Analysis of Agricultural Programs at Tennessee Community Colleges

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Introduction

This publication focuses on agricultural degree programs offered by Tennessee community colleges. After a brief literature review, we discuss national trends for associate’s degrees and baccalaureate degrees offered in agriculture, including an analysis of the gap in the demand for and supply of agricultural program graduates. We also evaluate compensation for agricultural degrees at community colleges in Colorado. Associate’s and certificate degree programs for Tennessee community colleges are then discussed. We also highlight the need for additional data regarding this topic. Our primary goals are to analyze the nature of agricultural programs at Tennessee community colleges and to determine whether the number of agricultural graduates from such programs is sufficient. The audience for this publication includes policy makers, community college leadership, workforce development professionals and anyone interested in the future of the agribusiness sector.
Literature Review

In our review of literature regarding community and technical colleges, agriculture in higher education (Rocca and Washburn, 2005; Espey and Boys, 2015), and extension and community and technical colleges (Kane, 2002; Thomas and Donaldson, 2014), we found little recent systematic research specifically aimed at agricultural programs in community and technical colleges. Further, there is a dearth of research regarding specific agricultural occupations that can be readily filled by community and technical college graduates. Hemp (1980) did evaluate agricultural teachers of Illinois community colleges in terms of experience and other factors. Similarly, McCaslin et al. (1995) evaluated the professional needs of community college and technical school agricultural teachers in Ohio. Stevenson et al. (2014) examined interest by community college students in rural areas regarding careers in food safety. Experience in the food safety industry was positively related to careers in food safety, while minority students were less interested in such occupations. In their evaluation of the demand for summer school courses, Keith and Akers (2010) found that animal science and equine science classes were the most preferred. Johnson et al. (1992) examined community college students who wish to transfer into agriculture at four-year institutions in Mississippi in 1985 and 1992. They found that many students lacked an agricultural background and that minorities were underrepresented. Johnson (1992) evaluated transfer students from community colleges into the College of Agriculture at Mississippi State University. He found that students with lower ACT scores performed as well as those with higher scores. Reneau and Kabat (1986) examined the awareness of high school students regarding agricultural programs at a community college in southern Illinois. They found a marked increase in enrollment in agricultural programs, followed by a marked decline.

National Trends

Research regarding agricultural employment opportunities and training focuses on four-year degree and graduate programs. This information is relevant for the many community college agricultural graduates who wish to pursue a four-year degree. It is also relevant in that at least some of the gap between occupational demand and supply for program graduates might be filled by individuals with a two-year associate’s degree. Geocker et al. (2015) indicate that agricultural majors are in high demand. In 2015, nearly 60,000 high-skilled agricultural job opportunities were created in the United States; however, there were only 35,000 qualified graduates to fill those positions (from U.S. colleges of agriculture and life sciences, forestry, and veterinary medicine or allied disciplines). The need to fill these jobs will become more important as we continue to develop solutions to feed more than 9 billion people by 2050.
In 2016-2017, 37,719 United States graduates will enter the workforce with proficiencies in food, agriculture, renewable natural resources or the environment. These graduates are expected to fill 61 percent of the projected 57,900 average annual openings (U.S. Bureau of Labor Statistics, 2019).

**Figure 1** shows the number of associate’s degrees awarded in agricultural and natural resources from postsecondary institutions from 2006 to 2016. The discipline experienced a 34.6 percent increase in the number of graduates from 5,838 in 2006 to 7,858 in 2016. As shown in **Figure 2**, the total number of associate’s degrees awarded across the board increased 52 percent, with 481,720 graduates with associate’s degrees in 1990 to over a million in 2017. Associate’s degrees in agriculture accounted for less than 1 percent of the total associate’s degree graduates from 2006 to 2017 (**Figure 3**). However, the number of agricultural graduates is increasing (**Figure 4**).

**Bachelor’s Degrees**

An analysis of baccalaureate degree programs in agriculture is appropriate, as most graduates of Tennessee community colleges can transfer to a bachelor’s degree program at any public university and many private universities in Tennessee. Bachelor’s degrees conferred in agricultural and natural resources have been on the rise in the last 10 years, but, as shown in **Figure 3**, these degrees make up less than 1 percent of the total number of graduates across all programs. The percentage of agricultural graduates has slowly decreased since 1999. The largest percentage of agricultural graduates was recorded in 1980 and fell sharply following the farm crisis of the mid-1980s. The average projected salary for agricultural and natural resources graduates is $53,565 (National Association of Colleges and Employers, 2018).

**Earned Income Analysis**

We also analyzed earned income for community graduates with degrees in agriculture at 16 Colorado community colleges, based on postsecondary education data collected by the U.S. Census. This information is relevant for Tennessee, in that it provides insight into the relative remuneration between different types of programs. (Note, we are forced to use Colorado because such information is not currently available for Tennessee or any other state; by inference, we assume that is a responsible proxy for Tennessee.) This data, postsecondary employment outcomes, is a combination of earned income by graduates of the respective institutions received one, five and 10 years after graduation, using administrative employment records that cover more than 96 percent of the U.S. working population. We analyze earned income at the 50th percentile for 2016 (i.e., for individuals who graduated in the 2015, 2011 and 2006 cohorts) (U.S. Census, 2019). Individuals with associate’s degrees in agriculture earned an average of $32,861 versus $41,093 for all community college graduates (20 percent less) (**Figure 5**). Likewise, individuals who
Figure 1. Associate’s Degrees in Agricultural and Natural Resources Conferred by Postsecondary Institutions, 2006-2016.

Figure 2. Total Number of Associate’s Degrees Conferred by Postsecondary Institutions, 1990-2017.

**Figure 3. The Percentage of Agricultural and Natural Resources Associate’s Degree Graduates Compared to Total Associate’s Degree Graduates, 2006-2017.**
received one- or two-year certificates in agriculture from community colleges earned an average of $35,619 versus $45,206 for all one-two certificate program graduates (22.2 percent less). On the other hand, individuals receiving certificates in agriculture that required less than a year of training earned on average $41,314 or 8.7 percent more than their community college counterparts. This result is perhaps surprising; however, an earlier report (National Research Council, 1988) argues that the evolution of technology has altered the nature and greatly broadened the array of agricultural occupations and professional careers. We add that more recently the introduction of technologies such as drones (Daniels, 2019) increased widening of career opportunities. O*NET data (2019) for agricultural technologists also indicate a demand for individuals with postsecondary certificates. Arguably, these changes in technology underline the demand for, and hence higher remuneration for, certificate-based training in the Colorado data. Overall, our analysis does imply that the “job


Figure 4. Bachelor’s Degrees in Agricultural and Natural Resources Conferred by Postsecondary Institutions, 1970-2017.
gap” between supply and demand observed for higher education occupations in agriculture could in part be filled by increased remuneration.¹

Figure 5. Earned Income for Colorado Community College Graduates in All Programs Versus Agricultural Degree Program Graduates in 2016.

AGRICULTURE AT TENNESSEE COMMUNITY COLLEGES

Tennessee Community Colleges

The State of Tennessee supports 40 community and technical colleges across the state, offering more than 400 programs of study. There are 13 community colleges that prepare students to either enter the workforce immediately or to continue their academic studies in a four-year school setting. The 27 colleges of applied technology are focused on training workers for immediate employment in specific sets of occupations (Tennessee Higher Education Commission, 2018). All of these institutions are governed by the Tennessee Board of Regents, which is the largest system of higher education in Tennessee.

Overall enrollment in the state’s community colleges declined by 9.5 percent from 98,459 in 2010 to 89,064 in 2018.² However, total enrollment over the most recent

¹ As pointed out by a reviewer, this gap can be filled by individuals with training in other areas (e.g., business students filling agricultural business positions). Although beyond the scope of our analysis, the degree to which such cross-discipline hiring influences business efficiency and effectiveness and ability to address agricultural-based social issues (such as meeting the need for future growth in agricultural production) is a topic worthy of additional analysis.
academic years increased by 2.1 percent from 87,220 enrolled in the fall of 2017 to 89,064 in the fall of 2018. Further, degrees or certificates conferred at these institutions increased by 57.1 percent from 9,699 in 2010 to 15,240 in 2018 (Tennessee Board of Regents, 2019). The number of degrees or certificates conferred has increased by 17.3 percent from 2015-2018 with 12,993 degrees conferred in 2015 and 15,240 conferred in 2018 (Tennessee Board of Regents, 2019). At least one institution, Pellissippi State Community College, grew with a 172.7 percent increase in total graduates from 792 in 2010 to 2,160 in 2018.

These recent increases are probably due, at least in part, to the Tennessee Promise Program (based on Tennessee Promise Scholarship Act of 2014, Tennessee Code § 49-4-708) that prescribed a tuition-free education and mentoring program at Tennessee community colleges and technical schools for students graduating from Tennessee high schools. The goal of the effort is to increase the number of state students who attend college by removing financial burdens. A Tennessee resident/U.S. citizen/eligible noncitizen/student who graduates from an eligible high school, homeschool or earns a GED/HISET (prior to their 19th birthday) can receive an award at an eligible postsecondary institution toward tuition and mandatory fees, after all other gift aid has been applied. Program participants also receive individual guidance from a mentor, primarily through mandatory meetings. Tennessee Promise participants must also complete eight hours of community service per term enrolled, as well as maintain satisfactory academic progress (2.0 GPA) at their respective institution (Tennessee Department of Education, 2019).

**Agriculture at Tennessee Community Colleges**

This study focuses on the nine community colleges in Tennessee with agricultural programs, specifically Cleveland State Community College, Columbia State Community College, Dyersburg State Community College, Jackson State Community College, Motlow State Community College, Northeast State Community College, Roane State Community College, Volunteer State Community College and Walters State Community College (Chattanooga State Community College, Nashville State Community College, Pellissippi State Community College and Southwest Tennessee Community College do not offer agricultural degrees). Agricultural programs and degrees offered by the nine institutions are listed in Table 1. The majority of agricultural programs reside in STEM-type programs (science, technology, engineering and mathematics). Six institutions (Cleveland State Community College, Columbia State Community College, Dyersburg State Community College, Jackson State Community College, Motlow State Community College and Volunteer State Community College) provide associate’s degrees in agribusiness, while four

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2 However, enrollment at Columbia State Community College, Motlow State Community College and Pellissippi State Community College continued to increase with 5,945, 6,612 and 11,390 students in 2017.

3 Programs that were considered agricultural as reported by the represented institutions and indicated in our document.
(Cleveland State Community College, Northeast State Community College, Roane State Community College and Walters State Community College) provide associate’s degrees in general agriculture. Four institutions (Columbia State Community College, Jackson State Community College, Motlow State Community College and Northeast State Community College) provide degree programs in animal science or preveterinary. Columbia State Community College, Dyersburg State Community College, Jackson State Community College and Northeast State Community College provide degree concentrations related to horticulture or plant and soil sciences. Forestry, wildlife and fisheries degree options are offered at Cleveland State Community College, Roane State Community College and Northeast State Community College. Only two institutions provide certificate programs in agriculture, Cleveland State Community College in agribusiness and Dyersburg State Community College in agrichemical applications. Given our analysis of earned income for agricultural program graduates in Colorado, Tennessee community colleges might consider offering short-term (i.e., less than one year) certificate programs in agriculture.

The associate’s degrees provided at Northeast State Community College in prewildlife and fisheries biology and preveterinary medicine are formulated to transfer to Lincoln Memorial University for four-year degree completion. Volunteer State Community College has “2+2 with APSU,” which is a program developed with Austin Peay State University. Volunteer State Community College’s agriscience associate of science is a two-year program for students who will transfer to Austin Peay State University to continue study, leading to the completion of a bachelor's degree in agriculture with a concentration in agriscience, agricommunications and agribusiness. Volunteer State Community College is the only community college that
<table>
<thead>
<tr>
<th>Community College</th>
<th>Program</th>
<th>Associate’s Degrees Offered*</th>
<th>Certificates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleveland State</td>
<td>Business</td>
<td>Agribusiness, Agriculture</td>
<td>Agribusiness Certificate</td>
</tr>
<tr>
<td>Cleveland State</td>
<td>Science, Technology, Engineering and Mathematics (STEM) Programs</td>
<td>Forestry, Wildlife and Fisheries</td>
<td></td>
</tr>
<tr>
<td>Columbia State</td>
<td>Science, Technology and Mathematics Division</td>
<td>Agriculture — Agricultural Business, Animal Science, Plant Science</td>
<td></td>
</tr>
<tr>
<td>Dyersburg State</td>
<td>Division of Arts and Science</td>
<td>Agriculture — Agricultural Business, Plant Science</td>
<td>Agriculture Applications Certificate</td>
</tr>
<tr>
<td>Jackson State</td>
<td>Math and Natural Sciences</td>
<td>Agriculture — Agricultural Business, Animal Science, Plant and Soil Science</td>
<td></td>
</tr>
<tr>
<td>Motlow State</td>
<td>Natural Sciences</td>
<td>Agriculture — Agricultural Business, Animal Science</td>
<td></td>
</tr>
<tr>
<td>Northeast State</td>
<td>Science</td>
<td>Agriculture, Horticulture, Prewildlife and Fisheries Biology, Preveterinary Medicine</td>
<td></td>
</tr>
<tr>
<td>Roane State</td>
<td>Environmental</td>
<td>Agriculture, Forestry, Wildlife and Fisheries</td>
<td></td>
</tr>
<tr>
<td>Volunteer State</td>
<td>Mathematics and Science Division</td>
<td>Agriculture — Agriscience, Agriculture — Agricommunications, Agribusiness</td>
<td></td>
</tr>
<tr>
<td>Walters State</td>
<td>Agriculture</td>
<td>Agriculture</td>
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</tbody>
</table>

* Includes associate of science (AS), associate of applied science (AAS) and Tennessee Investment Preparing (TIP) AS degrees.
supports a concentration in agricultural communications. The associate’s degree provided by Walters State Community College is designed to prepare students for any four-year institutions with emphasis in agricultural education; animal science; food and agricultural business; food science and technology; forestry, wildlife and fisheries; and plant/soil sciences.

As shown in Table 2, six of the nine community colleges with agricultural programs graduated 113 students with degrees in agriculture from 2014 through 2018 academic years. Three institutions provided no information and two provided only the total number of agricultural program graduates in this period. With incomplete data, it is difficult to draw much in the way of conclusions regarding growth or decline in the number of degrees awarded by Tennessee community colleges in agriculture. But given the employment gap between the study of and demand for agricultural graduates at the national level, we are left to wonder if the number of agricultural graduates from Tennessee community colleges is meeting the needs of agribusiness in the state and elsewhere and society in general.

### Table 2: Tennessee Board of Regents Community College New Graduates in Agricultural Programs by Academic Year 2014 Through 2018.

<table>
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<td>Cleveland State</td>
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<td>4</td>
<td></td>
<td>2</td>
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<td>6</td>
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<td>15</td>
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<td>151</td>
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<td>4</td>
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<td>4</td>
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<td>4</td>
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<td>15</td>
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<tr>
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<td>9</td>
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<td>23</td>
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<td>Motlow State$^2$</td>
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<td>Northeast State$^2$</td>
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<td>Roane State</td>
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<tr>
<td>Volunteer State$^2$</td>
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<tr>
<td>Walters State</td>
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<td>6</td>
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<td>8</td>
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<td></td>
<td>113</td>
</tr>
</tbody>
</table>

$^1$Total graduates since 2014; breakdown by academic year unavailable.

$^2$These institutions did not respond to multiple requests for data.

### Conclusion

Nationally, the number of associate’s degrees awarded in agriculture and natural resources from 2006 to 2016 grew by 34.6 percent. Despite this growth, an estimated 39 percent gap exists between supply of and demand for new graduates with training in food, agriculture, renewable natural resources or the environment (from U.S. colleges of agriculture and life sciences, forestry and veterinary medicine or allied disciplines). Thus, employers will be forced to look to other areas such as biology for workers (United States Bureau of Labor Statistics, 2019 and Goecker et al., 2015).
Community colleges can equip students with the skills needed to pursue careers in agriculture. While associate's degrees in agriculture accounted for less than 1 percent of the total graduates with associate's degrees from 2006 to 2017 in the U.S., the total percentage of agricultural graduates are increasing. Analysis of earned income of community college graduates in Colorado indicated agricultural program graduates earned 30 percent less than their nonagricultural counterparts (perhaps suggesting that remunerations need to be increased to attract more students).

Total enrollment across all programs at all Tennessee community colleges increased by 2.1 percent from 2017 to 2018. Nine out of the 13 institutions have associate’s degree programs and two offered certificate programs in agriculture. Six institutions offered three degree programs, while Northeast State Community College offered four programs and two institutions offered one program. Agribusiness was offered by six institutions, followed by general agriculture by four, animal science (including preveterinary) by four and wildlife fisheries plus forestry by four institutions. Six of the nine institutions had 113 associate’s degree graduates over four academic years starting in 2014 and ending in 2018. But given the employment gap between study of and demand for agricultural graduates at the national level, we draw the conclusion that the number of agricultural graduates from Tennessee community colleges is not meeting the needs of agribusiness in the state and elsewhere and society in general.

References


