

# **Economic Impacts of Construction on the Nursery/Greenhouse and Landscape Services Sectors in Tennessee**

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**Department of Agricultural Economics**

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# **Economic Impacts of Construction on the Nursery/Greenhouse and Landscape Services Sectors in Tennessee**

## **Executive Summary**

*The nursery/greenhouse and landscape services industries are important industries in Tennessee, generating over \$574 million in direct economic activity in the state in 1997. The objective of this study is to examine the economic impacts the construction sector has on the nursery/greenhouse and landscape services sectors in Tennessee. This study employed input-output analysis for five regions within the state to derive the economic relationships and linkages between construction sectors and the nursery/greenhouse and landscape services sectors. Direct, indirect and induced effects were analyzed for total industry output, employment, and value-added. Results indicate that the greatest impacts on both nursery/greenhouse and landscape services from an additional \$1 million in construction statewide would result from an increase in residential maintenance and repairs, followed by new residential construction, and finally by new commercial and industrial construction. Approximately 12.3% of the output from Tennessee's nursery/greenhouse industry can be attributed to activity in these construction sectors in the state, about 7% of output from Tennessee's landscape services can be attributed to construction activity.*

**Key words:** economic impacts, construction, nursery/greenhouse, landscape services

## **Economic Impacts of Construction on the Nursery/Greenhouse and Landscape Services Sectors in Tennessee**

### **Introduction**

The nursery/greenhouse industry is a major component of the agricultural sector in Tennessee. Tennessee's nursery greenhouse industry ranks 14th among all states in the U.S. (1997 Census of Agriculture). In 1997, the nursery/greenhouse and landscape services sectors generated over \$574 million in direct economic activity in Tennessee (1997

IMPLAN data). Construction, in particular, new housing and residential improvements, has been shown to influence the nursery/greenhouse sector. Results from past studies suggested positive relationships between the sales of nursery/greenhouse products and the level of residential construction and home renovations (Johnson and Jensen) at an aggregate market level. New construction generates demand for landscape services and landscape materials, including

nursery/greenhouse products. Past research has also suggested that as homeowners improve their homes, they also spend to improve the landscaping around their homes. Since the early 1990's, real growth in the value of new residential buildings has averaged 7 percent for the U.S. and 11 percent for Tennessee. This study examines how the value of construction impacts the landscape services and nursery/greenhouse sectors using an input-output model. The study also examines how growth in construction could impact the nursery/greenhouse and landscape services sectors.

***Tennessee ranks 14<sup>th</sup> among all states in nursery/ greenhouse production. In 1997, the state's nursery/ greenhouse and landscape services industries generated over \$574 million in direct economic activity and employed over 21,000 people.***

## **Previous Studies**

A number of studies have examined the economic impacts and linkages of the nursery/greenhouse and landscape services sectors. Harris, Rader, and Johnson examined the economic activity in both backward and forward linkages from the greenhouse and nursery products sector in 1977 using input-output analysis. They found the most major contributors to economic activity were from transportation and trade, services, chemicals and chemical products, and petroleum and petroleum products. Cox, Leones, and Hollyer examined the linkages between U.S. greenhouse and nursery products and landscape services and found that in Arizona, almost half of wholesale nursery sales were to landscape firms. Using IMPLAN, Tavernier, Li, and Thatch analyzed the economic importance of the greenhouse, nursery, and sod industry to New Jersey in 1990. The results from their study indicated that households comprised the greatest final demand, followed by government and export purchases. The study showed that the greatest indirect impacts were to real estate, wholesales, agricultural chemicals, and agricultural services sectors. The greatest induced effects were to real estate and general merchandise. While each of these studies provided important insights into the economic importance and impacts of the nursery/greenhouse and landscape services sectors, none examined how construction activity impacts the landscape services and nursery/greenhouse sectors. The study of economic impacts of construction on the nursery/greenhouse and landscape services sectors are of particular interest because of recent strength in construction markets and results from aggregate market studies suggesting positive linkages.

## **Objectives**

The objectives of this study were to: 1) estimate the impacts of new residential, residential repair, and commercial construction activity on the nursery/greenhouse and landscaping industries in Tennessee; and 2) estimate the economic impacts of a 10 percent growth in construction on the nursery/greenhouse and landscaping industries and on Tennessee's economy.

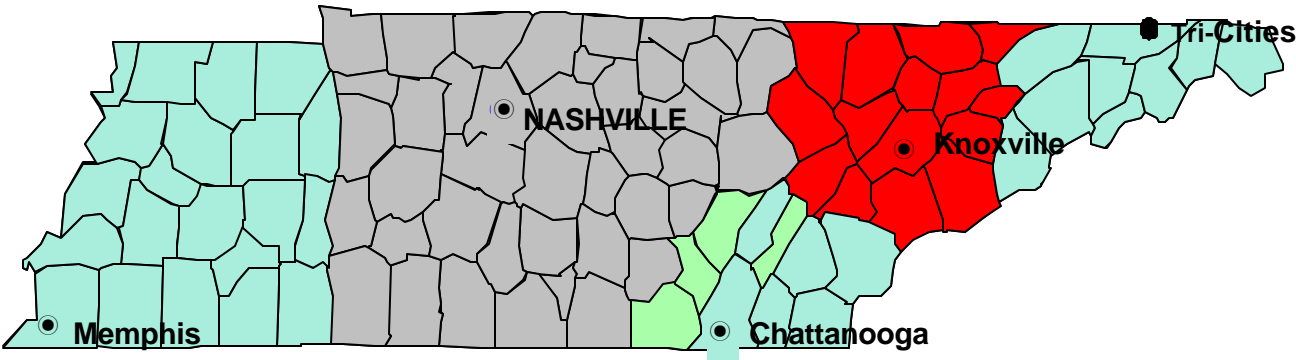
## **Methods**

This study employed input-output analysis to derive the economic relationships and linkages between construction sectors and the nursery/greenhouse and landscape services sectors. The effects of construction of new residences, home repairs/renovations, and private non-residential construction were each examined.

The fundamental purpose of input-output analysis is to examine the interdependence of industries in the economy. Input-output analysis can provide important and timely information on the interrelationships in a regional economy and on how the changes impact that economy. The impacts of a sector's economic activity can be direct, indirect, and induced. Change in final demand for a sector's product generates direct impacts on an industry. Indirect impacts occur through changes in inter-industry purchases, as these industries respond to the changes in demands by the industry directly affected. Examples include input suppliers or service providers. In addition, induced impacts are generated because of changes in incomes of households and other institutions and resulting increases/decreases in spending power generated by the change in final demand.



Based on areas of overall economic activity, the state was divided into five regions, which closely coincide with those used by the Bureau of Economic Analysis. A map of the economic trade regions is displayed in Figure 1. These regions are based on the economic activity centers of Memphis, Nashville, Chattanooga, Knoxville, and the Tri-Cities Area (Bristol, Johnson City, Kingsport). Regional analysis enables a more detailed examination of where economic activity may be occurring within the state. The model used in this study was based on the 1997 IMPLAN model for the state, with values for agriculture adjusted for the 1997 Census of Agriculture.



**Figure 1. Economic Trade Regions.**

The model was used for several purposes. First, the economic effects of Tennessee’s nursery/greenhouse and landscape services sectors were examined for the state and for the economic trade regions. Direct effects on total industry output, employment, and value-added<sup>1</sup> were examined. The total effects, which include direct, indirect, and induced effects, were also examined. The results provided overall and regional summaries of these sectors economic importance. Second, estimates of direct total industry output from new

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<sup>1</sup> Value-Added – All income to workers paid by employers; self-employed income; interest, rents, royalties, dividends, and profit payments; excise and sales taxes paid by individuals to businesses.

residential, residential repairs/maintenance, and industrial and commercial construction were examined. These estimates portray the magnitude of direct industrial output resulting from new private construction and from residential repairs/maintenance for the state and its economic trade regions. Third, we examined the total impacts of construction activity (indirect and induced), including new residential, residential maintenance and repair, and new commercial and industrial, on total industry output, employment, and value-added of the nursery/greenhouse and landscape services sectors. For each of the economic trade regions, the impacts of an additional million dollars of activity from each of the construction types on the sectors of interest were estimated. We also examined total impact for the state from an additional \$5 million dollars in activity. The difference between the total impact statewide and the sum of the regional impacts can be accounted for by interregional trade within the state.

## Results

### *Economic Impacts of the Nursery/Greenhouse and Landscape Services Sectors*

***Statewide total direct industrial impacts from the nursery greenhouse industry were about \$213.36 million in 1997. The Nashville region generated the largest economic effects from the nursery/greenhouse industry. This region contains Warren County, the state's largest nursery and greenhouse products producing county.***

The estimated total industrial output from the nursery/greenhouse industry was about \$213.36 million for the state of Tennessee in 1997 (Table 1). Over 5,300 jobs were generated directly from the nursery/greenhouse industry and \$72.80 million was generated in value-added. When the indirect and induced effects from the nursery/greenhouse industry were considered, the total estimated effects were \$430.32 million, 8,556 jobs, and \$192.95 million in

value-added. The estimated effects for each of the economic trade regions within Tennessee were also examined (Table 1). The Nashville region generated the largest effects from the nursery/greenhouse industry. This came as no surprise since the region contains Warren County, the state's largest nursery and greenhouse products producing county (See darkest shaded county in the map presented in Figure 2). The second and third largest effects were in the Knoxville Region and the Memphis region. The smallest effects were in the Chattanooga Region. The Chattanooga region employed only about 154 persons in the nursery/greenhouse industry. An additional 49 persons were employed through indirect and induced effects. The total effects, including direct, indirect, and induced for total industry output in this region were \$9.03 million. About \$12.5 million dollars in total industry output (indirect and induced effects) were generated through intrastate trade among the economic trade regions.

Statewide, the landscape services industry provided about \$361.10 million in total industry output directly, and about \$707.98 million when indirect and induced effects were also considered (Table 1). About 15,973 persons were employed directly by landscape services, while an additional 5,282 jobs were created through indirect and induced effects.

As with the nursery/greenhouse industry, the largest effects were in the Nashville Region. In the Nashville Region, about \$282.15 million in total industry output were generated through direct, indirect, and induced effects, while 8,395 jobs were generated in total. The value-added generated was \$186.41 million. However, unlike the nursery/greenhouse industry, the

***Statewide total direct industrial impacts from the landscape services sector were \$361.10 million in 1997. The Nashville region generated the largest economic effects from the landscape services sector.***

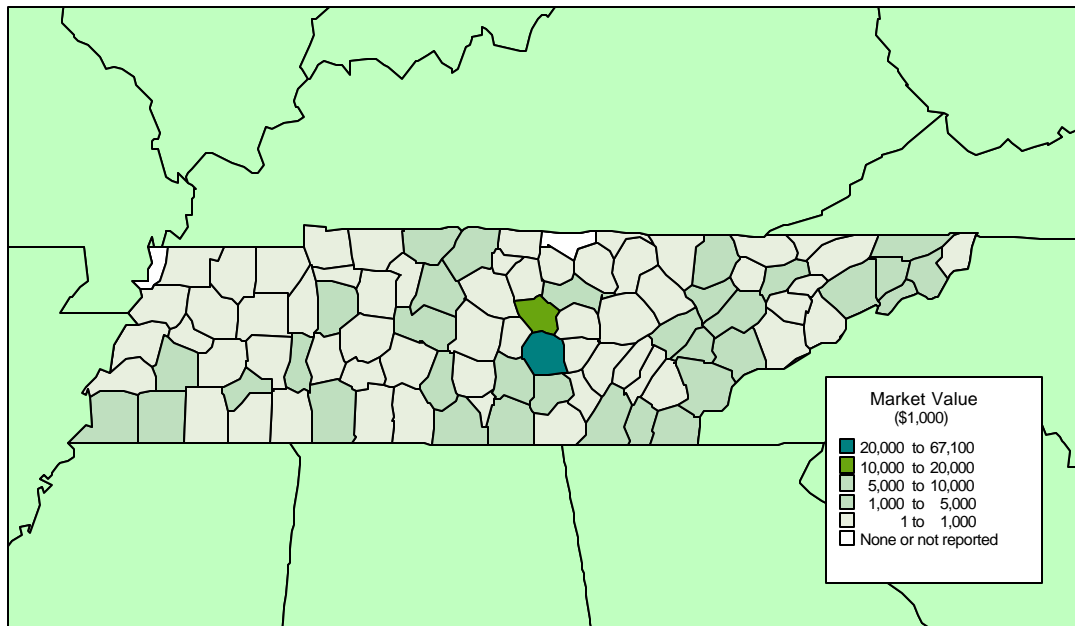
second largest impacts were in the Memphis Region, reflecting the importance of proximity to large urban areas compared with the nursery/greenhouse industry. The smallest effects were in the Tri-Cities Region, where the total effects, including indirect and induced effects were around \$32.30 million in total industrial output, 1,187 in employment, and \$22.71 million in value-added. Approximately \$41.03 million in total industry output was generated through intrastate trade among the economic trade regions.

**Table 1. Estimated Effects of Nursery/Greenhouse and Landscape Services Sectors on Tennessee's Economy and by Region.**

	Direct Effects			Total Effects		
	TIO* (\$ million)	Employ- ment	VA** (\$ million)	TIO (\$ million)	Employ- ment	VA** (\$ million)
<b>Nursery/Greenhouse</b>						
Region:						
Memphis	22.77	429	6.75	42.05	681	17.55
Nashville	144.61	2,916	39.93	296.23	5,077	121.72
Chattanooga	5.60	154	2.30	9.03	203	4.31
Knoxville	32.06	1,226	17.78	57.95	1,678	33.08
Tri-Cities	8.32	628	6.03	12.55	714	8.54
Intrastate Trade				12.51	203	7.75
State	213.36	5,353	72.79	430.32	8,556	192.95
<b>Landscape Services</b>						
Region:						
Memphis	109.30	4,510	82.14	194.26	5,708	133.08
Nashville	143.36	6,381	107.74	282.15	8,395	186.41
Chattanooga	26.20	1,217	19.69	42.61	1,467	29.70
Knoxville	62.16	2,961	46.72	115.63	3,919	79.20
Tri-Cities	20.07	904	15.08	32.30	1,187	22.71
Intrastate Trade				41.03	579	21.12
State	361.09	15,973	271.37	707.98	21,255	472.22
<b>TOTAL</b>	<b>574.45</b>	<b>21,326</b>	<b>344.16</b>	<b>1,138.30</b>	<b>29,811</b>	<b>665.17</b>

\*TIO=Total Industry Output

\*\*VA- Value-Added



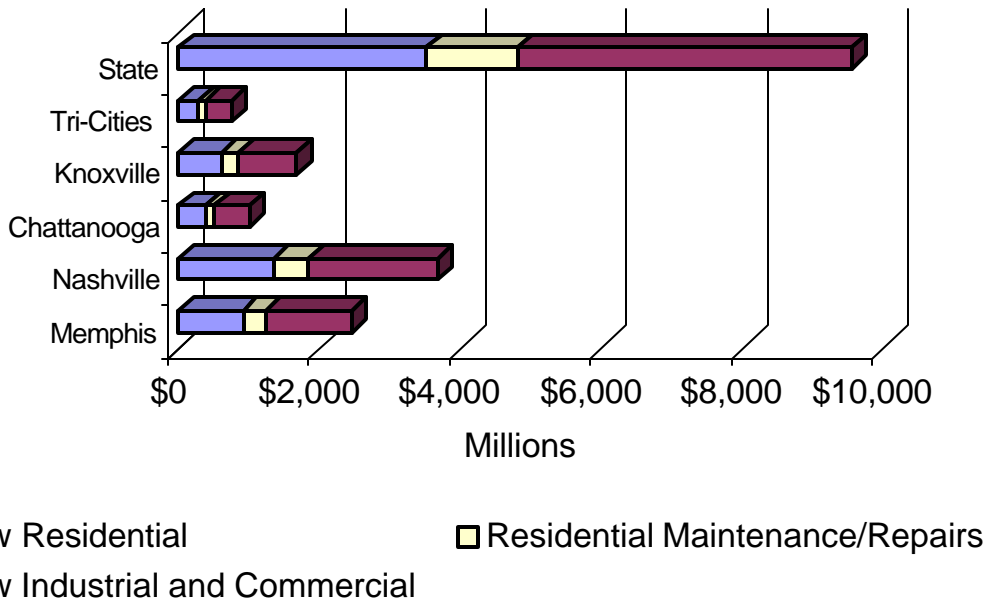
**Figure 2. 1997 Market Value of Nursery and Greenhouse Products, by County, Tennessee**

**Source: 1997 Census of Agriculture**

*Impacts of Construction on the Nursery/Greenhouse and Landscape Services Sectors*

Estimates of the direct effects of total industrial output from private construction were generated (Figure 3). The effects were from three types of construction: new residential, residential maintenance and repairs, and new industrial and commercial construction. The statewide total industry output from new residential construction was around \$3.52 billion, while total industrial output from residential maintenance and repairs was about \$1.28 billion. Total industry output from new commercial and industrial construction was \$4.73 billion. For each of the types of construction, the largest level of

activity took place in the Nashville Region, followed by the Memphis, and Knoxville Regions. The smallest levels were in the Chattanooga and Tri-Cities Regions.



**Figure 3. Direct Effects-Total Industry Output by New Residential, Residential Maintenance and Repair, and Industrial and Commercial Construction.**

*The greatest dollar-for-dollar impacts from construction on the nursery/greenhouse and landscape services sectors are from residential maintenance and repairs expenditures.*

The impacts of a \$1 million increase in total industry output from construction on the nursery/greenhouse and landscape services industries were estimated (Table 2). The greatest impacts on both nursery/greenhouse and landscape services from an additional million dollars in construction statewide would result from an increase in residential maintenance and repairs, followed by new residential construction, and finally

by new commercial and industrial construction. This pattern holds for total industry output, employment, and value-added.

**Table 2. Total Impacts of Construction on Nursery/Greenhouse and Landscape Services Sectors.**

	<b>Total Impact (Indirect and Induced)</b>		
<b>Total Industry</b>	<b>Output (Dollars)</b>	<b>Employment (Jobs)</b>	<b>Value Added (Dollars)</b>
<b>\$1 Million in New Residential Construction per Region</b>			
<b>Nursery/Greenhouse</b>			
Region:			
Memphis	1,777	.0334	527
Nashville	5,077	.1023	1,402
Chattanooga	1,249	.0343	513
Knoxville	4,307	.1647	2,387
Tri-Cities	2,730	.2060	1,978
Intrastate Trade	7,675	.0317	977
State	22,815	.5724	7,784
<b>Landscape Services</b>			
Region:			
Memphis	3,017	.1245	2,267
Nashville	3,217	.1432	2,418
Chattanooga	2,525	.0201	1,897
Knoxville	3,250	.1548	2,442
Tri-Cities	2,520	.1135	1,894
Intrastate Trade	995	.1305	749
State	15,524	.6866	11,667
<b>\$1 Million in Residential Maintenance and Repair per Region</b>			
<b>Nursery/Greenhouse</b>			
Region:			
Memphis	1,969	.0370	584
Nashville	5,648	.1138	1,560
Chattanooga	1,387	.0381	570
Knoxville	4,813	.1841	2,668
Tri-Cities	3,064	.2313	2,220
Intrastate Trade	8,504	.0325	1,059
State	25,385	.6368	8,661
<b>Landscape Services</b>			
Region:			
Memphis	3,100	.1280	2,330
Nashville	3,323	.1478	2,497
Chattanooga	2,584	.1201	1,942
Knoxville	3,368	.1604	2,531
Tri-Cities	2,595	.1167	1,950
Intrastate Trade	1,063	.0362	799
State	16,033	.7092	12,049

**Table 2. Continued.**

	<b>Total Impact (Indirect and Induced)</b>		
	<b>Total Industry Output (Dollars)</b>	<b>Employment (Jobs)</b>	<b>Value Added (Dollars)</b>
<b>\$1 Million in New Industrial and Commercial Buildings per Region</b>			
<b>Nursery/Greenhouse</b>			
Region:			
Memphis	288	.0054	85
Nashville	862	.0173	238
Chattanooga	172	.0047	71
Knoxville	698	.0267	387
Tri-Cities	363	.0274	263
Intrastate Trade	1,490	.0156	277
State	3,873	.0971	1,321
<b>Landscape Services</b>			
Region:			
Memphis	2,111	.0870	1,586
Nashville	2,272	.1011	1,708
Chattanooga	1,721	.0780	1,294
Knoxville	2,267	.1080	1,704
Tri-Cities	1,702	.0766	1,279
Intrastate Trade	876	.0038	657
State	10,949	.4545	8,228

The greatest impacts on total industry output from an additional \$1 million in new residential construction, residential maintenance and repairs, or new industrial and commercial construction, for the nursery/greenhouse sector would occur in the Nashville Region, followed by the Knoxville, and Tri-Cities Regions. The smallest impacts would occur in the Chattanooga Region, which indicates more economic activity leakage occurring to areas outside this region. The largest employment impacts would occur in the Tri-Cities Region, followed by Knoxville, and Nashville. The smallest employment impacts would occur in Memphis for new residential and residential maintenance and repairs and Chattanooga for new industrial and commercial construction. For all three construction sectors examined value-added impacts would be greatest for the Knoxville Region, followed



by the Tri-Cities, and Nashville Regions. The smallest impacts would occur in the Chattanooga Region. The high values for intrastate trade in total industry output by the nursery/greenhouse industry may suggest that many contractors, or retail nurseries used by contractors, purchase directly from wholesalers outside their region.

The impacts of additional new residential construction and residential maintenance and repair on total industry output and value-added by the landscape services sector were the greatest in the Knoxville Region, followed by the Nashville, and Memphis Regions. For commercial construction, the greatest impacts for total industry output and value-added would occur in the Nashville Region, followed by the Knoxville and Memphis Regions. The Tri-Cities Region would experience the smallest impacts for new residential construction and commercial construction. However, for residential maintenance and repair, the smallest impacts would occur in the Chattanooga Region. The largest employment impacts for all construction activities would occur in the Knoxville Region followed by the Nashville Region. The smallest employment impacts would be experienced in the Tri-Cities Region for residential maintenance and repair and commercial construction. For new residential construction, the Chattanooga Region would experience the smallest employment impacts.

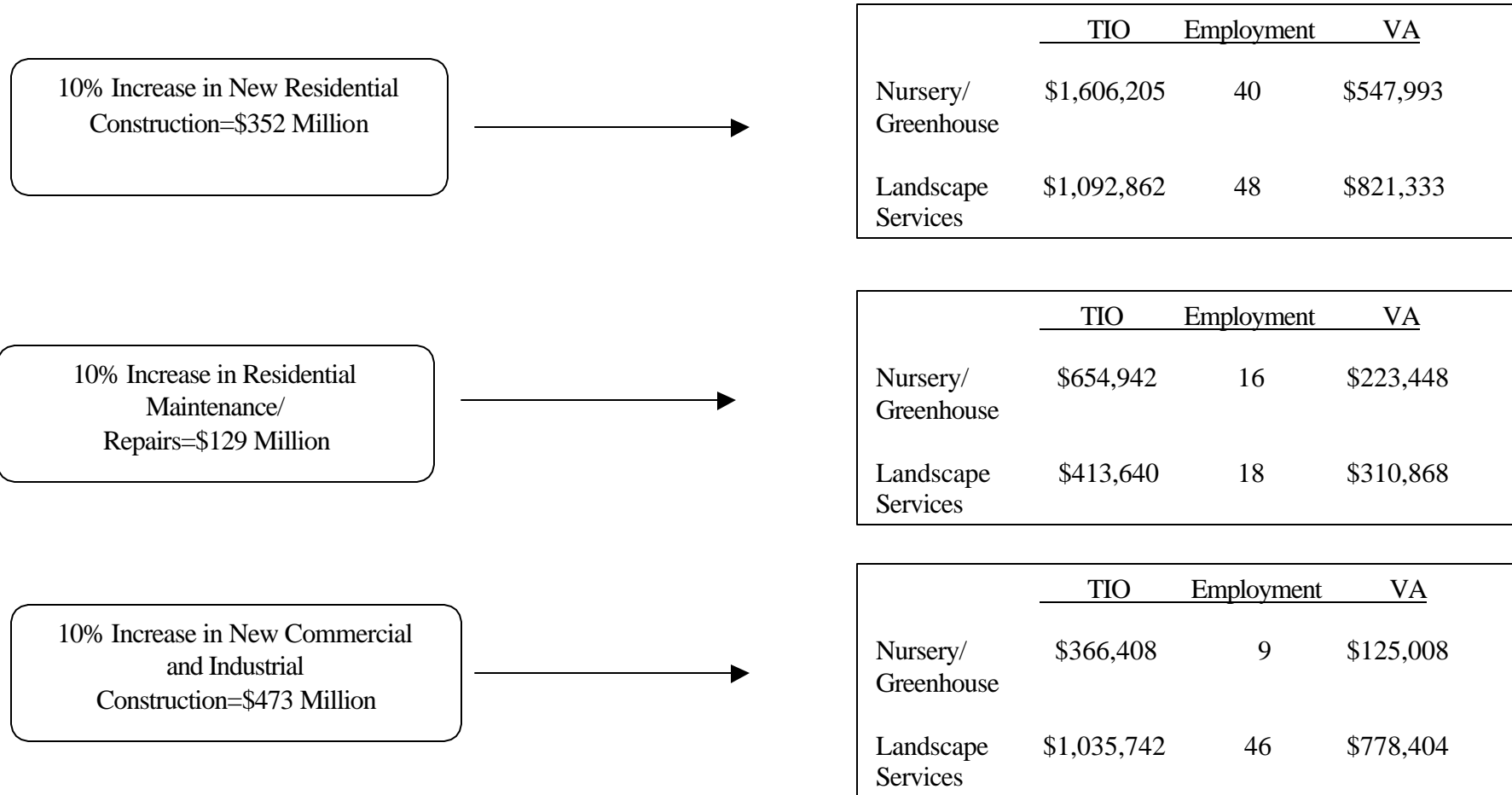
While examining the impacts of an additional million dollars in construction upon the nursery/greenhouse and landscape services industries is useful, it is also helpful to examine the impacts relative to the actual magnitudes of the industries. As was stated earlier in this study, Tennessee has experienced just over 11 percent real growth in new residential construction during the 1990's. If 10 percent growth is assumed for each of the types of construction, the overall magnitudes of the impacts on the industries of interest can

be projected. A 10% increase from the 1997 Total Industry Output estimates for new residential construction would imply a \$352 million increase (Figure 4). This increase would have over \$1.6 million in impacts on the total industry output from the nursery/greenhouse industry and nearly \$1.1 million on the landscape services industry. Over 85 new jobs in these industries would be added. Increases in value-added would be in excess of \$1.3 million.

A 10% increase in residential maintenance and repairs (\$129 million) would increase total industry output by over \$.6 million for the nursery/greenhouse industry and over \$.4 million from the landscape services industry. An increase of 34 new jobs would occur. Value-added would increase by over \$.5 million.

A 10% increase in new commercial and industrial construction would be \$473 million and would positively impact total industry output from the nursery/greenhouse industry by nearly \$.4 million and the landscape services by over \$1.0 million. The majority of the jobs added would occur in the landscape services industry, with 46 jobs added. Value-added from the nursery/greenhouse and landscape services industries would increase by over \$.9 million.

A 10% increase in each of the types of construction would result in a 1.2% increase in nursery/greenhouse total industry output and a .7% increases in landscape services total industry output. These combined construction activities constitute about 12.3% of the final demand for nursery/greenhouse industry output and 7.0% of the final demand from the landscape services total industry output.



**Figure 4. Total Impacts of 10% Growth in Construction on the Nursery/Greenhouse and Landscape Services Industries.**

## **Conclusions**

The results from this study suggest that construction activity is important to the nursery/greenhouse and landscape services industries in Tennessee. As with findings from past aggregate level studies, the greatest impacts were from home renovations, repairs, and related activity. The results also suggest that statewide analysis may not fully capture the regional importance of the industries, particularly the linkage between urban centers and landscape services activity. Results from the study also suggest that IMPLAN is a useful tool for the identification of the economic linkages between construction and the nursery/greenhouse industry in the state. The model not only can assist in the evaluation of growth projections and the magnitude of their impacts for different levels of economic activity, but also can serve as a useful planning tool for policy-makers in evaluating potential impacts of their decisions concerning agricultural industries for the state.

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