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# A Ten-Year Review of the Southeast U.S. Green Industry, Part I: Labor and Firm Characteristics<sup>1</sup>

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## Introduction

The green industry is a vibrant part of Tennessee's agricultural economy, directly contributing \$965 million annually to the state's economy, \$23.5 million in annual state and local taxes, and over 13,000 jobs (Jensen et al., 2020).<sup>2</sup> In recent years, labor shortages have become more pronounced nationally and within the state of Tennessee (Velandia et al., 2021). Tennessee growers report that hiring locally and retaining locally hired employees is challenging, and that labor-related challenges are on the increase. In 2018, nearly 80 percent of nurseries indicated that labor is their greatest hurdle, and over 50 percent stated the lack of qualified labor limited their ability to hire additional employees (McClellan, 2018). Alongside the issue of an uncertain and inadequate labor force is the increasing demand for nursery and landscape products and services. Nationally, the industry demonstrated a 0.6 percent annual growth from 2015 to 2019, which is expected to increase 1.8 percent annually through 2025 (Daly, 2021). Just prior to the COVID-19 pandemic, members of the Tennessee green industry anticipated expanding production by 16.5 percent over the next five years (Jensen et al., 2020). With the development of the COVID-19 pandemic that led to dramatically increased interest in home gardening, the green industry experienced an increase in national sales, with 47 percent of participating nurseries and 87 percent of garden centers reporting an increase in sales in 2020 relative to 2019 (Daly, 2021; Nursery Management, 2020). Southeastern U.S. households reported an increase in plant purchases of 3.4 percent and landscaping purchases by 4.6 percent from 2019 to 2020 (Campbell, Rihn, and Campbell, 2021). Given the increase in demand, green industry firms will likely increase production, which will require more labor.

In an effort to help the green industry better understand employment issues, related trends and to better position their businesses for the future, a two-part series titled "A Ten-Year Review of the Southeast U.S. Green Industry" was developed. In "Part I: Labor and Firm Characteristics" annual sales, product types and workforce demographics are covered for three sub-samples, including: national, a select geographical area in the southeast U.S. (hereafter termed "five-state region" which includes Georgia, Kentucky, North Carolina, South Carolina and Tennessee), and the state of Tennessee. In the companion publication, "A Ten-Year Review of the Southeast U.S. Green Industry, Part 2: Addressing Labor Shortages and Internal and External Factors Affecting Businesses Strategies," we discuss specific strategies that businesses are using to address the labor shortage. In Part 2, we also discuss the importance of other factors and issues that are also weighing on business decisions that affect the future sustainability of the green industry.

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<sup>2</sup> The green industry is defined as nursery and greenhouse growers, grower/retailers, and local retailers or wholesalers.

## Data and Analysis

The data used in this analysis were from the 2009, 2014 and 2019 National Green Industry Surveys. The Green Industry Research Consortium research team has conducted the national survey every five years since 1988, meaning the current dataset represents the fifth, sixth and seventh data collection events. Core questions of the survey address production methods, marketing strategies and other important topics to the green industry. By using the same survey instrument, time series data can be collected and trends over a period of time can be assessed. In this report, we focus on firms' responses to labor-related questions in the U.S., five-state region (including Georgia, Kentucky, North Carolina, South Carolina and Tennessee), and Tennessee only. Responses to questions related to business type (wholesale only, retail only, mixed firms), product forms (primarily containerized plants, other forms), number of employees (full-time, temporary/seasonal, H-2A), actions to address labor challenges (2019 data only), and important internal and external factors that impact business strategies are investigated. This report focuses on the business types, product forms and number of employees. The second report in this series discusses the actions to address labor challenges and business strategies.

The sample was randomly drawn from a list of green industry firms in the U.S. Contact information for firms from all 50 states was obtained from the *National Plant Health Board* (the Department of Agriculture or its equivalent within each state) because commercial growers need to be registered and certified for compliance with phytosanitary regulations if they are selling live plants. Table 1 shows a breakdown of the number of firms in the contact list, firms receiving the survey, returned surveys and survey responses used in this publication. In 2009, the total contact list contained 38,000 firms, with 17,019 being invited to participate (Hodges et al., 2010). In 2014, over 104,000 firms were listed, and a total of 32,000 firms were invited to participate either via email or mail (Hodges et al., 2015). In 2019, 51,933 firms were on the contact list, and 43,877 firms were contacted (Khachatryan et al., 2020).

**Table 1.** Overview of the Sampling Conducted in the 2009, 2014 and 2019 National Green Industry Survey.

Survey Year	Firm Types Contacted	Total Contact List	Firms Surveyed	Returned Surveys	Survey Responses Included in Publication*
2009	Nurseries (wholesale growers), retailers	38,000	17,019	3,044	2,257
2014	Wholesale growers, dealers, landscapers, retailers	104,000	32,000	2,657	1,761
2019	Wholesale growers, dealers, landscapers, retailers	51,933	43,877	2,170	1,210

\***Note:** The number of survey responses used in this analysis was less than the number returned due to the removal of incomplete responses, duplicates, firms reporting less than \$10,000 in annual sales and landscape service only firms. The landscape service only firms were removed to maintain consistency across survey years.

Participating firms were grouped by business type: 1) wholesale only operations were firms that only sold through wholesale channels; 2) retail only firms are those that only have retail sales; and 3) mixed firms were those with a combination of these and other business functions (e.g., retailers, growers, etc.). Previous research shows that product form (e.g., container) can influence labor needs in the green industry (Eaton and Appleton, 2009). Thus, product forms were used to identify firms that primarily produced containerized plants (more than 50 percent in sales were attributed to container plants) and other operations (firms with less than 50 percent in container sales). Responses were grouped by survey year and statistical significance was estimated between survey years and also by product form (containerized plant producing firms versus other product forms) using ANOVA and Tukey's honest significance at the 10 percent level.

### Descriptions of Participating Firms

In 2009, most of the responding firms were a mix of wholesale, retail and other business functions (47 percent of the sample), followed by wholesale grower only (35 percent), and retailer only (18 percent; Table 2). The reported average annual sales were \$2.85 million for the wholesale grower only firms, followed by \$1.73 million for the mixed firms, and \$0.73 million for the retailer only firms. In 2014, mixed firms represented 51 percent of the sample with \$1.9 million in annual sales, followed by retailer only firms (25 percent) with \$1.4 million in sales, and wholesale

grower only firms (24 percent) with \$3.5 million in sales. In 2019, wholesale grower only firms were more prevalent, representing 52 percent of the sample, with nearly \$2 million in sales, followed by mixed firms (39 percent at \$0.9 million in annual sales). The retailer only firms represented 9 percent of the sample having a total of \$0.6 million in annual sales.

Given that the region where firms are located strongly impacts green industry firms' business strategies, we divided the sample into a five-state region consisting of Tennessee and four other states in the Southeast (i.e., Georgia, Kentucky, North Carolina, South Carolina). Tennessee's statistics are also provided. The five-state region included states that were selected for analysis given their proximity to Tennessee and having the highest number of completed survey responses (180 firms from GA, 82 from KY, 267 from NC, 83 from SC, and 167 from TN). However, it is important to note the small sample size in some of these groups, particularly for retail only operations suggests that these results should be interpreted cautiously. For the five-state region, in 2009, 45 percent of the sample were mixed firms with \$2.1 million in annual sales, followed by wholesale only firms (41 percent) with \$2.5 million in sales, and retailers only (13 percent) with nearly \$0.5 million in annual sales. In 2014, the five-state region sample again consisted of primarily mixed firms (57 percent) with \$2.4 million in annual sales, followed by wholesale only firms (24 percent) with \$5.4 million in sales, and retail only firms (19 percent) with \$1.4 million in sales. In 2019, wholesale only firms made up a large portion of the sample at 59 percent and had \$0.7 million in sales, mixed firms were the next largest portion of the total sample at 35 percent and \$0.8 million in sales, and then retailer only firms (6 percent) with \$0.9 million in sales. Tennessee's trends were a bit different from the national and regional trends. In 2009, wholesale only firms represented the largest firm group at 55 percent of the sample and reported nearly \$1.9 million in annual sales, followed by mixed firms (39 percent) and retail only firms (6 percent), both of which had nearly \$0.9 million in annual sales.

Product form can greatly impact labor requirements. For instance, it has been estimated that container nursery operations require one person per acre for production while field nursery operations require one person per 5-10 acres (Eaton and Appleton, 2009). Firms reported the percentage of their annual sales attributed to different product forms, including containerized, balled and burlapped, field grown bag, bare root, balled and potted/process balled, in-ground containers, and other types. Regardless of the survey year, U.S. firms reported the majority of their sales (57 percent in 2009 to nearly 66 percent in 2019) were from containerized plants (Table 3.) Balled and burlapped plants represented the product category that generated the next largest percentage of sales, followed by other types, and bare root plants. Fewer sales were attributed to balled and potted/process balled, in-ground containers, and field grown bag. Similar trends were noted for the five-state region and Tennessee. However, Tennessee participants indicated an increased percent of annual sales attributed to bare root plants in 2019, which was unique to that state and may be attributed to their more established bare root liner production. Figure 1 demonstrates the percent of container operations by survey year and location. Container operations are those who indicated 50 percent or more of their sales were attributed to containerized plants. Similar to the overall results, container operations made up a large portion of the sample, particularly for retailers and firms with mixed business types. This may reflect the need for flexible harvest and transplant dates and ease of transport-related tasks to the different clients these firm types target.

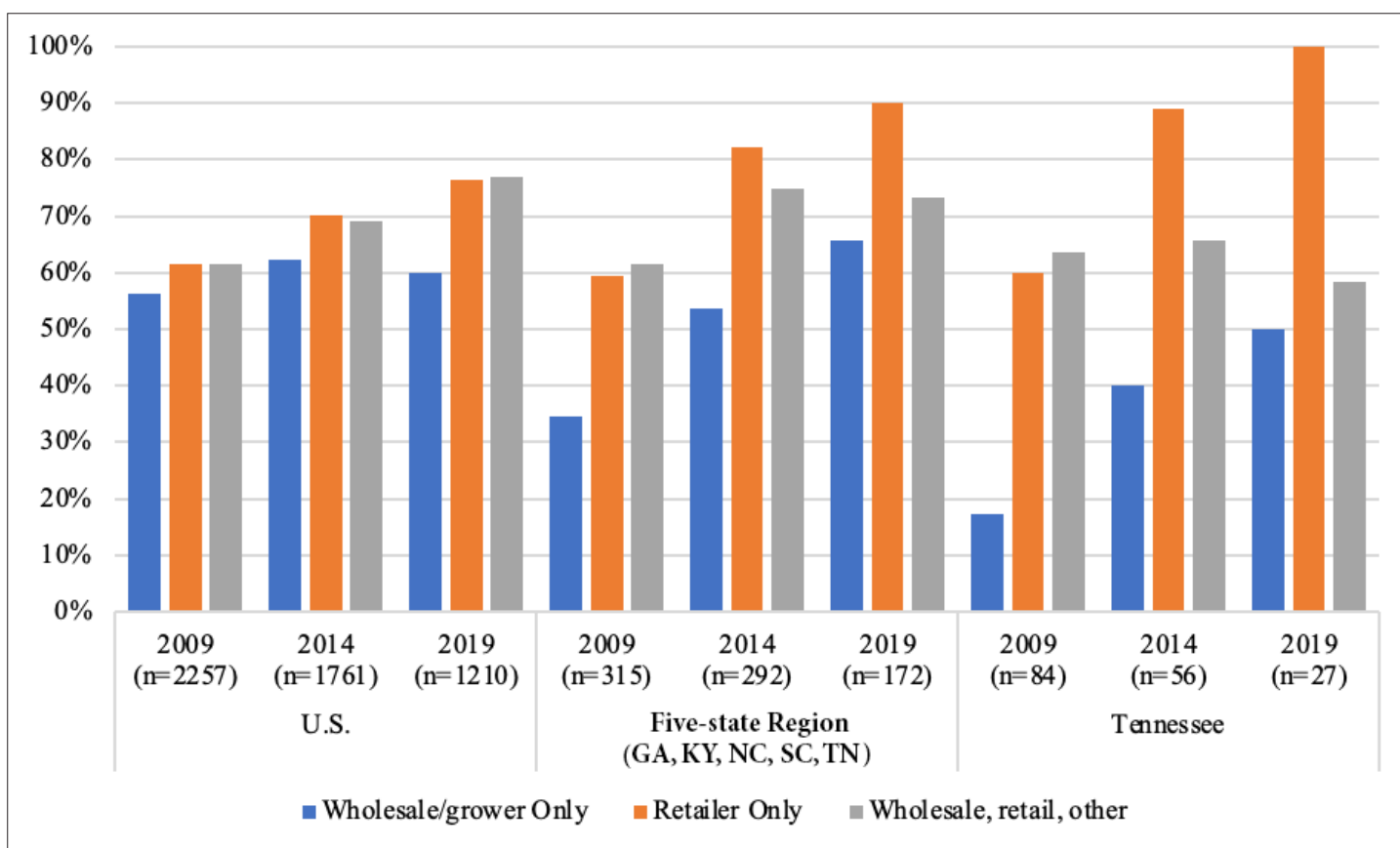
**Table 2.** Number of Firms in Each Firm Type Category and Reported Annual Sales, by Survey Year and Location.

	U.S.			Five-state Region (GA, KY, NC, SC, TN)			Tennessee		
	2009	2014	2019	2009	2014	2019	2009	2014	2019
Total Number of Firms Observed	2257	1761	1210	315	292	172	84	56	27
<b>Firm Type</b>									
Wholesale/grower only	784	415	634	130	69	102	46	15	12
Retailer only	404	442	110	42	56	10	5	9	3
Wholesale, retail, other	1069	904	466	143	167	60	33	32	12
<b>Reported Annual Sales (in millions)</b>									
Wholesale/grower only	\$ 2.847	\$ 3.454	\$ 1.951	\$ 2.486	\$ 5.371	\$ 0.737	\$ 1.845	\$ 0.331	\$ 0.208
Retailer only	\$ 0.728	\$ 1.381	\$ 0.604	\$ 0.488	\$ 1.360	\$ 0.853	\$ 0.860	\$ 0.148	\$ 2.143
Wholesale, retail, other	\$ 1.727	\$ 1.892	\$ 0.943	\$ 2.097	\$ 2.403	\$ 0.809	\$ 0.861	\$ 2.013	\$ 0.515

**Table 3.** Percent of Annual Sales Attributed to Different Product Forms, by Survey Year and Location.

Product Form	U.S.			Five-state Region (GA, KY, NC, SC, TN)			Tennessee		
	2009	2014	2019	2009	2014	2019	2009	2014	2019
Containerized	57.1%	64.5%	65.7%	47.4%	68.1%	67.2%	48.0%	60.9%	53.4%
Balled and burlapped	17.2%	11.1%	8.9%	25.9%	10.2%	10.4%	24.0%	17.9%	15.1%
Field grow bag	1.2%	0.4%	1.1%	0.4%	0.5%	0.4%	0.4%	0.5%	0.0%
Bare root	5.9%	6.1%	6.6%	11.9%	8.2%	9.4%	19.3%	12.5%	29.1%
Balled and potted/process balled	1.7%	0.8%	0.8%	1.3%	0.9%	0.3%	0.9%	1.8%	0.3%
In-ground containers	1.6%	1.8%	1.9%	1.2%	1.3%	0.8%	0.9%	0.3%	0.1%
Other types	9.0%	9.5%	7.6%	5.6%	6.5%	5.4%	3.5%	4.1%	1.9%
Total Number of Firms Observed	2257	1761	1210	315	292	172	167	56	27

**Figure 1.** Percent of Container Operations within the Sample, by Survey Year and Location.



### Number of Employees

Participating firms reported their number of employees by type of employee, including full-time, temporary/seasonal, and H-2A temporary agricultural workers. H-2A data were collected in survey years 2014 and 2019 only. Table 4 summarizes the average number of employees for wholesale only, retail only and mixed operations firms. For wholesale only operations, U.S. firms averaged 20 permanent employees, 18 temporary/seasonal employees, and three H-2A temporary agricultural workers. As a point of comparison, the U.S. Department of Labor (2021) tracks the number of immigrant workers (including H-2A employees) by industry. Between 2014 and 2019, the number of H-2A employees in Georgia, South Carolina and Tennessee decreased while the number of H-2A employees in Kentucky and North Carolina increased for the farmworkers and laborers, crop, nursery and greenhouse (SOC Code 45-2092) category.

In general, wholesale only firms demonstrated a decreasing number of employees overtime except for temporary/seasonal employees in 2014, where temporary/seasonal employees peaked at 24 employees and was lowest in 2019 with 11 employees. In the five-state region, firms exhibited a higher number of permanent and H-2A workers in 2014 while temporary/seasonal employees stayed consistent across survey years. In Tennessee, the number of employees was not significantly different across survey years.

In the U.S., retail only operations averaged four permanent employees, six temporary/seasonal employees, and less than one H-2A worker across the survey years. The only significant difference was observed in the five-state region, where firms reported a larger number of permanent employees in 2009 (six employees) than the firms reported in 2014 (two employees).

The mixed operation firms had on average eight permanent and temporary/seasonal employees and one H-2A worker. In the total U.S., firms in 2009 reported more permanent and temporary/seasonal employees than participating firms in 2014. While in the five-state region, firms participating in 2009 reported more permanent employees than the 2019 participating firms.

**Table 4. Average Number of Employees by Employment Type, Operation Type, Location and Survey Year.**

<b>Wholesale Only Operations</b>													
	<b>U.S.</b>				<b>Five-state Region (GA, KY, NC, SC, TN)</b>				<b>Tennessee</b>				
	2009	2014	2019	Sig.*	2009	2014	2019	Sig.*	2009	2014	2019	Sig.*	
Permanent	23.3	22.1	14.2	a	15.6	33.3	6.3	a	9.4	3.8	2.3		
Temporary/Seasonal	19.9	24.4	11.0	ab	12.8	20.3	8.8		8.4	3.3	1.5		
H-2A <sup>z</sup>	---	5.5	2.3	c	---	12.8	1.1	c	---	0.8	0.0		
<b>Retail Only Operations</b>													
	<b>U.S.</b>				<b>Five-state Region (GA, KY, NC, SC, TN)</b>				<b>Tennessee</b>				
	2009	2014	2019	Sig.*	2009	2014	2019	Sig.*	2009	2014	2019	Sig.*	
Permanent	5.3	3.7	4.5		5.9	2.2	5.5	a	13.0	2.1	12.7		
Temporary/Seasonal	7.2	5.3	6.7		4.2	3.8	6.0		9.2	1.8	13.7		
H-2A <sup>z</sup>	---	0.0	0.1		---	0.0	0.0		---	0.0	0.0		
<b>Mixed Operations</b>													
	<b>U.S.</b>				<b>Five-state Region (GA, KY, NC, SC, TN)</b>				<b>Tennessee</b>				
	2009	2014	2019	Sig.*	2009	2014	2019	Sig.*	2009	2014	2019	Sig.*	
Permanent	9.2	7.6	5.9	a	11.3	5.1	5.0	b	7.9	6.4	4.6		
Temporary/Seasonal	9.2	7.3	6.2	a	6.9	4.6	5.2		4.3	3.9	7.3		
H-2A <sup>z</sup>	---	1.0	0.7		---	1.7	0.3		---	0.0	0.0		

\*Statistical significance represented as:

a=significance between survey year 2009 and 2014 at 10 percent;

b=significance between survey year 2009 and 2019 at 10 percent;

c=significance between survey year 2014 and 2019 at 10 percent.

<sup>z</sup> Data related to H-2A employees were only collected in the 2014 and 2019 surveys, therefore --- is used to signify no data for these years. Low H-2A worker numbers were reported by Tennessee firms regardless of survey year or firm type likely due to a smaller sample size and the firms surveyed not employing H-2A workers.

### Container Versus Other Plant Production and the Number of Employees

The number of employees was compared for operations that primarily sold containerized plants (more than 50 percent of sales) and other product forms (Tables 5-7). For wholesale only firms in the U.S., in 2009, firms primarily selling containerized plants had significantly more permanent employees than firms selling other product forms (Table 5). The number of employees was not significantly different between the two product forms in 2014 or 2019, nor were the results for temporary/seasonal and H-2A employees significant. However, the reported number of permanent employees decreased from 2009 to 2014 for container firms. The number of temporary/seasonal



employees for container firms also decreased from 2014 to 2019 by more than 50 percent. The number of H-2A workers decreased from 2014 to 2019 in firms selling plants in other forms. For retail only firms, in 2009 and 2014, primarily container operations had more employees than operations selling other product forms. There were no significant differences in 2019. The temporary/seasonal and H-2A employees were not significantly different across product forms for retail only operations. Survey year did not influence employee numbers for retail only operations. Some of the lack of significance in retail only operations may be attributed to the nature of retail sales where many plants are sold in containers for ease of transport, storage, etc., and the number of employees is dependent upon retail-related tasks and activities (e.g., cashiering, display management, restocking plants, watering, etc.) rather than production-oriented tasks (e.g., potting into containers, rooting plants, grafting, etc.). Additionally, the significant changes in the production firms may reflect the labor shortage observed among agricultural firms whereas retail staffing tends to be more stable. For the mixed operations, the product form did not significantly influence the number of employees. However, the number of permanent employees decreased for container operations between 2009 and 2019 by more than 50 percent.

**Table 5.** Average Number of Employees for Wholesale, Retail, and Mixed Operations in the U.S., by Product Form (Container Operation vs. Other Forms).

	2009 <sup>z</sup>		2014 <sup>z</sup>		2019 <sup>z</sup>		Year Sig. <sup>y</sup>
	Container	Other Forms	Container	Other Forms	Container	Other Forms	
<b>Wholesale Only Operations</b>							
Permanent Employees	29.3	14.6 a	25.1	16.9	13.0	15.9	c
Temporary/Seasonal	22.4	16.9	26.3	20.9	10.6	11.5	d
H-2A <sup>x</sup>	---	---	3.0	9.8	2.6	2.0	g
<b>Retail Only Operations</b>							
Permanent Employees	6.4	3.2 a	4.5	1.7 a	4.8	3.5	
Temporary/Seasonal	8.1	5.8	6.0	3.8	7.4	4.8	
H-2A <sup>x</sup>	---	---	0.1	0	0.2	0	
<b>Mixed Operations</b>							
Permanent Employees	10.4	7.3	8.1	6.3	5.6	7.1	c
Temporary/Seasonal	8.8	9.8	7.2	7.7	5.6	8.3	
H-2A <sup>x</sup>	---	---	0.9	1.1	0.8	0.5	

<sup>z</sup>a indicates significance at the 10 percent level between container and other forms.

<sup>y</sup> significance between survey years for container operations where b=significance between 2009 and 2014, c=significance between 2009 and 2019, and d=significance between 2014 and 2019 at the 10 percent level. For other product form operations, significance is indicated at e=significance between 2009 and 2014, f=significance between 2009 and 2019, and g=significance between 2014 and 2019 at the 10 percent level.

\* Data related to H-2A employees were only collected in the 2014 and 2019 surveys.

In the five-state region, very few significant differences were observed between container and other form operations (Table 6). In 2009, wholesale only firms who primarily sold containerized plants had more permanent employees than firms selling other product forms. In 2019, wholesale only firms selling other product forms had more temporary/seasonal employees than container firms. No significant differences were observed in retail only firms. The number of H-2A workers at other product form firms was higher in 2014 than 2019. Container firms that sold retail only reported having more permanent employees in 2009 relative to 2014. In 2009, mixed firms who sold other product forms employed more temporary/seasonal employees than container operations. Mixed firms who primarily sold other product forms reported having more temporary/seasonal employees in 2009 than in 2014.

**Table 6.** Average Number of Employees for Wholesale, Retail and Mixed Operations in the Five-state Region, by Product Form (Container Operation vs. Other Forms).

	2009 <sup>z</sup>		2014 <sup>z</sup>		2019 <sup>z</sup>		Year Sig. <sup>y</sup>
	Container	Other Forms	Container	Other Forms	Container	Other Forms	
<b>Wholesale Only Operations</b>							
Permanent Employees	26.1	9.0 a	36.5	29.3	5.9	7.1	
Temporary/Seasonal	11.7	13.5	26.4	14.4	2.4	19.6	a
H-2A <sup>x</sup>	---	---	0.0	20.9	0.7	1.9	g
<b>Retail Only Operations</b>							
Permanent Employees	7.5	3.1	2.2	2.3	5.2	8.0	b
Temporary/Seasonal	5.8	2.5	4.1	2.8	2.6	10.0	
H-2A <sup>x</sup>	---	---	0.1	0.0	0.0	0.0	
<b>Mixed Operations</b>							
Permanent Employees	10.2	13.1	5.3	4.6	5.0	5.0	
Temporary/Seasonal	5.0	9.9 a	5.2	3.1	5.7	3.5	e
H-2A <sup>x</sup>	---	---	0.9	5.0	0.2	0.7	

<sup>z</sup>a indicates significance at the 10 percent level between container and other forms.

<sup>y</sup> significance between survey years for container operations where b=significance between 2009 and 2014, c=significance between 2009 and 2019, and d=significance between 2014 and 2019 at the 10 percent level. For other product form operations, significance is indicated at e=significance between 2009 and 2014, f=significance between 2009 and 2019, and g=significance between 2014 and 2019 at the 10 percent level.

\*Data related to H-2A employees were only collected in the 2014 and 2019 surveys.

Tennessee firms did not exhibit a lot of variance across firm types, product forms and survey years (Table 7). However, wholesale only operations in 2019 reported slightly greater numbers of permanent and temporary/seasonal employees in operations selling their products in other forms than in primarily containerized operations. Between years, container operations selling wholesale only employed more temporary/seasonal employees in 2009 than in 2019, perhaps due to the uncertain economy following the Great Recession.

**Table 7.** Average Number of Employees for Wholesale, Retail and Mixed Operations in Tennessee, by Product Form (Container Operation versus Other Forms).

	2009 <sup>z</sup>		2014 <sup>z</sup>		2019 <sup>z</sup>		Year Sig. <sup>y</sup>
	Container	Other Forms	Container	Other Forms	Container	Other Forms	
<b>Wholesale Only Operations</b>							
Permanent Employees	14.6	8.1	5.8	2.2	1.2	3.5	a
Temporary/Seasonal	9.6	8.2	2.6	3.9	0.2	2.8	ac
H-2A <sup>x</sup>	---	---	0.0	1.3	0.0	0.0	
<b>Retail Only Operations</b>							
Permanent Employees	20.7	1.5	2.5	0.0	12.7	0.0	
Temporary/Seasonal	13.7	2.5	2.3	0.0	13.7	0.0	
H-2A <sup>x</sup>	---	---	0.0	0.0	0.0	0.0	
<b>Mixed Operations</b>							
Permanent Employees	8.1	7.6	5.8	7.5	5.0	4.0	
Temporary/Seasonal	4.2	4.5	4.4	3.2	9.8	3.5	
H-2A <sup>x</sup>	---	---	0.0	0.0	0.0	0.0	

<sup>z</sup>a indicates significance at the 10 percent level between container and other forms.

<sup>y</sup> significance between survey years for container operations where b=significance between 2009 and 2014, c=significance between 2009 and 2019, and d=significance between 2014 and 2019 at the 10 percent level. For other product form operations, significance is indicated at e=significance between 2009 and 2014, f=significance between 2009 and 2019, and g=significance between 2014 and 2019 at the 10 percent level.

\*Data related to H-2A employees were only collected in the 2014 and 2019 surveys.



## Summary and Discussion

This report summarizes labor and firm characteristics for the U.S. green industry from 2009 to 2019 nationally, for a defined five-state region in the Southeast, and for the state of Tennessee. Overall trends show a slight constriction in the average number of employees in the green industry. This is particularly evident in U.S. wholesale only operations where permanent, temporary/seasonal and H-2A worker numbers were the lowest in 2019 relative to the other survey years. Interestingly, the temporary/seasonal employee numbers were up in 2014 relative to 2009, which may reflect residual Great Recession impacts. Specifically, given that the green industry is closely tied to the housing market, the recession negatively impacted the industry resulting in consolidation in the number of firms and size of firms (Hodges et al., 2010). The employment trends, particularly in the 2009 survey, may reflect the gradual rebound by the industry where they were still recovering from the recession, which likely impacted their labor needs. The tight margins of green industry firms are another factor that likely impacted the type of labor employed. For instance, temporary/seasonal employees are less expensive given that the employer does not typically pay their benefits and employers can more easily add or subtract employees as work demand shifts throughout the growing season. As a result, temporary/seasonal employees may be an attractive option for firms, particularly those with seasonal products (e.g., nursery stock) where labor needs are not consistent throughout the year.

The survey results provide specific information that may assist Tennessee producers, educators and policymakers. In Tennessee, nurseries representing only wholesale production composed 55 percent, 26 percent and 44 percent of responses in 2009, 2014 and 2019, respectively. Container production represented the majority of annual sales of Tennessee respondents for all three survey years. Over the 10-year time period, the portion of sales by primarily container operations reflected in survey responses increased from 2-fold greater than balled and burlapped plants to 3.5-fold greater. In 2019, there were just 12 responses from wholesale only growers, which may have contributed to the large variation in data and thus the general lack of statistical significance in spite of large changes in responses over the time period. Non-significant trends are presented for discussion purposes only.

Mirroring anecdotal information, employee numbers at Tennessee nurseries trended downward over time, but as noted above, these decreases were generally not statistically significant. For example, irrespective of product form, there were 75 percent fewer permanent employees and 82 percent fewer temporary or seasonal employees in 2019 than in 2009 for all wholesale only operations combined. Likewise, while permanent employees decreased from 14.6 in 2009 to 1.2-92 percent fewer employees at container operations in 2019, this change was also not statistically significant. A significant downward trend occurred among wholesale only firms regarding temporary/seasonal jobs in container operations, a decrease from 9.6 employees in 2009 to 0.2 in 2019. Among retail only operations, permanent employees decreased 39 percent from 2009 to 2019 (not significant) while there was no percentage change in temporary or seasonal employees such that in 2019 the number of permanent and seasonal employees were comparable. At mixed operations with primarily container production, permanent employees decreased 38 percent from 2009 to 2019, but temporary and seasonal positions increased 1.3-fold in Tennessee.

Production of bare root plants has increased in Tennessee in recent years. This is important given that bare root plants typically require less labor than container-grown plants. This shift in type of product may have impacted labor needs. Driving factors behind this shift still need to be addressed. Tennessee retail operators appear to be utilizing proportionately more temporary or seasonal workers. Moreover, across all three operation types very few H-2A program positions appear to be utilized. Effectively recruiting, managing and retaining non-permanent employees are topics that future research and Extension programming could address to assist the nursery industry. Additionally, given the general decrease in employees, scientists and Extension professionals may need to explore strategies to more efficiently utilize the existing labor force and ways to maintain and increase production with a limited workforce.

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