relatively small sample of the actual acreage planted, the planted acreage is likely higher than survey results indicate. Additionally, plantings from 2011 are not included. A 2012 nursery survey indicated the number of trees obtained from our 2012 planting survey accounted for only 44% of the trees sold by southeastern U.S. pecan nurseries (P. Conner, personal communication). Georgia pecan producers also established 57, 277, 501, and 40 acres of new pecan orchards by transplanting trees moved from already existing orchards with a tree spade in 2010, 2012, 2013, and 2014, respectively (Table 3). In addition, our results indicated 875, 1778, 141, and 60 acres of abandoned pecan orchards were brought back into production in 2010, 2012, 2013, and 2014, respectively. Combined newly planted acres from nursery transplants, tree spading, and revitalization of abandoned orchards accounted for 2202, 5649, 3863, and 3614 acres of new Georgia pecan acreage in 2010, 2012, 2013, and 2014, respectively (Table 3).

New orchard plantings averaged 40, 35, 42, and 62 acres in size for 2010, 2012, 2013, and 2014, respectively (Table 2). Acreage of new orchard plantings ranged from 2 to 150 acres in 2010, 1 to 350 acres in 2012, 1 to 435 acres in 2013, and 1 to 476 acres in 2014. Orchard plantings of 30 acres or more accounted for 48%, 40%, 36%, and 37% of all Georgia pecan orchard plantings in 2010, 2012, 2013, and 2014, respectively.

Georgia pecan producers planted 14 to 30 different pecan cultivars, depending on the survey year. This included nongrafted seedling trees to be grafted in the orchard at a later date. Aside from nongrafted seedling trees planted in 2010, 'Desirable' and 'Pawnee' accounted for the highest percentage of pecan trees planted each year until 2014, both in the percentage of total trees planted and the percentage of producers planting trees (Table 1). Only 7% of pecan producers planted nongrafted seedlings in 2010, while over 30% of producers planted either 'Desirable' or 'Pawnee'. Of these two cultivars, a higher percentage of Desirable trees were planted than Pawnee in 2010, 2012, and 2013. In 2014, 22% of the pecan trees planted in Georgia were 'Pawnee' and only 8% of planted trees were 'Desirable'. Similarly, 46% of Georgia pecan producers surveyed planted 'Pawnee' in 2014, while 33% planted 'Desirable'. These survey results indicate a shift in preference of Georgia pecan producers for 'Pawnee'

Table 2. Percentage of nursery-grown pecan trees planted to new orchards or interplanted in existing orchards, mean tree density of new orchard plantings, and mean area planted from nurseries in Georgia based on 2010 and 2012–14 surveys.

Yr	New orchards (%)	Interplanted (%)	Mean tree density of new plantings (trees/acre)[z]	Mean area planted from nurseries (acres)[z]
2010	47	53	24	40
2012	90	10	26	35
2013	95	5	29	42
2014	94	6	33	62

[z]1 tree/acre = 2.4711 trees/ha, 1 acre = 0.4047 ha.

Table 3. Number of pecan acres added in Georgia as trees planted from nurseries, spaded trees, and revitalization of old pecan orchards based on 2010 and 2012–14 surveys.

Yr	Area planted from nurseries (acres)[z]	Area planted by tree spading (acres)	Revitalized abandoned area (acres)	Total additional area (acres)
2010	1270	57	875	2202
2012	3594	277	1778	5649
2013	3222	501	141	3864
2014	3514	40	60	3614

[z]1 acre = 0.4047 ha.

over 'Desirable'. This is likely the result of a preference for the earlier harvest date of 'Pawnee' over 'Desirable', allowing Georgia pecan producers to potentially market the 'Pawnee' crop at a higher price than that obtained for 'Desirable'. The harvest date for 'Pawnee' in Georgia is ≈1 month earlier than that of 'Desirable' and has historically received a higher price. In addition, pecan scab remains one of the primary production constraints for pecan in the southeastern United States, leading many growers to begin shifting away from Desirable, a highly susceptible cultivar, which suffered heavy losses to pecan scab in 2013, a year in which much of the Georgia pecan belt received a high degree of disease pressure due to excessive rainfall. 'Pawnee' is susceptible to pecan scab as well but generally less so than 'Desirable', allowing the disease to be managed more readily on 'Pawnee' (Sparks, 1992).

The survey results indicate a shift toward the planting of pecan trees at higher density by Georgia pecan producers (Table 2). Mean tree density of new orchard plantings established from nursery-grown transplants was 24, 26, 29, and 33 trees/acre in 2010, 2012, 2013, and 2014, respectively. The profitability of pecan orchard enterprises eventually declines if tree canopies encroach to cause excessive orchard shading. This deterioration of canopy light environment, and associated "sunlight stress," typically increases alternate bearing, which is perhaps the economically most important biological problem faced by commercial pecan enterprises (Smith and Weckler, 2010). Historically, the most common solution to canopy encroachment has been the removal of trees from the orchard as they begin to crowd.

The increased mean planting density observed during the survey is likely a result of the current option of pecan tree transplanting with a tree spade to establish additional acreage when the trees begin to crowd and the recent potential development of mechanical hedging techniques adapted for use in the southeastern United States (Stevenson, 2013). Timely use of mechanized hedge-type pruning as a horticultural tool has been demonstrated to be an effective approach for maintaining tree density, preventing orchard crowding, and partial moderation of alternate bearing in the relatively light-intensive western U.S. pecan production region (Wood and Stahmann, 2004). Previous studies of various hedge-pruning techniques in low-light-intensity environments, such as those found in the southeastern United States, have thus far demonstrated poor pecan tree response to moderate-width hedge-type pruning (Lombardini, 2006; Wood, 2009). However, Wood (2009) suggested wide-width canopy side-hedging strategies, with cuts made on a 3- to 4-year cycle, may hold potentially positive benefits for pecan in the southeastern United States, a suggestion which has been demonstrated anecdotally by Stevenson (2013). As a result, many Georgia pecan producers are considering mechanical hedge pruning as a possible future option for newly established orchards.

Although there are no verifiable records of the pecan orchard acreage removed from commercial production or lost to real estate development from 2010 to 2014, the economic trends of depressed real estate development and rising agricultural prices, including those for pecan, are suggestive that acreage loss is minimal for the survey period. The current survey documents the planting or renewal of at least 15,329 additional pecan acres in Georgia since 2010, with the exclusion of data from 2011.

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