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ESTIMATED ECONOMIC CONTRIBUTIONS FROM THE NURSERY/ GREENHOUSE INDUSTRY IN TENNESSEE

by

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Estimated Economic Contributions from the Nursery/Greenhouse Industry in Tennessee

Study Purpose — The purpose of this study is to project the economic contributions of Tennessee’s nursery/greenhouse production industry to the state’s economy. By projecting the economic contributions, not only can the direct effects from the state’s industry be measured but also the multiplier effects of the industry. For example, economic impacts occur when nursery/greenhouse industry producers purchase inputs and supplies from in-state businesses. Also, economic impacts occur when workers who are employed by nursery/greenhouse firms spend their income on goods and services produced in Tennessee.

Methods — To measure the economic impacts from the nursery/greenhouse industry, several data sources were used. These include a) data from a 2020 survey of green industry growers and participants, b) 2017 Census of Agriculture data for Tennessee, c) 2018 Census County Business Patterns, and d) the economic input/output model IMPLAN.

Survey Methods — The survey sample (n=1,380) was comprised of Tennessee Department of Agriculture license holders in nursery (n=581), greenhouse (n=257), and dealer (n=542) categories. The “dealer” category did not include “big box” home improvement and discount stores that have retail sales of nursery products but did include smaller mixed-product type retailers such as hardware stores and green grocers who sell plants. The sample for dealers was drawn from nursery growers, grower/retailers, and local retailers or wholesalers that are representative of the majority of these businesses in Tennessee.

The survey used a mixed-mode method following the framework of Dillman et al. (2014). Of the 1,380 license holders, 1,177 had email addresses and were contacted. These nursery growers, retailers and wholesalers received up to three email invitations to participate in the survey, followed by one invitation by USPS, which included a mailed paper survey. The remaining 203 sample members received up to two mailed surveys and one mailed reminder postcard. Sample members who had participated in the survey did not receive follow-up invitations. A copy of the survey instrument is available in the Appendix of this document.

Survey distribution began in mid-February 2020 and ended in mid-May. The goal of the broad window for distribution and response was to ensure surveys arrived at different points in the nursery production calendar, given that some business types are very busy in late winter/early spring and others in late spring. Email invitations to participate in the survey were sent twice in February 2020 and once in May 2020. Mailed surveys were distributed once in February 2020, again in March 2020, and finally in May 2020.

A total of 258 survey responses were received. The response rate is calculated at 20.6%. This accounts for the 7.5% of the sample being not deliverable by mail and 1.3% of the sample reporting they are out of business.

Business Type, Sales, and Expenditure Questions — To project the economic contributions from the firms within the nursery/greenhouse industry, several survey questions (Questions 1 and 12—see Appendix) were first used to classify the firms. These questions asked a) about the percent of sales from different types of business activities (nursery/greenhouse grower, retail nursery/garden center, broker/re-

wholesaler, landscape services) and b) the percent of retail sales direct to consumers versus sales to landscapers and wholesalers/brokers. Nursery/greenhouse crop producers who were not also retailers were classified in the nursery/greenhouse grower category. Respondents who produced nursery/greenhouse crops and also sold at retail were classified as nursery/greenhouse growers with retailing. Those who retailed or wholesaled (merged due to small numbers wholesaling) but did not grow were classified as retailers/not growers. A few responding businesses also provided some landscape services, but if they primarily landscaped, they were removed from the sample. The business classifications are shown in Table 1. As can be seen, most of the 198 businesses were nursery/greenhouse growers (95 respondents, or 48 percent), while others also had a retailing business (58 respondents, or 29.3 percent). Among respondents, 22.7 percent (45 respondents) did not grow nursery/greenhouse crops and were either brokers or retailers. Considering only growers in the percentage calculations, about 62.1 percent were growers who did not retail, while 37.9 percent had both growing and retailing business components.

Table 1. Classification of the Nursery/Greenhouse Businesses Based on Survey Responses

<i>Type of business</i>	Number	Percent of Sample
1-nursery/greenhouse grower	95	48.0
2-nursery/greenhouse grower with retailing	58	29.3
3-retailer/not grower (broker or retailer, no production)	45	22.7
Total	198	100.0%

Census of Agriculture — According to the 2017 Census of Agriculture, Tennessee has 946 firms in greenhouse, nursery, and floriculture production (USDA/NASS, 2019). Among these are 36 sod operations and 22 cut flower operations. These two firm categories are excluded to focus on the nursery/greenhouse crops industry; this gives 888 total operations in Tennessee involved with growing nursery/greenhouse crops. Therefore, 551 out of the 888 firms are nursery/greenhouse growers, while 337 grow and retail their plants.

County Business Patterns — For the third category of business type (those who retail or wholesale but do not grow plants), the data showed that the majority of these firms retailed directly to consumers. Hence, for NAICS Code 444220 (*Nursery, Garden Center, & Farm Supply Stores*) the number of firms for Tennessee from the 2018 County Business Patterns was used for analyzing this business category (US Census/CBP, 2018). This industry is comprised of establishments primarily engaged in retailing landscape and garden products, such as trees, shrubs, annuals, perennials, seeds, bulbs, and sod, that are predominantly grown elsewhere. In Tennessee, there are 335 of these types of firms. Because this study focuses on industry participants for which plants are the primary product, we did not survey large retailer chains or farm supply store chains. To use the NAICS data, we similarly excluded large firms and retained small firms, i.e., those with fewer than 20 employees. The resulting number of nursery/greenhouse retail firms that do not grow plants is 279.

Statewide Number of Firms, Projections — With these 279 firms included as category 3 (Retailer/not Grower), the statewide distribution of the number of firms in each category is similar to that of the survey respondents. As shown in Table 2, the projected number of growers is 551, while 337 growers/retailers are projected. Firms that retail but do not grow nursery/greenhouse crops are projected at 279. This represents 47.2 percent growers, 28.9 percent grower/retailers, and 23.9 percent other firms that primarily retail but do not grow crops. This is similar to the percentages classified based on the survey responses at 48.0, 29.3, and 22.7 percent, respectively. Also, the percentages of firms that

were considered growers or grower retailers statewide, as seen in Table 2, is 76 percent (888/1,167), while among the respondents, this percentage is 77 percent (153/198).

Table 2. Projected Number of Nursery/Greenhouse Firms Statewide for Tennessee

<i>Business Category</i>	Projected Statewide Firms	Estimated Percent	Sample Number Firms	Percent of Sample
1-Nursery/greenhouse grower* (NAICS 111421)	551	47.2	95	48.0
2-Nursery/greenhouse grower with retailing* (NAICS 111421, NAICS 444220)	337	28.9	58	29.3
3-Retailer/not grower (broker, retailer, landscape with no production)*** (NAICS 444220)	<u>279</u>	23.9	<u>45</u>	<u>22.7</u>
Sum	1,167		198	100.0%

*NAICS 111421 Nursery stock growing, 444220 Garden centers.

**Census of Agriculture lists 888 nursery/greenhouse grower firms (excluding sod and cut flower firms). This number is multiplied by percentages of respondents in business categories 1 or 2 when divided by the sum in categories 1 and 2 (ex: 95/ (95+58)).

*** The County Business Patterns number of firms in NAICS 444220 for TN that have 20 employees or less (to eliminate large garden center chains and farm store chains) is used.

Employees, Sales, and Expenditures — To estimate the economic contribution of the industry, not only are projections of firm numbers needed, but also information is needed about the firms’ average employee numbers, payroll, sales, and expenses (See survey question 7). The averages in the tables that follow were calculated for responses to particular questions related to these firm-specific metrics. Table 3 displays the average number of employees per firm, as well as payroll. Note that firms with \$10 million or greater in sales were removed from the analysis as they were much larger than the other firms used in the study. To calculate the value per firm, the average payroll across firms is divided by the average number of employees. The economic input/output model uses counts for each employee, whether s/he is part- or full-time. These averages per firm were multiplied by the number of firms in a particular business category (1-3) in the state (from the Census of Agriculture).

Table 3. Average Employees and Payroll Per Firm, by Business Category for Tennessee Nursery/Greenhouse Firms

<i>Business Category</i>	<i>Measure</i>	Average Per Firm ^{**} (N=127)				Total
		Full-time employees	Part-time, year-round employees	Non H-2A Temporary or seasonal employees ^{***}	Temporary workers through H-2A program ^{****}	
1-Nursery/ greenhouse grower (n1=60)*****	Number	5.5	1.5	1.1	1.9	10.0
	Annual Payroll	\$318,574	\$7,390	\$7,727	\$36,380	\$370,071
2-Nursery/ greenhouse grower with retailing (n2=37)	Number	7.1	3.8	1.0	0.0	11.9
	Annual Payroll	\$222,546	\$51,238	\$9,762	0.0	\$283,546
3-Retailer/not grower (n1=30)	Number	3.3	0.8	2.9	0.0	7.0
	Annual Payroll	\$100,067	\$3,125	\$6,331	0.0	\$109,523

*Payroll excludes benefits or other employee costs.

** If a firm answered any part of the number of employees in question 7, but not another, that missing value was counted as a zero. The same method was used for payroll. If a respondent did not answer any part of question 7, these were treated as missing values.

***Temporary or seasonal employees, excluding H-2A workers, is the average number during peak season.

****Temporary workers through H-2A program payroll excludes housing and transportation costs in payroll estimate, and hence these costs are not included in the economic impacts.

***** n1, n2, and n3 are the numbers of firms answering for each type.

Table 4 presents the 2019 average sales per firm across each business category (see question 11 of the survey). Again, this average is multiplied by the number of firms statewide in the three business categories. Table 5 shows the average expenses by type (e.g., equipment, etc.) for each business category (question 16 of the survey). As with labor and payroll, the averages are calculated across respondents who answered the multipart expense question. The column labeled “% TN” in Table 5 reflects survey respondents’ percentages for each particular input they stated was purchased in Tennessee. Expenditures on items not purchased in Tennessee would not have economic impacts within the state’s economy. When applied in the economic input/output model, the dollar value for each type of expense is multiplied by the percent purchased in Tennessee and the number of firms statewide in a particular business category (1-3).

Table 4. Average 2019 Sales Per Firm, By Business Category For Tennessee Nursery/Greenhouse Firms

Business Category	Average 2019 Sales Per Firm* (N=143)
1-Nursery/greenhouse grower (n1=69)**	\$848,269
2-Nursery/greenhouse grower with retailing (n2=42)	\$1,217,763
3-Retailer/not grower (n3=32)	\$475,370

*Calculated using midpoints of a categorical 2019 sales question in the survey.

** n1, n2, and n3 are the numbers of firms answering for each type.

Table 5. Average Expenditure Per Firm, by Business Category for Tennessee Nursery/Greenhouse Firms

Expense Categories	Averages (N=93)*, **					
	1-Nursery/ greenhouse grower (n1=45)		2-Nursery/ greenhouse grower with retailing (n2=27)		3-Retailer/ not grower (n3=21)	
	Expense*	% TN	Expense*	% TN	Expense	% TN
Equipment Expenses						
Maintenance/repair of structures (including overwintering houses and equipment storage buildings)	\$7,688	90	\$13,014	90	\$1,011	90
New/used equipment purchases, including vehicles	\$21,494	90	\$21,620	90	\$1,091	90
Equipment leases/rentals, including vehicles	\$194	100	\$4,586	100	\$1	100
Equipment maintenance/repair (including vehicles; excluding irrigation repair)	\$10,331	100	\$10,167	100	\$136	100
Equipment supplies	\$10,774	98	\$2,220	98	\$54	98
Fuel for machinery operations (not for pumping water)	\$7,666	95	\$9,928	95	\$153	95
Other equipment expense	\$224	100	\$210	100	\$0	100

Table 5. Continued

Expense Categories	Averages (N=93)*,**					
	1-Nursery/ greenhouse grower (n1=45)***		2-Nursery/ greenhouse grower with retailing (n2=27)		3-Retailer/ not grower (N3=21)	
	Expense*	% TN****	Expense	% TN	Expense	% TN
Utility And Other Overhead Expenses (excluding irrigation expenses)						
Water/sewer (does not include irrigation water)	\$3,648	100	\$1,404	100	\$85	100
Electricity	\$5,844	100	\$3,759	100	\$462	100
Natural gas	\$2,648	100	\$1,402	100	\$153	100
Insurance	\$7,323	95	\$19,242	95	\$586	95
Training	\$482	100	\$504	100	\$68	100
Other overhead expenditures	\$1,957	100	\$2,255	100	\$83	100
Irrigation Expenses						
Irrigation water	\$948	100	\$2,489	100	\$65	100
Irrigation repairs and maintenance, e.g., replacing pipe or cleaning emitters	\$1,159	89	\$2,131	89	\$41	89
Irrigation filtration and maintenance, including chlorination or sanitizing	\$171	100	\$220	100	\$0	100
Fuel/utilities for pumping water	\$726	100	\$544	100	\$118	100
Plant Propagation, Production, & Shipping Expenses						
Liners purchased (i.e., bareroot or container-grown trees & shrubs)	\$71,820	62	\$55,470	62	\$141	62
Other propagules (seed, root stock, plugs, etc.)	\$20,675	59	\$12,764	59	\$137	59
Pesticides and fertilizers (including lime and sulfur)	\$10,760	91	\$6,865	91	\$1,399	91
Container substrate, soil conditioners (e.g., compost)	\$20,465	96	\$7,083	96	\$554	96
Burlap, labels, containers, and other supplies for producing plants	\$6,788	95	\$15,371	95	\$211	95
All other plant expenses (except wages)	\$5,455	100	\$2,267	100	\$588	100
Total expenses	\$219,240		\$195,514		\$7,137	

*The expense reported is from in and out of state.

** If a firm answered any part of the expenditures in question 16, but not another, that missing value was counted as a zero. If they answered none the response was counted as a missing value.

*** n1, n2, and n3 are the numbers of firms answering for each type.

**** The percentages purchased in Tennessee were from the survey responses and may vary from the regional purchase coefficients (RPCs) (purchased locally) in IMPLAN.

Input/Output Model - IMPLAN, an economic input/output model, is used for the state of Tennessee's 2018 economy (IMPLAN, 2018). This model includes over 540 industries that are classified based on the North American Industry Classification System (NAICS) in Tennessee's economy and measures the economic transaction (buying/selling) relationships among industries in the economy.

For each type of business category, expenditure and employment data from the survey are used along with the estimated numbers of firms in Tennessee to project statewide expenditures and jobs by the nursery/greenhouse industry. These statewide projections are then used within the IMPLAN model to project the economic activity including both direct and multiplier effects.

Tables 3, 4, and 5 report labor costs, sales, and variable expenses used in the IMPLAN modeling. Note that these costs do not include fixed costs such as land rents and investment capital outlays. Examples of fixed costs might include building greenhouses or purchasing additional land. For this analysis, they are accounted for in proprietor's income and their impact are based on the proprietor's consumption function. It should be noted that fixed costs such as investments would increase the impact of the greenhouse/nursery industry to the state's economy. However, these are not part of year-to-year variable costs.

Economic Impact Projections — Combined expenditures for 1-Nursery greenhouse growers, 2-Nursery/greenhouse growers with retailing, and 3-Retailers/not growers the direct economic contributions are \$131.6 million, which supported 1,654 jobs (Table 6). The direct value-added contribution was \$61.5 million. The direct labor income earned was \$46.4 million. When the multiplier effects through the economy (both from purchases of input supplies and services by the green industry firms and from spending in the local economy from the wages earned) are included, the estimated total economic contribution to the state's economy was \$245.2 million. Total employment contribution was 2,363 jobs. For value added and labor income, the total estimated contributions were \$122.3 million and \$84.0 million, respectively. Total nursery/greenhouse industry expenditures generated \$11.3 million in state and local taxes. Of the combined expenditures, 1-Nursery/greenhouse growers comprise the largest economic contribution to the state at \$155.6 million in economic activity, followed by 2-Nursery/greenhouse growers with retailing (\$86.6 million) and 3-Retailers/not growers (\$3.0 million). For the remaining metrics (employment, labor income, and total value added), 1-Nursery/greenhouse growers are also projected to have the largest values among the three business categories.

Economic impact modeling also enables measurement of the impacts on other industries from the nursery/greenhouse industry's economic activity. There are three different impacts measured by the model. The initial impact of direct impact results from sales of the products produced by the industry studied. The other two impacts occur because of the industry's input purchases of goods and services to operate the nursery/greenhouse businesses and the payment of employee wages and salaries and their purchase of goods and services. These three impacts are summed to develop a total impact. For 1-Nursery/greenhouse growers, the top five industries impacted (backward linked through the market channel) are:

- greenhouse, nursery, and floriculture production;

- support activities for agriculture and forestry (firms that provide support services for agriculture and forestry);
- insurance carriers;
- building material and garden equipment and supply stores; and
- lawn and garden equipment manufacturing.

This predominantly also holds true for 2-Nursery greenhouse growers with retailing and 3-Retailers/not growers with the exception of the addition of maintenance and repair construction of nonresidential structures. For employment, the top five industries impacted are:

- support activities for agriculture and forestry;
- greenhouse, nursery, and floriculture production;
- building material and garden equipment and supply stores;
- automotive repair and maintenance; and
- commercial and industrial machinery and equipment repair and maintenance.

Table 6. Estimated 2020 Economic Contributions for Expenditures from Tennessee’s Nursery/Greenhouse Industry

<i>Measure</i>			<i>1-Nursery/ greenhouse grower</i>	<i>2-Nursery/ greenhouse grower with retailing</i>	<i>3-Retailer/ not grower</i>	Total
Total Industry Output	(Million \$)	Direct	\$84.4	\$46.6	\$1.6	\$132.6
		Total	\$155.6	\$86.6	\$3.0	\$245.2
Employment	(Jobs)	Direct	1,146	487	20.0	1,654
		Total	1,601	733	28.0	2,363
Labor Income	(Million \$)	Direct	\$31.1	\$14.5	\$0.8	\$46.4
		Total	\$54.9	\$27.8	\$1.2	\$83.9
Total Value Added	(Million \$)	Direct	\$39.4	\$21.2	\$0.9	\$61.5
		Total	\$78.0	\$42.7	\$1.6	\$122.3
State/Local Taxes	(Million \$)	Total	\$7.0	\$4.2	\$0.1	\$11.3

Combining payroll for 1-Nursery/greenhouse growers, 2-Nursery/greenhouse growers with retailing, and 3-Retailers/not growers, the direct economic contributions are \$334.2 million, which was responsible for 11,473 jobs (Table 7). The direct value added and labor income earned was also \$334.2 million. The estimated total economic contribution from payroll was \$622.7 million. Total employment contribution was over an estimated 14,300 jobs. For value added and labor income, the total estimated contributions were \$503.2 million and \$436.4 million, respectively. Total nursery/greenhouse industry payroll generated \$15.8 million in state and local taxes. 1-Nursery/greenhouse growers had the largest payroll economic contribution to the state of \$384.7 million in economic activity, followed by 2-Nursery/greenhouse growers with retailing (\$180.3 million) and 3-Retailers/not growers (\$57.7 million). For the remaining metrics (employment, labor income, and total value added), nursery/greenhouse growers again had the largest values.

The income and wages earned by workers in the nursery/greenhouse industry are spent throughout the economy, and, hence, the industries providing goods and services are impacted. This employee/

household spending would include items such as housing, medical services, restaurants, retail stores, and other services. For all three nursery/greenhouse business categories, the top five industries impacted based on economic activity are:

- owner-occupied dwellings,
- hospitals,
- physicians;
- real estate, and
- limited service restaurants.

For employment, the top five industries impacted are:

- full service restaurants,
- limited service restaurants,
- hospitals,
- physicians, and
- general merchandise retail stores.

Table 7. Estimated 2020 Economic Contributions for Payroll from Tennessee’s Nursery/Greenhouse Industry

<i>Measure</i>			<i>1-Nursery/ greenhouse grower</i>	<i>2-Nursery/ greenhouse grower with retailing</i>	<i>3-Retailer/not grower</i>	<i>Total</i>
Total Industry Output	(Million \$)	Direct	\$206.5	\$96.8	\$30.9	\$334.2
		Total	\$384.7	\$180.3	\$57.7	\$622.7
Employment	(Jobs)	Direct	5,510	4,010	1,953	11,473
		Total	6,645	5,542	2,123	14,310
Labor Income	(Million \$)	Direct	\$206.5	\$96.8	\$30.9	\$334.2
		Total	\$269.6	\$126.4	\$40.4	\$436.4
Total Value Added	(Million \$)	Direct	\$206.5	\$96.8	\$30.9	\$334.2
		Total	\$310.9	\$145.7	\$46.6	\$503.2
State/Local Taxes	(Million \$)	Total	\$9.7	\$4.6	\$1.5	\$15.8

Estimated net returns can be calculated from the survey data by taking the average sales per firm and subtracting expenditures and payroll from the survey respondents. Combining net returns for 1-Nursery/greenhouse growers, 2-Nursery/greenhouse growers with retailing, and 3-Retailers/not growers, the direct economic contributions are \$498.0 million (Table 8). The direct value added and labor income earned was also \$498.0 million. The estimated total economic contribution from net returns was \$927.8 million. Total employment contribution was over an estimated 2,700 jobs. For value added and labor income, the total estimated contributions were \$749.9 million and \$650.2 million, respectively. Total nursery/greenhouse industry net returns generated \$23.5 million in state and local taxes. 1-Nursery/greenhouse growers with retailing had the largest net return economic contribution to the state of \$469.7 million in economic activity, followed by 2-Nursery/ greenhouse growers (\$269.2 million) and 3-Retailers/not growers (\$188.8 million). For the remaining metrics (employment, labor

income, and total value added), nursery/greenhouse with retailing had the largest values. For all business categories, the top five industries impacted based on economic activity are owner-occupied dwellings, hospitals, physicians, real estate, and limited service restaurants. For employment, the top five industries impacted are full service restaurants, limited service restaurants, hospitals, physicians, and general merchandise retail stores.

Table 8. Estimated 2020 Economic Contributions for Net Returns from Tennessee’s Nursery/Greenhouse Industry

<i>Measure</i>			<i>1-Nursery/ greenhouse grower</i>	<i>2-Nursery/ greenhouse grower with retailing</i>	<i>3-Retailer/ not grower</i>	Total
Total Industry Output	(Million \$)	Direct	\$144.5	\$252.1	\$101.4	\$498.0
		Total	\$269.2	\$469.7	\$188.8	\$927.8
Employment	(Jobs)	Direct	0.0	0.0	0.0	0.0
		Total	794.0	1,386.0	557.0	2,737.0
Labor Income	(Million \$)	Direct	\$144.5	\$252.1	\$101.4	\$498.0
		Total	\$188.7	\$329.2	\$132.3	\$650.2
Total Value Added	(Million \$)	Direct	\$144.5	\$252.1	\$101.4	\$498.0
		Total	\$217.6	\$379.6	\$152.6	\$749.9
State/Local Taxes	(Million \$)	Total	\$6.8	\$11.9	\$4.8	\$23.5

*Net returns above fixed costs.

The estimated economic contributions (i.e., Tables 6, 7, and 8 summed) to Tennessee for expenditures, payroll, and net returns for the nursery/greenhouse industry are shown in Table 9.

Table 9. Estimated 2020 Economic Contributions for Expenditures, Payroll, and Net Returns from Tennessee’s Nursery/Greenhouse Industry

<i>Measure</i>			<i>1-Nursery/ greenhouse grower</i>	<i>2-Nursery/ greenhouse grower with retailing</i>	<i>3-Retailer/ not grower</i>	Total
Total Industry Output	(Million \$)	Direct	\$435.4	\$395.5	\$133.9	\$964.8
		Total	\$809.5	\$736.6	\$249.5	\$1,795.6
Employment	(Jobs)	Direct	6,656	4,497	1,973	13,126
		Total	9,040	7,661	2,708	19,409
Labor Income	(Million \$)	Direct	\$382.1	\$363.4	\$133.1	\$878.6
		Total	\$513.2	\$483.4	\$173.9	\$1,170.5
Total Value Added	(Million \$)	Direct	\$390.7	\$370.1	\$133.2	\$894.0
		Total	\$606.5	\$568.0	\$200.8	\$1,375.3
State/Local Taxes	(Million \$)	Total	\$23.5	\$20.7	\$6.4	\$50.6

Conclusions and Limitations — This study provides estimates of the economic impacts of nursery/greenhouse growers, grower/retailers, and smaller retailers in Tennessee. The industry directly contributes nearly \$965 million in economic activity to the state’s economy and with multiplier effects, nearly \$1.8 billion. The industry employs 13,126 directly and with multiplier effects, 19,409. Estimates were derived using data from an industry survey, Census of Agriculture, County Business Patterns, and the economic input/output model called IMPLAN.

It is important to note that this study has several limitations. First, the data represent a snapshot in time. Industry and economic circumstances are continually changing; hence, the study reflects measures of industry expenditures at the time of the study. In the past year, the nursery/greenhouse industry has, as many other industries, been impacted by the COVID-19 pandemic. To measure how the industry changes with these economic circumstances, analysis would need to be conducted over multiple years. Second, we did not capture land rents, capital outlays for buildings and equipment, management wages, and other fixed costs; therefore, the net returns we project are above these costs. Also, IMPLAN is a model that represents backward linkages, and not forward linkages. Hence, additional future analysis is needed to measure gardening expenditures by home gardeners, landscapers, and other end users of nursery/greenhouse products. This study also limited retailers to smaller retailers (under \$10 million) to provide a conservative measure of the industry’s economic activity that does not include larger retail chains, such as big box stores, farm supply store chains, and other larger retailers.

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Appendix: Survey Instrument

TENNESSEE NURSERY/GREENHOUSE INDUSTRY SURVEY

CHARACTERISTICS OF YOUR BUSINESS

1. What percent of your sales was from each of these business activities in 2019?
____% Nursery/greenhouse grower
____% Retail nursery/garden center
____% Broker/re-wholesaler
____% Landscaping services → *If Landscaping is 100%, your survey is complete. Please return it in the envelope provided.*
 None of the above – check this box if you are not involved in the business activities listed.

→ *Thank you. Your survey is complete. Please return it in the envelope provided.*
2. In what Tennessee **county** is your business primarily located? _____
3. In what **year** was your business established? _____ (Please record the first year of operation, even if the name, ownership structure or business type has changed since its establishment.)
4. In what category do you hold your Tennessee Department of Agriculture certification?
 Nursery

 Greenhouse

 Dealer
5. For 2019, report greenhouse, other covered space, and outdoor land area used for the production of horticultural crops. Include aisles, walkways, and other production areas. Exclude nonagricultural production areas and areas growing non-horticultural crops.
_____ Sq ft greenhouse area (include heated and unheated structures)
_____ Sq ft in shade structure area
_____ Acres in natural shade production
_____ Acres of open area to grow horticultural crops (excluding sod and Christmas trees)
6. *Only for dealers/brokers/re-wholesalers:* Please record the area of your business space used for all aspects of plant production and plant sales not reported in Question 5.
_____ Sq ft for plant sales

LABOR

7. On average in 2019, how many employees did your business operation have? Please report by employee type and include the annual payroll for each type. Include only those employees involved in activities related to plant sales (propagation, production, pest management, sales, shipping, etc.)

Employees	Number	Annual Payroll (excluding benefits or other employee costs)
Full-time employees	_____	\$ _____
Part-time, year-round employees	_____	\$ _____
Temporary or seasonal employees, excluding H-2A workers (avg. number during peak season)	_____	\$ _____
Temporary workers through H-2A program (exclude housing and transportation costs in payroll estimate)	_____	\$ _____

8. How has the number of employees in each category changed in the last three years? Consider only those employees involved in activities related to plant sales (propagation, production, pest management, sales, shipping, etc.).

Employees	Change in last 3 years			% change (if any)
	Decreased	No change	Increased	
Full-time employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %
Part-time, year-round employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %
Temporary or seasonal employees, excluding H-2A workers (avg. number during peak season)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %
Temporary workers through H-2A program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ %

9. Please indicate the extent to which each scenario describes your labor situation.

	Not at all like me	Slightly like me	Somewhat like	Exactly like me
My business has experienced a labor shortage within the last three years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My labor issues are greater now than they were three years ago	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A shortage of labor is constraining my ability to maintain production levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A shortage of labor is constraining my ability to increase production levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Measures I'm taking to address the labor shortage are negatively affecting my profitability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is challenging to hire local labor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is challenging to retain local labor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The wage rate for local labor is not affordable for my operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The process and paperwork to acquire H-2A labor prohibits me from using this labor type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing housing and transportation for H-2A laborers prohibits me from using this labor type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would rather scale back production than contract H-2A laborers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Which of the following things are you doing, or doing more of, to address labor shortages in the last three years? Check all that apply.

- Adopting labor-saving mechanization (for example, potting machine, portable conveyers)
- Adopting labor saving strategies (for example, lean flow)
- Paying higher wages
- Moving to the H-2A program
- Training employees to improve skills
- Adding employee benefits
- Other, please specify: _____
- Nothing

SALES

11. What were your gross annual sales in 2019?

- Less than \$10,000
- \$10,000 to \$99,999
- \$100,000 to \$249,999
- \$250,000 to \$499,999
- \$500,000 to \$999,999
- \$1,000,000 to \$1,999,999
- \$2,000,000 to \$4,999,999
- \$5,000,000 to \$9,999,999
- \$10,000,000 or more

12. Indicate what share of your sales in 2019 were in each category. The total should add to 100%.

- ___% Retail sales (direct to consumer)
- ___% Wholesale to Tennessee retailer
- ___% Wholesale to Tennessee landscapers
- ___% Wholesale to a Tennessee broker
- ___% Wholesale to any entity in the U.S. but outside of Tennessee
- ___% Wholesale to any entity outside of the U.S.

13. In the next five years, I anticipate my business's nursery sales will:

- Decline by _____%
- Not change
- Increase by _____%

14. What **percentage of your gross annual sales** was from production or sales of each category below. The total should add to 100%.

Category of sales	% of your 2019 gross sales
Deciduous shade and flowering trees	___ %
Deciduous shrubs	___ %
Evergreen shrubs	___ %
Evergreen trees	___ %
Vines and groundcovers	___ %
Roses	___ %
Herbaceous perennials	___ %
Bedding plants - flowering annuals, vegetables, and herbs	___ %
Flowering potted plants	___ %
Christmas trees (live or cut)	___ %
Fruit-bearing trees	___ %
Fruit-bearing shrubs	___ %
Foliage	___ %
Propagated material (liners, cuttings, plugs, etc.)	___ %
Other nursery/greenhouse-related sales: _____	___ %
Other sales: _____	___ %
TOTAL	100%

EXPENSES

15. Some diversified businesses have expenses associated with different business activities. What percent of your 2019 expenses align with each business sector listed here? Zero is an acceptable answer.

___% Nursery/greenhouse grower ___% Broker/re-wholesaler
 ___% Retail nursery/garden center ___% Landscaping services

16. Please provide your **best estimates of expenses in 2019**. Also indicate what % of purchases in each category was in Tennessee, e.g., if half of was purchase in Tennessee, please answer 50%.

Remember, all information will be kept confidential and presented in aggregate.

Expense Categories	Expense (2019)	% purchased in Tennessee
Equipment Expenses		
a. maintenance/repair of structures (including overwintering houses and equipment storage buildings)	\$ _____	N/A
b. new/used equipment purchases, including vehicles	\$ _____	_____ %
c. equipment leases/rentals, including vehicles	\$ _____	_____ %
d. equipment maintenance/repair (including vehicles; excluding irrigation repair)	\$ _____	_____ %
e. equipment supplies	\$ _____	_____ %
f. fuel for machinery operations (not for pumping water)	\$ _____	N/A
g. other equipment expense: _____	\$ _____	_____ %
Utility and Other Overhead Expenses (exclude irrigation expenses)		
h. water/sewer (does not include irrigation water)	\$ _____	N/A
i. electricity	\$ _____	N/A
j. natural gas	\$ _____	N/A
k. insurance	\$ _____	N/A
l. training	\$ _____	N/A
m. other overhead expenditures:	\$ _____	N/A
Irrigation Expenses		
n. irrigation water	\$ _____	N/A
o. irrigation repairs and maintenance, e.g., replacing pipe or cleaning emitters	\$ _____	N/A
p. irrigation filtration and maintenance, including chlorination or sanitizing	\$ _____	N/A
q. fuel/utilities for pumping water	\$ _____	N/A

Plant Propagation, Production, & Shipping Expenses

r. liners purchased (i.e., bareroot or container-grown trees and shrubs)	\$ _____	_____ %
s. other propagules (seed, root stock, plugs, etc.)	\$ _____	_____ %
t. pesticides and fertilizers (including lime and sulfur)	\$ _____	_____ %
u. container substrate, soil conditioners (e.g., compost)	\$ _____	_____ %
v. burlap, labels, containers, and other supplies for producing plants	\$ _____	_____ %
w. all other plant expenses (except wages):	\$ _____	_____ %

TENNESSEE PEST PLANT RULE

The proposal to add species to the Tennessee Pest Plant Rule (0080-0-24-02) was tabled for two years, giving the industry the opportunity to assess the economic impact of adding these species. These questions will inform that economic impact assessment.

17. Each species listed here is a proposed addition to the Tennessee Pest Plant Rule which prohibits propagating, selling, offering for sale or releasing a listed pest plant within Tennessee. A “pest plant,” also known as an “invasive species,” is a nonnative plant that has spread or may spread into natural areas, dominate or disrupt those ecosystems and cause economic and/or environmental damage. Which of these species did your business sell in 2019? **Check all that apply.** Then, for each species you sell, please indicate what percentage of your gross annual sales was from that species. You may enter numbers less than 1 by using decimals (for example, 0.25).

Species	Check, if you sold this in 2019	% of your 2019 gross sales
Tree of Heaven (<i>Ailanthus altissima</i>)	<input type="checkbox"/>	____ %
Mimosa, Silk Tree (<i>Albizia julibrissin</i>)	<input type="checkbox"/>	____ %
Asian Bittersweet (<i>Celastrus orbiculatus</i>)	<input type="checkbox"/>	____ %
Burning Bush (<i>Euonymus alatus</i>)	<input type="checkbox"/>	____ %
Wintercreeper euonymus (<i>Euonymus hederaceus</i> , formerly <i>E. fortunei</i>)	<input type="checkbox"/>	____ %
Chinese Parasol Tree (<i>Firmiana simplex</i>)	<input type="checkbox"/>	____ %
English Ivy (<i>Hedera helix</i>)	<input type="checkbox"/>	____ %
Japanese Hops (<i>Humulus japonicus</i>)	<input type="checkbox"/>	____ %
Chinese Lespedeza (<i>Lespedeza cuneata</i>)	<input type="checkbox"/>	____ %
Belle Honeysuckle (<i>Lonicera xbella</i>)	<input type="checkbox"/>	____ %
Japanese Climbing Fern (<i>Lygodium japonicum</i>)	<input type="checkbox"/>	____ %
Beale’s Barberry, Leatherleaf mahonia (<i>Mahonia bealei</i>)	<input type="checkbox"/>	____ %

Heavenly Bamboo (<i>Nandina domestica</i>)	<input type="checkbox"/>	____ %
Princess Tree, Empress Tree (<i>Paulownia tomentosa</i>)	<input type="checkbox"/>	____ %
Bradford Pear, straight species Callery Pear (<i>Pyrus calleryana</i>)	<input type="checkbox"/>	____ %
Fig Buttercup, Lesser Celandine (<i>Ranunculus verna</i> , formerly <i>R. ficaria</i>)	<input type="checkbox"/>	____ %
Japanese Wisteria, Chinese Wisteria (<i>Wisteria floribunda</i> , <i>W. sinensis</i>)	<input type="checkbox"/>	____ %
Total		Total ____ %

18. You just estimated the share of your total gross sales in 2019 that are of species proposed to be added to the Tennessee Pest Plant Rule. Some plants might be replaced by others and some may not be replaceable in your production system. Which of these most closely represents the share of lost gross sales that **could be replaced**?

- 0%
- 1 - 25%
- 26 - 50%
- 51 - 75%
- >75%

19. In the long term, how do you estimate your business profitability to be affected by the addition of these plants to the Pest Plant Rule? This assessment includes loss of sales of proposed additions to Pest Plant Rule, effects on overall business traffic, and changes in production inputs and marketing costs for substitute plants. Which of these most closely represents the total effect on profitability?

- increased profitability
- no change
- 1 – 5% decrease in profitability
- 6 – 10% decrease in profitability
- 11- 25% decrease in profitability
- 26 – 50% decrease in profitability
- 51- 75% decrease in profitability
- >75% decrease in profitability

20. Some proposed additions to the Tennessee Pest Plant Rule may have available substitutes, including other plants or sterile/low-seeding cultivars of this species; others may have no substitute. Indicate your perception of the availability of substitute species, on a scale of 1 to 5, where 1 is “No substitute available” and 5 is “Perfect substitute available.” If you have no information about substitutes, check “don’t know.” If the plant has a sterile cultivar, please check that box.

Species	Perception of availability of a substitute						Check here if substitute is a sterile/low seeding cultivar of the plant
	Don't know	No substitute available				Perfect substitute available	
Tree of Heaven (<i>Ailanthus altissima</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Mimosa, Silk Tree (<i>Albizia julibrissin</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Asian Bittersweet (<i>Celastrus orbiculatus</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Burning Bush (<i>Euonymus alatus</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Wintercreeper euonymus (<i>Euonymus hederaceus</i> , formerly <i>E. fortunei</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Chinese Parasol Tree (<i>Firmiana simplex</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
English Ivy (<i>Hedera helix</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Japanese Hops (<i>Humulus japonicus</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Chinese Lespedeza (<i>Lespedeza cuneata</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Belle Honeysuckle (<i>Lonicera xbella</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Japanese Climbing Fern (<i>Lygodium japonicum</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Beale's Barberry, Leatherleaf mahonia (<i>Mahonia bealei</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Heavenly Bamboo (<i>Nandina domestica</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Princess Tree, Empress Tree (<i>Paulownia tomentosa</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Bradford Pear, straight species Callery Pear (<i>Pyrus calleryana</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Fig Buttercup, Lesser Celandine (<i>Ranunculus verna</i> , formerly <i>R. ficaria</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>
Japanese Wisteria, Chinese Wisteria (<i>Wisteria floribunda</i> , <i>W. sinensis</i>)	<input type="checkbox"/>	1	2	3	4	5	<input type="checkbox"/>

21. Please share your perspectives about invasive plants and how they impact your business. For this question, “invasive plant” is synonymous with “pest plant”.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The issue of invasive plants is very important to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The issue of invasive plants is very important to my customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I try to direct customers to plants that are least likely to harm the environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garden centers and nurseries are responsible for educating customers about the invasive potential of plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would be willing to label plants that I sell to let customers know that they are potentially invasive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I knew a plant was or had the potential to become invasive, I would not sell that plant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel compelled to sell plants that may become invasive because they are attractive to my customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If a competing business sells a popular plant that may have the potential to become invasive, I might feel compelled to sell it, too	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

WRAP UP

21a. Approximately what percentage of your total 2019 household income was from your nursery/greenhouse business?

- None
- 1 – 25%
- 26 – 50%
- 51 – 75%
- 75 – 100%

Survey continues on next page

22. If the additions to the Tennessee Pest Plant Rule are accepted and you currently grow any of those species, what plants would you consider growing instead of the prohibited plants? _____

23. Please complete this sentence:

I believe that expanding the listed plant species in the Tennessee Pest Plant Rule will cause _____

THANK YOU FOR COMPLETING THIS SURVEY.

Please return the survey in the enclosed envelope. No postage is necessary.

If that envelope is missing, you can mail the survey to:

Susan Schexnayder
University of Tennessee Institute of Agriculture
2431 Joe Johnson Drive, Room 274