AIMAG Agri-Industry Modeling and Analysis Group

Industry Brief

Economic Impacts of Tennessee Agricultural Experiment Station Expenditures at the Branch Stations

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Each year the University of Tennessee spends approximately $10.7 million for Tennessee Experiment Research Station activities at 10 Branch Experiment Stations located throughout the state. The stations support most of the research conducted by the Tennessee Agricultural Experiment Station (TAES) for the benefit of Tennessee's diversified agriculture and natural resource-based industries. The purpose of this study is to ascertain the economic contributions that ten of these Branch Experiment Stations have on the economies of the counties and surrounding counties in which they are located. Additional benefits occurring from the research conducted at TAES and adopted in the state are not incorporated in the analysis.

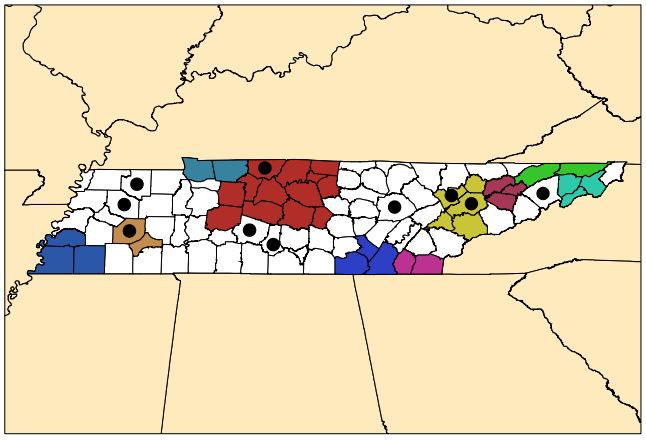

Figure 1. Location of Ten Tennessee Agricultural Experiment Stations

The Experiment Stations are located throughout the state with three located in Eastern Tennessee, four in Central Tennessee, and three in West Tennessee (Figure 1). Descriptions of what type of research occurs at each of the ten experiment stations along with where each station is located are shown in Table 1.

The impacts are measured in ten Zones of Economic Influence (ZEI). These ZEI's are defined in Table 1. This is achieved by examining Branch Experiment Station expenditures and applying these to IMPLAN, an input-output model that examines economic linkages between sectors of the states economy. Direct, indirect, and induced impacts are examined for total industry output, employment, and value-added[i]. The impacts on wages paid to UT employees are separated from those that occur when purchasing other goods and services.

Table 1. Location and description of the research conducted at ten University of Tennessee Branch Experiment Stations

Experiment Station Location	Zones of Economic Influence	Description
Forestry -- Anderson, Morgan, and Coffee Counties	Anderson, Blount, Coffee, Knox, Loudon, Morgan, Union	The University of Tennessee Forestry Experiment Station (UTFES) is a regionally recognized leader in developing new technologies applicable to modern forestry and wildlife resources management on an 11,120-acre field research laboratory.
Plateau -- Cumberland	Bledsoe, Cumberland, Fentress, Morgan, Overton, Putnam, Rhea, Roane, Van Buren, White	The station is about equal distance from Nashville, Knoxville, and Chattanooga and is the site of research in beef, fruits and vegetables, field crops, and swine. The station is most noted for its studies in beef, squash, muskmelons, watermelons, pumpkins, greens, cabbage, green beans, apples, blueberries, and tomatoes.
Tobacco – Greene	Cocke, Greene, Hamblen, Hawkins, Unicoi, Washington	Known for its research on burley tobacco production and beef cow/calf production. Areas of research at the station include all aspects of burley tobacco production with emphasis on breeding and production economics, variety testing, pest management, and breeding of field crops important to the agriculture of Upper East Tennessee.
West Tennessee – Madison	Carroll, Chester, Crocket, Gibson, Hardeman, Haywood, Henderson, Madison	Known for its research on production of agronomic and horticultural crops, the West Tennessee Experiment Station, established in 1907, is the second branch station established within our system.
Knoxville – Knox, Blount	Anderson, Blount, Knox, Loudon, Union	Known for its research on production of agronomic and vegetable crops including ornamental horticulture and turf grass; beef, dairy, and swine production; and aquaculture and biotechnology (cloning, etc.). It can trace its origin back to the formation of the land grant university and establishment of the Agricultural Experiment Station in 1882.
Dairy – Marshall	Bedford, Giles, Lincoln, Marshall, Maury	Known for research studies on use of forage in dairy rations, dairy cattle breeding and genetics, dairy reproduction studies, mastitis and udder health, and water quality and dairy waste.
Martin – Weakley	Carroll, Gibson, Henry, Obion, Weakley	Located near UT Martin, the facilities are used for both research and teaching. The station emphasizes work in swine research with emphasis on the productivity of the sow unit and performance in the nursery phase of the production cycle.

Experiment Station Location	Zones of Economic Influence	Description
Middle Tennessee – Maury	Giles, Hickman, Lawrence, Lewis, Marshall, Maury, Williamson	Known for its research in forage crops, land reclamation, and beef and dairy cattle breeding. Dairy research at Middle Tennessee is much the same as at the Dairy Station with emphasis on dairy animal health and reproduction. The station also provides significant support for fruit, vegetable, and agronomic crop research. Middle Tennessee is also home to the bull test station, which serves to improve the genetics in Tennessee's beef herds.
Milan – Gibson	Carroll, Crockett, Dyer, Gibson, Madison, Obion, Weakley	The station is comprised of three locations, the South Tract on Tennessee Highway 104, the North Tract on US Highway 70A & 79 and the Arsenal Tract on the arsenal property. With a total 486 acres of crop land used for an array of research purposes focused primarily on no-till crop production. Soil conservation research investigates the rate of erosion, soil productivity impacts, and soil run off.
Highland -- Robertson	Cheatham, Davidson, Montgomery, Robertson, Sumner	Known for its research in cow-calf management and dark-fired and burley tobacco production efficiency. The station conducts cow-calf research emphasizing forage utilization and breeding efficiency; fire and air-cured dark and burley tobacco breeding, management, and curing.
Source: http://www.agriculture.utk.edu/		

Annual Expenditures

Over ten million dollars are spent each year by the Branch Experiment Stations with approximately 71 percent of the expenditures allocated to salaries, wages and fringe benefits. The West Tennessee and Knoxville Branch Experiment Stations report the largest expenditures, accounting for nearly 50 percent, followed by Middle Tennessee and the Dairy Experiment Stations (Figure 2, Table 2).

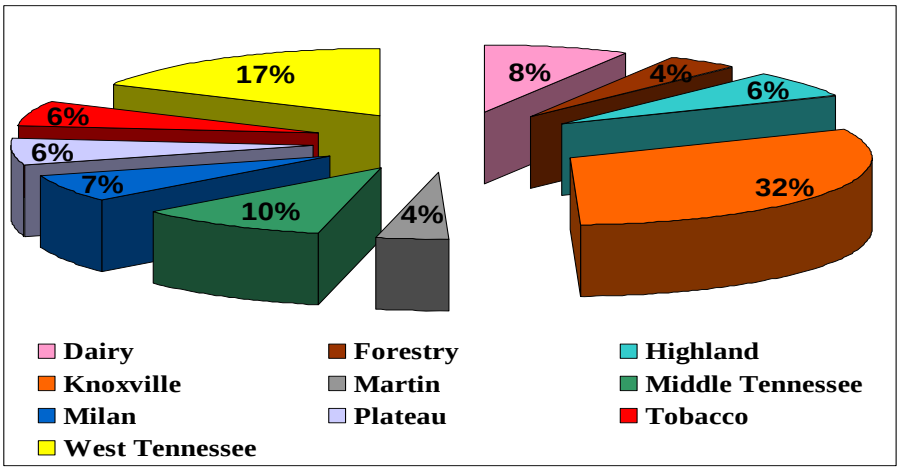

Figure 2. Proportion of total expenditures to Branch Experiment Stations

Table 2. Typical annual expenditures by Branch Experiment Stations

Branch Experiment Station	Location	Total Operating and Maintenance	Wages	Total Expenditures
Dairy Experiment Station	Marshall	$300,000	$530,000	$830,000
Forestry Experiment Station	Anderson, Morgan, Coffee	$50,000	$375,000	$425,000
Highland Rim Experiment Station	Robertson	$150,000	$535,000	$685,000
Knoxville Experiment Station	Knox, Blount	$1,200,000	$2,150,000	$3,350,000
Martin Experiment Station	Weakley	$210,000	$220,000	$430,000
Middle Tennessee Experiment Station	Maury	$350,000	$745,000	$1,095,000
Milan Experiment Station	Gibson	$260,000	$450,000	$710,000
Plateau Experiment Station	Cumberland	$130,000	$560,000	$690,000
Tobacco Experiment Station	Greene	$140,000	$500,000	$640,000
West Tennessee Experiment Station	Madison	$330,000	$1,520,000	$1,850,000
Total		$3,120,000	$7,585,000	$10,705,000

Estimated Economic Impacts of the Annual Expenditures

Durable and nondurable goods and services

Expenditures when used to purchase inputs and labor at the Branch Experiment Stations result in additional economic activity. Individuals are employed and purchase goods and services within the region. Durable and nondurable inputs are ordered and transported to the station for use in the production of agricultural commodities as well as in support of the ongoing research efforts[ii]. The $3.1 million spent on operations and maintenance, excluding wages and salaries, result in an estimated $5.0 million impact in the Zones of Economic Influence. Of this $5.0 million, the purchase of inputs resulted in an estimated $1.1 million of additional economic activity within the zone and induced another $0.8 million (Table 3). These expenditures result in an additional 46.8 jobs above the number employed directly by the Branch Experiment Stations (Table 4). These employment impacts, along with proprietor profits resulting from sales to the experiment station, result in increased value added within the ZEI's of nearly $1.7 million (Table 5).

Table 3. Impacts of TAES Branch Experiment Station expenditures on Total Industry Output in the Zones of Economic Influence

	Total Industry Output			
Branch Station	Direct	Indirect	Induced	Total
		Dollars		
Dairy Experiment Station	$300,000	$66,289	$49,173	$415,462
Forestry Experiment Station	$50,000	$13,940	$22,710	$86,651
Highland Rim Experiment Station	$150,000	$64,186	$52,119	$266,305
Knoxville Experiment Station	$1,200,000	$416,687	$407,756	$2,024,443
Martin Experiment Station	$210,000	$85,422	$33,479	$328,901
Middle Tennessee Experiment Station	$350,000	$136,002	$84,113	$570,115
Milan Experiment Station	$260,000	$85,075	$54,271	$399,346
Plateau Experiment Station	$130,000	$54,542	$30,776	$215,318
Tobacco Experiment Station	$140,000	$40,599	$29,615	$210,214
West Tennessee Experiment Station	$330,000	$118,640	$72,801	$521,441
Total	$3,120,000	$1,081,382	$836,813	$5,038,196

Table 4. Impact of TAES Branch Experiment Station expenditures on employment in the Zones of Economic Influence

	Number of Jobs			
Branch Station	Direct	Indirect	Induced	Total
		Jobs		
Dairy Experiment Station	1.8	2.1	0.6	4.5
Forestry Experiment Station	0.5	0.2	0.3	1.0
Highland Rim Experiment Station	1.2	0.7	0.5	2.4
Knoxville Experiment Station	7.0	6.3	4.4	17.7
Martin Experiment Station	1.5	0.9	0.5	2.9
Middle Tennessee Experiment Station	2.4	2.8	0.9	6.1
Milan Experiment Station	1.6	0.9	0.8	3.3
Plateau Experiment Station	0.9	1.0	0.5	2.4
Tobacco Experiment Station	0.9	0.5	0.5	1.9
West Tennessee Experiment Station	2.2	1.3	1.1	4.6
Total	20.0	16.7	10.1	46.8

Table 5. Impacts of TAES Branch Experiment Station expenditures on value-added in the Zones of Economic Influence

	Value-Added			
Branch Station	Direct	Indirect	Induced	Total
		Dollars		
Dairy Experiment Station	$62,929	$31,062	$27,574	$121,565
Forestry Experiment Station	$19,222	$8,071	$14,126	$41,419
Highland Rim Experiment Station	$37,820	$27,003	$32,075	$96,898
Knoxville Experiment Station	$299,239	$201,955	$250,234	$751,428
Martin Experiment Station	$40,836	$27,181	$19,984	$88,001
Middle Tennessee Experiment Station	$77,508	$54,217	$47,962	$179,687
Milan Experiment Station	$54,920	$43,791	$32,857	$131,568
Plateau Experiment Station	$27,116	$27,222	$18,774	$73,112
Tobacco Experiment Station	$29,013	$20,424	$18,080	$67,517
West Tennessee Experiment Station	$78,286	$52,862	$43,640	$174,788
Total	$726,889	$493,788	$505,306	$1,725,983

Wages and Salaries

Nearly $7.59 million is spent on wages and salaries at the ten Branch Experiment Stations. These expenditures also impact various sectors of the economy within the regions where the stations are located. For instance, the $2.15 million spent at the Knoxville Branch Experiment Station, has nearly a $3.0 million total impact within its ZEI creating an additional 10.1 jobs beyond those hired directly by the Knoxville Station (Tables 6 and 7). Statewide, an estimated $1.0 million is added to the ZEI's in value-added as a result of consumption activities of those employed and paid $7.6 million in wages and salaries by the TAES (Table 8).

Table 6. Impacts of TAES Branch Experiment Station wage and salary expenditures on Total Industry Output in the Zones of Economic Influence

	Total Industry Output			
Branch Station	Direct	Indirect	Induced	Total
		Dollars		
Dairy Experiment Station	$530,000	$31,339	$61,298	$622,637
Forestry Experiment Station	$375,000	$36,275	$95,350	$506,625
Highland Rim Experiment Station	$535,000	$55,021	$137,616	$727,637
Knoxville Experiment Station	$2,150,000	$218,791	$576,074	$2,944,865
Martin Experiment Station	$220,000	$13,351	$25,809	$259,160
Middle Tennessee Experiment Station	$745,000	$57,146	$126,948	$929,094
Milan Experiment Station	$450,000	$28,028	$63,094	$541,122
Plateau Experiment Station	$560,000	$40,826	$82,875	$683,701
Tobacco Experiment Station	$500,000	$39,137	$82,502	$621,639
West Tennessee Experiment Station	$1,520,000	$97,741	$220,116	$1,837,857
Total	$7,585,000	$617,655	$1,471,682	$9,674,337

Table 7. Impacts of TAES Branch Experiment Station wage and salary expenditures on Employment in the Zones of Economic Influence

	Number of Jobs			
Branch Station	Direct	Indirect	Induced	Total
		Dollars		
Dairy Experiment Station	15.0	0.4	0.8	16.2
Forestry Experiment Station	10.0	0.4	1.3	11.7
Highland Rim Experiment Station	15.5	0.6	1.6	17.7
Knoxville Experiment Station	56.0	2.5	7.6	66.1
Martin Experiment Station	5.0	0.2	0.4	5.6
Middle Tennessee Experiment Station	22.3	0.7	1.5	24.5
Milan Experiment Station	11.1	0.4	0.9	12.4
Plateau Experiment Station	15.8	0.5	1.2	17.5
Tobacco Experiment Station	14.0	0.6	1.3	15.9
West Tennessee Experiment Station	31.3	1.3	3.2	35.8
Total	196.0	7.6	19.8	223.4

Table 8. Impacts of TAES wage and salary expenditures at the Branch Experiment Stations on value-added

Branch Station	Value-Added			
	Direct	Indirect	Induced	Total
	Dollars			
Dairy Experiment Station	$102,986	$17,897	$33,926	$154,809
Forestry Experiment Station	$95,698	$20,874	$57,927	$174,499
Highland Rim Experiment Station	$137,495	$32,105	$84,722	$254,322
Knoxville Experiment Station	$559,065	$126,217	$351,170	$1,036,452
Martin Experiment Station	$45,840	$6,816	$15,251	$67,907
Middle Tennessee Experiment Station	$168,566	$33,952	$71,750	$274,268
Milan Experiment Station	$95,901	$15,298	$37,671	$148,870
Plateau Experiment Station	$130,143	$21,762	$49,467	$201,372
Tobacco Experiment Station	$121,364	$20,217	$49,616	$191,197
West Tennessee Experiment Station	$337,962	$52,194	$130,470	$520,626
Total	$1,795,020	$347,332	$881,970	$3,024,322

Total Impact of TAES Expenditures

Tennessee Experiment Station Expenditures in excess of $10.7 million at the Branch Experiment Stations result in an estimated total impact of $14.7 million, with close to $1.7 million indirect and another $2.3 million induced (Table 9). An estimated $4.7 million in value-added or 32.3 percent of the total impact to the Tennessee economy occurs as a result of Tennessee Agricultural Experiment Station expenditures at the 10 branch stations.

Please note that this does not include the impact of the research conducted at the branch stations. Therefore, these numbers likely underestimate the overall economic impact of TAES research at branch stations. These potential benefits include adoption of output enhancing and/or cost reducing technologies. Minimum tillage farming systems conserve energy and reduce erosion while maintaining output. Other benefits include safer, less costly food supplies. While these benefits were not measured as part of this study, it has been estimated that annual rates of return range from 30 to 60 percent (Lyu, White, Liu, 1984; Norton & Ortiz, 1992; as reported in Norton; available at http://www.nal.usda.gov/pgdic/Probe/v2n2/bene.html). Using estimated annual rate of returns estimated in previous studies, the $10.7 million in Branch Experiment Station expenditures increases the annual impacts estimated in this study by an estimated $3 to $6 million.

Table 9. Accumulated annual impacts within the Zones of Economic Influence of the Tennessee Agricultural Experiment Station's expenditures at 11 branch stations

Branch Station	Total Industry Output			
	Direct	Indirect	Induced	Total
	Dollars			
Dairy Experiment Station	$830,000	$97,628	$110,471	$1,038,099
Forestry Experiment Station	$425,000	$50,215	$118,060	$593,276
Highland Rim Experiment Station	$685,000	$119,207	$189,735	$993,942
Knoxville Experiment Station	$3,350,000	$635,478	$983,830	$4,969,308
Martin Experiment Station	$430,000	$98,773	$59,288	$588,061
Middle Tennessee Experiment Station	$1,095,000	$193,148	$211,061	$1,499,209
Milan Experiment Station	$710,000	$113,103	$117,365	$940,468
Plateau Experiment Station	$690,000	$95,368	$113,651	$899,019
Tobacco Experiment Station	$640,000	$79,736	$112,117	$831,853
West Tennessee Experiment Station	$1,850,000	$216,381	$292,917	$2,359,298
Total	$10,705,000	$1,699,037	$2,308,495	$14,712,533

[i] Economic impacts result because the Tennessee Agricultural Experiment Branch Stations (TAES) purchase goods and services from other industries (Direct impacts). In turn, those industries would need to purchase goods and services from other industries (Indirect impacts). In addition, household and institutional spending would increase due to the added industry activity (Induced impacts) resulting from the initial TAES expenditures. The Total Industry Output (value of production by industry) measures the impact of the expenditure, while Value-Added measures changes to employee compensation, proprietor income, indirect business taxes, and other property income. The numbers of jobs created are an estimate of the number of full and part time positions required to meet the change in demand for goods and services.

[ii] These impacts are measured through IMPLAN.