

Career Pathways of Agriculture Students: An Introspective Look Through a 40-Year Lens

by

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Career Pathways, Workforce Development, Institutional Data Practices, Student Outcomes,
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Abstract

Escalating workforce demands, rapid technological advancements, and the rise of niche markets have significantly impacted agricultural career pathways and post-secondary educational opportunities, increasing the importance of advanced degrees and specialized certifications. Over the past four decades, the skills and education required for agricultural professionals have transformed, with substantial growth in demand for highly skilled individuals to fill both traditional and new positions, including within the expanding Agricultural Leadership, Education, and Communications field. The industry also needs a diverse and highly skilled workforce to navigate modern agriculture's complexities. A comprehensive examination of the agricultural industry explored existing and emergent career paths, analyzed historical trends in agricultural employment, and identified new career trajectories resulting from workforce expansion, talent retention, and various state and national initiatives emphasizing the need for a highly skilled and educated workforce. The skills and competencies required for these evolving roles were examined, considering the impact of technological advancements and the resulting demand for specialized knowledge. The alignment of existing educational programs with current and projected workforce needs was assessed, identifying potential gaps and areas for improvement.

Based on these findings, I recommend unifying the disconnected Agricultural Leadership, Education, and Communications program under a single department within the College of Agriculture. The group housed within the College of Education should transition to the College of Agriculture, joining the other existing program areas (ag communications, ag leadership, and agricultural science) under unified leadership. This consolidation reflects this field's position as

an applied field of agriculture and mirrors every aspirational or peer program, both nationally and internationally. While teacher training is one aspect, it's a small part of agriculture's broader social and behavioral sciences. Auburn University should look to peer and aspirational Land-Grant institutions for models and best practices to serve its mission of improving agriculture and Alabama. A limited perspective of the administrative organization is hindering progress and undermining efforts to retain Alabamians in the state's most valuable workforce, the agricultural workforce. I recommend that Auburn University adheres to established CIP codes, using 01.0801 for ALEC teacher/extension agent aspects and 01.0899 for non-formal aspects (Ag Leadership/Ag Science). This work aimed to understand how educational institutions can effectively prepare students for diverse agricultural career opportunities, contributing to a robust and adaptable workforce that meets 21st-century challenges.

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List of Abbreviations

ACCCP	Alabama Committee on Credentialing and Career Pathways
ACHE	Alabama Commission on Higher Education
AOA	Alabama Office of Apprenticeship
ATLAS	Alabama Terminal on Linking and Analyzing Statistics
AWC	Alabama Workforce Council
CIP	Classification Instructional Programs
CTE	Career and Technical Education
FFA	Future Farmers of America
GOEWT	Governor's Office of Education and Workforce Transformation
NAICS	North American Industry Classification System
NCES	National Center for Education Statistics
NGA	National Governor's Association
RA	Registered Apprenticeship
STAR	Skilled Through Alternate Route
WBL	Work-Based Learning
WIOA	Workforce Innovation Opportunity Act

Chapter 1: Nature of the Problem

Introduction

As a result of the technological changes in the workplace, career opportunities in Agriculture are changing and will require new skills alongside postsecondary credentials. While agriculture careers have changed greatly over the last several generations. The next generation of farmers, cattlemen, leaders, communicators, development officers, educators, researchers, and county extension agents will need to be prepared with a new set of knowledge and have access to different types of hands-on learning experiences (Clemons & Lindner, 2019; Harder et al., 2021, McKibben et al., 2022; McKibben et al., 2024a; McKibben et al., 2024b; McKibben & Murphy, 2021). Career opportunities will be abundant but hardly recognizable to agriculturists of the 20th century. Integration of modern tools and methods of production and education will yield greater effectiveness and efficiency in producing crops, raising livestock, preparing agricultural products, and marketing products to consumers (Waling. 2024, Lindner et al., 2020).

Over the past 40 years, agriculture has been transformed by shifts in technology, education, workforce demands, conservation practices, cultural viewpoints, standardized practices, and industry needs (Misra & Ghosh, 2024). These changes have created new challenges for the industry. As a result, there is a growing need for additional workforce development programs, new majors, specialized degree options, and diverse career paths within agriculture (U.S Bureau of Labor Statistics. 2024). New programs, majors, and career and on-the-job training opportunities are rising. Feldpaush et al. found that collegiate agriculture programs face a pressing need to produce graduates who are prepared for successful careers (2019). Educators are challenged by generational differences in student attitudes and

backgrounds, requiring them to adapt curricula to ensure students establish successful career paths (Feldpaush et al., 2019).

Context of the Problem

As uncertainty and increased demand on the workforce cultivates new problems to solve, the gap between trained, skilled, and credentialed personnel continues to grow. This is exceedingly true when discussing agriculture and related industries. Despite the common misconception that agriculture only involves farmers and is a declining industry, Alabama's agriculture, food, and natural resources sector supports over 500,000 jobs—accounting for 22% of the state's workforce—through careers in agriculture, forestry, and related services (Alabama Works. 2024). This is the exact number of credentialed workers that Governor Kay Ivey wanted to add to Alabama's workforce by 2025. While many efforts have been set in place to attempt to achieve this goal, these efforts alone do not answer the call to fill the widening gap in the agricultural industry.

With technology reaching further than ever before, post-secondary and secondary agriculture programs continue to grow and offer unique learning opportunities outside the typical classroom setting (Clemons et al., 2018; Croom et al., 2023; Faulk et al., 2024; Hancock et al., 2023; Hancock et al., 2024). Numerous programs are embracing technology and change, and new programs are coming into existence at a rapid pace. By utilizing technologies such as artificial intelligence, drone operations, precision agriculture, and virtual/augmented reality experiences for on-the-job training or acclimation, the agricultural industry is changing at an exceptionally fast rate. (USDA. 2024) Michael Simmons stated that “20 years from now, the rate of change will be 4x what it is now...” Ray Kurzweil said it another way in that “we won't experience 100 years of progress in the 21st century, but 20,000 years of progress...” In his book,

“Through the Looking Glass,” Lewis Carroll depicted a scene where the Red Queen tells Alice she must run as fast as she can to stay in the same place. This is often referred to as the “Red Queen Effect,” this theory describes a world in a perpetual state of acceleration, this ever-present acceleration leads to unsustainable and cancerous growth and development (Voelpel et al., 2004).

Multiple endeavors involving Career and Technical Education (CTE) have been initiated to fill the need of industry partners. Wang et al. (2022) noted that from 1948 to 2017, U.S. agricultural output increased by 187%, while the workforce declined by 76%, a trend expected to persist. While Alabama has built a climate for businesses, industries, and entrepreneurs to innovate and thrive, Alabama is experiencing a workforce population crisis. Tare Hutchison, from the Alabama Department of Labor, stated that “We have more open jobs than we have people right now...” (Carpenter. 2024) The agriculture industry is no exception. According to Harold Hunt, “agriculture, forestry and related industries contribute more than \$70 billion to Alabama’s economy, accounting for almost 40 percent of Alabama’s gross domestic product” (Alabama Works. 2024).

With the complexity and challenges of workforce development programs expanding, studying connections between student success, innovative program development, industry partnerships, common fallacies, and agriculture’s history is vital in understanding the changes in industry standards, availability of careers and the pathways that lead to credentialed workers, and how those certifications or degrees impact the labor force.

Theoretical Framework

Agricultural education combines diverse philosophies that influence methodologies and practices. It is rooted in vocational education, now called Career and Technical Education

(Clemons et al., 2021; Pense et al., 2015). With the increasing need for skilled workers, both the agricultural industry and its educational field have expanded (Croom et al., 2023; Heidenreich et al., 2020; Howerton et al., 2019).

For this paper, we will discuss constructivism theory (Piaget, 1970) and seven of the sixteen theorems on Vocational Education by Dr. Charles Prosser (Prosser & Quigley, 1949). Constructivism theory requires a clear vision of what it means to allow learners to connect with their own experiences to gain new knowledge. “The learner is expected to consider the information being taught and construct an interpretation. The interpretation is constructed based on past experiences, personal views, and cultural background. Following the interpretation, the learner is expected to reflect on the new knowledge” (Brau, 2020, Nature of the Learner, para. 1).

There are three foundational psychologists who contributed to the constructivism theory, Jean Piaget, Len Vygotsky, and John Dewey. Each brought their own unique perspective to the forefront and helped narrow the focus of what constructivism is. (See Table 1)

Table 1

Foundational Psychologists of Constructivism

Jean Piaget, 1970	Known as one of the first theorists in constructivism and indicated that humans create knowledge through interaction with their experiences and ideas.
Lev Vygotsky, 1978	His work contained the central scope focused on the social aspects of acquiring knowledge and suggested that learners create an environment of shared meanings with their peers. Founder of Vygotsky’s Social Development Theory.

John Dewey, 1910	Dewey emphasized the nurture of independent reasoning ability and stressed the importance of inquiry sustained learning being supported by ensuring a synthesis of the participants environment.
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The work of Piaget was not fully understood until the early 20th century, and once rediscovered, educators began to understand the depth and breadth of his work in cognitive adaptation and the development of cognitive schema.

Vygotsky's work remained behind the iron curtain until the 1970's when his publications were translated into English and distributed within the United States. His approach to childhood development is a form of social constructivism and was based on the idea that social interactions are the catalyst for cognitive functions. Vygotsky believed that everything was learned on two levels:

1. Between people (Inter-psychological)
2. Individually (Intra-psychological)

Both “applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals” (Vygotsky. 1978).

Dewey emphasized that hands-on learning fosters deeper knowledge, creativity, and collaboration (Behling & Hart, 2008). He believed that educators needed to provide students with experiences that were valuable and enables them to contribute to society, the workplace, and at home. Much of which is required, not only in the agriculture sector, but in other industries as well.

Comparable to the works of Dewey, Vygotsky, and Piaget, Dr. Charles Prosser yielded several favorable developments in the early 1900's. One of which led to the passing of the Smith-Hughes Act of 1917. Major influencers Senator Carroll Page, Hoke Smith, Representative Dudley Hughes, and Charles Prosser, all pivotal members in advocating federal legislation, relied heavily on groundbreaking work that had been completed alongside David Snedden, Rufus Stimpson, and Charles Allen. Between these seven highly educated, skilled, and passionate individuals, the world of vocational education was never viewed the same. "The Smith-Hughes Act of 1917 contained a provision that all agricultural students were required to have supervised farm practice" (Moore, 1988, p. 52). This ultimately led to the development of supervised agricultural experiences (SAE's) in 1942.

Two years earlier, Prosser outlined 16 theorems as the foundation for effective vocational education (Moore, 2003). Like Dewey, he criticized conventional school systems that only focused on academics and college preparation. Seven of Dr. Prosser's theorems directly relate to the purpose of this study which is to embrace the importance of CTE programs, its partners, industry leaders, and curriculum alignment (See Table 2).

Table 2

Seven of Prosser's Theorems on Vocational Education

Theorems	Focus	Description
Theorem One	Work Environment	It is efficient for vocational education to be taught in an environment like the workplace, where a learner will eventually work.
Theorem Two	Industry Standards	Practical vocational training is only possible when the training jobs are carried out using the

		same tools, machines, and operations as in the occupation.
Theorem Nine	Industry Needs	Vocational education must recognize conditions and prepare individuals to meet the market's demands.
Theorem Ten	Real World Jobs	Learners can establish process habits more effectively when the training is based on actual work instead of exercises or fictitious tasks.
Theorem Eleven	Partnership	The only reliable content source for specialized training is the experience of masters in the field.
Theorem Twelve	Aligning Curriculum	All occupations contain a body of content unique to their field, general teaching will not help develop a competent worker.
Theorem Fifteen	Adaptability	A flexible and fluid administration will make vocational education more efficient in proportion to its elasticity and fluidity rather than rigidity and standardization.

Source: Bloomfield, S. 2023. Examining Business and Industry Involvement in Alabama CTE Programs, Teacher Satisfaction with the Partnership, and Perceived Barriers.

Theorems *one* and *two* strongly encourage employers to utilize the same tools, equipment, space, and work environment with which the student may be exposed to. In doing so, participants are made aware of the employer's expectations and the positions scope of requirements.

The Future Farmers of America (FFA) “focus on learning through doing” has helped facilitate and solidify the three-component model currently used in agricultural education and has proven to be successful in preparing students for college and workforce placement across the nation. The three-component model is comprised of classroom and laboratory instruction, leadership development, and experiential learning. (NAAE. 2024)

A study conducted in 2019, sought to determine if there was a difference in ACT WorkKeys Assessment scores when 11th grade Illinois agriculture students from Gold and Silver Emblem FFA Chapters were compared with all other state 11th grade students. Mouser et al., (2019) found that agriculture students were more career ready than their peers in math and are as career ready as their peers in reading. This study provided measurable evidence that agricultural education fosters career readiness, highlighting the value of hands-on learning and the work environment (Mouser et al., 2019). Theorem *nine* points out that vocational education programs must be equipped to prepare individuals for the workplace. This includes the placement of highly skilled qualified instructors to effectively lead and facilitate a learning experience. Vocational education programs can never exist as just a course in school but must be considered as a community, state, and nationwide project. Instructors who fulfill these rolls must have recent employment experience and be able to navigate the current needs of employers, partners, and the economy in which that role is provided within.

The Alabama Workforce Council works extensively to foster opportunities, such as those mentioned above, while adding value to an internship or employment program. “Through collaborations with the Alabama Community College System, we are actively promoting innovative training models that combine short-cycle training with supportive services, facilitating individuals in both learning and earning” (McCartney, T., 2024, p. 3). Tools and

programs such as the Alabama Talent Triad, Alabama Works, Workforce Innovation and Opportunity Act Programs (WIOA), Rapid Response Team and more, Alabamians now have a road map to success. By visiting any one of these programs, participants have access to a wide array of employment, internship, on-the-job learning, and program opportunities that align with every individual's need or interest. Which also encompasses the requirements of Prosser's *theorem ten*. The importance of practical, live work assists workers in developing the skills that are essential to the occupation.

Theorem eleven places a specific focus on partnerships. The importance of effective involvement from occupational advisors to assist in curriculum planning is crucial when preparing students for a job within that industry. Strong relationships between rural community college leaders, industry partners, and workforce stakeholders are essential for economic growth and regional vitality (Kinder & Cruse, 2024). Consistent with the idea of theorem eleven, *theorem twelve* iterates the need for curriculum alignment with industry partners to help confirm the course content, level of training needed, and experience of masters in that occupation. Broader areas of instruction in the subject matter, unrelated to problems at hand, have little to no benefit to the development of the worker and hinder the ability of the employer to fulfill his immediate need. To accomplish this, CTE educators, instructors, and administrators must be flexible and adaptable as employment needs, industry conditions, course content, and more may change as needs change across the board. This is outlined in Dr. Prosser's *theorem fifteen* and states that "vocational educators should be always alert to possible improvement and be willing to work toward continually adjusting the programs in light of changing employment requirements" (Prosser, C.A. & Quigley, T.H. 1949, Theorem 15).

Prosser mentions several other key distinctions such as reducing cost per capita, being open minded to individuals' characteristics, and ensuring that the individual participating is doing so out of desire and will to be present. Investigating the who, what, when, where, why and how Alabama's CTE and agriculture programs are facilitated will provide deeper insight as to what career pathways are readily available to agriculture students, what changes have occurred, and how it directly impacts Alabama's labor force. Instead of focusing on the unemployment rate, we must shift the narrative and focus on the labor force participation rate. The who, what, when, where, why and how individuals are participating in the workforce will help in understanding the needs of the community, workforce, business and industry leaders, as well as mitigate foreseeable problems before they even arise.

Purpose of Research

The purpose of this study was to determine the impact of students who obtained agriculture degrees on the labor force, specifically, Alabama's labor force. Additionally, this research aims to identify the career pathways that are available to agriculture students, examine how those pathways have evolved over the last 40 years, and explore how new programs are expanding opportunities for students interested in agriculture.

Results from this study are of particular interest to the following entities: high school students; college administrators; regional workforce boards; industry partners and leaders; and divisions within the Alabama Department of Workforce.

Statement of Research Questions

This study addressed the following research questions:

1. What career pathways are readily available to agriculture students and how have they changed over the last 40 years?

2. What changes have occurred to warrant the demand for creation of new programs and the expansion of existing programs?
3. How do degrees obtained in agriculture, and related fields, impact the labor force?
Specifically, Alabama's labor force?

Definitions of Relevant Terms

Before proceeding, the reader must understand key terms that are utilized throughout the study. These key terms are listed below with their corresponding definitions.

Career Pathways: “a schematic or mapped series of manageable education and training steps toward industry-aligned skills, credentials, and career advancement. Each step is designed to prepare people for employment while providing a clear pathway to the next level of education and training within an industry. Pathways may also include necessary credentials and supportive services” (Urban Institute. 2022).

Career and Technical Education (CTE): “a term applied to schools, institutions, and educational programs that specialize in the skilled trades, applied sciences, modern technologies, and career preparation. It was formerly (and is still commonly) called *vocational education*” (The Glossary of Education Reform. 2014).

Alabama Workforce Transformation Act: “This act amends Sections 25-2-2, 25-2-3, and 25-2-6, Code of Alabama 1975, to: (1) rename the Alabama Department of Labor the Alabama Department of Workforce and designate the head of the department as the Secretary of Workforce; (2) further provide for the duties and authorities of the department and secretary; and (3) transfer certain state and federal workforce programs, staff, and assets to the department. This act adds Chapter 15 to Title 25 to the Code of Alabama 1975, to: (1) establish the Alabama Workforce Board as the State Workforce Development Board; (2) provide duties and authorities

of the board; (3) establish the executive committee of the board, which shall work with the secretary to create the strategic workforce plan to guide state and federal workforce development policies; and (4) permit the formation of regional workforce boards. This act amends Sections 41-29-5 and 41-29-282, Code of Alabama 1975, to rename the Alabama Department of Commerce Workforce Development Division the Alabama Industrial Development Training Institute and to provide for the operation of the institute. This act repeals Sections 41-29-290 through 41-29-297, Code of Alabama 1975, relating to the Alabama Workforce Council and Section 41-29-300, Code of Alabama 1975, relating to Regional Development Councils. This act also directs the Code Commissioner to make certain revisions to the Code of Alabama 1975, to conform with these changes” (Alabama Workforce Transformation Act, <https://alison.legislature.state.al.us/bill-search?tab=3>).

Alabama Workforce Pathways Act: “This act: (1) requires the State Board of Education to establish a Workforce Pathways diploma pathway and curriculum; (2) provides that any student who earns a diploma through this pathway is eligible for admission to any postsecondary education institution, subject to the institution's admission requirements; (3) authorizes the board to seek additional funding from the Legislature to upgrade or construct career and technical education centers; and (4) authorizes the Legislature to provide funding for the Alabama Short-Term Credential Program for scholarships towards in-demand college courses in the Alabama Community College System” (Alabama Workforce Pathways Act, <https://alison.legislature.state.al.us/bill-search?tab=3>).

Academic Program Inventory: a comprehensive list of all instructional programs approved by the Alabama Commission on Higher Education in Alabama’s public colleges and universities. This

list is updated after each commission meeting and is organized by Institution and Classification Instructional Programs (CIP) Codes.

Alabama Committee on Credentialing and Career Pathways (ACCCP): a sub-committee of the Alabama Workforce Council that identifies regional and statewide in-demand occupations, career pathways, and credentials of value on an annual basis. “The ACCCP is tasked with analyzing primary and secondary labor market data and data from the Alabama Terminal on Linking and Analyzing Statistics (ATLAS) on Career Pathways to determine, annually, among the sixteen (16) career clusters and seventy-nine (79) associated career pathways, which occupations and career pathways are in-demand at the regional and state level” (The Alabama Committee on Credentialing and Career Pathways. <https://alabamaworks.com/acccp/>).

Assumptions

The underlying assumption of this study was that students who obtained a post-secondary degree in agriculture, or related fields, are intricately woven into the fabric of Alabama’s workforce and play a major role in filling job openings outside their range of degree obtainment. This assumption lends weight to the argument that agriculture students are more career ready and can often hold positions in occupations broadly defined by the 16 national career clusters. An important element to bear in mind is that numerous programs are being added on a quarterly basis to the Academic Program Inventory housed at the Alabama Commission on Higher Education. If agriculture students were not entering various fields outside the parameters of their traditional codified degree programs (i.e. agriculture general studies, agriculture economics, agriculture business, etc.) why then, would new programs such as agriculture communications, forest business and investment, parks and recreation management, and restoration ecology be integrated as new areas of study?

Limitations

Limitations to this study are as follows:

1. During the data retrieval process, discrepancies were found in how CIP codes were reported from institutions, such as Auburn University. This made tracking the individuals beginning to end point harder to identify.
2. Number of labor force records. Over 61,000 records were utilized to draw conclusions and show patterned trends within Alabama's workforce.
3. Discrepancies brought forth during testing due to incorrect CIP codes and/or NAICS codes.
4. No direct in-depth study has been completed previously.

Delimitations

The boundaries of this paper are confined to the State of Alabama, its program implementation strategies, and its labor force. National and additional states data were utilized to show comparisons in program implementation, program vitality, labor force wage appropriations, and program inventory to that of Alabama's. It is important to note that statements regarding trends, statistical significance of results, conclusions, and recommendations have no theoretical application outside of this scope.

Significance of the Study

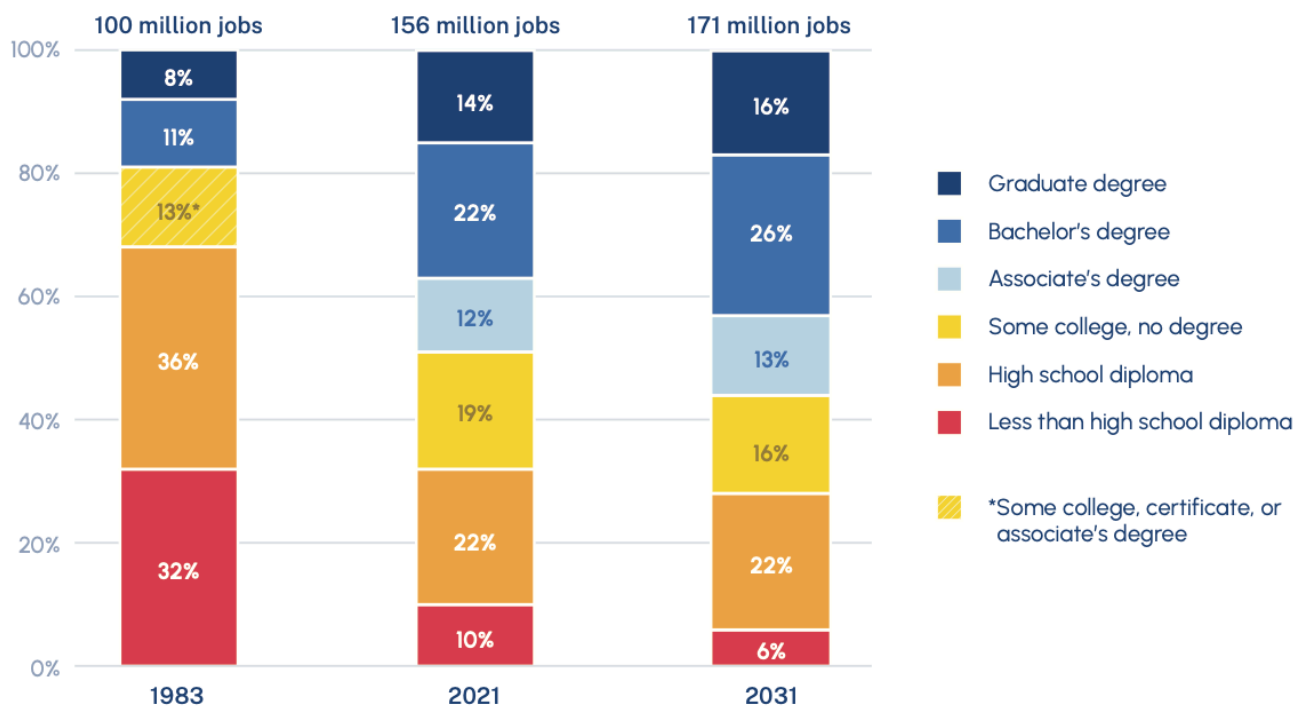
Through numerous federal and state efforts, such as the Perkins Reauthorization Act of 2018 (Perkins V), career and technical education now has the largest seat at the table in terms of economic and workforce success. A report on Investing in America's Future (2012) stated that "out of 30 of the fastest-growing occupations, about two-thirds require postsecondary training." By 2031, an estimated 72 percent of jobs in the U.S. will require a post-secondary degree and/or

training. (Georgetown University. 2024) Over the last three decades, demand for post-secondary degrees and credentialed workers have grown.

(See Figure 1).

Figure 1

Forty-two percent of jobs in 2031 will require at least a bachelor's degree, while only 28 percent will go to workers with a high school diploma or less.

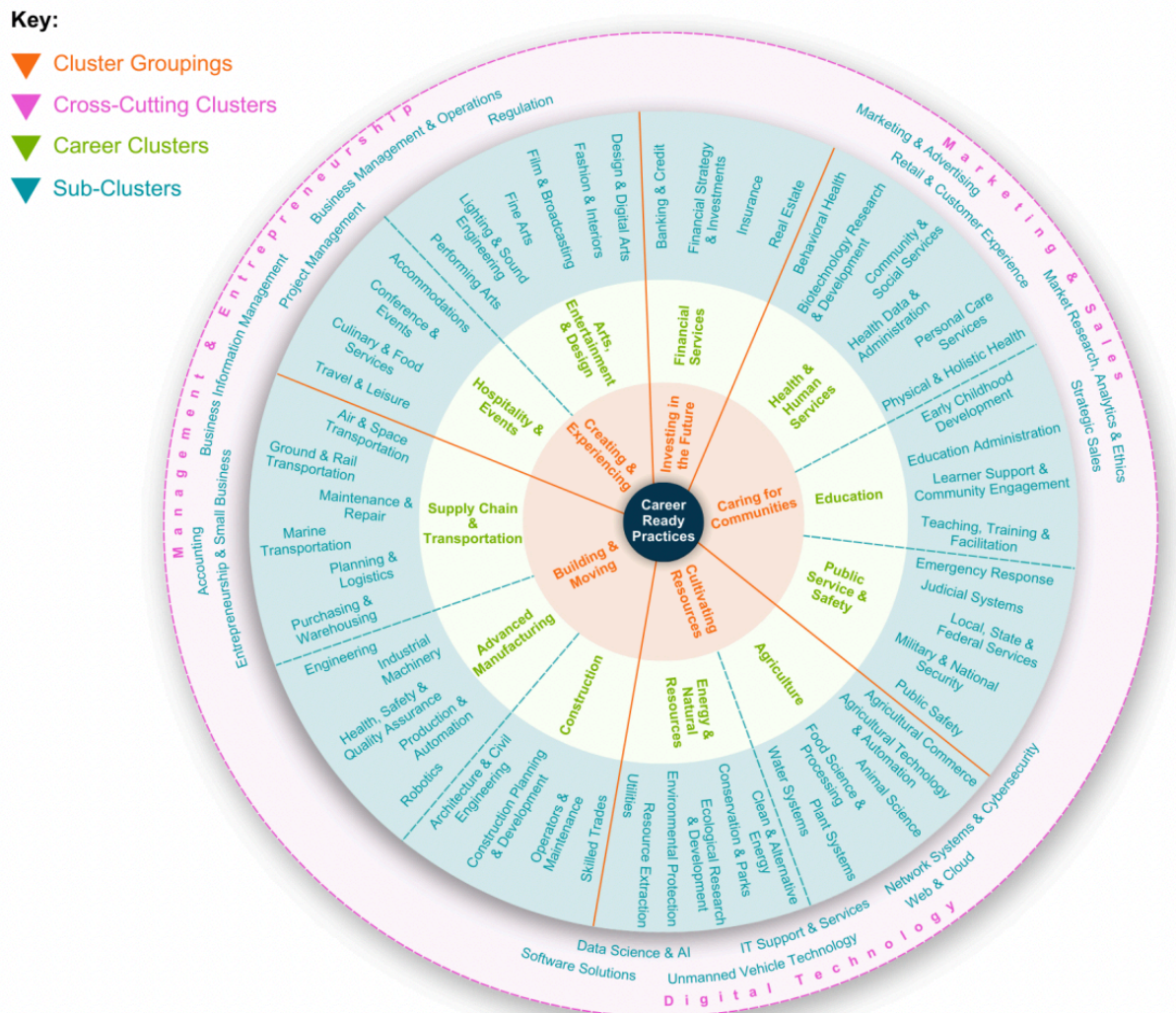


Source: Georgetown University Center on Education and the Workforce forecast using data from the US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS); US Census Bureau, American Community Survey (ACS); US Bureau of Labor Statistics; IHS Markit; Lightcast; and US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), 1983. *Note: Before 1992, the education variable in the Current Population Survey was identified as years of schooling. We are therefore unable to differentiate between “some college or certificate” and “associate’s degree” in those years. Columns may not sum to 100 percent due to rounding.

The agriculture industry is comprised of more than one career cluster. In fact, employment opportunities for an individual with an agriculture related degree has the potential to be employed in any one of Alabama’s 16 recognized career clusters with varying degrees of overlap in between. (See Figure 2).

Figure 2

Career Cluster Model - Wheel View



Alabama's Acknowledged Career Cluster Model Wheel

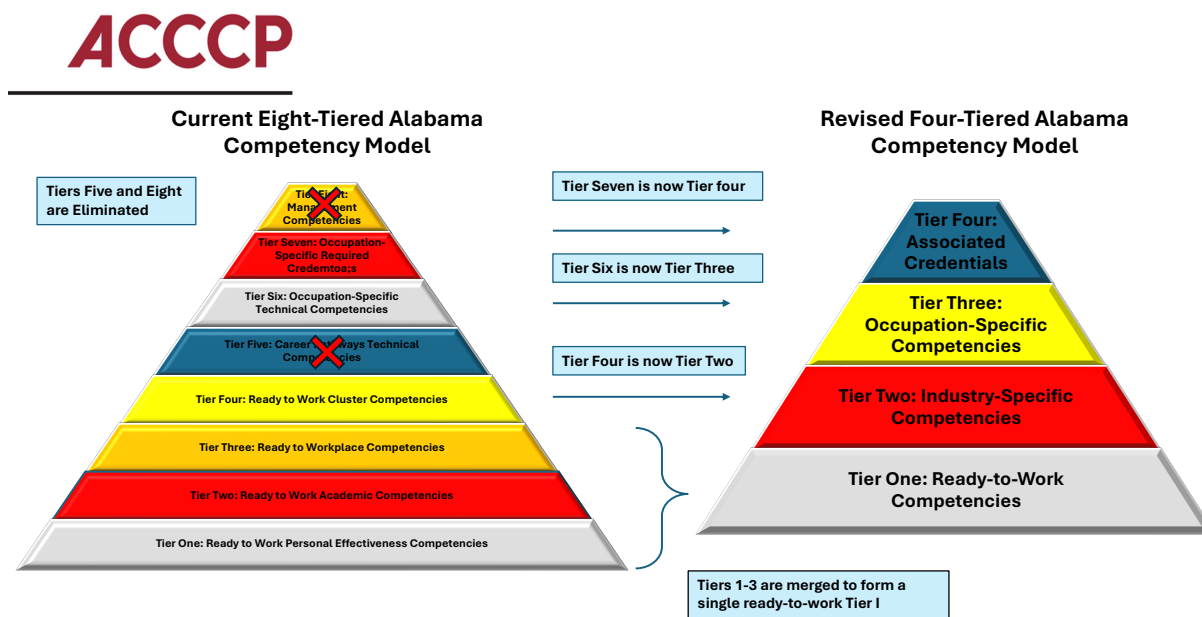
Source : N. Moore, personal communication. June 6, 2024

If you notice, the model is constructed on a continuum with an outer ring that applies to any of the career clusters, its subclusters, and groupings within the wheel. This model was adopted based on the Alabama Committee on Credentialing and Career Pathways (ACCCP)

movement from the eight-tiered competency model to a 4-tiered competency model. (See Figure 3)

Figure 3

ACCCP Eight-Tier to Four-Tier Competency Model



Source : N. Moore, personal communication. June 6, 2024)

The need and demand for qualified, highly skilled, educated workers is at an all-time high, and the agriculture industry is no exception. Through the establishment of the Alabama Governor’s Office of Education and Workforce Transformation (GOEWT) combined efforts of the Alabama Workforce Council, Success+, Alabama Works, ALFuel, ACT 2024-115, and ACT 2024-126, Alabama’s post-secondary degree and credential obtainment rate has progressed at a steady pace; however, the work is never done.

Nationally, there are more than 70 million workers who are Skilled Through Alternate Route (STAR) programs, and of those 70 million workers, roughly 1.9 million account for 59 percent of Alabama’s workforce. In April of 2024, Alabama’s labor force participation rate

increased to 57.5 percent, but that also means that 42.5 percent of the state is not actively participating in the labor force.

Despite the need in agriculture related fields and the impacts it has on the economy, students, consumers, and most importantly, the food chain, no studies have examined how agriculture students are intertwined within Alabama's workforce. Additionally, no studies have been completed to identify the variations that exists in career clusters and how there is no "one size fits all" model.

Chapter 2 Literature Review

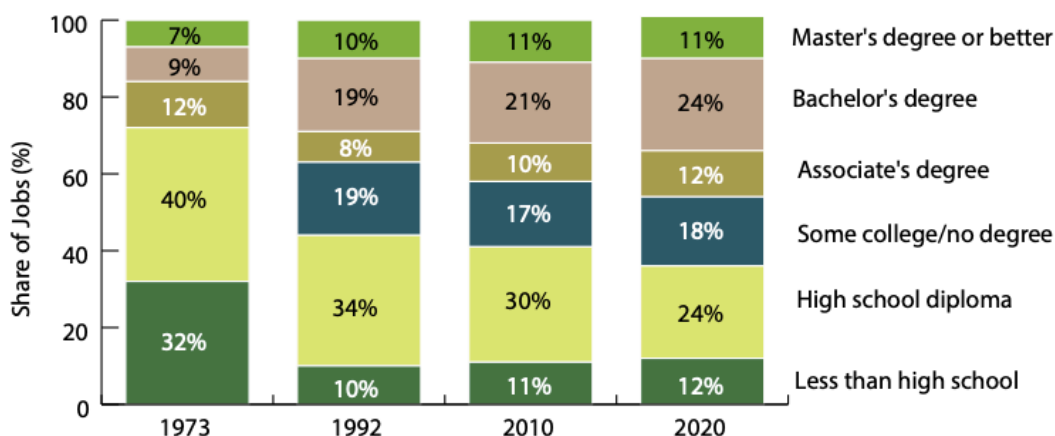
Introduction – What is Career and Technical Education?

Career and technical education; vocational education; hands-on-learning; on-the-job learning; apprenticeships; internships, etc. These are all common names or associations that have helped define Career and Technical Education over the last 40 years. The National Center for Education Statistics (NCES) defines career and technical education (CTE) as courses or programs offered at both the secondary and post-secondary level that focus on the knowledge and skills required for specific jobs or fields of work; however, looking back over the course of CTE's evolutionary period we find that career and technical education was originally known as vocational education. It has long provided hands-on training for employment, dating back to apprenticeship systems like those in the Neo-Babylonian Empire (626 BC). Today, it blends classroom learning with practical experience (Brush, K., 2016).

Career and Technical Education is comprised of many moving parts that start at the federal level and filters down to local-regional workforce boards. A sustainable workforce has been a concern across the nation since the deindustrialization period. (State of Alabama Work-Based Learning State Report. 2019) Having sustainable, productive, highly skilled, and motivated individuals in the workforce has been a target of the modern American economy since that time. Carnevale et al. stated that “post-secondary education and training on the job and in schools have become the gateways to the middle class.” Figure 4 illustrates the drastic changes within the United States labor market from 1970 to 2020.

Figure 4

U.S. Share of Jobs Percentage Compared to Degree Obtainment 1973 – 2020



Source: Carnevale et al. (2012). *Career and Technical Education: Five Ways That Pay*. Pg. 2

In 1970, 74 percent of the middle class were represented by workers with a high school diploma or less. By 2007, less than two out of five workers had a high school diploma or less (Carnevale et al., 2012). In 1973, over 75 percent of jobs within the labor force required a high school diploma or less but by 2020, every two out of three jobs required a form of post-secondary education and/or training. This number continues to grow and morph with the advancements in technology, education, workforce demands, conservation practices, cultural viewpoints, standardized practices, and industry needs. “The American economy has transitioned from one with strong job prospects for workers with less than a high school diploma to one that relies heavily on workers with post-secondary education or training” (Georgetown University, 2024, p. 6).

“The Strengthening Career and Technical Education for the 21st Century Act (Perkins V) was signed into law by President Trump on July 31, 2018. This bipartisan measure reauthorized the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV) and continued

Congress’ commitment in providing nearly \$1.4 billion annually for career and technical education (CTE) programs for our nation’s youth and adults” (Perkins Collaborative Resource Network. 2024). With Perkins V, congress appropriates roughly \$7.4 million annually to support research; development and demonstration; dissemination; and evaluation and assessment activities targeted at improving the quality and effectiveness of career and technical education programs. There are currently 15 different national initiatives that help support or are required practices by Perkins V. (See Table 3)

Table 3

Perkins Collaborative Resource Network National Initiatives

Career Pathways Systems	CTE Challenge Prize Competitions	CTE Correctional Education
CTE Teacher Pipeline	CTE Research Network	Cybersecurity Education
Employability Skills	National Evaluation of Career and Technical Education under Perkins V	Partnership Formation and Development in Manufacturing
Pathways to Credentials	Programs of Study	Supporting Student Success in CTE
U.S. Presidential Scholars in Career and Technical Education Program	Unlocking Career Success	Work-Based Learning

Note: List of initiatives can be found at <https://cte.ed.gov/initiatives/about-national-initiatives>

Prior to Perkins V passing in 2018, the State of Alabama was awarded a grant from the National Governor's Association (NGA) to improve and enhance work-based learning (WBL) opportunities for students in Alabama at both the high school and post-secondary level in 2017. Within the grant application, four goals were established as ongoing objectives based upon current outcome reports. These four goals included:

1. Identify a vision for developing and sustaining a statewide WBL initiative for 16–29-year-old youth and young adults to fill middle-skill STEM-related jobs,
2. Establish a data collection and measurement system for WBL programs,
3. Build on existing initiatives to increase 16-29-year-old youth and young adult statewide participation in WBL programs and,
4. Promote WBL statewide to advance employer engagement, youth, young adults, and families.

Several workforce challenges plagued Alabama during that time including low labor force participation rates, forgotten middle-skilled jobs, fluctuating unemployment rates, and education numbers in terms of degree obtainment, completions, and student retention. To help alleviate some of the pressure, Governor Kay Ivey issued her 2017-2022 Strategic Plan that laid out several action items related to bridging Alabama's Education-to-Workforce Talent Pipeline to advance work-based learning. These action items included:

- Align Alabama's Workforce Development, Secondary and Postsecondary Career Technical Education (CTE), and Adult Education Programs
- Develop the Alabama Terminal for Linking and Analyzing Statistics (ATLAS) on Career Pathways
- Braid Education and Workforce Funding Streams

- Identify Valuable Credentials and Career Pathways
- Establish the Alabama Office of Apprenticeship
- Advance Awareness of Career Pathways in Work-Based Learning and Middle-Skill Training Programs
- Build a variety of seamless stackable credential pathways throughout our academic career/vocational two-year and four-year public institutions which lead to a variety of high- demand/skilled and vocational jobs/careers

In addition, the Alabama WBL core work team structured numerous opportunities and events to collect data and discuss the status of WBL programs in Alabama with stakeholders, business leaders, and educators. The summation of these findings was presented at the Pathway's to Careers Governor's Summit in 2019. It is important to note that majority of survey respondents serve on average up to 100 students with co-ops, internships, and apprenticeships leading the way as the most popular form of WBL experiences. Four key categories erupted from these findings and are as follows:

1. Education and Marketing
2. Changes to WBL Program Structure/ Requirements
3. Funding
4. State Support

Within each characteristic, there were several sub-characteristics that need to be brought forth as they directly relate to the research at hand. These include education of stakeholders, market utilization, changing the narrative, and facilitating better collaboration between all vested entities. These will be discussed later in this study as it pertains to the agriculture industry and its career pathways.

Throughout the years, Alabama’s workforce initiatives have seen transformations, elevating standards, and continued progress towards its *Strong Start, Strong Finish* education initiative and goal of adding an additional 500,000 highly skilled employees to its workforce by 2025. Based on the “Preparing Alabama’s Workforce for Opportunity and Growth Report” (2018) several strengths, opportunities, and best practices were recognized alongside some challenges that might hinder the attainment gap. The following challenges illustrate the complexity of career and technical education when not properly addressed: (a) Awareness, (b) Access, (c) Social and Economic Factors, (d) Collaboration, (e) Curriculum and Instruction, and (f) Policy and Data. Each element contains its own set of idiosyncrasies and requires state and local governing officials to set the bar higher than ever before.

Since its formation in 2015, the Alabama Workforce Council (AWC) has initiated numerous statewide efforts to help provide tools for students, industry leaders, partners, and business owners alike. Thanks to initiatives such as the Alabama Works Success+ Plan, the expansion of registered apprenticeship (RA) programs by the Alabama Office of Apprenticeship (AOA), and the analysis of labor market data by the Alabama Committee on Credentialing and Career Pathways (ACCCP) using the Alabama Terminal on Linking and Analyzing Statistics (ATLAS) on Career Pathways, Alabama has successfully addressed several challenges, including: (a) identifying in-demand career pathways, (b) identifying necessary credentials linked to each high-demand occupation, (c) developing and distributing competency models for all 16 career clusters, (d) expanding apprenticeship opportunities, (e) administering apprenticeship tax credits, (f) increasing program awareness, (g) passing pertinent legislation to ensure program success, and more.

While the concepts of vocational and career and technical education have been around for centuries, the specifics of who, what, when, where, why, and how they have benefited the United States, the State of Alabama, regional workforce demands, and the unemployment rate tell their own unique story.

History of CTE and Its Agricultural Roots

Formal vocational education in schools began in the early 20th century with its roots buried in traditional practices and techniques of training young individuals for work. Barlow (1976) defined this type of preparation in these words: “Turning our attention back 200 years to 1776, we find three ways in which a person prepared for work. The first was organized apprenticeship... The two types – voluntary and involuntary – provided apprentices, whether boys or girls, with five basic elements: (1) food, clothing, and shelter, (2) religious instruction, (3) general education, (4) instruction in trade or occupation; and (5) the mysteries of the trade (related subjects). Involuntary apprenticeship provided a neat way for towns to take care of their child welfare cases (particularly in the earlier colonial period). A second way of preparing for work was in a mother-daughter, or father-son relationship in which the fundamentals of a trade or occupation were taught to children in the family. This process is as old as time. The third was the pick-up method, by observation and imitation, but with little actual instruction. A sharp boy or girl, bent upon learning a trade could ultimately pick-up the essential information needed to begin. Experience at doing the task finally made him a craftsman. But vocational education, as we know it today is strictly a 20th century invention” (Barlow, M.L., 1976, pp. 1-2).

Miller (1985) characterized public education in the U.S. as ill-suited and unattractive to young students who needed but did not receive work preparation training. David Snedden (1910) stated that “schools in the first decade of the 20th century largely held to the elements of a so-

called liberal education. Preparation for college was the outcome – an outcome serving fewer than 10 percent of the population. Liberal education was not concerned with making efficient producers, although it did indirectly contribute to that end; rather, it concerned itself with consuming” (Snedden, D, 1910, pp. iii-iv).

As widespread dissatisfaction with public school education in America grew, the demand for a new type of education that was more practical, useful, and focused on preparing men and women for work in the industrial age sprouted. The development of the new quadrivium brought forth the work of four key players: David Snedden, Charles Prosser, Charles Allen, and Rufus Stimson.

David Snedden set the context for vocational education in 1910 when he drew a clear distinction between liberal and vocational education. In an excerpt from his work *The Problem of Vocational Education* he divided vocational education into areas based on the occupations in which individuals were prepared. These included:

1. Professional Education
 - a. Prepared lawyers, physicians, engineers, teachers, clergy, and military personnel.
2. Commercial Education
 - a. Prepared bookkeepers, clerks, stenographers, commercial travelers, and business leaders.
3. Industrial Education
 - a. Prepared bricklayers, machinists, shoemakers, metal workers, factory hands, and others in high manufacturing pursuits.
4. Agricultural Education

- a. Prepared students in “skills and knowledge looking to the tillage of the soil and the management of domestic animals” (p.9).

5. Education in the Household Arts

- a. Prepared girls for dressmaking, cooking, and management of the home.
(Snedden, D. 1910)

He also further divided vocational education into the following:

1. Higher Vocational Education and
2. Vocational Training
3. Elementary Vocational Training – under the age of 15
4. Secondary Vocational Training – ages 15-18
5. Higher Vocational Training – ages 19+

Snedden “wrote and spoke extensively on the need for and importance of vocational education. He authored at least 97 journal articles... and eight books concerned with vocational education” (Moore, G. & Gaspard, C., 1987, pp. 3-17).

Dr. Charles Prosser, known as the “father of vocational education,” served as the first federal Commissioner for Vocational Education, a position that was created by the Smith-Hughes Act of 1917. He played a key role in shaping policies and procedures for the national vocational education system (Moore & Gaspard, 1987). His guidelines remained intact until 1963.

Prosser’s experience as a lawyer, superintendent, past president of the Indiana Teacher Association, and legislative feats strongly shaped and prepared him for the work he put forth. He is identified for providing the greatest contribution to the development of vocational education.

Charles Allen brought forth the concept of job analysis and in doing so, developed a systematic method of teaching later known as the Allen Four-Step Method. This method involved four steps in teaching that include preparation, presentation, application, and inspection. More broadly defined as the art of show, tell, do, and check. This ultimately became the premiere method of teaching in vocational education for decades. In his writings, Allen translated the educational philosophies of Dewey, Herbart, Pestalozzi, Rousseau, and others into practical teaching methods (Hawkins, Prosser, & Wright, 1951).

Rufus Stimson is often referred to as the “forgotten leader in agriculture.” There are several reasons that Stimson may have been overlooked but his contributions to career and technical education are far from being discounted. From 1897 – 1901, Stimson taught as a professor of English, ethics and public speaking at the Connecticut Agricultural College, now known as the University of Connecticut. He served as the president of the Connecticut Agricultural College until 1908. Shortly thereafter, he became the director of Smith’s Agricultural School in Northampton, Massachusetts. After his retirement in 1938, he received an appointment as a Research Specialist in Agricultural Education in the U.S. Office of Education. His efforts during this period yielded a published historical narrative of agricultural education in 1942.

During his tenure as President of the Connecticut Agricultural College, Stimson formulated a new idea and way to teach agriculture, later known as the Project Method. This came after his concern for how agriculture was taught and discussions concerning the need for education reform, including the need for practical secondary agricultural education were discussed. Stimson’s work later caught the attention of Charles Prosser and David Snedden. The Project Method received considerable attention in 1915 at the Panama-Pacific International Expo

and was later implemented as a provision in the Smith - Hughes Act of 1917. This piece of legislation laid the foundational groundwork for supervised agriculture experiences (SAE) and required all agriculture students to have supervised farm practice.

Finally, while not a part of the quadrivium, John Dewey was an influential player who developed the Theory of Occupations. This theory “provided an intellectual foundation for an emerging group of early twentieth-century vocational educators. His theory is composed of three major themes: (a) a synthetic epistemology of work and school, (b) a redefinition of nineteenth-century manual training practices, and (c) a theory of cultural recapitulation” (Lakes, 1985, pp. 41-47). Dewey believed that ensuring a citizen’s right to fully participate in industrial policy and decision-making could best be achieved through vocational education. In addition, he saw need for unification of vocation and culture where industrial intelligence was at the helm.

“In *Democracy and Education*, Dewey (1916) described what he thought a vocational education should be: An education which acknowledges the full intellectual and social meaning of vocation would include instruction in the historic background of present conditions; training in science to give intelligence and initiative in dealing with material and agencies of production; and study of economics, civics, and politics, to bring the future worker in touch with the problems of the day and the various methods proposed for its improvement. Above all, it would train power of readaptation to changing conditions so the future workers would not become blindly subject to a fate imposed on them. (p. 372)” (Lakes, 1985, pp. 41-47). This 'project method' arose from the student's desire to create activities that would necessitate further academic study.

Overall, Dewey believed the true aim of educators is to facilitate youth development, fostering a lifelong capacity for growth and continuous learning. Dewey opposed educators

imposing personal aims on education, arguing that a democratic society should eliminate the divide between liberal and practical education. Instead, he advocated for a curriculum that integrates intellectual and practical learning, making thought a guide for action and leisure a reward for service (Wonacott, 2003). Career and Technical Education has a rich and diverse history that is driven by numerous inputs and ideologies; however, there is irrefutable proof that CTE as we know it today exists because of the agriculture industry, its practices, policy implementation, and its key players that helped facilitate the revolution of the CTE era.

Legislation – Importance of Career Pathway Success

Prior to 1917, there was not any form of federal legislation mandating the vocational/career technical side of education. This was rectified in 1917 with the passage of the Smith-Hughes Act that essentially provided federal funding for vocational and technical education within the public secondary school systems. “Several specific elements of the Act contributed to the isolation of vocational education from other parts of the comprehensive high school curriculum, and they include: (a) separate state boards for vocational education, (b) separation of funds, (c) segregation of vocational education students, and (d) segregation of the curriculum” (Hayward, GC, 1993, The Smith Hughes Act)

From 1917 – 1963, the basic elements of the Smith-Hughes Act and Federal vocational-technical education did not change; however, emphasis and focal points did. In the 1930’s severe unemployment problems shifted the focus from national defense to employability and focused on the rise of junior colleges and vocational courses. In the 1940’s the War Production Training Act was implemented, and a collateral federal effort known as the Rural War Production Training Act, which emphasized agriculture related programs, was put into place. Within three decades, the vocational education sector experienced four major shifts in focus. They were:

1. Training boys and girls for work to national defense strategy (1900 - 1920's)
2. National Defense to Unemployment (1930's)
3. Unemployment to war effort assistance (1940's)
4. War Effort Assistance to Transitioning to peace-time economy. (1950's)

In the 1950s, vocational education was shaped by emerging light industries, growing health occupation careers, and the integration of work experience into public education (Hayward, 1993). This ultimately led to two amendments of the George Barden Act of 1946 that included Title II, Vocation Education in Practical Nursing, and Title VIII that sought to stimulate technical programs due to the launch of Sputnik.

The 1960's proved to be a decade of rapid development in vocational education as several acts quickly made their way through congress including:

1. The Manpower Development and Training Act of 1961 (MDTA)
 - a. Bridged the gap between the affluent and disadvantaged population.
2. The Vocational Education Act of 1963 (VEA)
 - a. Came 50 years after the passage of the Smith-Hughes Act and sought to expand influence over state programs.
 - b. Considered the poor and handicapped population.
3. The Civil Rights Act of 1964 & 1972 (sex and handicapping condition)
 - a. All educational policy was now subject to this act.
4. Educational Amendments 1968 and 1976
 - a. 1968 amendments expanded the provisions of the 1963 act and included “provisions for research and training, exemplary programs and projects,

residential vocational education, cooperative education, and work study”
(Hayward, GC. 1993. p.20).

- b. 1976 amendments expanded the use of set-asides and “specified that there should be a national assessment of vocational education (NAVE), to be conducted in the final five years of the Act’s five-year cycle by the National Institute of Education - now the Office of Educational Research and Improvement” (Hayward, GC. 1993. p.20).

In 1984, in response to the NAVE’s findings, Congress passed the Carl D. Perkins Vocational Education Act. The general goals of this act were as follows:

1. “...expand, improve, modernize, and develop quality vocational education programs in order to meet the needs of the Nation’s existing and future workforce for marketable skills and to improve productivity and promote economic growth...” (Hayward, GC. 1993. p.21).
2. “... assure that individuals who are inadequately served under vocations education programs are assured access to quality vocational education programs, especially individuals who are disadvantaged, handicapped, entering non-traditional occupations for their sex, adults in need of training or retraining, single parents or homemakers, individuals with limited proficiency in English, and individuals who are incarcerated...” (Hayward, GC. 1993. p.21).

While these two goals were quite ambiguous, given the state of the educational system during this time, both goals were associated with raising the productivity of the workforce and allowing target populations access to better opportunities in vocational education. Since then,

four additional acts have been passed, known as Perkins II, Perkins III, Perkins IV, and Perkins V. Each brought their own unique purpose to the table.

Perkins II was passed by Congress in late summer of 1990 and is known as the Carl D. Perkins Vocational and Applied Technology Education Act. This represented the most significant policy shift in the history of federal involvement in vocational-technical education funding. For the first time, emphasis was placed on both academic and occupational skills in federal vocational legislation. Perkins II emphasizes the following:

1. The integration of academic and vocational education,
2. Articulation between segments of education engaged in workforce preparation – epitomized by Congressional support for Tech Prep, and
3. Closer linkages between school and work. (Hayward, GC. 1993. p.24).

Perkins III was passed during the 105th convening of Congress in 1998 under President Bill Clinton. “The purpose of this Act is to develop more fully the academic, vocational, and technical skills of secondary students and postsecondary students who elect to enroll in vocational and technical education programs, by-

1. Building on the efforts of States and localities to develop challenging academic standards,
2. Promoting the development of services and activities that integrate academic, vocational, and technical instruction, and that link secondary and postsecondary education for participating vocational and technical education students,
3. Increasing State and local flexibility in providing services and activities designed to develop, implement, and improve vocational and technical education, including tech-prep education, and

4. Disseminating national research, and providing professional development and technical assistance, that will improve vocational and technical education programs, services, and activities” (Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998).

Perkins IV was passed in 2006 under President George w. Bush and helped introduce important changes in federal support for CTE; however, the changes did not span far enough systemically to create better outcomes for students and employers. It wasn’t until 2012, when the fiscal year ran out for Perkins IV that President Obama’s blueprint for a reauthorized Perkins Act would help usher in a new era of rigorous, result-driven, and relevant CTE programs shaped by four core areas:

1. Alignment

- a. Effective alignment between high-quality CTE programs and labor market needs to equip students with 21st century skills and prepare them for in-demand occupations in high growth industries,

2. Collaboration

- a. Strong collaborations among secondary and postsecondary institutions, employers, and industry partners to improve the quality of CTE programs,

3. Accountability

- a. Meaningful accountability for improving academic outcomes and building technical and employability skills in CTE programs for all students, based upon common definitions and clear metrics for performance, and

4. Innovation

- a. Increased emphasis on innovation supported by systemic reform of state policies and practices to support CTE implementation of effective practices at the local level. (Investing In America's Future. 2012)

Rigorous, relevant, and effective CTE programs would “set a higher bar for the expectations and outcomes of CTE programs... and would provide state and local administrators with sufficient flexibility to design programs that fit their labor market needs the lead students to successful outcomes.” (Investing In America's Future. 2012. p. 5) Figure 5 provides a brief overview of the Obama administration's proposed reforms, organized by principle with brief descriptions of each area within the 2006 act verses the reauthorized act.

The reauthorization of Perkins IV laid the groundwork for the contemporary workforce development practices we see today. It established foundational principles aligned with 21st-century technology, creating opportunities that enabled the Trump Administration to allocate a substantial \$1.4 billion annually for Career and Technical Education (CTE) programs nationwide.

Figure 5

Overview of the Existing Perkins Act and Proposed Reforms

The Current Act	Principle of Reform	Proposed Reforms
Limited provisions to encourage high-quality CTE programs No requirements for states to work with workforce and economic development agencies to identify areas of focus for CTE program	Effective ALIGNMENT between CTE and labor market needs to equip students with 21st-century skills and prepare them for in-demand occupations in high-growth industry sectors	• Clear Expectations for High-quality Programming: Provide states better guidance on establishing high-quality programs • A More Active Role for States: Empower states to identify the in-demand occupations in high-growth industry sectors on which CTE programs should focus
Separate funding for secondary and postsecondary institutions No clear ways for employers, industry, and labor to engage in program and curriculum design and implementation No leveraging of private in-kind and cash resources to share program expenses	Strong COLLABORATION among secondary and postsecondary institutions, employers, and industry partners to improve the quality of CTE programs	• Consortia Funding: Establish consortia to ensure collaboration among secondary and postsecondary institutions • Private-sector Match: Use a match contribution to strengthen the participation of employers, industry, and labor partners in program design and execution
Funds distributed by states to local recipients by formula States define participation and accountability measures differently No mechanism to reward high-performing local recipients for success	Meaningful ACCOUNTABILITY for improving academic outcomes and building technical and employability skills in CTE programs, based upon common definitions and clear metrics for performance	• Within-state Competitions to Distribute Funds to Consortia: Provide states increased autonomy to select and fund high-quality programs responsive to regional labor-market needs

Source: (Investing in America's Future: A Blueprint for Transforming Career and Technical Education. 2012. p. 3-4)

Figure 5 (cont.)

The Current Act	Principle of Reform	Proposed Reforms
Funds distributed by states to local recipients by formula States define participation and accountability measures differently No mechanism to reward high-performing local recipients for success	Meaningful ACCOUNTABILITY for improving academic outcomes and building technical and employability skills in CTE programs, based upon common definitions and clear metrics for performance	• Common Definitions to Strengthen Data Systems and Close Equity Gaps for Participation: Use uniform definitions for participation and performance indicators to create high-quality data systems that enable meaningful comparisons and identification of equity gaps • Incentives for High Performance: Incentivize and reward local recipients that exceed performance targets
No clear identification of the state's role in creating the conditions for high-quality CTE programs to thrive Formula funding that supports too many purposes and limited reserve funding to create performance and innovation incentives	Increased emphasis on INNOVATION supported by systemic reform of state policies and practices to support CTE implementation of effective practices at the local level	• State Conditions for Success and Innovation: Ensure states have in place the policies and systems to support programs at the local level • A Competitive CTE Innovation and Transformation Fund: Develop and implement new practices and models at the local level and support systemic reforms at the state level

Source: (Investing in America's Future: A Blueprint for Transforming Career and Technical Education. 2012. p. 3-4)

On July 31, 2018, Perkins V was officially signed into law by President Donald Trump. This act became known as The Strengthening Career and Technical Education for the 21st Century Act. This law reauthorizes and updates the Act of 2006 and ensures that CTE programs continue to meet the demands of the 21st century economy.

Several changes include:

- Changes to Accountability - "Perkins IV required the U.S. Secretary of Education and states to agree on performance levels for each accountability indicator under

the law. Perkins V eliminates this provision. However, if states want to adjust their performance levels after the first two years of implementing their state Perkins V plans, they must set performance levels that are higher than the actual performance of the two most recent program years (except in unusual circumstances). Also new, Perkins V requires states to institute a public comment process to gather feedback on their performance levels, which was not required under Perkins IV” (Alliance for Excellent Education. 2018)

- New Definitions – additions and redefining the following terms
 - CTE Concentrator,
 - CTE Participant,
 - Qualified Intermediary,
 - Professional Development,
 - Program of Study, and
 - Work-Based Learning,
- Systems Alignment – Calls for the collaboration efforts of secondary and post-secondary institutions, employer, and other partners to provide combined approaches to delivering healthy CTE programs through statewide or industry partnerships. The state must define how it will ‘support effective and meaningful collaboration between secondary schools, post-secondary institutions, and employers to provide’ expertise and understanding in all fields within an industry. (Alliance for Excellent Education. 2018) States may now utilize state leadership funds to establish these partnerships.

- Integrated Professional Development – Perkins V permits the states to deliver collective professional development opportunities to its core academic and CTE instructors. Additionally, Perkins V limits accountability to students who have met the criteria to be considered as “CTE Concentrators” under the law. Furthermore, states must include one indicator of program quality to their accountability system and provide disaggregate data for the performance of each indicator by CTE program or area of study to evaluate a programs functionality.

Perkins V also includes various provisions that support the execution of Linked Learning and additional high-quality college/career pathways initiatives. This expansion is thanks to Perkins V offering opportunities for students to learn and earn post-secondary credit while in high school through either dual enrollment, early college high school programs, and by articulation agreements that are aligned with a program of study. States and districts are allowed to utilize state and local funds to support these advantages.

Finally, Perkins V increases the states use of Perkins funding for state leadership activities. “States may use up to 10 percent of their Perkins V funds to support state leadership activities. These activities may include establishing partnerships among school districts, institutions of higher education, employers, and others that provide students with opportunities to:

- complete course work that integrates CTE and rigorous academics,
- earn a postsecondary credential or credit toward a credential at no cost to the student or the student’s family, or
- participate in work-based learning as part of available programs of study”

(Alliance for Excellent Education. 2018).

In early 2019, Alabama Governor Kay Ivey established the Governor’s Office of Education and Workforce Transformation (GOEWT) to help implement Governor Ivey’s Strong Start, Strong Finish initiative and workforce development strategic plan for the State of Alabama. Her memorandum noted several goals and initiatives for the GOEWT, and they were as follows:

1. To increase the labor force participation and decrease the unemployment and unemployment rates,
2. To surpass the Alabama post-secondary attainment goal, and
3. To create career pathways in all 16 career clusters for in-school youth, out-of-school youth, adults, and disconnected populations.

The following three objectives were tasked to complete this goal:

4. Braid Alabama’s federal education and workforce development funding streams to support an education-to-workforce pipeline,
5. Create and manage the Alabama Terminal for Linking and Analyzing Statistics (ATLAS) on career pathways, and
6. Create the Alabama Industry-Recognized and Registered Apprenticeship Program (AIRRAP).

Since that time, numerous updates have taken place in policy, practices, and implementation to meet the needs of Alabama’s industry and workforce partners. Several of these include the following:

- The Alabama Workforce Transformation Act #2024-115 – “This act amends Sections 25-2-2, 25-2-3, and 25-2-6, Code of Alabama 1975, to: (1) rename the Alabama Department of Labor the Alabama Department of Workforce and

designate the head of the department as the Secretary of Workforce; (2) further provide for the duties and authorities of the department and secretary; and (3) transfer certain state and federal workforce programs, staff, and assets to the department. This act adds Chapter 15 to Title 25 to the Code of Alabama 1975, to: (1) establish the Alabama Workforce Board as the State Workforce Development Board; (2) provide duties and authorities of the board; (3) establish the executive committee of the board, which shall work with the secretary to create the strategic workforce plan to guide state and federal workforce development policies; and (4) permit the formation of regional workforce boards. This act amends Sections 41-29-5 and 41-29-282, Code of Alabama 1975, to rename the Alabama Department of Commerce Workforce Development Division the Alabama Industrial Development Training Institute and to provide for the operation of the institute. This act repeals Sections 41-29-290 through 41-29-297, Code of Alabama 1975, relating to the Alabama Workforce Council and Section 41-29-300, Code of Alabama 1975, relating to Regional Development Councils. This act also directs the Code Commissioner to make certain revisions to the Code of Alabama 1975, to conform with these changes” (Act Summary.

<https://alison.legislature.state.al.us/bill-search?tab=3>).

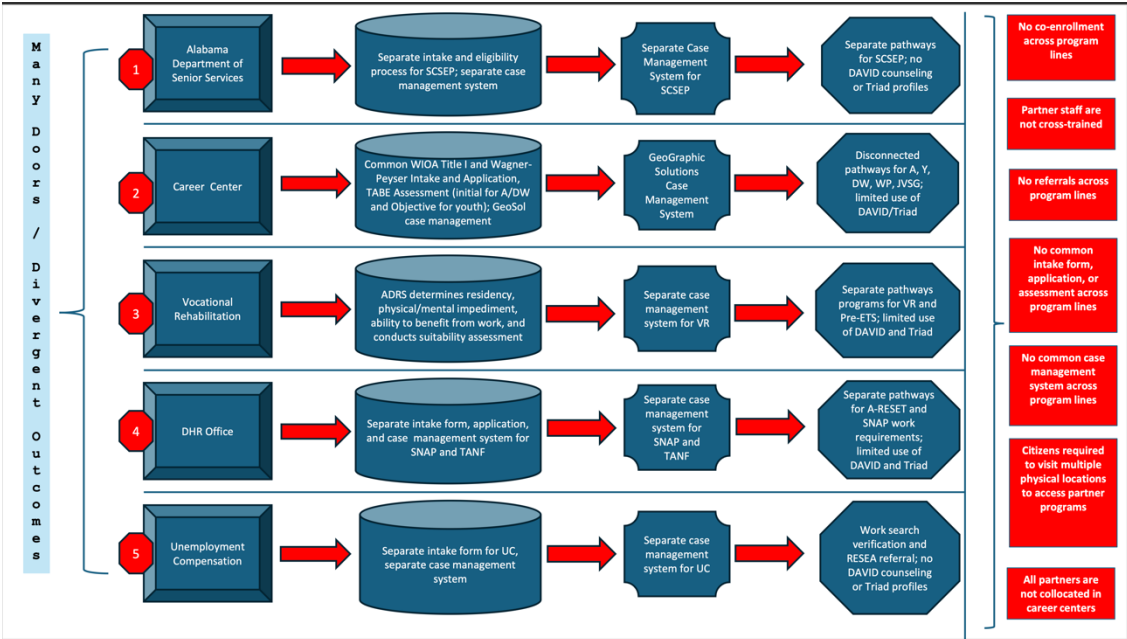
- The Alabama Workforce Pathways Act #2024-126 – “This act: (1) requires the State Board of Education to establish a Workforce Pathways diploma pathway and curriculum; (2) provides that any student who earns a diploma through this pathway is eligible for admission to any postsecondary education institution, subject to the institution's admission requirements; (3) authorizes the board to

seek additional funding from the Legislature to upgrade or construct career and technical education centers; and (4) authorizes the Legislature to provide funding for the Alabama Short-Term Credential Program for scholarships towards in-demand college courses in the Alabama Community College System” (Act Summary. <https://alison.legislature.state.al.us/bill-search?tab=3>).

- No Wrong Door Pathway Model – There are many doors with divergent outcomes across Alabama’s workforce scope. See Figure 6 & 7
- Alabama Works Career Pathway Model – Updated Model based on the passing of recent legislation. See Figure 8.

Figure 6

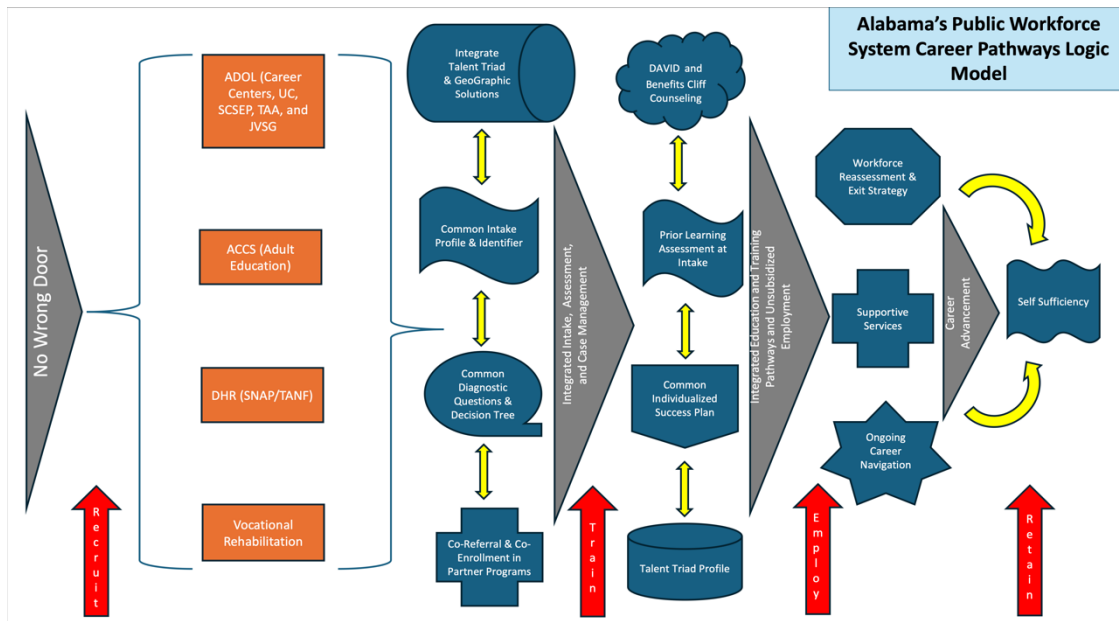
No Wrong Door Model



Source : N. Moore, personal communication. June 6, 2024)

Figure 7

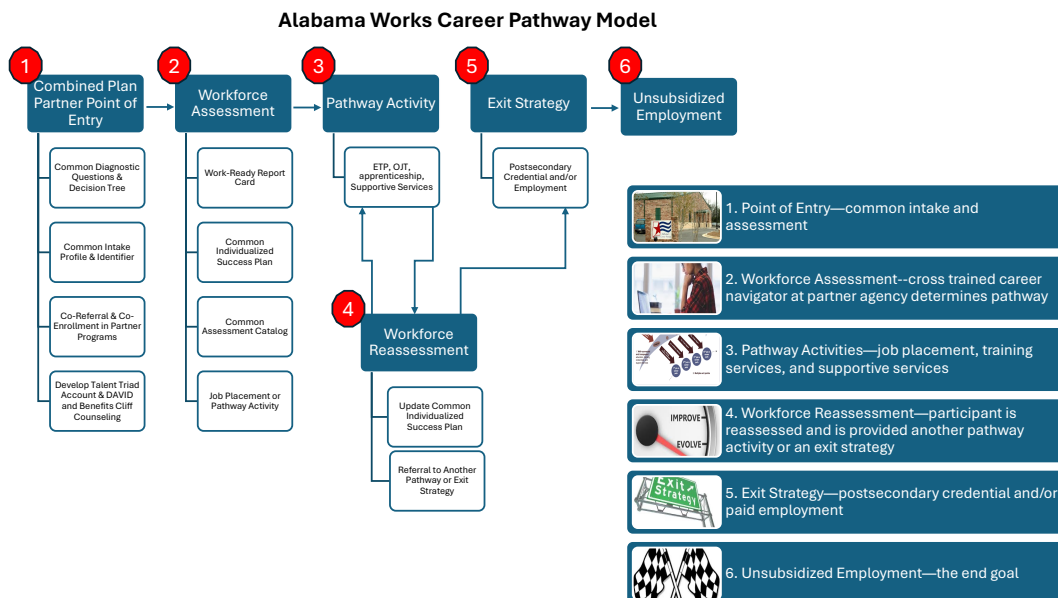
Alabama's Public Workforce System Career Pathways Logic



Source : N. Moore, personal communication. June 6, 2024)

Figure 8

Alabama Works Career Pathway Model



Source : N. Moore, personal communication. June 6, 2024)

Overall, national and statewide legislation has significantly shaped the current landscape of career and technical education (CTE). As technology and innovation evolve, the models and pathways that define CTE will also continue to adapt and transform.

Work and Service Learning: The Ground It Covers and the Importance of Agriculture Careers and Pathways

Work and service learning allow youth to explore new worlds, gain self-awareness, act independently, increase their responsibilities and skills, and serve others (Hamilton, M. & Hamilton, S., 2004; McKibben et al., 2023). Service learning has been shown to be preferred by agriculture students and build self-efficacy in difficult tasks (McKibben et al., 2024a).

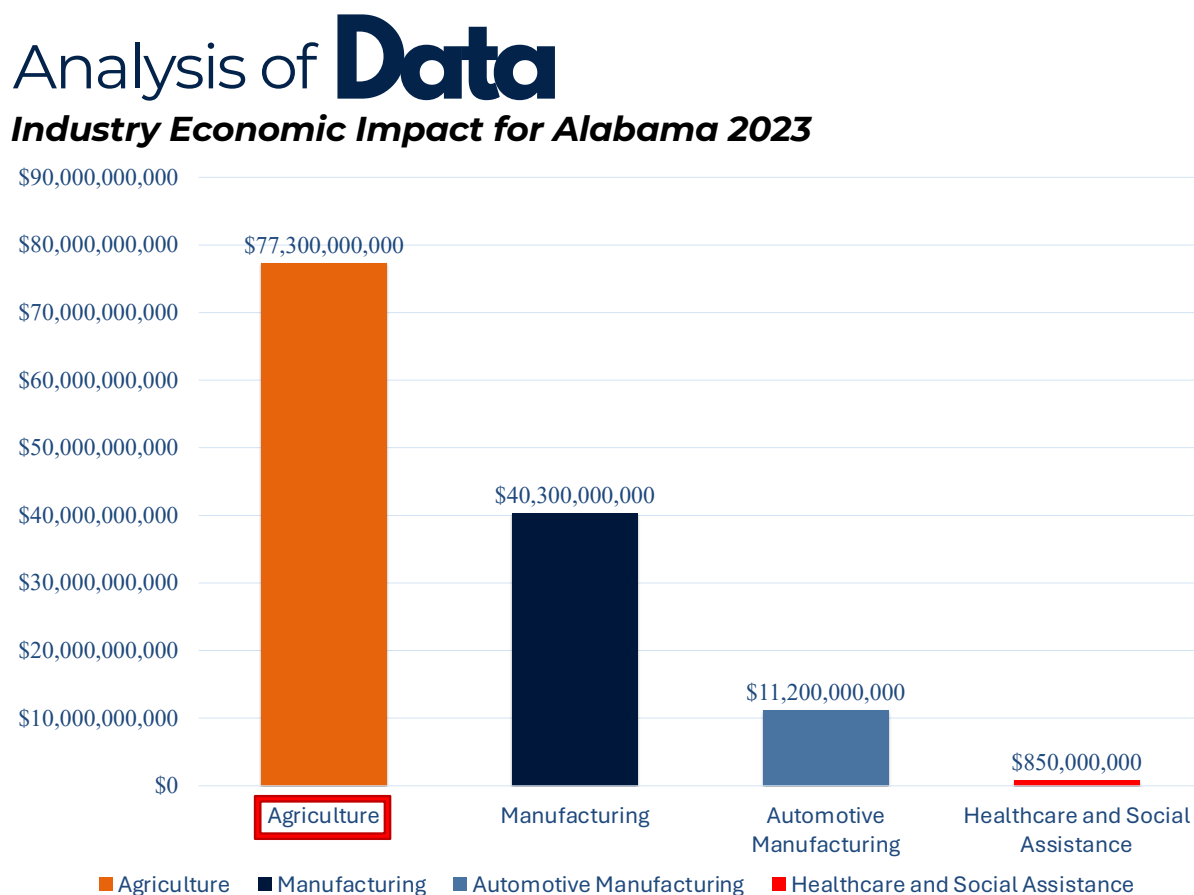
Agriculture education has instilled the principles of a strong work ethic and drive since its inception, as exemplified by the FFA Creed and Motto.

From the time of its establishment, agriculture education and its counterparts have embraced work-based learning and workforce development training. This approach was utilized long before other industries recognized its potential to strengthen and retain a greater number of professionals within a given field.

In Alabama, over 22 percent of the state's workforce is comprised of agricultural workers. According to the Alabama Department of Agriculture and Industries, agriculture and forestry contribute over \$70 billion annually to Alabama's economy and employ more than 580,000 people. See Figure 9.

Figure 9

Industry Economic Impact for Alabama 2023



Sources: Rabinowitz, A. & Brothers, D. (2025). Agriculture & Forestry Grow Alabama: An Economic Contribution Study. [ACES.edu](https://aces.edu); GetMGA. (2025). Economic Impact of Community Health Centers in Alabama. getmga.com; IBISWorld. (2025) Alabama State Economic Profile. ibisworld.com

The state ranks second in the nation in broiler chicken production, third in peanut production, and is a leading producer of cotton and soybeans. Additionally, the poultry industry accounts for roughly \$15 billion of the state’s economic impact and supports over 86,000 jobs. Alabama also has the third-largest commercial timberland base in the United States, helping generate over \$21 billion annually and employing around 122,000 people. Several other industries that are impacted by agriculture, its workers, and students include: (a) technology, (b) management, (c) buyers and purchasing agents, (d) CTE educators, (e) economists, (f)

communications specialists (g) landscaping, (h) mechanics, (i) sports turfgrass production, (j) health services and more.

Mortimer (2003) found that the quality of work experience matters more than the number of hours worked during the week. Youth who have successful work experiences develop higher ranked competencies in both global senses of efficacy and economic domains. He states that high quality work experiences also involve learning opportunities that help individuals acquire occupational values. At its core, Alabama's agricultural industry touches every one of the 16 career clusters mentioned by Alabama Works:

- Advanced Manufacturing
 - Engineering; Health, Safety and Quality Assurances; Industrial Machinery; Production and Automation; Robotics; and more.
- Arts, Entertainment & Design
 - Film and Broadcast (i.e. Cowboy Channel, Cowgirl Channel, ALFA, etc.); Design, Performing Arts (i.e. Cody Johnson); Lighting and Sound Engineering; etc.
- Construction
 - Architecture and Civil Engineering; Machine Operators and Maintenance, and skilled trades.
- Digital Technology
 - Unmanned Vehicle Technology (i.e. combines, precision ag, etc.); IT Support; Data Science; and AI.
- Education

- CTE Educators; Community Engagement; Teaching, Training, and Facilitation.
- Energy and Natural Resources
 - Alternative energy; Ecological research and development; Environmental Protection; Resource Extraction; and more.
- Financial Service
 - Banking and Credit (i.e. Alabama Ag Credit); Financial Strategy and Investment; Real Estate (i.e. Agricultural Land Leasing); and Insurance.
- Health and Human Services
 - Holistic Health; Pharmaceutical (i.e. Pfizer, Bayer, Zoetis: all are utilized for both humans and animals); Behavioral Health (i.e. Both in humans and animals); Data and Administration; and Personal Care services.
- Hospitality and Events
 - Conference and Events (i.e. SASDA); Travel and Leisure (i.e. Agri-Tourism); Culinary and Food Services (i.e. Farm-to-table restaurants); and accommodations (i.e. Dude Ranches, Horseback riding facilities, bed and breakfasts and more).
- Management and Entrepreneurship
 - Business Management and Operations; Project Management; and regulation.
- Marketing and Sales
 - Marketing and Advertising (i.e. Agriculture Communications Specialists); Market research, analytics, and ethics; Retail and Customer Service; and

Strategic Sales. (i.e. Purina, Nutrena, fertilizer sales, pharmaceutical reps, etc.)

- Public Service and Safety
 - Public Safety; Military and National Security; Emergency Response; Local, State, and Federal Services.
- Supply Chain and Transportation
 - Air and Space; Ground and Rail; Maintenance and Repair; Planning and Logistics; and Purchasing and Warehousing.

Each career cluster listed above involves something or someone that is invested in agriculture. The pathways in which a student may take to arrive at their career destination of choice will differ drastically based on their interests, past employment opportunities, work ethic, drive, and determination to become what they envision. Based on the information provided, we can hypothesize that by participating in an active agriculture career pathway, a student can set a strong foundation for success in any job or industry they aspire to enter.

Barriers to Career Pathways in Agriculture

Perception, defined as the ability to see, hear, or become aware of something through the senses. An individual's perception of what agriculture is spans across a wide variety of ideas, opinions, and often misinformation about the topic itself (Clemons et al. 2018). According to Bowman (2022), there are 5 regular misconceptions about agriculture, and they are as follows:

1. Agriculture is just traditional farming,
2. Most farms are corporate owned,
3. A career in agriculture doesn't require higher education,
4. GMOs are bad for you, and

5. Farming is bad for the environment

For the purposes of this paper, we will focus on points one through three.

In the first point, agriculture is just traditional farming, we see a common misconception made by individuals who are viewing agriculture through the lens as consumer with no background or forward knowledge of agriculture. Additionally, this may be an individual who has only been exposed to one side of the industry. With vast advancements in technology, production practices, and more, the agriculture industry is more diverse now than it has ever been, and yes... It involves more than just plowing the ground.

In point two, the general population can easily conclude that farms are corporately owned due to big box labels like Tyson, ConAgra, Kellogg's and more being at the forefront with numerous advertising campaigns, marketing ploys, and public outreach programs to encourage someone to purchase their product verses their competitor. All of the "products" sold by each of these companies come from the same place... a farmer's field. The practices and methods in which those products are harvested differ depending on an operations farming practice. According to U.S. Department of Agriculture, almost 99% of farms in the U.S. are family owned, and roughly 90% are still small family farm operations.

The final misconception of agriculture, a career in agriculture doesn't require higher education, is a myth in of itself. "Given our increasingly skills-based economy, and with nearly three quarters of all jobs expected to require post-secondary education by 2031, high quality postsecondary training and education pathways are more crucial than ever to ensure equitable access to quality jobs – especially as new industries emerge" (Kinder, K. & Cruse, L. 2024). Agriculture cannot afford to have uneducated individuals at the helm as it is the vein that supplies 100 percent of the United States common goods. From plastics; petroleum; makeup;

hair care products; dog food; school supplies; books; food; and more, agriculture is the foundation of any product that has ever been made. Common viewpoints such as the points listed above create a jaded perspective of the agricultural industry and therefore leads to additional hindrances along the way. Several examples of these limitations include:

- Strong relationships and Leadership Buy-In – Maintaining and building strong community, industry, and educational partnerships are crucial in developing a successful career pathway in the agricultural industry.
- Effective and multifaceted partnerships – Establishing a vast array of industry partnerships must be placed at the forefront to impact and fill the needs of the trade.
- Resource Maximization across the board – This includes resources harnessed by employers, students, local labor markets, and educational institutions.
- Inclusive Industry and Career Pathway Options – Programs and economic efforts must account for the atmosphere of the locale in which a program is operating.
- Access to funding – Combining of local, state, and federal funding opportunities to maximize a student or employers' outcome.
- Effective Policy Management and Implementation

“Policies are ultimately about people- the learners, the families, the college staff and faculty, the employers, and the myriad other community members striving to create thriving rural communities... advancing a rural economic agenda requires understanding and addressing the deep inequities that affect rural regions...” (Kinder, K. & Cruse, L., 2024, p. 24).

Agricultural Education at Auburn University

“The Agriscience Education program at Auburn University has a history that dates to over 100 years of preparing teachers and leaders in Agriculture. It was the first program in the College of Education at Auburn. As the only university based Agricultural Education program in the State of Alabama, faculty, staff, and graduate students have a unique and special obligation preparing and supporting the next generation of leaders and teachers of agriculture” (Lindner & Clemons, 2019).”

Auburn is recognized as being in the top third of all programs in the United States for creating agricultural education teachers (Foster et al., 2019). Auburn is the only active developer of agriculture educators in Alabama (Smith et al., 2018) and is a primary source of graduate training for the agricultural education communities of Alabama and Georgia. In Fall 2020, there were 87 students known as Agriscience majors within the Curriculum and Teaching department of the College of Education. Despite having only three tenure track faculty members, there are 40 plus PhD students, 20 plus EdS students, 25 plus master’s students, and 20 known undergraduate majors. While dozens if not more students in the college of agriculture that would traditionally be Agricultural Education majors at our peer or aspirational Land Grant universities are students in the College of Agriculture’s Agricultural Science program, a parallel degree to the agriscience education major (Parr & Aldridge, 2016; Foshee, 2020), teacher education admission occurs late in the College of Education, resulting in an inverted undergraduate major with predominantly upperclassmen listed as majors; they can only be officially “admitted” to teacher preparation upon reaching junior status and passing certain courses, and attaining certain milestones before ever allowed entrance to advising or degree. The Agriscience Education program supports 80 of these Agricultural Science degree undergraduate majors in the

Department of Horticulture in the College of Agriculture. The Agricultural Science degree requires many CTCT-agricultural content courses, particularly those related to agricultural mechanics, skill development, and rural youth development, outreach, communications, teaching, etc... and would be simply a degree option alongside the agricultural education degree in a department of agricultural leadership, education, and communications at all other Land-Grant institutions, and non-Land-Grant. Agriscience Education faculty put significant effort into developing skill-based education in agriculture, unlike most purely teacher preparation programs where students take courses primarily outside the College of Education.

Agriscience Education majors, particularly graduate students, more often represent other facets of the agricultural education spectrum than traditional teacher preparation programming common in colleges of education. These include extension, communications, journalism, outreach, development, human resources, agricultural advisory, administration, and other branches of agricultural human and behavioral sciences known as Agricultural Leadership, Education, and Communications or Agricultural (ALEC) and Extension Education, Leadership, and Communications. This is no more evident than in the American Association for Agricultural Education's (AAAE) research values documents. AAAE is the largest and most prestigious scholarship organization for the ALEC community. In the organizational research values document is outline nine different research areas that are the prevue of the field of ALEC; Advancing Public Knowledge of AFNR, Systems Enhancing Environmental Health, Ensuring Belonging in AFNR, Examining Social Dynamics in Human and Life Sciences, Increasing Prosperity Through Innovation in AFNR Systems, Nurturing Positive Youth Development Through AFNR Systems, Promoting Personal Responsibility and Safety in AFNR Systems (AAAE, 2023).

There are over 14,000 secondary agriculture educators in more than 8,600 programs nationwide (NAAE) and more than 35,000 extension professionals in the United States representing 112 university systems (Extension Foundation, 2025). Alabama has 308 agriculture teachers across 207 secondary programs (ALAAE) and Alabama Cooperative Extension Services has agents in all 67 counties with more than 800 staff serving the people of Alabama (ACES, 2025). Auburn graduates work throughout the country and comprise a significant portion of the 677 teachers in Georgia, serving over 42,000 students (GVATA, 2025) many of the 2500 secondary agriculture teachers in Texas (Teach Ag Texas, 2025), Maryland, and represent many professional researchers all the way to California (Miller et al., 2025).

In 2019, more than 600 agriculture teachers exited the classroom, predominantly due to retirement, which represented 24.6% of the workforce (Foster et al., 2019). In the same year, over 1,450 new hires were made. Although 224 new teaching positions were established, approximately 130 of these positions remained unfilled. As more schools are establishing agricultural programs, the demand for qualified teachers increases, necessitating additional faculty to prepare them. However, the reduction in classroom teachers over the past few years has resulted in fewer candidates available to become faculty members, thereby compounding the need for viable faculty in agricultural education due to a lack of population (Foster et al., 2019; McKibben et al, 2022). Auburn is at a crucial point to become a key player in agricultural education, thanks to substantial growth in graduate student numbers and strategic planning Auburn is at a point to fill many of these vacancies, spreading Alabama's influence and Auburn's process (Lindner & Clemons, 2019).

As of 2024 there were 98 programs nationwide that reported producing agricultural education majors (Smith et al., 2025). Those programs represent approximately 200 FTE

positions. Over 90% of those FTE positions are held in the College of Agriculture or similar (college of agriculture and forestry, college of science/school of agriculture, etc...) even when a college of Education is present on the campus. No research intensive (R1) Land Grant institution's ALEC department or workgroup is housed in the College of Education, except Auburn. While Auburn's academic lock was more common in the prior century, for more than 40 years it has been an abnormality. As such, the structures of research, scholarship, grantsmanship, outreach and more importantly the culture of ALEC is strongly aligned with colleges of agricultural rather than colleges of education. Typically, certification matters, pedagogy courses, internship placement and supervision, are handled internally by most ALEC departments with information being passed to the university's certification officer who is often based in the College of Education. This is the case for many of Alabama's other institutions of higher education, such as the Biology, Family Consumer Sciences, both being housed and administered in the College of Agriculture at Alabama A&M University, the only other public Land-Grant in Alabama (Alabama A&M, 2024) or Music Education at many institutions across Alabama being housed in their schools or colleges of performing arts or similar.

The Southern Region of the American Association of Agricultural Education (AAAE) includes 15 states and represents dozens of institutions including Auburn. Most agricultural education majors are housed within larger departments of Agricultural Leadership, Education, and Communications or similar names (AAAE, 2025). Those departments are housed within the College of Agriculture (38), with only one actively operating within a College of Education. Auburn stands out as the only R1 research and Land Grant institution in the South with its agricultural education unit in the College of Education (AAAE, 2025). The institutions listed as members of the Southern Region whose programs are not in colleges of agriculture or similar are

two former normal schools in Oklahoma: Northwestern Oklahoma State University (School of Education) and Panhandle State University of Oklahoma (College of Arts and Education). Both of these programs have shuttered their degrees, and the students have shifted predominantly to Oklahoma State University whose department of Agricultural Education, Communications, and Leadership is in their Ferguson College of Agriculture.

Auburn's unique organization can be attributed to the historical background of agricultural education at Auburn. The initial formalization and placement of the program was crucial to the College of Education's formation and planned mission. Agricultural Education, established as a formal group in 1915 fund by money made available through the Smith-Hughes Act of 1914 was initially tasked with continuing the training of secondary and elementary agriculture teachers from the College of Agriculture. It later expanded to other content fields, specifically science and mathematics. Through this the group changed quickly into the School of Agricultural Education (1920), the School of Education (1921), and the College of Education (1986) contained the curriculum and degree in Agricultural Education behind its administrative walls (Yeager & Stevenson, 2000).

Prior to the enactment of the Smith-Hughes Act of 1914, what is now Auburn University had already undertaken substantial efforts in training for secondary Agricultural Education. This was a function of necessity that began with the establishment of Congregational District Agricultural Schools in 1889, which were administered by Auburn's College of Agriculture (Stimson & Lathrop, 1942; Thompson, 1965). Thach noted in 1913 that over half of the graduates from the College of Agriculture were entering the field of education the following year (Thach, 1914). In an effort of multiple years of negotiation Thach was able to hire Zebulon Judd of North Carolina as Auburn's first official faculty member in agricultural education. Judd had

minimal background or experience in developing agricultural education teachers by his own admission and his only link to the discipline was a new paper article he authored about a teaching farm in his district during his tenure as superintendent of Wake County Schools (Judd, 1912). It appears that President Thach, in hiring Judd for the position of “Smith-Hughes” teacher trainer (Thach, 1913), aimed to utilize newly available federal funding to expand Auburn's capabilities in General Rural Education, given their existing strength in agricultural education (Thach, 1913). By appointing an emerging scholar from North Carolina, whose doctoral research focused on rural education (Judd, 1912), Thach sought to reposition Auburn as a leader in rural education. This strategic move aimed to leverage the institution's newfound redundancy in agricultural education to develop educators in other specializations.

Mimicking the discussion for the past 110 years, Ruffus Stimson, a cornerstone of agricultural education (Moore, 1988), lectured the leaders at the time who thought agricultural education should leave agriculture colleges and join the new education organizations that:

The founders of our association would hardly have found it necessary to set up a separate organization if the provisions of the National Education Association had been adequate to their needs. The teaching of agriculture is in part vocational, but also in part. cultural; our association therefore represents interests and activities broader than those of the National Society for the Promotion of Industrial Education. Impediments to becoming part of the Association of American Agricultural Colleges and Experiment. Stations may be found in the fact that a considerable body of useful members of our association are not eligible to membership under the present constitution of that association, and that amendments for making them eligible and creating a section for our purposes might not be favored.

(Stimson, 1913)

Summary

Career and Technical Education is the backbone of our nation's workforce and is solely responsible for the revitalization of the United States workforce transformation efforts today. While our modern perspective of career and technical education lies within the confines of work-based learning, skilled worker training, post-secondary degree obtainment, and employment opportunities, its roots stem from agriculture, its practices, and advancements throughout history.

According to Lynch (2000), vocational education was not on the 'radar' of general education policy makers, principles or comprehensive high schools, or school system superintendents until the 1960's when congress dove deeper into the needs of the underserved and rural community members. Earlier reform models had focused primarily on the academic side of the spectrum and not the vocational side which led to a mismatch in the understanding of what vocational/ career and technical education really was.

Since then, numerous efforts by federal, state, local, and city officials have addressed certain areas within the fault line but have not fully addressed the skewed perception of industries and are still tasked with filling the employment gap within those specialty areas. As Moore (1988) stated, "we must not forget the practical, applied aspects of agriculture." It's these aspects and practical applications that have built what we now know as Career and Technical Education.

Alabama is known for its diverse agriculture output and is considered one of the strongest in the nation in terms of exports. Its students are touted as some of the robust leaders in the industry and are engrained among many of our skilled industries. This study aims to demonstrate

Alabama's diverse employment population and showcase the breadth and depth in which its agriculture students occupy industries and majors across the state. Auburn has been

Chapter 3 Methodology

Introduction

This chapter describes the methods and practices used to gain insight into the ways in which agricultural education and the agricultural industry has grown, shifted, and changed over the last few decades. For this study, a combination of qualitative and quantitative methods was used in collecting, compiling, and researching the topic at hand. The analysis of multiple sources of information helped identify factors that prompted these changes and where they have placed the industry today in terms of importance, productivity, and retaining workers within a given field. A review of Alabama's agricultural economy and agriculture education provides context for the interplay between the changing economy and education's response to these changes. This study was guided by the following research questions:

1. What career pathways are readily available to agriculture students and how have they changed over the last 40 years?
2. What changes have occurred to warrant the demand for creation of new programs and the expansion of existing programs?
3. How do degrees obtained in agriculture, and related fields, impact the labor force? Specifically, Alabama's labor force?

The current chapter reviews the study population, research design, instrumentation, data collection methods, data analysis, and a summary of the research methods.

Population and Analysis

The study analyzed Alabama's labor force participants over five years, specifically from 2015 to 2019. Three overlapping data sets were created to assess the interplay between the economy and agriculture education:

1. Graduates and Program Completers from Alabama Public Community Colleges and Universities. A total of 61,171 graduates and completers were categorized based on:
 - a. their major based upon their assigned Classification of Instructions Programs (CIP) Codes,
 - b. their workforce type based upon their assigned North American Industry Classification System (NAICS) industry codes,
 - c. the type of institution attended (two-year or four-year). This categorization helped identify and define the top 10 majors, industries, and institutions for each reporting year that were utilized for this portion of the study.
 - d. credential level,
 - e. demographic characteristics
2. A subpopulation of agricultural education program graduates and program completers. This population was defined based on CIP codes exclusively related to the agricultural industry and its counterparts such as forestry, aquaculture, parks and recreation management, landscaping, plant toxicology, and more. A total of 2,316 records were identified.
3. A subpopulation of persons working in agriculture. This subpopulation was defined utilizing specific NAICS codes related to the agricultural industry and its associated fields. A total of 242 records were identified.

The data sets above were created from student records from the Alabama Commission on Higher Education (ACHE), unemployment and employment records from the Alabama Department of Labor, now a subunit of the Alabama Department of Workforce. It is important to note that several factors including inadequate reporting, lack of unified data tracking, and

external factors provided some inconsistency between the data sets. Any necessary revisions to the original data to address these situations will be reported as a part of the analysis. Existing workforce, census, and economic reports were used to provide context to the quantitative analysis.

Research Design

Several types of approaches were used in studying the agricultural and overall industry trends for the state of Alabama. The following data collection strategies were used and include:

1. Quantitative Methods
 - a. Secondary Data Analysis
 - b. Categorization and Ranking
 - c. Descriptive Statistics
 - d. Lambda Coefficients
 - e. Crosstabulation
2. Subset Analysis
 - a. Specialized Focus on the Agricultural Industry
3. Longitudinal Analysis
 - a. Time Series Analysis

During the study, cross-sectional comparisons were made between populations one, two, and three. These comparisons observed the relationships between agriculture students and Alabama's workforce as well as laborers who were employed in an agriculture related field who did not have an agriculture specific CIP code.

In summary, this study employs quantitative methods, using secondary data analysis, classification, ranking, and descriptive statistics, along with specialized subset analysis for the

agricultural industry. The longitudinal nature of this study involves time-series analysis to capture changes over the five-year period. These methods were used because the research questions posed within this study asked how degrees obtained in agriculture impact Alabama's labor force, and what changes have occurred to warrant the demand for work and education within this industry.

Instrumentation

A consolidated database was developed by integrating data from the previously defined populations, which included student information from the Alabama Commission on Higher Education (ACHE), and employment and unemployment records from the Alabama Department of Labor. A database was developed by enabling comprehensive comparisons regarding program completers, the institutions from which they received their degrees, CIP codes, NAICS codes, credential levels, and demographic information.

The Alabama Commission on Higher Education files included standard demographic information such as gender, age, year enrolled, year graduated, major, institution, and credit hours. Records from the Alabama Department of Labor included information such as employer, NAICS code and title, employer address, city, state, working in Alabama, wages, reporting year, CIP code, and major title. United States Department of Agriculture (USDA), AlabamaWorks, and ACHE's program inventory provided additional details to supplement this research study with gross domestic product output (GDP), total acres of cropland, total acres of farmland, farm ownership by legal status, industry employment and workforce trends, and higher education programs that are available within the state of Alabama.

Collection of Data

Data was collected from various sources and combined utilizing data merging techniques. The consolidated database file served as the foundation for the reference file during the merging process. The following were utilized in the data management process:

1. Gathering information about each student from different datasets. This data was then combined and compared based upon a graduate's CIP code, NAICS code, working status, institution type, and report year. This served as the foundation for the development of the crosswalk database.
2. Dividing the population into subsets for comparison. Each student record was coded to include those who were working in Alabama and exclude those not found in Alabama, those who are unemployed, and those where no records were found. Entries excluded from the dataset were omitted from the final analysis process. Subsequently, workers included in the dataset were divided into additional subsections that identified a student based on his/her CIP code, NAICS code, and institution type to allow for the analysis and crosswalk development process to transpire.
3. Examination of differences among the groups. Comparative analysis was utilized for comparing these groups and were dependent upon the data available, number of comparison groups, and records that were compatible.

Data Analysis

A variety of approaches and statistical measures were used to answer different research questions. The data utilized within this study consisted of the total population of graduates and program completers that work in Alabama, a subpopulation of agricultural education program completers, and a subpopulation of persons working in agriculture. The data were categorized

and analyzed using the Statistical Package for the Social Science (SPSS) software (Version 29). Additional classifications were assigned via Excel and then transferred into the database in SPSS for comparison. The following is a listing of the research questions and delineation of how each question was answered.

Research Question 1: What career pathways are readily available to agriculture students and how have they changed over the last 40 years? The Urban Institute (2024) defines a career pathway as “a schematic or mapped series of manageable education and training steps toward industry-aligned skills, credentials, and career advancement. Each step is designed to prepare people for employment while providing a clear pathway to the next level of education and training within an industry. Pathways may also include necessary credentials and supportive services.” There are numerous ways to become involved in an agriculture career pathway; however, each path and subsequent result varies.

For this study, a career pathway is determined by the NAICS code assigned to an individual as well as their assigned CIP code. These variables were obtained by combining the Alabama Commission on Higher Education and the Alabama Department of Labor reports to achieve the total number represented in each variable group. ACHE’s Program Inventory was used to demonstrate the number of agricultural programs that are available within the state based on their assigned CIP code. A five-year comparison was conducted using descriptors from the consolidated database to identify the occupations of program completers for each report year from 2015 to 2019. Additional information from ACHE’s program inventory database allowed for program comparisons from 2000 to 2024 and included details such as elimination, addition, or changes to a program. Several other data sources supporting research question one and two include qualitative and quantitative data from Alabama Works, the Alabama Cooperative

Extension Program, National Center for Education Statistics (NCES), O*Net, and the Alabama Department of Education.

Research Question 2: What changes have occurred to warrant the demand for creation of new programs and the expansion of existing programs? Nationally, the demands placed on the workforce are like those in the mid to late 1900's. Hands on, directed learning experiences are becoming the norm, and the workforce is struggling now more than ever to fill vacant positions due to the shift in industry needs and labor force participation.

Prosser's theorem fifteen mentioned flexibility and adaptability being crucial points to consider when working alongside CTE programs. (Prosser & Quigley, 1949) Being well prepared and equipped with the knowledge needed due to sudden changes is a vital asset when preparing and producing highly qualified, marketable, and well-trained employees. As a result, it is essential to identify what changes have occurred within the agricultural industry that has led to more adaptable and flexible program options for students.

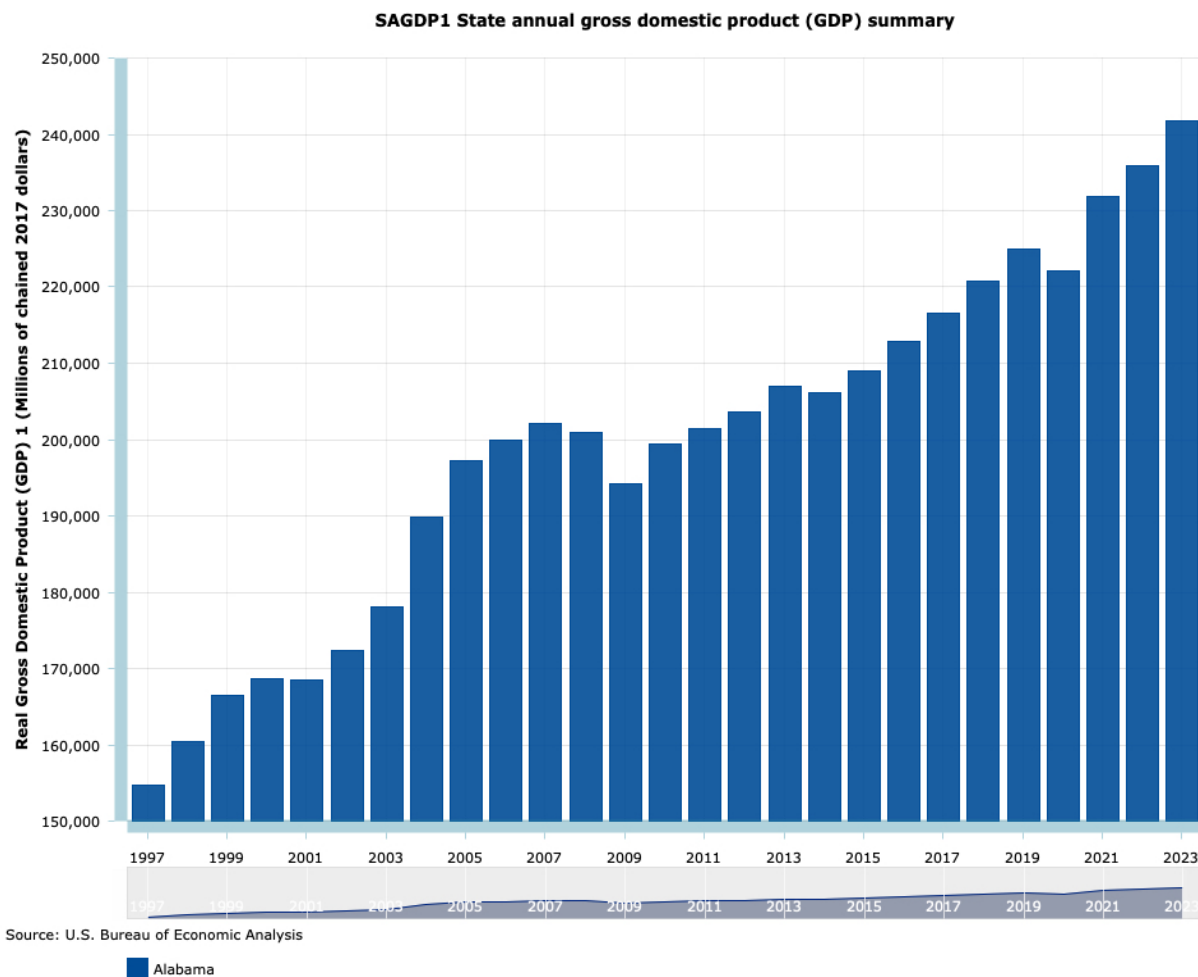
The answer to research question two was obtained by cross examining trends from the late 20th century well into the 21st century. This was accomplished by reviewing industry markets, program vitality reports, as well as the workforce dynamics involved in the agriculture sector since 1985. A series of data analysis was completed that ultimately led to the trend dataset answering question two.

Research Question 3: How do degrees obtained in agriculture, and related fields, impact the labor force? Specifically, Alabama's labor force? Several studies have shown that agriculture students are more career ready compared to their peers. "The unique nature of the agricultural education experience and delivery model produces career ready students that can be uniquely quantified..." (Mouser et al., 2024, p. 25)

Agriculture and its gross domestic products (GDP) impact every square inch of other industries and provide critical byproducts for them. (i.e. ethanol, plastics, makeup, paper, petroleum, silage, fertilizer, energy sources, etc.) In Alabama, there has been a major uptick in GDP since the mid 1990's. (See Figure 10)

Figure 10

Alabama Annual Gross Domestic Product Summary: Years 1997 - 2023



Source: U.S. Bureau of Economic Analysis. 2024. <https://www.bea.gov>

With the continued rise in Alabama's GDP output, the impact on the labor market and workforce demand has grown exponentially over the last 20 years. Nationally, "employment of farmers, ranchers, and other agricultural managers is projected to decline 2 percent from 2023 to

2033... about 88,500 openings for farmers, ranchers, and other agricultural managers are projected each year, on average, over the decade. All of those openings are expected to result from the need to replace workers who transfer to other occupations or exit the labor force, such as to retire” (U.S. Bureau of Labor Statistics. 2024).

The answer to research question three was obtained by defining 22 industry codes based on the assigned NAICS code to each student record. This also included the no records found as industry code number 1, which was later excluded to provide only 21 industry codes. The national database served as the foundation for this process. Specific CIP codes were selected based on their proximity to the agriculture industry and were filtered to provide the total number of agriculture program completers. The two variables were then combined and ran via crosstabs providing the comparison of employment by industry, and agriculture majors verses all other majors. Lambda coefficients were run to provide a measure of strength of the relationship between both nominal variables and to provide the statistical significance of the coefficients.

Summary

In summary, the relationship between rapid economic change and the preparation of graduates for a changing workforce is complex and requires thorough analysis. Identifying the existing patterns between the academic program production and its interface with workforce serves as a precursor to better preparation of students and a more aligned workforce.

Chapter 4: Analysis of Data

Introduction

As the demand for skilled laborers in specific industry sectors increase, the reliability and productivity of the state's workforce efforts have been placed under the microscope. Advisory councils, state leaders, and business partners are pressing institutions to aggressively address the gap between workforce needs and academic and technical program production of graduates and completers with the requisite skills to address those needs.

Senate Bill 253, known as the Alabama Workforce Pathways Act, was passed and enacted on May 23, 2024. "This act: (1) requires the State Board of Education to establish a Workforce Pathways diploma pathway and curriculum; (2) provides that any student who earns a diploma through this pathway is eligible for admission to any postsecondary education institution, subject to the institution's admission requirements; (3) authorizes the board to seek additional funding from the Legislature to upgrade or construct career and technical education centers; and (4) authorizes the Legislature to provide funding for the Alabama Short-Term Credential Program for scholarships towards in-demand college courses in the Alabama Community College System" (Act Summary. <https://alison.legislature.state.al.us/bill-search?tab=3>).

This study investigates how agricultural education has participated in the development of career and technical education, how its students impact Alabama's labor force and industry sectors, and how changes in the workplace and economy over the last 40 years have paved the way for the next generation entering the workforce.

Participants

This chapter presents the results of the data analysis procedures and data collected from ACHE, the ALDOL, and residual data from AlabamaWorks, O*Net. Additional economic development studies were used as comparisons regarding the validity of tests completed within this study. Graduates and program completers from Alabama public community colleges and universities from 2015-2019 were utilized for this study. Comprised of 61,171 students, Table 4 provides the demographic data and frequencies of the 61,171 graduates used for this study.

Table 4

Frequencies of Alabama Graduates 2015 - 2019

n = 61,171

Gender	<i>f</i>	%
Male	26,955	44.1
Female	34,209	55.9
Unknown	6	0.00
Institution Type	<i>f</i>	%
ACCS	11,382	18.6
University	49,789	81.4
From Alabama	<i>f</i>	%
Yes	55,864	91.3
No	5,307	8.7

A subpopulation was extracted from the total number of records and was defined based on their CIP codes exclusively related to the agricultural industry and its counterparts. A total of 2,316 records were identified. Table 5 provides the demographic and frequency data of this subpopulation.

Table 5

Frequencies of Agriculture Degree Holders 2015 - 2019

n = 2,316

Gender	<i>f</i>	%
Male	1,242	53.6
Female	1,074	46.3
Unknown	0	0.00

Institution Type	<i>f</i>	%
ACCS	136	0.06
University	2,180	94.1
From Alabama	<i>f</i>	%
Yes	2046	88.3
No	270	11.7

The subpopulation of agriculture degree recipients was further differentiated by those working exclusively in agriculture or related fields as defined by industry classification codes from the NAICS code database. A total of 242 records were identified. Table 6 demonstrates frequencies and demographic data of the subpopulation.

Table 6

Frequencies of Workers in Agriculture and Related Fields 2015 – 2019

n = 242

Gender	<i>f</i>	%
Male	171	70.7
Female	71	29.3
Institution Type	<i>f</i>	%
ACCS	13	0.05
University	207	85.6
From Alabama	<i>f</i>	%
Yes	203	83.4
No	39	16.1

Descriptive Analysis and Results

Comparative and cross-sectional analysis, as well as descriptive statistics, were used to categorize and isolate the data to show relationships between each data set and to identify key areas in how agriculture students and employees impact Alabama’s workforce. Each subgroup was defined and compared to the records from the consolidated database and were then placed in comparison charts to demonstrate the effects of each subpopulation on Alabama’s workforce and industry sectors. Additional resources were utilized from ACHE’s program inventory data and

from the National Center for Education Statistics CIP directory to help establish program trends from 1985 to 2019.

Research Question 1 - *What career pathways are readily available to agriculture students and how have they changed over the last 40 years?*

The NAICS online national database for Agriculture, Forestry, Fishing, and Hunting report that there are currently 372,015 active businesses across the United States who report having employed individuals within the industry. NAICS codes 111110 through 115310 are included and are comprised of 19 subcategories under this designation. Additional NAICS codes to be considered include 31, 32, 33, 42, 44, 45, and 541940. Each code is listed in Table 7 for reference.

Table 7

Additional National NAICS Codes to Consider

NAICS Code	Title	Number of Business Total
31	Production/ Manufacturing – Food, Beverages, Textiles	664,398
32	Production/ Manufacturing – Chemicals, Paper, Plastics, Pharmaceuticals\	
33	Production/ Manufacturing – Metals, Automotive, Aerospace, Electronics	
42	Buying and Selling, Wholesale	704,874
44-45	Buying and Selling, Retail	1,880,608
541940	Veterinary Services	47,395

Some industry examples of these NAICS codes include grain and oil seed milling; sugar and confectionery manufacturing; fruit and vegetable preservation; dairy, meat, and other food manufacturing; lumber, leather, wood product, paper, and petroleum manufacturing; fertilizer, farm machinery, lawn and garden equipment, and commercial service industry machinery

manufacturing; farm machinery, industrial, service, grocery, farm product, and petroleum wholesalers and retailers; as well as livestock veterinary services, clinics, animal hospitals, and testing services. While this is not a comprehensive list of all the career path possibilities, it is a starting point for those who are seeking a specific career or pathway in the agricultural industry sector.

For the State of Alabama, there are over 40 different degree programs that can assist in leading a student to any of the numerous career opportunities that are available in the agriculture sector. ACHE is the state agency responsible for the approval of all academic programs offered by the state's public community colleges and universities. According to ACHE's program inventory, and for the purposes of this study, there are 47 specific CIP codes related directly to the agriculture field. Many of these include but are not limited to Agri-Business; Agricultural Business and Economics; Agricultural Communications; Agricultural Economics; Agricultural Production; Agricultural Science; Agricultural Foundations; Animal Bio-Health Sciences; Animal Sciences; Animal, Poultry, and Food Science; Biological and Agricultural Technology Management; Biosystems Engineering; Career and Technical Education; Commercial Food Service; Crop, Soil, and Environmental Sciences; Fisheries, Aquaculture, and Aquatic Sciences; Food Science; Forestry and Wildlife Sciences; Horticulture; Landscape Design; Marine Biology; Veterinary Technology; and more.

Esters and McCulloh. (2008) stated that "agricultural education has long emphasized the role of career development at the secondary level. For example, the popular teaching methods textbook, *Handbook on Agricultural Education in Public Schools* (Phipps & Osborne, 1988), considers helping students to make career decisions a vital component of managing an agricultural education program. However, the career development needs of students enrolled in

post-secondary programs of agriculture have been receiving greater attention. This is primarily due to concerns about high school students' decisions to pursue the agricultural sciences as an academic major and career option... goals for career development in higher education should be such that all types of career concerns and needs are addressed. These career needs range from exploration of job opportunities related to majors, to development of job-seeking skills, to general issues of career preparation, decision- making, and choice.” (p. 6)

“In the past 40 years, much has been written about career exploration, including both theory and research” (Bartley & Robitschek, 2000). “Career exploration generally is defined as those self-appraisal and external activities that provide individuals with information to foster progress in the selection of, entry into, and adjustment to an occupation” (Blustein, 1989b; Jordann, 1963; Stumpf et al., 1983) (As cited in Esters & McCulloh. 2008).

Esters and McCulloh (2008) also found that students indicated only a moderate level of career exploratory behaviors which suggested a need for emphasizing integration of various career development experiences across academic programs. “The findings of this study also have implications for the U.S. agricultural industry, which is faced with major challenges concerning the current and future shortage of individuals to work in agriculture-related careers, as well as for colleges of agriculture that prepare students for the agricultural workforce” (Esters & McCulloh. 2008).

Changes in industry practices, demands and technology have impacted the agricultural industry at an unprecedented rate, and will require the incorporation of training for the changing workplace.

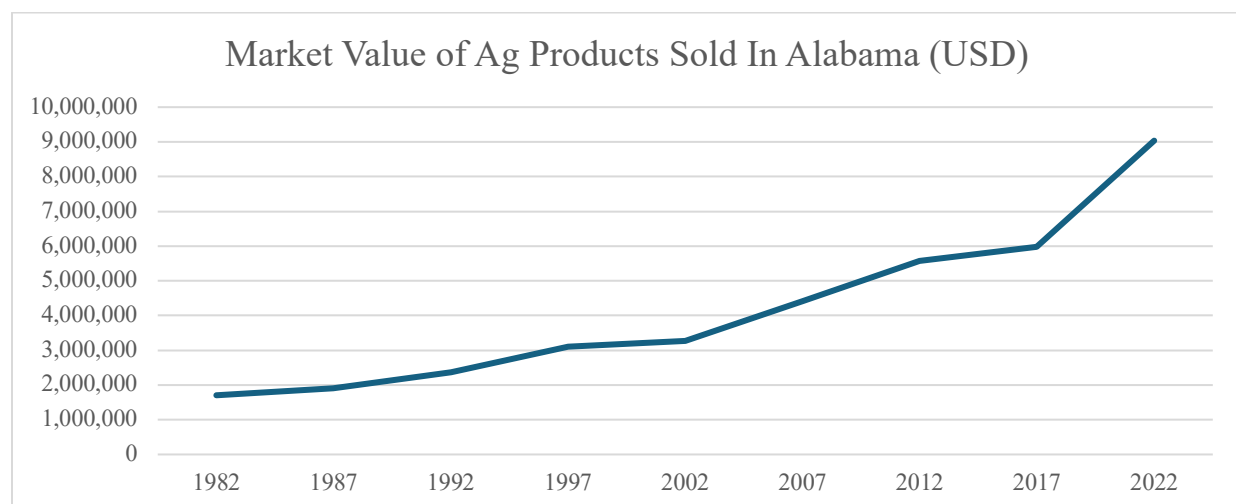
Research Question 2 - *What changes have occurred to warrant the demand for creation of new programs and the expansion of existing programs?*

Over the years, many educational programs have seen changes, expansions, and consolidations based on industry demands and labor requirements. For example, the expansion of the agricultural teacher education programs from 1985 to the early/mid 2000's. Based on the National Center for Education Statistics (NCES) 1985 – 2000 CIP Table report, CIP code 13.1301 identifies the agricultural teacher education program, the only agricultural education program during that time. This code is still utilized today, but additional programs were added in the 2000 – 2010 CIP crosswalk report from NCES and include CIP codes 01.0801(Agricultural and Extension Education Services), 01.0802 (Agricultural Communications/Journalism), and 01.0899 (Agricultural Public Services). These codes identify new multi-track programs that were expansions from single agricultural teacher education track from 1985 to the early/mid 2000's.

In Alabama, the need for agriculture degree holders and skilled workers has grown due to the changing nature of the workplace. The increased skill of the workforce has yielded an increase in gross domestic product output and market value of products sold within the state (See Figure 11).

Figure 11

1982 – 2022 U.S. Census of Agriculture Market Value of Agriculture Products Sold in Alabama

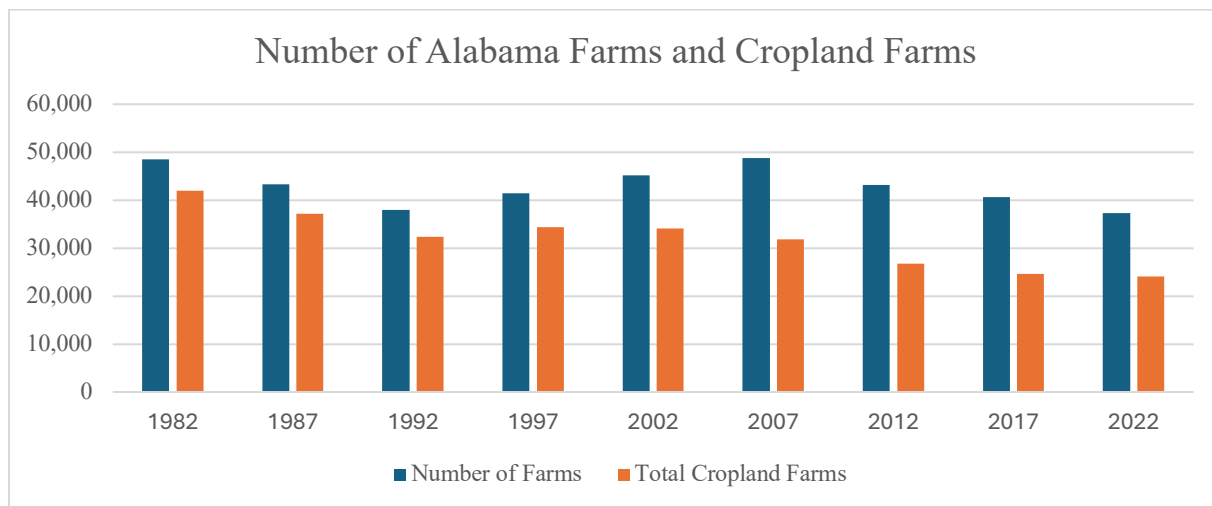


Source: USDA: National Agriculture Statistics Service (NASS)

Additionally, fluctuation in the number of farms, cropland farms, and turnover in ownership – more specifically to a large increase in corporate ownership - has created a demand for workers that are skilled in numerous facets of the industry, and individuals who can assist in the dissemination of information to the consumer (See figures 12, 13, and 14 for reference).

Figure 12

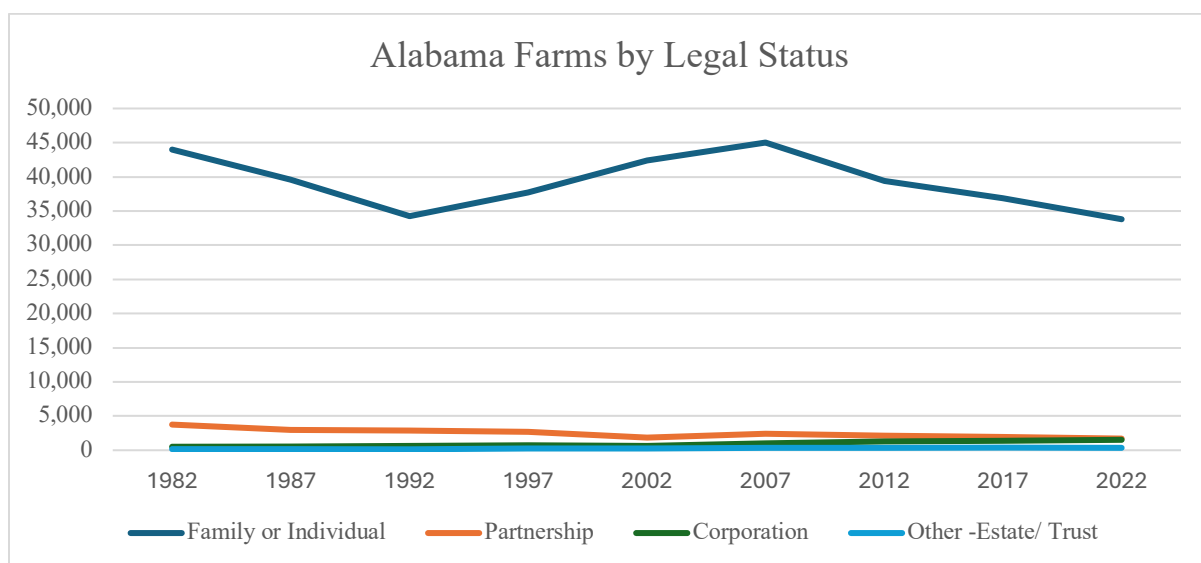
1982 – 2022 U.S. Census of Agriculture Number of Farms and Cropland Farms in Alabama



Source: USDA: National Agriculture Statistics Service (NASS)

Figure 13

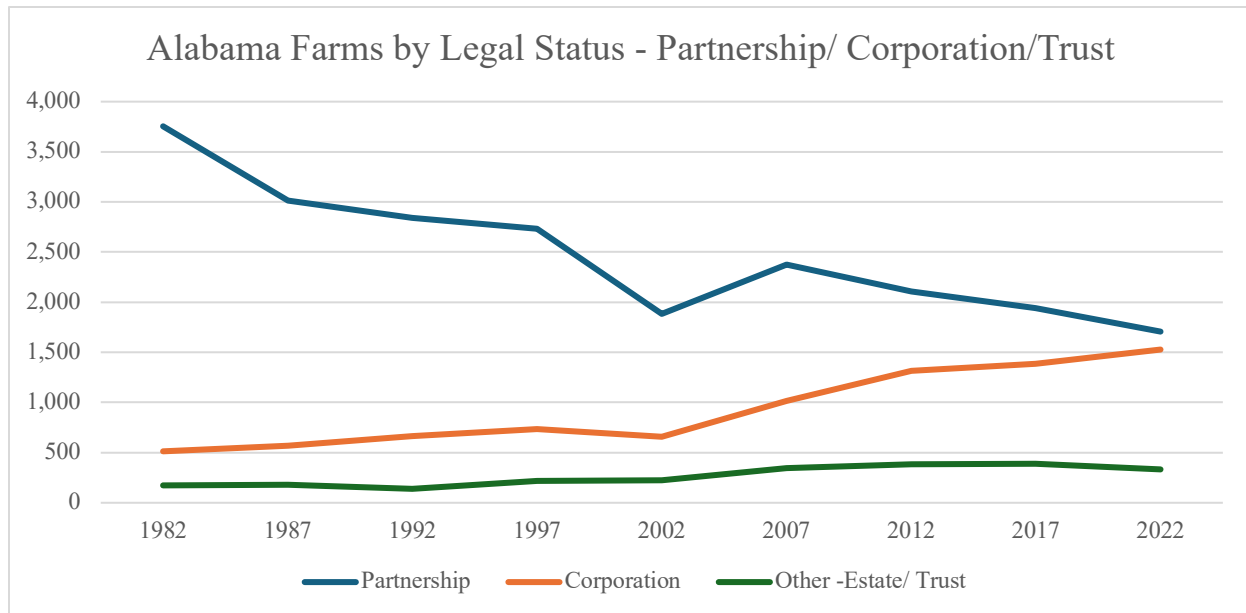
1982 – 2022 U.S. Census of Agriculture Farms by Legal Status in Alabama



Source: USDA: National Agriculture Statistics Service (NASS)

Figure 14

1982 – 2022 U.S. Census of Agriculture Farms by Legal Status in Alabama – Partnership/Corporate/ Other



Source: USDA: National Agriculture Statistics Service (NASS)

The majority of Alabama’s farms are still family owned and operated, but that does not mean that the narrative of industry needs verses the gap in degree obtainment and job placement change. In addition, the effects and impact of the industry changes are not fully recognized until the NAICS, CIP, and Industry codes are compared across the board.

Research Question 3 - *How do degrees obtained in agriculture, and related fields, impact the labor force? Specifically, Alabama’s labor force?*

According to Harold Hunt, “agriculture, forestry and related industries contribute more than \$70 billion to Alabama’s economy, accounting for almost 40 percent of Alabama’s gross domestic product” (Alabama Works. 2024). According to Wang et al. (2022) “between 1948 and 2017, U.S. agriculture output grew by nearly 187% even as the number of agriculture workers declined by nearly 76%. The trend of rising agriculture productivity and falling labor participation is expected to continue” (p. iii).

Figure 15 depicts Alabama’s employment numbers by industry from the years 2015 – 2019. The data shows that the leading employment industry within the state for those five years was Healthcare and Social Assistance with Agriculture, coming in second to last as an industry employer. It is important to note that this population does include individuals who had obtained an agriculture degree and that ‘No Records Found’ was excluded from the data analysis process, thus eliminating industry 22 from the findings. Figure 15 depicts a similar employment trend but does not include individuals who obtained an agriculture degree.

Figure 15

Employment by Industry Totals for Alabama 2015 – 2019

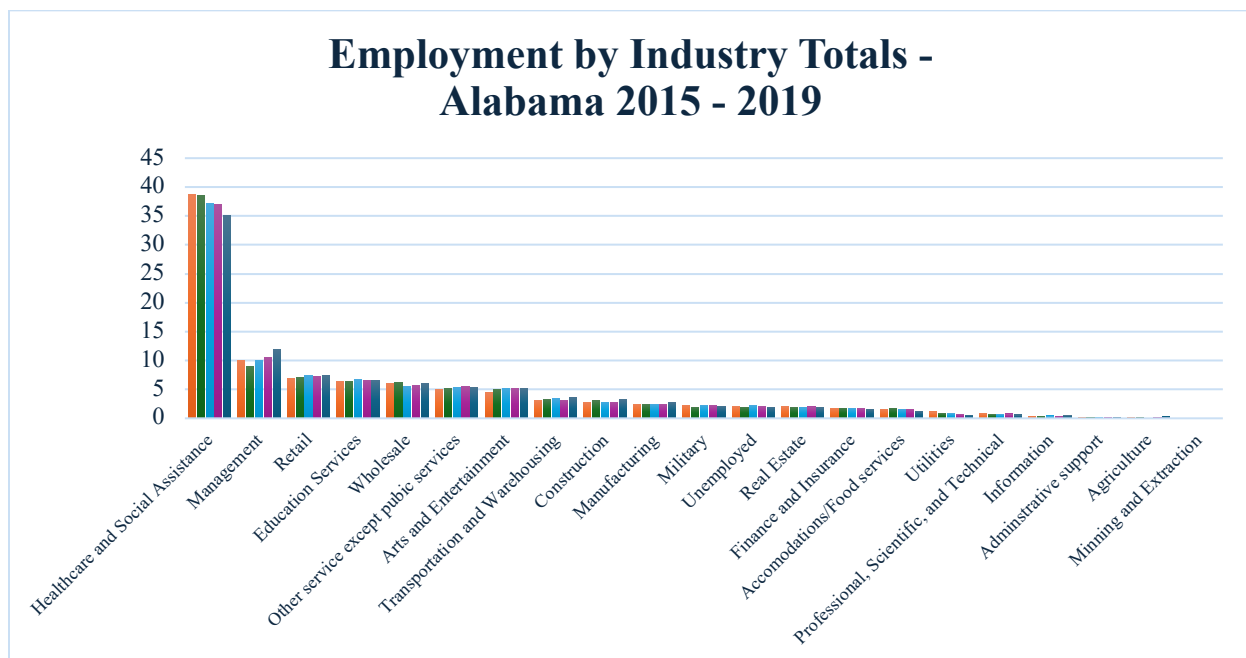
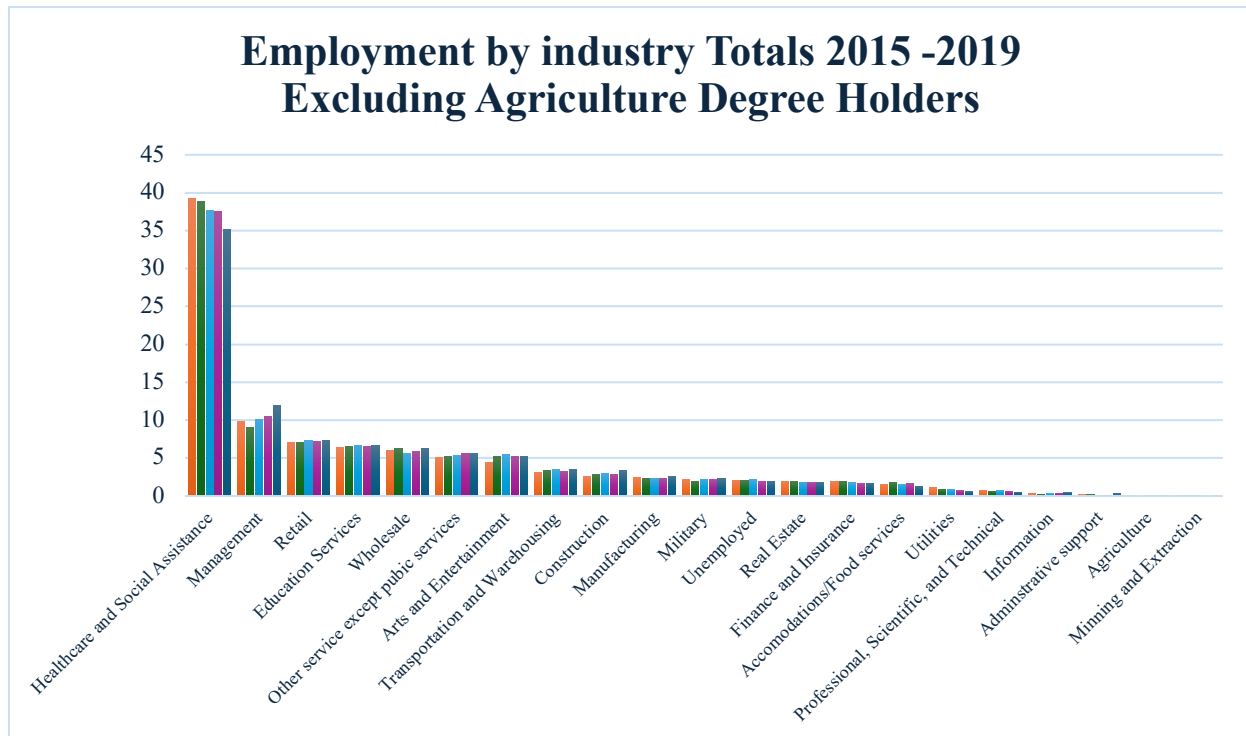


Figure 16

*Employment by Industry Totals for Alabama: Excluding Agriculture Degree Holders
2015 – 2019*

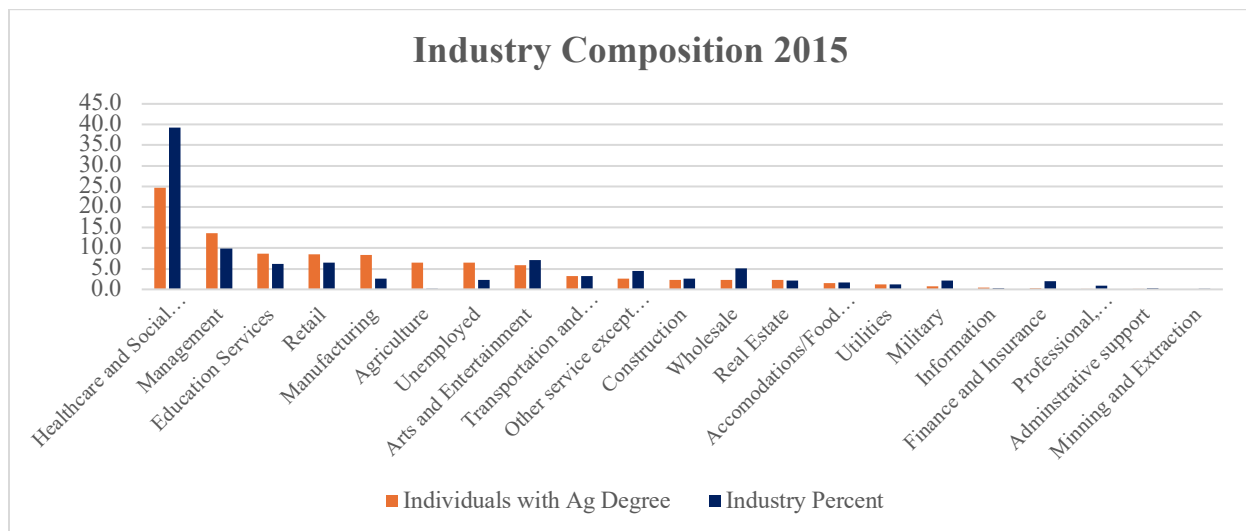


With the agriculture industry and its related counterparts contributing more than \$70 billion to Alabama’s economy and accounting for more than 40% of gross domestic product output, where are the agriculture workers and degree holders? Upon further investigation, it was noted that incorrect CIP identifiers had been assigned to students from the reporting institutions; therefore, placing students outside of their degree obtainment field. (i.e. Student A graduated with a bachelor’s in agriculture communications but was assigned a CIP code from Journalism/ Communications) This error greatly affects the trend data that is reported within this study.

Figure 17 demonstrates a breakdown of the 2015 industry employment data and depicts where individuals who obtained degrees in agriculture are employed and the percentage they occupy in relation to the industry employment percent totals.

Figure 17

Industry Composition Totals for 2015



In 2015, the majority of agriculture degree holders were employed in the Healthcare and Social Assistance industry with Management following behind. Those who were employed in the agriculture industry were primarily students who had obtained an agriculture degree accounting for 6.5% of the industry composition with only 0.1% of individuals being employed within the sector without having obtained an agriculture degree. It is important to note that not all CIP codes were properly assigned by the reporting institutions, thus leading to inaccurate representation of individuals who had obtained an agriculture degree within the 5 reporting years. Majority of agriculture degree holders can be identified throughout all 21 industry sectors within the State of Alabama. This trend is noted throughout all five comparison years. (See figures 18 - 21)

Figure 18

Industry Composition Totals for 2016

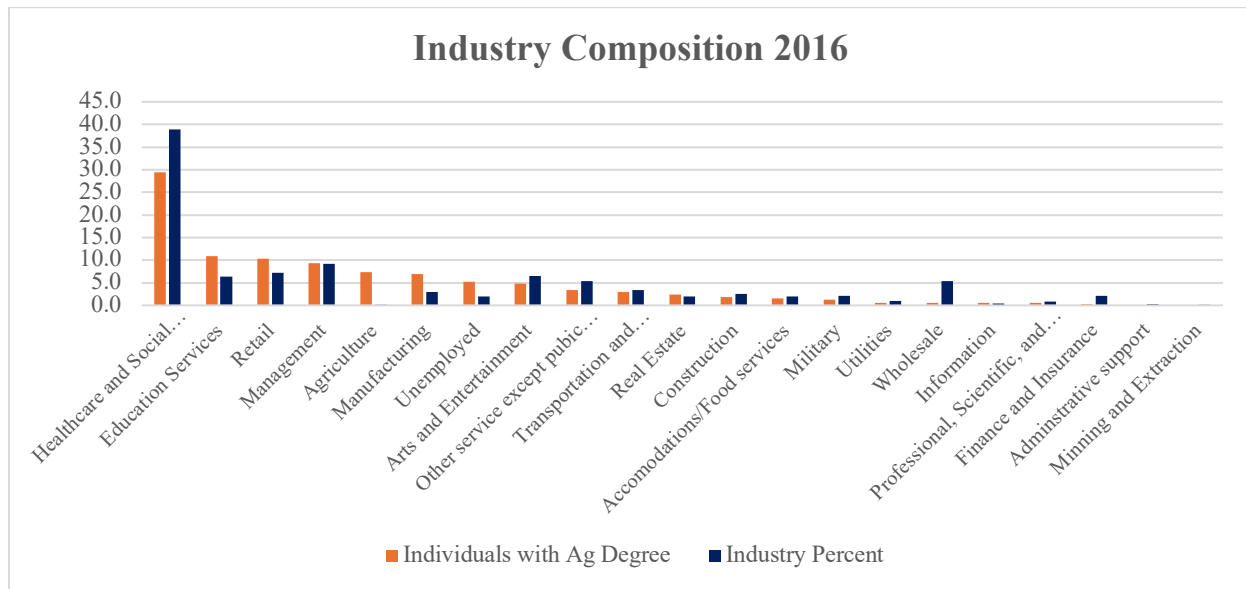


Figure 19

Industry Composition Totals for 2017

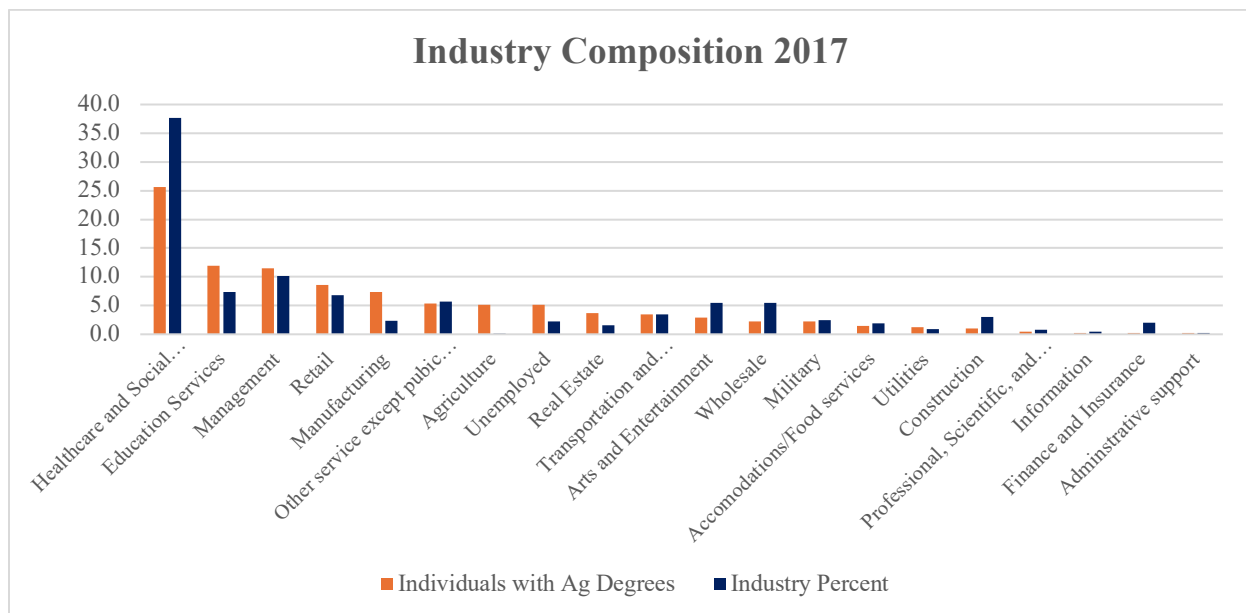


Figure 20

Industry Composition Totals for 2018

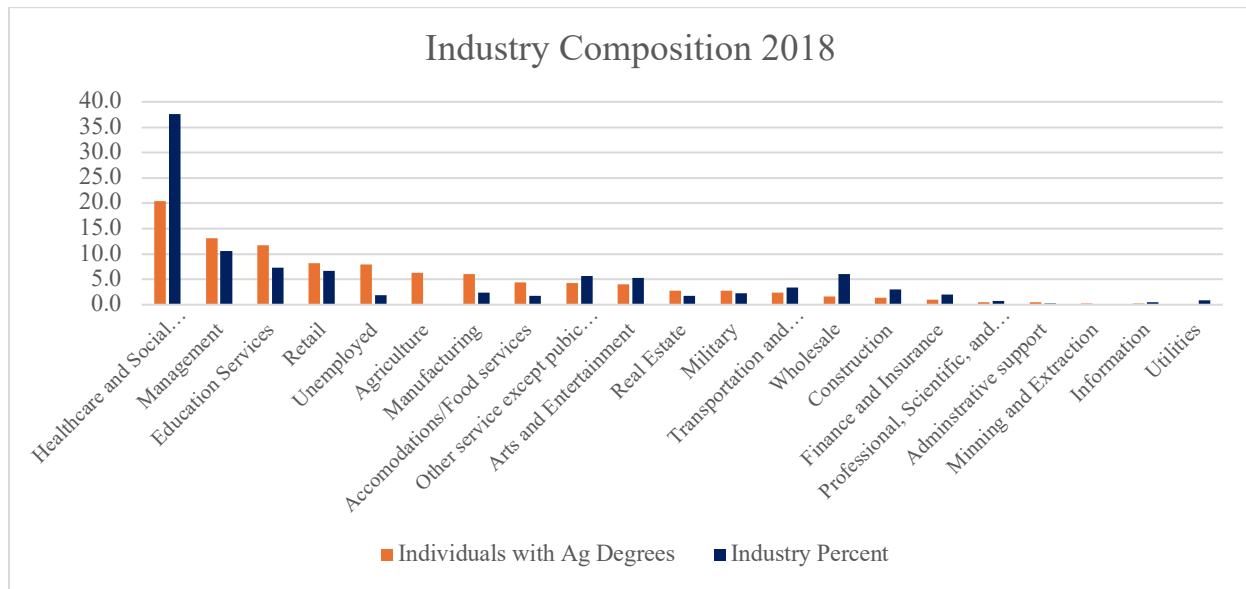
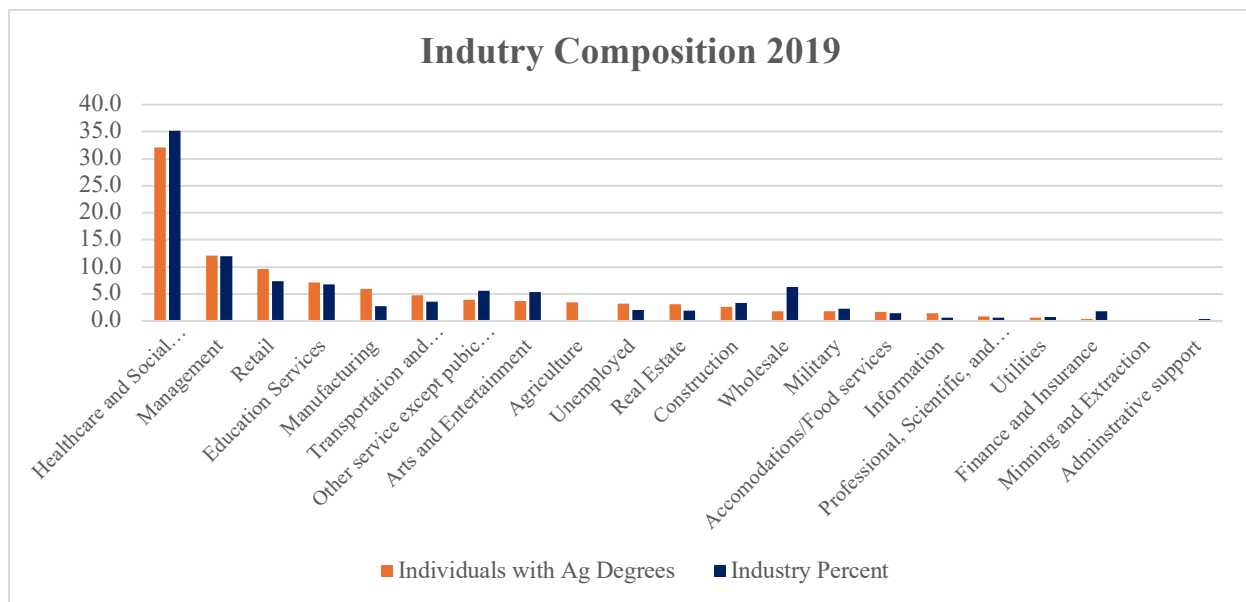


Figure 21

Industry Composition Totals for 2019



To assess the relationship between employment-related factors and student success, a cross tabulation and lambda coefficients were calculated for two variables from within the

combined dataset: *Industry General* and *Major Dependent (MCIP)*. “Unlike chi-square derivatives, the lambda coefficients provide a measure of the strength of relationship between two nominal variables and have proportional reduction in error interpretation” (Goodman & Kruskal, 1954) as cited in (Hartwig, F., 1973, p. 1).

The lambda (L) value for *Industry General* was 0.187, indicating a moderate association between the industry of employment and student success. This suggests that knowing the general industry in which a student is employed reduces prediction error by approximately 18.7%. Whereas the lambda (L) value for *Major Dependent (MCIP)* was 0.082, demonstrating a weaker association between the two variables. Knowledge of a student's major reduces prediction error by just 8.2%, suggesting that while it has some relevance, its predictive power is limited. (See Table 8)

Table 8

Directional Measures

Nominal by Nominal	Lambda Symmetric	Industry_Gen Dependent	Major Dependent	Goodman and Kruskal tau Industry_Gen Dependent	Major Dependent
Value	.126	.187	.082	.224	.042
Asymptotic Standard Error ^a	.001	.003	.001	.002	.000
Approximate T ^b	81.745	70.172	53.842		
Approximate Significance	<.001	<.001	<.001	<.001 ^c	<.001 ^c

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on chi-square approximation

The results suggest that the general industry of employment has a stronger influence on student success verses the student's major; however, both factors exhibit relatively low lambda values, indicating that other variables not examined in this analysis are likely more significant contributors to student success.

The findings highlight the potential importance of industry alignment in career outcomes and success. Students may benefit from targeted guidance toward industries where their skills and education are more closely matched to workforce demands. However, the weaker association with majors underscores the need for additional investigation into other influences, such as personal motivation, or socioeconomic factors but heightens the need for investigation into institutional data reporting practices; local, state, and federal reporting practices; and proper CIP code assignments within the institutions across the board.

With agriculture degree holders being present and represented throughout all 21 industries within the state, a comparison was run on the subpopulation of individuals who had obtained a degree in agriculture to see what NAICS Title they were associated with. The five-year average showed that 39% of individuals were employed in the colleges and universities track, whereas 24% were employed in the elementary and secondary school's track. Veterinary services, landscaping services and junior colleges were the final three NAICS titles where most degree holders were found. (See Figure 22)

Figure 22

Top 5 NAICS Employment Titles: Over 5 Years

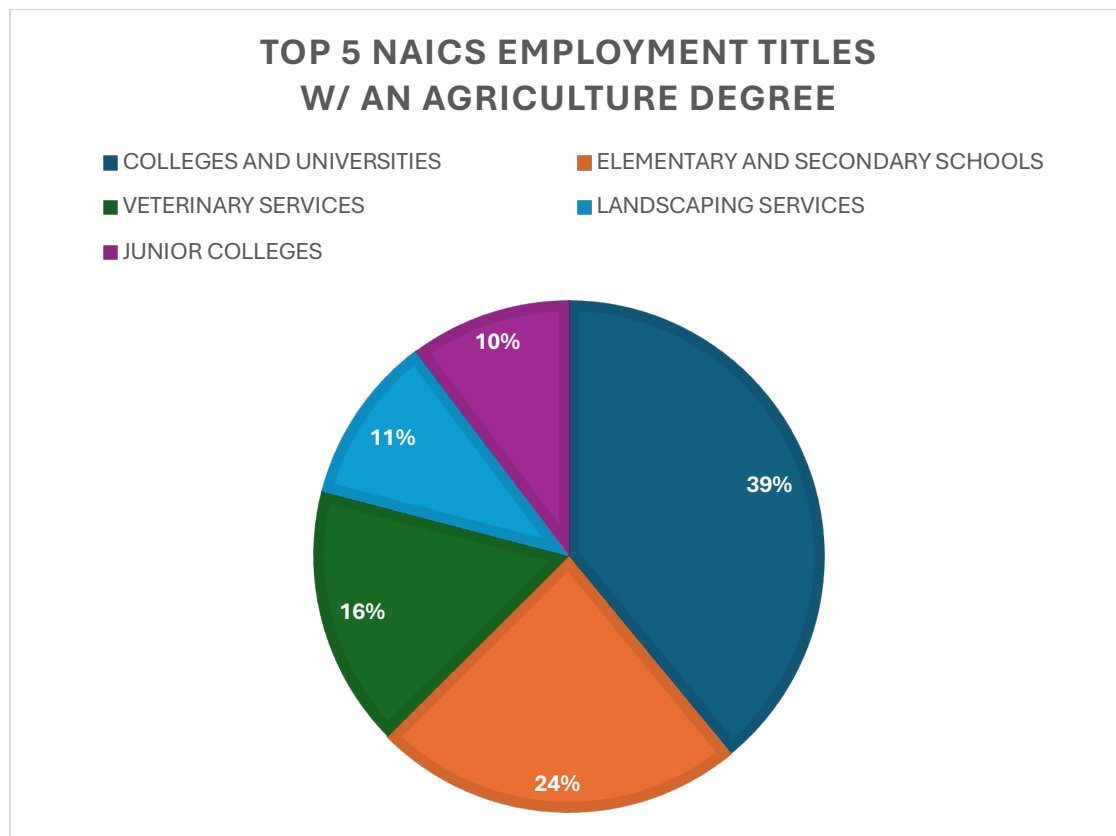
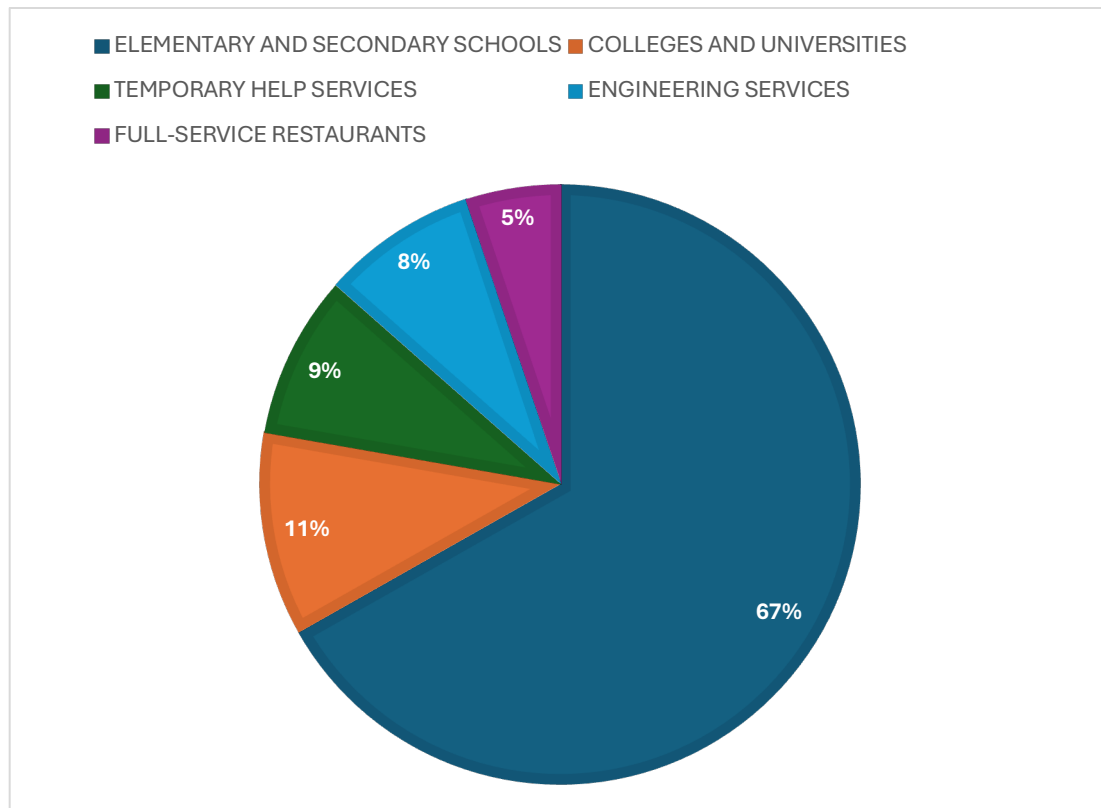


Figure 23 depicts the results of that analysis and shows that elementary and secondary schools led the way with 67% of individuals being employed within that area followed by colleges and universities coming in second at 11%. Temporary help services, engineering services, and full-service restaurants were the final three NAICS titles where non- agricultural graduates were found.

Figure 23

Top 5 NAICS Employment Titles: 5 Year Average – Excluding Ag. CIP's



Summary

Overall, the agriculture industry, its students, and employers impact Alabama's labor force in a wide range of industries. While agriculture students are intricately woven into the fabric of Alabama's workforce, the misassignment of CIP code identifiers throughout the 5 reporting years demonstrates the necessity of institutional research representatives to ensure that

programs and its completers are accurately identified and represented. Otherwise, critical gaps in program vitality; workforce development programs; labor trends; and federal funding, for both the state and federally funded institutions, will suffer greater fates if these errors are not corrected in future reporting practices.

The findings show that most agriculture degree graduates were employed outside of the agriculture industry. Significant changes have affected how individuals are represented across industry sectors. These include shifts in both federal and state legislation impacting student representation within the CIP and NAICS identification systems; program adjustments such as the addition, removal, or merging of programs within an institution; and the expansion of career pathway options. Furthermore, there remains a critical gap in understanding how degrees in agriculture and related fields can equip graduates with versatile, workforce-ready skills suited for multiple industry sectors—not just agriculture.

Finally, the results indicate a lack of well-defined degree-to-career pathways for agriculture students and graduates. Additionally, the findings suggest that the skills gained through agriculture college programs are broadly applicable to industries beyond the agricultural sector. Understanding our labor force, where our students are going, where they are employed, and why they are employed in that field are crucial to understand if the agricultural industry and its associated sectors expect to make changes in growing its programs and workforce participation numbers.

Chapter 5: Conclusions and Recommendations

Introduction

Changes and demands over the last several decades in employment, business practices, and the ever-growing global economy have required workers to be educated, flexible, and demonstrate excellent communication skills (Weeks, K. et al). Rice and Kitchel (2017) state that “preparing students for work and college is one of the primary goals of agricultural education teachers.” Agricultural education is positioned to prepare students beyond high school and “aligning the 21st century skills to instruction should be a priority” (pp. 127–142).

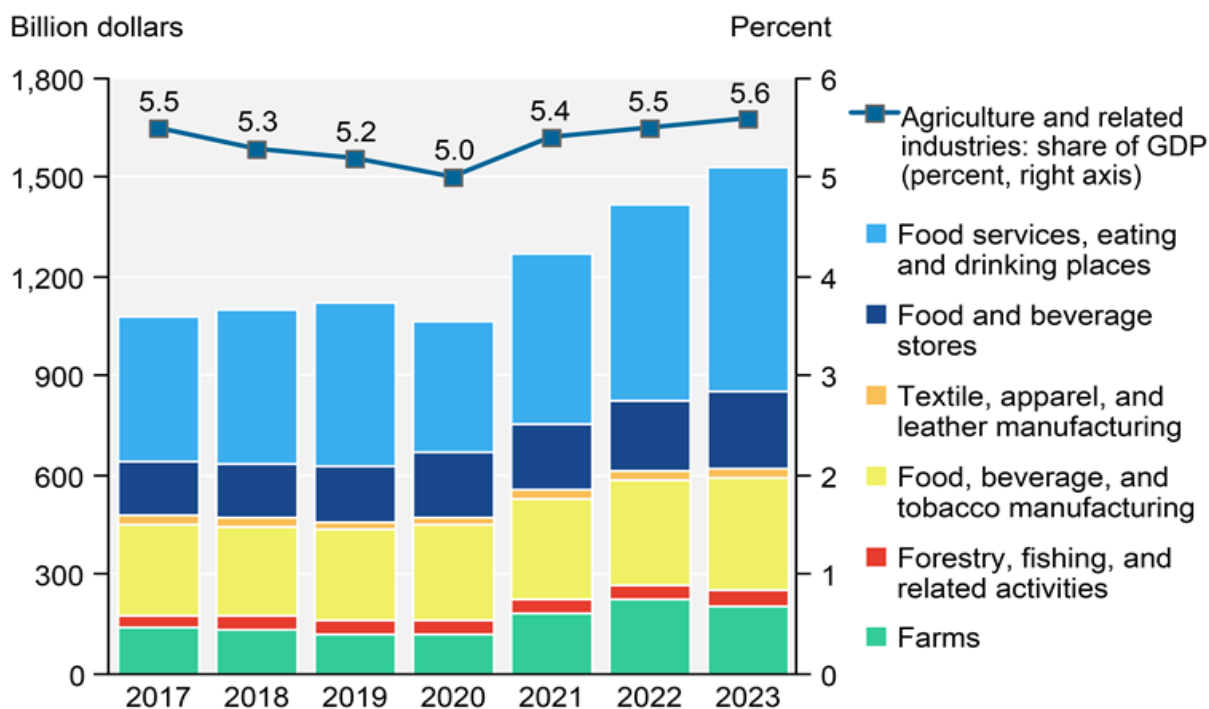
In February 2024, the Association for Career and Technical Education published a state facts sheet indicating that 58% of jobs in Alabama require skills training at or above the high school level, but less than a 4-year degree. Currently, only 47% are trained at the level that is required to fill key industry positions, including agricultural products and food production. (ACTE. 2024)

According to the USDA, agriculture, food, and related industries contributed roughly \$1.53 trillion to the U.S. gross domestic product output in 2023. (See Figure 24)

Figure 24

Value Added to U.S. GDP by Agriculture and Related Industries (2017 – 2023)

Value added to U.S. GDP by agriculture and related industries, 2017–23



Note: GDP = Gross Domestic Product.

Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of Economic Analysis, *Value Added by Industry*, March 28, 2024 release.

To understand where agriculture, food, and related industries ranked among Alabama’s workforce and employment opportunities, a consolidated database was developed utilizing secondary data sources from the Alabama Department of Labor, now a subunit of the Alabama Department of Workforce, the Alabama Commission on Higher Education (ACHE), and ACHE’s program inventory dataset. A summary of findings, conclusions, and recommendations are presented in this chapter. The following research questions guided this study.

1. What career pathways are readily available to agriculture students and how have they changed over the last 40 years?

2. What changes have occurred to warrant the demand for creation of new programs and the expansion of existing programs?
3. How do degrees obtained in agriculture, and related fields, impact the labor force?
Specifically, Alabama's labor force?

Summary of Findings

Findings from the comparative and cross-sectional analysis yielded the following results.

1. Over 370,000 active businesses across the United States employ individuals within the Agriculture, Forestry, Fishing, and Hunting industries. It is important to note that the agriculture industry itself includes food services, food and beverage stores, textile and apparel, food and beverage manufacturing, farms, veterinary services, buying and selling wholesale and retail.
2. Alabama's public community colleges and universities offer over 40 different agriculture degree programs. According to ACHE's program inventory, and for the purposes of this study, there are 47 specific CIP codes related directly to the agriculture field.
3. Changes in reporting standards, CIP code identifiers, and expansions in programs have led to challenges in effectively identifying and reporting a student's degree, occupation, and NAICS code assignment. Incorrect CIP code identifiers assigned to students by the reporting institutions have misplaced students within state, national, and federal databases; thereby affecting the correct number of agriculture degree holders employed within the state. (i.e. A student who graduated with an Agriculture Communications degree in 2016 was not assigned the appropriate CIP code and instead of being included in the College of Agriculture program completers, was included in the College of Education Journalism and Communications program completers. This affects, not only

university reporting and funding, but national reporting datasets related to the Department of Labor, the Integrated Postsecondary Education Data System (IPED's), and the National Center for Education Statistics (NCES).

4. From the years 2015 – 2019, the agriculture industry was ranked 2nd to last in employment industry totals for the state of Alabama. Healthcare and Social Services, Management, and Retails were the top 3 employed industries within the state. There was no difference in ranking based on whether a student had obtained an agriculture degree or not.
5. Students who obtained a degree in agriculture were more frequently found in industries outside of the agriculture discipline. (i.e. Transportation, construction, food services, finance and insurance, professional/ scientific fields, utilities, information, and administrative support.) It is important to note that some of these industries do overlap with the agriculture sector. (i.e. Agriculture specific banks/ lending services that align with the finance industry code.)
6. The top 5 NAICS employment titles for individuals who had obtained a degree in agriculture were colleges and universities; elementary and secondary schools; veterinary services; landscaping services; and junior colleges.
7. The top 5 NAICS employment titles for individuals without an agriculture degree include elementary and secondary schools; colleges and universities; temporary help services; engineering services; and full-service restaurants.

Conclusions

These results indicate that the agriculture industry, its students, and employers heavily impact Alabama's workforce; however, the agriculture industry is struggling to obtain and retain employees within the industry itself.

Multiple factors affect in state retention; however, one of the greatest issues is salary. Based on the Retain Alabama EDPA 2021 Report, salary, acceptance of people with diverse backgrounds, and job opportunities were the top 3 student perceptions that widened the gap between metrics and impressions within the state. (See Figure 25)

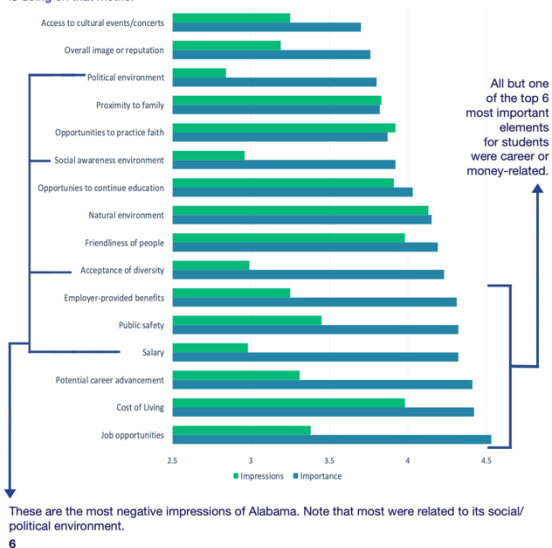
Figure 25

Student Perceptions about the State of Alabama

Learning #3

Students from across the country have the same perceptions of the state—both good and bad.

This graph shows various priorities students have when choosing a place to live after graduation. Blue bars signify how important that item is, while green bars show how well they think Alabama is doing on that metric.



"Ideally, I would like to live somewhere that is big enough that stores, restaurants, activities, and job opportunities are easily accessible but not so big that one has to deal with constant traffic or very high costs of living. I would like to live somewhere that has access to outdoor activities but isn't extremely remote. I would want to live in a city that has a welcoming culture."

- Out-of-state student

"I think salary is one of the most important factors as it impacts all the others."

- In-state student

"I think we are slowly progressing as a state with our politics and culture so it isn't as polarized. However, we still have a long way to go."

- In-state student

Filling the Gaps

In an ideal world, if a blue bar is all the way over to the right, the green bar would meet it. Where there is a large gap between the two bars, Alabama has a lot of work to do to improve students' perceptions. The largest gaps between impressions and a metric's importance are:

1. Salary
2. Acceptance of people with diverse backgrounds
3. Job opportunities
4. Potential for career advancement
5. Employer-provided benefits
6. Political environment
7. Social awareness environment
8. Public safety

As students are making decisions around post-graduate plans, we recognize the wide variety of priorities at play; the perceptions that span the widest gap between impression and importance are the areas with the most opportunity for growth in Alabama.

Students love Alabama's outdoors, but express concerns about politics.

For almost all racial demographics, Alabama's *outdoor amenities* and *natural environment* were students' favorite aspects of the state. African American respondents, however, cited *educational opportunities* as Alabama's strongest asset. Across the board, students ranked Alabama's *political environment* as the state's most negative characteristic.

7

Source: EDPA. 2021. <https://edaa.org/wp-content/uploads/2021/09/EDPA-Retain-Alabama-Report-FINAL.pdf>

In addition, "students are evaluating their post-graduate opportunities on a city level, not a state level, and Alabama's cities are competing against other Southern cities more than the East

or West Coasts.” (EDPA Report. 2021. <https://edaa.org/wp-content/uploads/2021/09/EDPA-Retain-Alabama-Report-FINAL.pdf>)

As industry practices and changes in technology continue to evolve, the need for skilled workers in the agriculture sector grows exponentially. With this growth comes the emergence and use of artificial intelligence systems, controlled environment farming practices, and changes in efficiency practices. "I think there's a lot of potential for both increasing productivity on the crop side, but also for reducing the amount of resources that we use on the productivity side. There's the data that we can actually collect to increase yields and improve the nutritional quality. But then there's also the facilitate facilitating of reductions in labor availability," said Mason Earles, an assistant professor at UC Davis in the departments of Viticulture & Enology and Biological & Agricultural Engineering and researcher at the AI Institute for Next Generation Food Systems or AIFS (Baier, B., Munneke, A. 2024).

“Agricultural Education is far more important than just an elective curriculum... Today’s educators should maintain a rich communications environment that encourages feedback and reinforcement, not only between the teacher and students, but also between classmates and the community” (Brescia, J. 2024).

Recommendations for Practice

Based on the conclusions, the following recommendations are made:

1. State legislators need to address and reassess their funding allocations for the Workforce Innovation and Opportunity Act (WIOA), AlabamaWorks Support services, and the Alabama Workforce Council (AWC).
2. State legislators and the AWC need to address industry priorities within the State of Alabama and remove tendencies that lean towards promoting other industries more

heavily than others. (i.e. automotive manufacturing, service technicians, utilities, and healthcare.)

3. Industry needs should be shared more readily among the AWC committees with full transparency and concise communication efforts.
4. Land-Grant institutions within the state need to work tediously on addressing the image quality of the agriculture industry within the state and partner with the AWC, industry partners, and workforce regions to better understand the gaps in employment, industry needs, and program vitality across the state. In addition, programs need to be adequately promoted to the workforce regions, AWC, legislators, and stakeholders across the state.
5. Data reporting practices for all public community colleges and institutions need to be audited and scrubbed frequently to ensure that proper CIP code assignments are adequately placed to ensure credible data reporting. (i.e. Improper CIP code assignments can cause in-state institutions to lose money to out-of-state institutions and can give the illusion that a program is not offered at the in-state institution(s). This can cost in-state institution(s) to lose upwards of over \$650,000 per year.)
6. Internal audits of data files from 2000 forward should be conducted to address all incorrect data entries. Measures to prevent incorrect CIP assignments from institutions should be established and implemented across the board for all public community colleges and 4-year institutions.

Recommendations for Research

Based on the conclusions, the following recommendations are made for research practices:

1. Additional research should be conducted concerning the average salary of agriculture associated workers within Alabama and the surrounding competitive states. (i.e. Georgia, Texas, Tennessee, and Kentucky.)
2. Research in career exploration practices, behaviors, and opportunities should be conducted to help assess the needs and level of importance that is placed on certain industries within the state.
3. Research concerning agriculture program vitality should be conducted and cross referenced with misplaced CIP codes throughout the years to establish a more complete understanding of the effectiveness of agriculture programs and its student's.
4. National research should be conducted to help demonstrate the importance of youth involvement programs, such as FFA and 4-H, to show how their students are better prepared for the workforce verses those in a standard educational program.

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Appendix 1

Appendix 2: Data Sharing Agreement



Alabama Commission on Higher Education

August 2, 2024

Jessie Lynn Nichols
2350 Hilltop Farm Road
Prattville, Alabama 36067

Dear Jessie Lynn:

This letter serves to formally grant permission to access and utilize the Commission's student data for the purpose of conducting your dissertation research entitled *Career Pathways of Agriculture Students: An Introspective Look Through a 40-Year Lens*.

These data include demographic codes related to gender, institution type, and residency. It also includes North American Industry Classification System (NAICS) codes utilized by the agency to classify business establishments as well as federal Classification of Instructional Program (CIP) codes to classify academic programs.

Please use these data as necessary for your study in accordance with the signed and attached *Data Sharing and Use Agreement* that outlines the agency's acceptable use guidelines in accordance with state and federal laws.

I appreciate your interest in Alabama's system of higher education and wish you the best of luck on your research.

Sincerely,

Dr. Jim Purcell
Executive Director



Alabama Commission on Higher Education
Mailing Address: P.O. Box 302000 Montgomery, Alabama 36130-2000
Delivery Address: 100 North Union Street, Suite 782
Montgomery, Alabama 36104-3758
Telephone: (334) 242-1998 a 1-800-960-7773 a Fax (334) 242-2269
www.ache.edu



ACHE Research Fellow Data Sharing and Use Agreement

As an ACHE Research Fellow, I acknowledge and accept the ultimate responsibility for protecting the rights, welfare, and anonymity of human subjects, ensuring the security and protection of the data, and maintaining ethical standards throughout the research project. As an ACHE Research Fellow, I will act in accordance with ACHE guidelines and comply with all applicable federal, state, and local laws regarding the protection of participants in human research. I further acknowledge and agree to adhere to the following data sharing guidelines associated with this Fellowship:

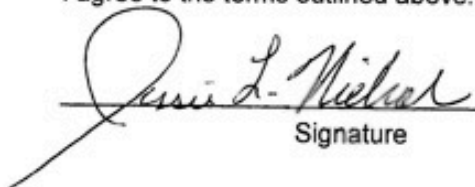
- **Authority.** Consistent with the Family Educational Rights and Privacy Act (FERPA), ACHE may disclose and exchange unit record student information from education records to authorized representatives without consent for use in studies in connection with an audit or evaluation of Federal or State supported education programs pursuant to 34 CFR § 99.31(a)(3), 20 U.S.C. § 1232g(b)(3). ACHE may also disclose and exchange unit record student information to authorized representatives without consent for the purpose of conducting studies in order to develop, validate, or administer predictive tests; administer student aid programs; or improve instruction, pursuant to 34 CFR § 99.31(a)(6)(i) and §§ 99.35; 20 U.S.C. § 1232g(b)(1)(F).
- **Legal Compliance.** In all aspects, research should comply with FERPA and applicable state and federal laws. Fellows may be required to provide supporting documentation, as necessary, to ensure research activity is performed in compliance with all applicable laws, FERPA regulations, and state and federal policies.
- **Ownership.** ACHE retains all rights and ownership to data exchanged throughout the duration of this Fellowship.
- **Oversight.** Conducting research as a Fellow implies a willingness to have ACHE staff provide limited oversight on research methodologies and dissemination of information, including an initial review of the research process and final approval of any reports and other documentation.
- **Research Credit.** While there is an expectation that Research Fellows will be the principal investigator for their research projects, there is also an assumption that the work with ACHE will be collaborative in nature. In some instances, ACHE staff may provide guidance on research methodology and data analysis that add value to the study, warranting some level of shared authorship with regard to scholarly publications and presentations.

Data Sharing Agreement, Continued

- *Use.* Data exchanged during the course of this Fellowship shall be used for its intended purpose in accordance with the specifications of this project. Any use beyond the scope of this project, including any use of data in reports, studies, and publications, is prohibited without the approval and written consent of ACHE.
- *Transfer.* Data exchanged during the course of this Fellowship shall be transferred in a manner that is secure and protected. Any transfer of data via email or other unsecured method is prohibited.
- *Storage.* Data exchanged during the course of this Fellowship shall remain secure, always being stored in a password-protected environment, preferably with an encrypted hard drive. No data shall be stored or reside on portable drives (USB/thumb drives, external hard drives, etc.), a private cloud-based location, or other similar environment. Institutional college and university secure portals protected with passwords and encryption are acceptable.
- *Suppression.* To help ensure anonymity, no report of aggregate data based on an identifiable group of students fewer than ten in number shall be released to anyone external to this Fellowship. All preliminary, draft, and final reports shall adhere to that statistical cell size, and groups of students fewer than ten in number shall be suppressed and denoted appropriately.
- *Anonymity.* Research Fellows should maintain anonymity regarding research subjects, and no effort should be made to examine individual records or otherwise attempt to analyze data in a manner that attempts to identify individuals within the dataset.
- *Confidentiality.* Research Fellows should maintain confidentiality with regard to research datasets. Any sharing of individual unit record data with a third party is prohibited.
- *Duration and Destruction.* Any data used during the course of Fellowship, including any copies, backups, etc., shall be destroyed within 60 days following completion of project, but not to exceed 30 months (2.5 years) following the execution of this agreement. In some circumstances, data may be maintained for longer periods with the written consent of ACHE.

If you consent to the terms of the Agreement, please sign below and return to Jacinta.Whitehurst@ache.edu.

I agree to the terms outlined above.


Signature

8-1-24
Date

Appendix 3: Tables

Table 1

Foundational Psychologists of Constructivism

Jean Piaget, 1970	Known as one of the first theorists in constructivism and indicated that humans create knowledge through interaction with their experiences and ideas.
Lev Vygotsky, 1978	His work contained the central scope focused on the social aspects of acquiring knowledge and suggested that learners create an environment of shared meanings with their peers. Founder of Vygotsky's Social Development Theory.
John Dewey, 1910	Dewey emphasized the nurture of independent reasoning ability and stressed the importance of inquiry sustained learning being supported by ensuring a synthesis of the participants environment.

Table 2

Seven of Prosser's Theorems on Vocational Education

Theorems	Focus	Description
Theorem One	Work Environment	It is efficient for vocational education to be taught in an environment like the workplace, where a learner will eventually work.
Theorem Two	Industry Standards	Practical vocational training is only possible when the training jobs are carried out using the same tools, machines, and operations as in the occupation.

Theorem Nine	Industry Needs	Vocational education must recognize conditions and prepare individuals to meet the market's demands.
Theorem Ten	Real World Jobs	Learners can establish process habits more effectively when the training is based on actual work instead of exercises or fictitious tasks.
Theorem Eleven	Partnership	The only reliable content source for specialized training is the experience of masters in the field.
Theorem Twelve	Aligning Curriculum	All occupations contain a body of content unique to their field, general teaching will not help develop a competent worker.
Theorem Fifteen	Adaptability	A flexible and fluid administration will make vocational education more efficient in proportion to its elasticity and fluidity rather than rigidity and standardization.

Source: Bloomfield, S. 2023. Examining Business and Industry Involvement in Alabama CTE Programs, Teacher Satisfaction with the Partnership, and Perceived Barriers.

Table 3

Perkins Collaborative Resource Network National Initiatives

Career Pathways Systems	CTE Challenge Prize Competitions	CTE Correctional Education
CTE Teacher Pipeline	CTE Research Network	Cybersecurity Education

Employability Skills	National Evaluation of Career and Technical Education under Perkins V	Partnership Formation and Development in Manufacturing
Pathways to Credentials	Programs of Study	Supporting Student Success in CTE
U.S. Presidential Scholars in Career and Technical Education Program	Unlocking Career Success	Work-Based Learning

Note: List of initiatives can be found at <https://cte.ed.gov/initiatives/about-national-initiatives>

Table 4

Frequencies of Alabama Graduates 2015 - 2019

n = 61,171

Gender	<i>f</i>	%
Male	26,955	44.1
Female	34,209	55.9
Unknown	6	0.00
Institution Type	<i>f</i>	%
ACCS	11,382	18.6
University	49,789	81.4
From Alabama	<i>f</i>	%
Yes	55,864	91.3
No	5,307	8.7

Table 5

Frequencies of Agriculture Degree Holders 2015 - 2019

n = 2,316

Gender	<i>f</i>	%
Male	1,242	53.6
Female	1,074	46.3
Unknown	0	0.00
Institution Type	<i>f</i>	%
ACCS	136	0.06

University	2,180	94.1
From Alabama	<i>f</i>	%
Yes	2046	88.3
No	270	11.7

Table 6

Frequencies of Workers in Agriculture and Related Fields 2015 – 2019

n = 242

Gender	<i>f</i>	%
Male	171	70.7
Female	71	29.3
Institution Type	<i>f</i>	%
ACCS	13	0.05
University	207	85.6
From Alabama	<i>f</i>	%
Yes	203	83.4
No	39	16.1

Table 7

Additional National NAICS Codes to Consider

NAICS Code	<i>Title</i>	Number of Business Total
31	Production/ Manufacturing – Food, Beverages, Textiles	664,398
32	Production/ Manufacturing – Chemicals, Paper, Plastics, Pharmaceuticals\	
33	Production/ Manufacturing – Metals, Automotive, Aerospace, Electronics	
42	Buying and Selling, Wholesale	704,874
44-45	Buying and Selling, Retail	1,880,608
541940	Veterinary Services	47,395

Table 8*Directional Measures*

Nominal by Nominal	Lambda Symmetric	Industry_Gen Dependent	Major Dependent	Goodman and Kruskal tau	
				Industry_Gen Dependent	Major Dependent
Value	.126	.187	.082	.224	.042
Asymptotic Standard Error ^a	.001	.003	.001	.002	.000
Approximate T ^b	81.745	70.172	53.842		
Approximate Significance	<.001	<.001	<.001	<.001 ^c	<.001 ^c

a. Not assuming the null hypothesis.

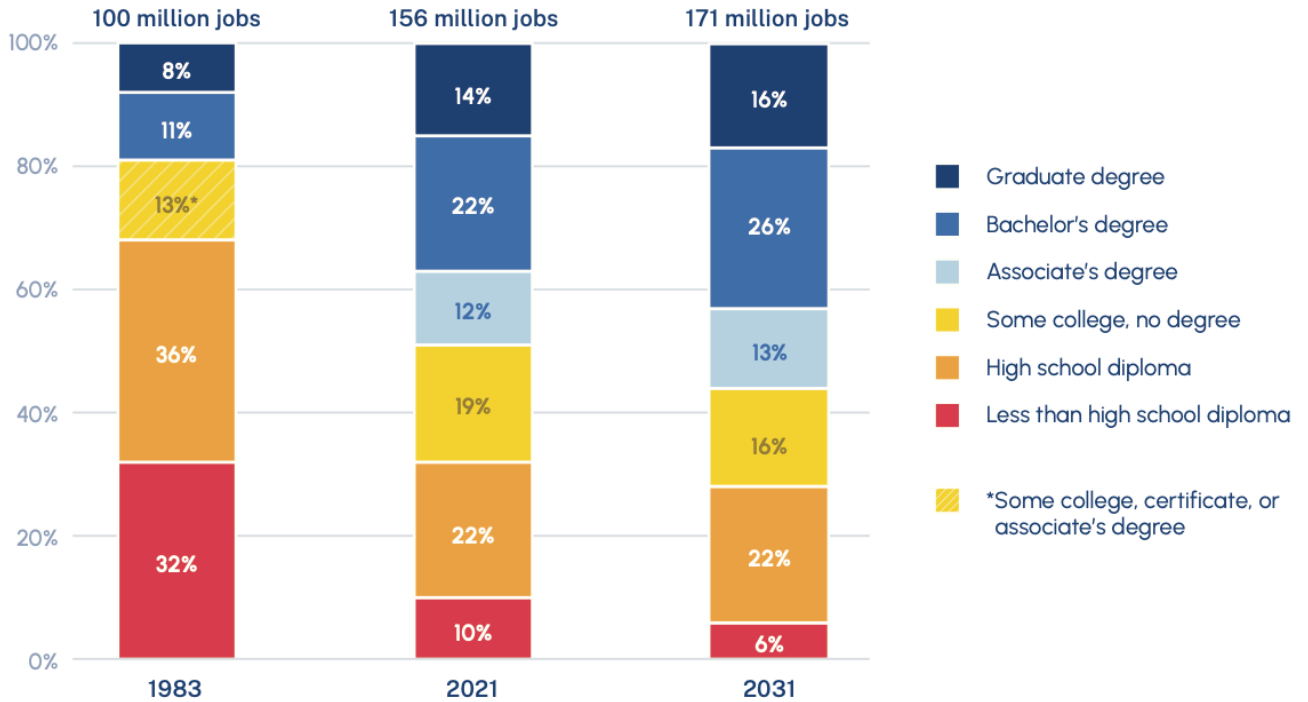
b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on chi-square approximation

Appendix 4: Figures

Figure 1

Forty-two percent of jobs in 2031 will require at least a bachelor's degree, while only 28 percent will go to workers with a high school diploma or less.



Source: Georgetown University Center on Education and the Workforce forecast using data from the US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS); US Census Bureau, American Community Survey (ACS); US Bureau of Labor Statistics; IHS Markit; Lightcast; and US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), 1983. *Note: Before 1992, the education variable in the Current Population Survey was identified as years of schooling. We are therefore unable to differentiate between “some college or certificate” and “associate’s degree” in those years. Columns may not sum to 100 percent due to rounding.

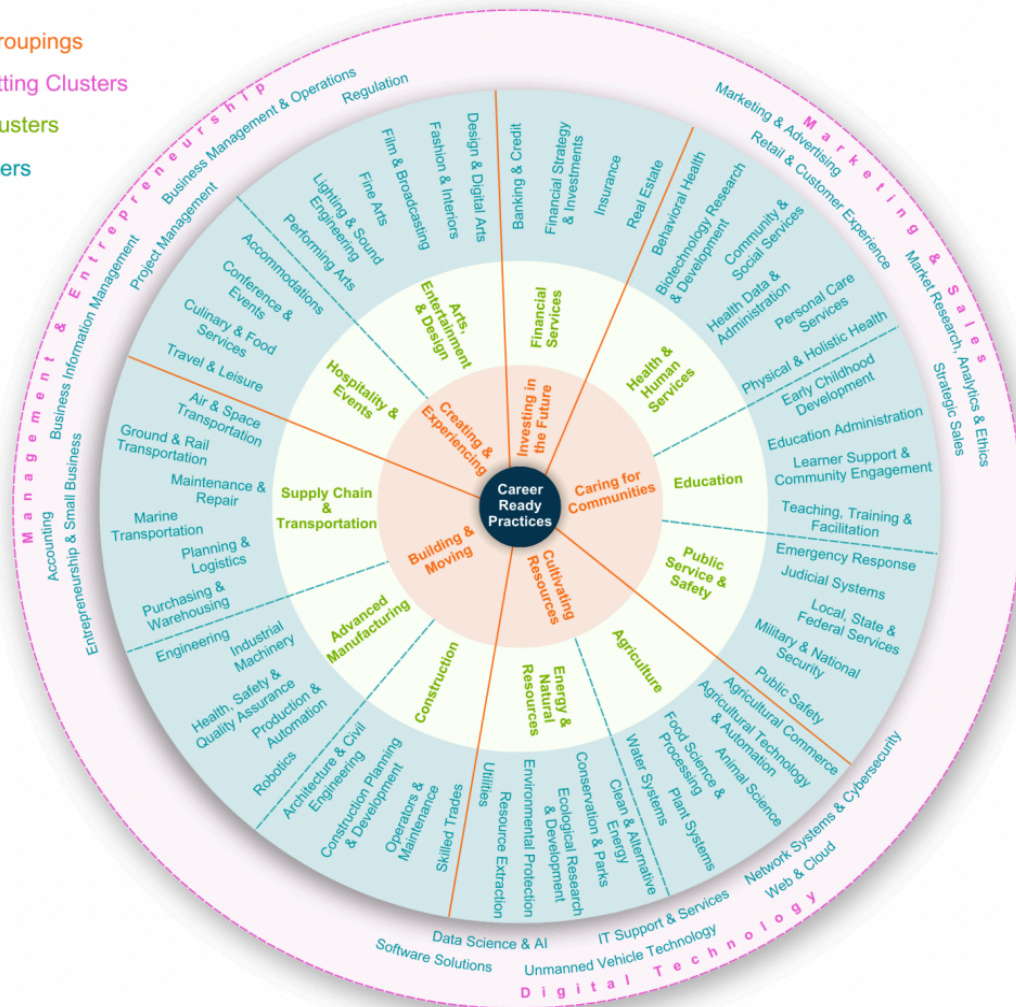
Figure 2

Alabama's Acknowledged Career Cluster Model Wheel

Career Cluster Model - Wheel View

Key:

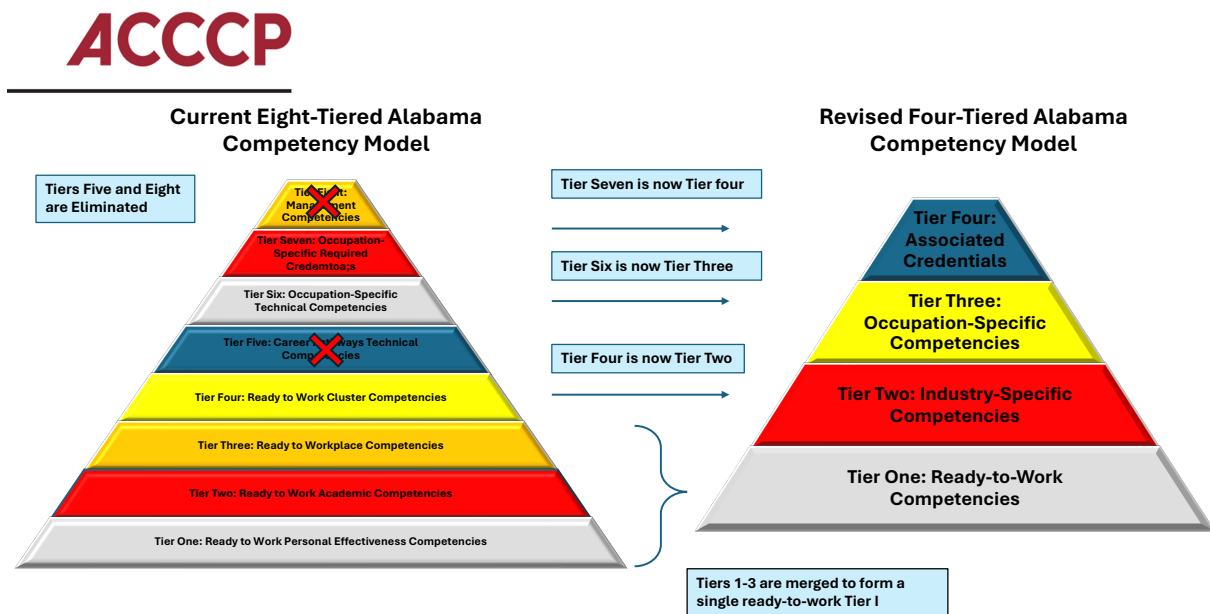
- ▼ Cluster Groupings
- ▼ Cross-Cutting Clusters
- ▼ Career Clusters
- ▼ Sub-Clusters



Source : N. Moore, personal communication. June 6, 2024

Figure 3

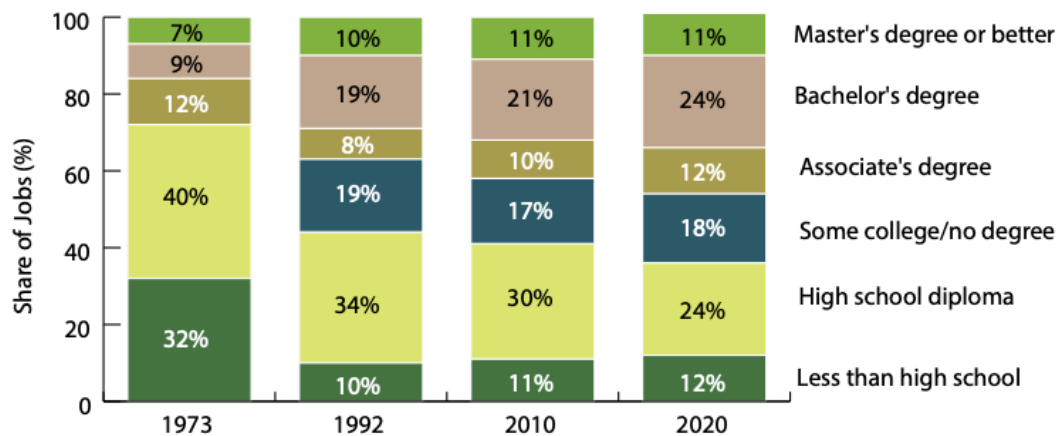
ACCCP Eight-Tier to Four-Tier Competency Model



Source : N. Moore, personal communication. June 6, 2024)

Figure 4

U.S. Share of Jobs Percentage Compared to Degree Obtainment 1973 – 2020



Source: Carnevale et al. (2012). *Career and Technical Education: Five Ways That Pay*. Pg. 2

Figure 5

Overview of the Existing Perkins Act and Proposed Reforms

The Current Act	Principle of Reform	Proposed Reforms
Limited provisions to encourage high-quality CTE programs No requirements for states to work with workforce and economic development agencies to identify areas of focus for CTE program	Effective ALIGNMENT between CTE and labor market needs to equip students with 21st-century skills and prepare them for in-demand occupations in high-growth industry sectors	• Clear Expectations for High-quality Programming: Provide states better guidance on establishing high-quality programs • A More Active Role for States: Empower states to identify the in-demand occupations in high-growth industry sectors on which CTE programs should focus
Separate funding for secondary and postsecondary institutions No clear ways for employers, industry, and labor to engage in program and curriculum design and implementation No leveraging of private in-kind and cash resources to share program expenses	Strong COLLABORATION among secondary and postsecondary institutions, employers, and industry partners to improve the quality of CTE programs	• Consortia Funding: Establish consortia to ensure collaboration among secondary and postsecondary institutions • Private-sector Match: Use a match contribution to strengthen the participation of employers, industry, and labor partners in program design and execution
Funds distributed by states to local recipients by formula States define participation and accountability measures differently No mechanism to reward high-performing local recipients for success	Meaningful ACCOUNTABILITY for improving academic outcomes and building technical and employability skills in CTE programs, based upon common definitions and clear metrics for performance	• Within-state Competitions to Distribute Funds to Consortia: Provide states increased autonomy to select and fund high-quality programs responsive to regional labor-market needs

Source: (Investing in America's Future: A Blueprint for Transforming Career and Technical Education. 2012. p. 3-4)

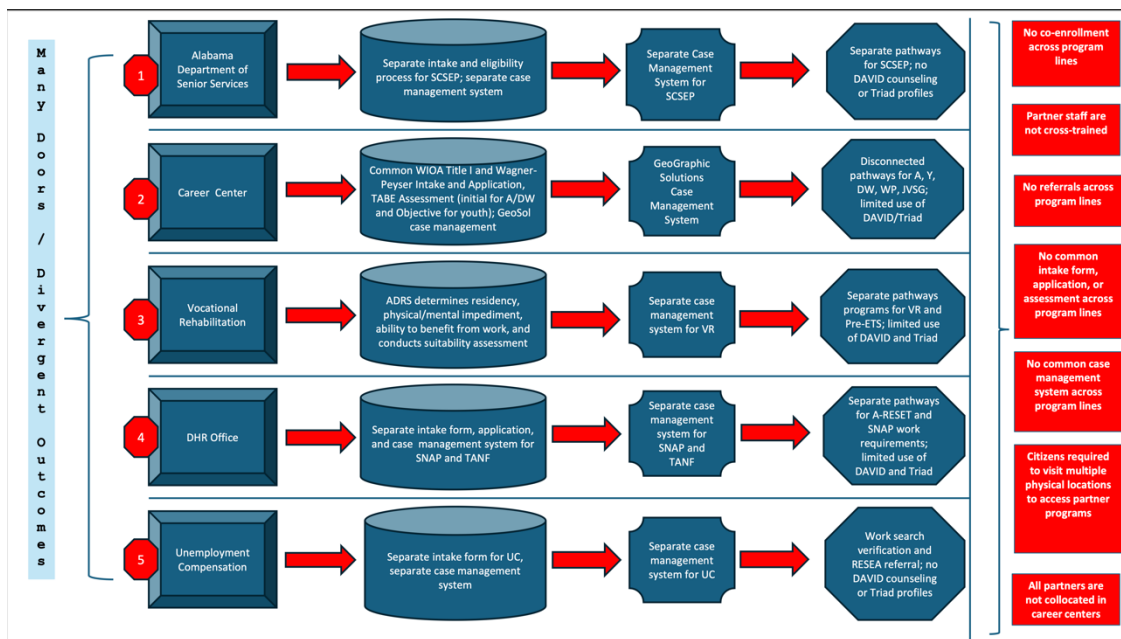
Figure 5 (cont.)

The Current Act	Principle of Reform	Proposed Reforms
Funds distributed by states to local recipients by formula States define participation and accountability measures differently No mechanism to reward high-performing local recipients for success	Meaningful ACCOUNTABILITY for improving academic outcomes and building technical and employability skills in CTE programs, based upon common definitions and clear metrics for performance	• Common Definitions to Strengthen Data Systems and Close Equity Gaps for Participation: Use uniform definitions for participation and performance indicators to create high-quality data systems that enable meaningful comparisons and identification of equity gaps • Incentives for High Performance: Incentivize and reward local recipients that exceed performance targets
No clear identification of the state's role in creating the conditions for high-quality CTE programs to thrive Formula funding that supports too many purposes and limited reserve funding to create performance and innovation incentives	Increased emphasis on INNOVATION supported by systemic reform of state policies and practices to support CTE implementation of effective practices at the local level	• State Conditions for Success and Innovation: Ensure states have in place the policies and systems to support programs at the local level • A Competitive CTE Innovation and Transformation Fund: Develop and implement new practices and models at the local level and support systemic reforms at the state level

Source: (Investing in America's Future: A Blueprint for Transforming Career and Technical Education. 2012. p. 3-4)

Figure 6

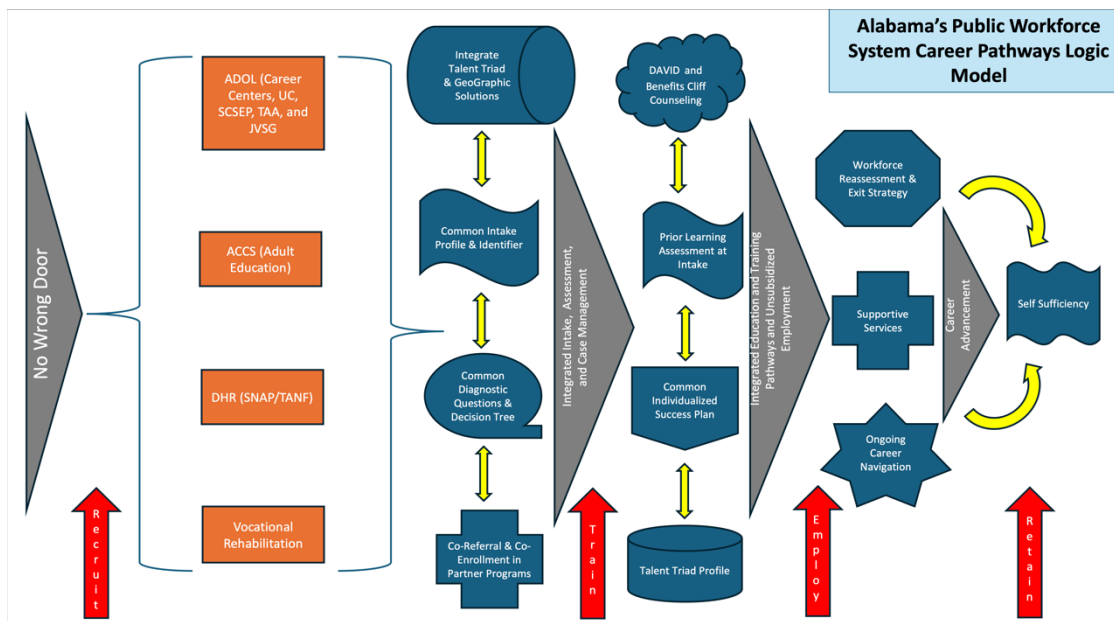
No Wrong Door Model



Source : N. Moore, personal communication. June 6, 2024)

Figure 7

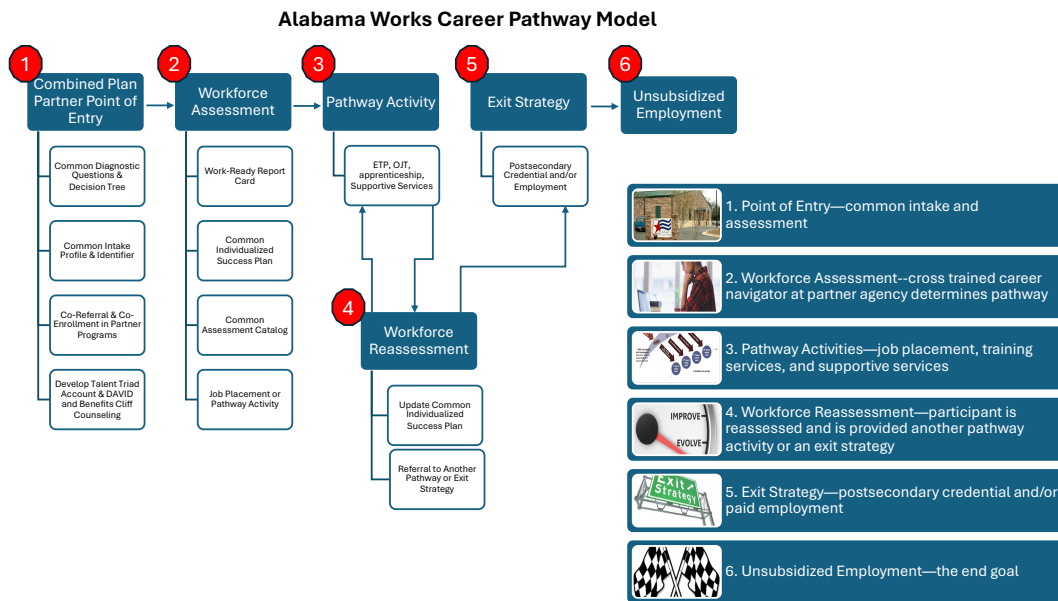
Alabama's Public Workforce System Career Pathways Logic



Source : N. Moore, personal communication. June 6, 2024)

Figure 8

Alabama Works Career Pathway Model



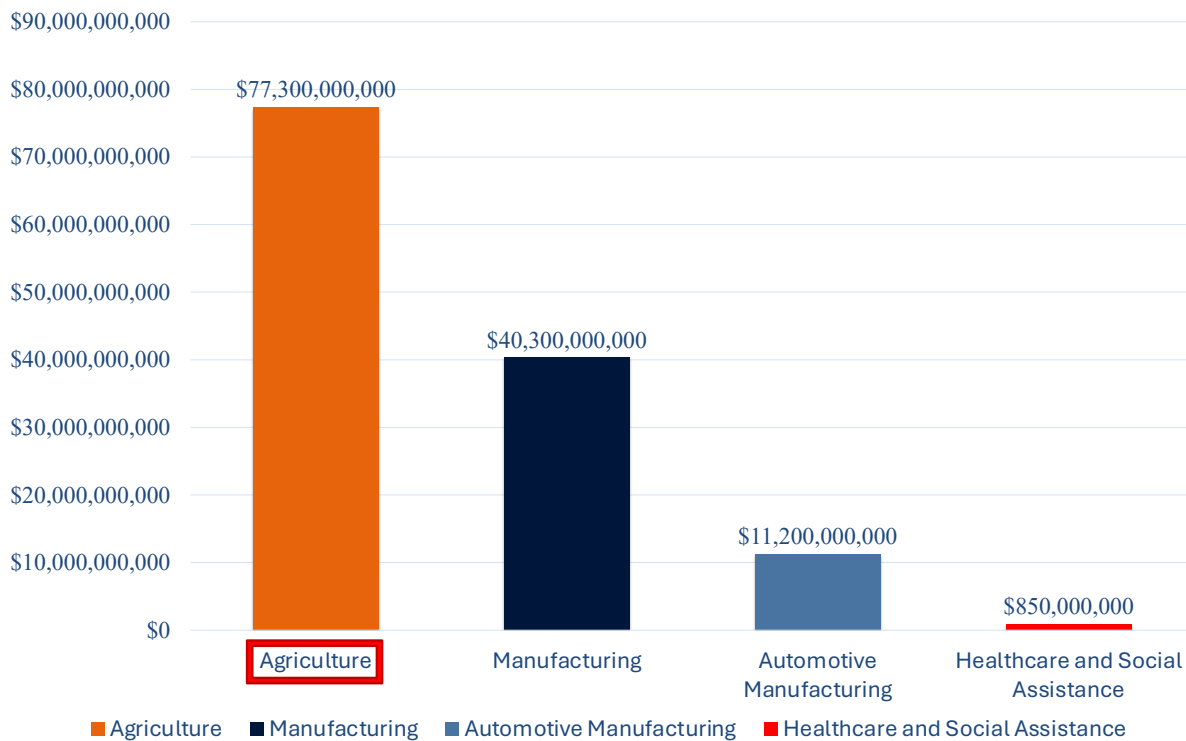
Source : N. Moore, personal communication. June 6, 2024)

Figure 9

Industry Economic Impact for Alabama 2023

Analysis of Data

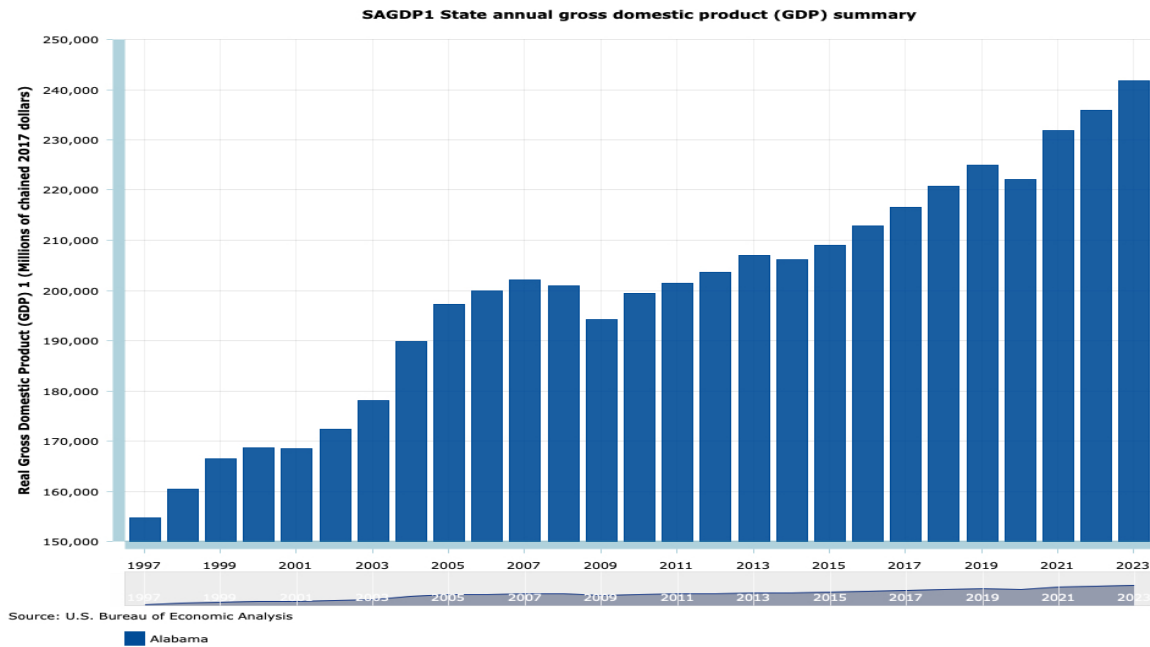
Industry Economic Impact for Alabama 2023



Sources: Rabinowitz, A. & Brothers, D. (2025). Agriculture & Forestry Grow Alabama: An Economic Contribution Study. [ACES.edu](https://aces.edu); GetMGA. (2025). Economic Impact of Community Health Centers in Alabama. [Getmga.com](https://getmga.com); IBISWorld. (2025) Alabama State Economic Profile. ibisworld.com

Figure 10

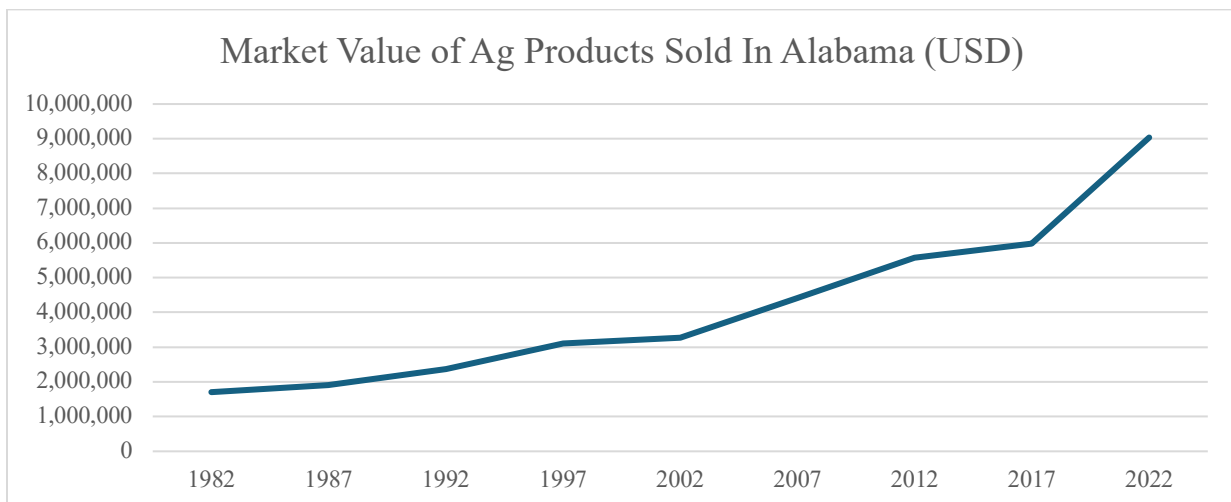
Alabama Annual Gross Domestic Product Summary: Years 1997 - 2023



Source: U.S. Bureau of Economic Analysis. 2024. <https://www.bea.gov>

Figure 11

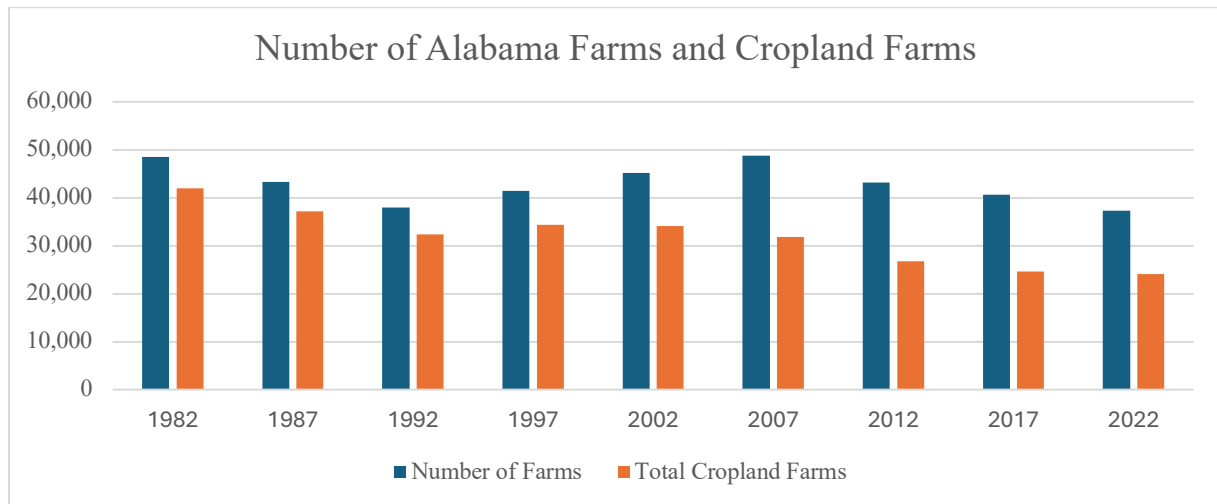
1982 – 2022 U.S. Census of Agriculture Market Value of Agriculture Products Sold in Alabama



Source: USDA: National Agriculture Statistics Service (NASS)

Figure 12

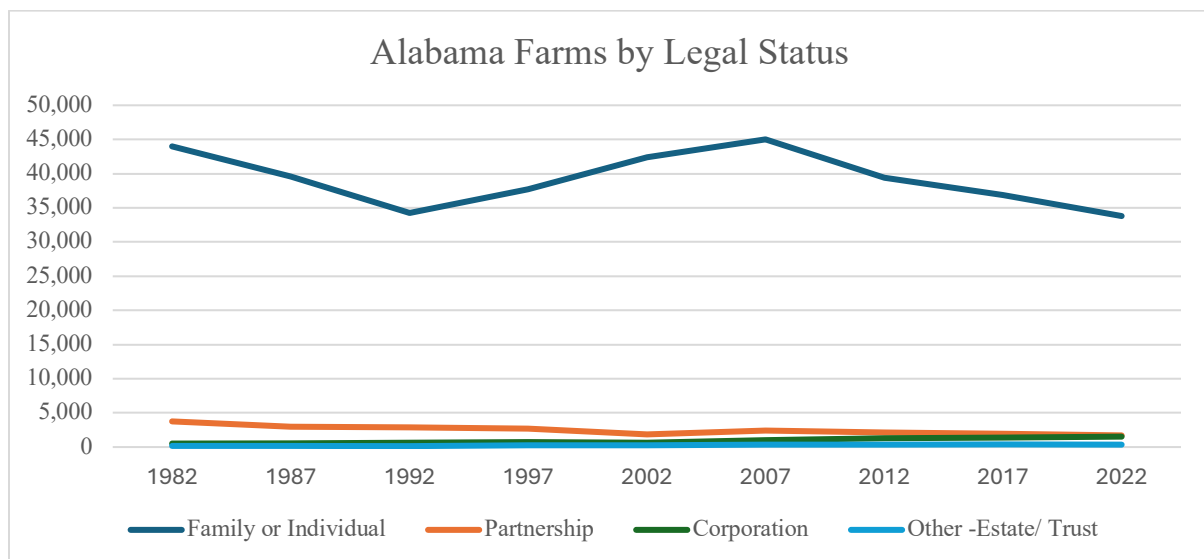
1982 – 2022 U.S. Census of Agriculture Number of Farms and Cropland Farms in Alabama



Source: USDA: National Agriculture Statistics Service (NASS)

Figure 13

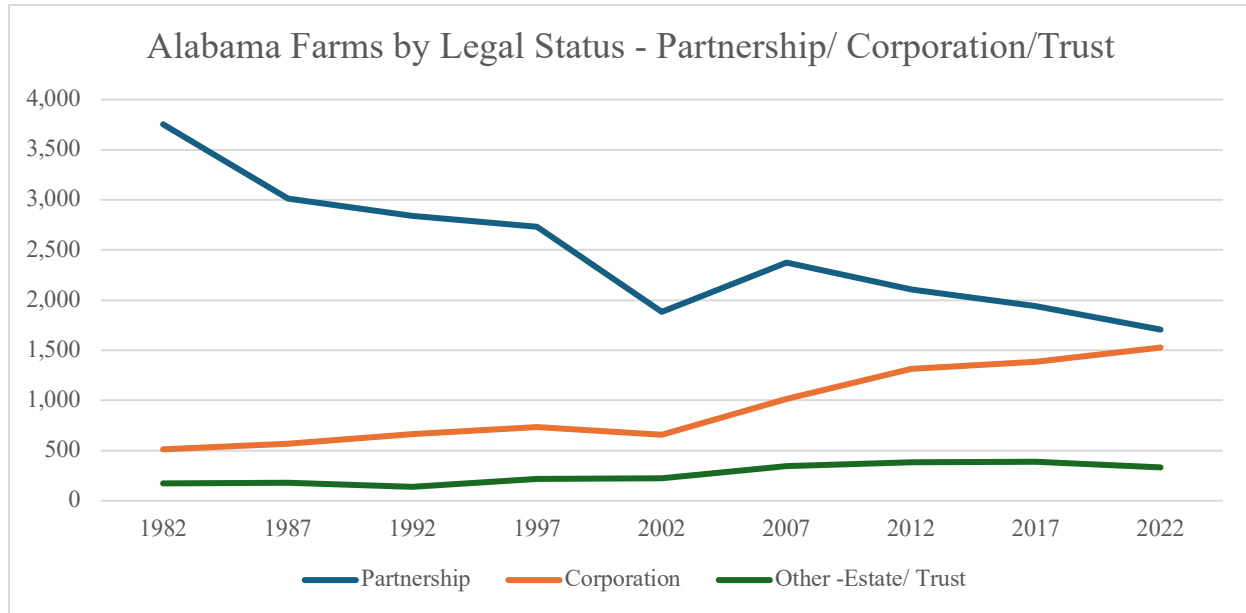
1982 – 2022 U.S. Census of Agriculture Farms by Legal Status in Alabama



Source: USDA: National Agriculture Statistics Service (NASS)

Figure 14

1982 – 2022 U.S. Census of Agriculture Farms by Legal Status in Alabama – Partnership/Corporate/ Other



Source: USDA: National Agriculture Statistics Service (NASS)

Figure 15

Employment by Industry Totals for Alabama 2015 – 2019

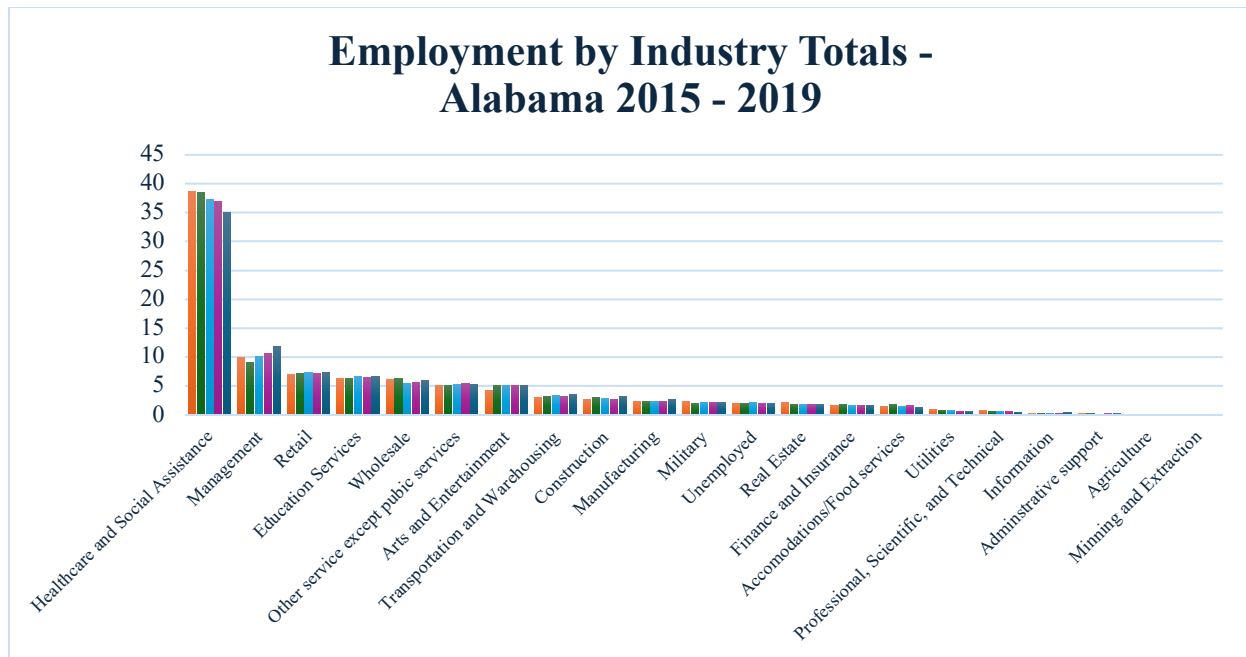


Figure 16

Employment by Industry Totals for Alabama: Excluding Agriculture Degree Holders 2015 – 2019

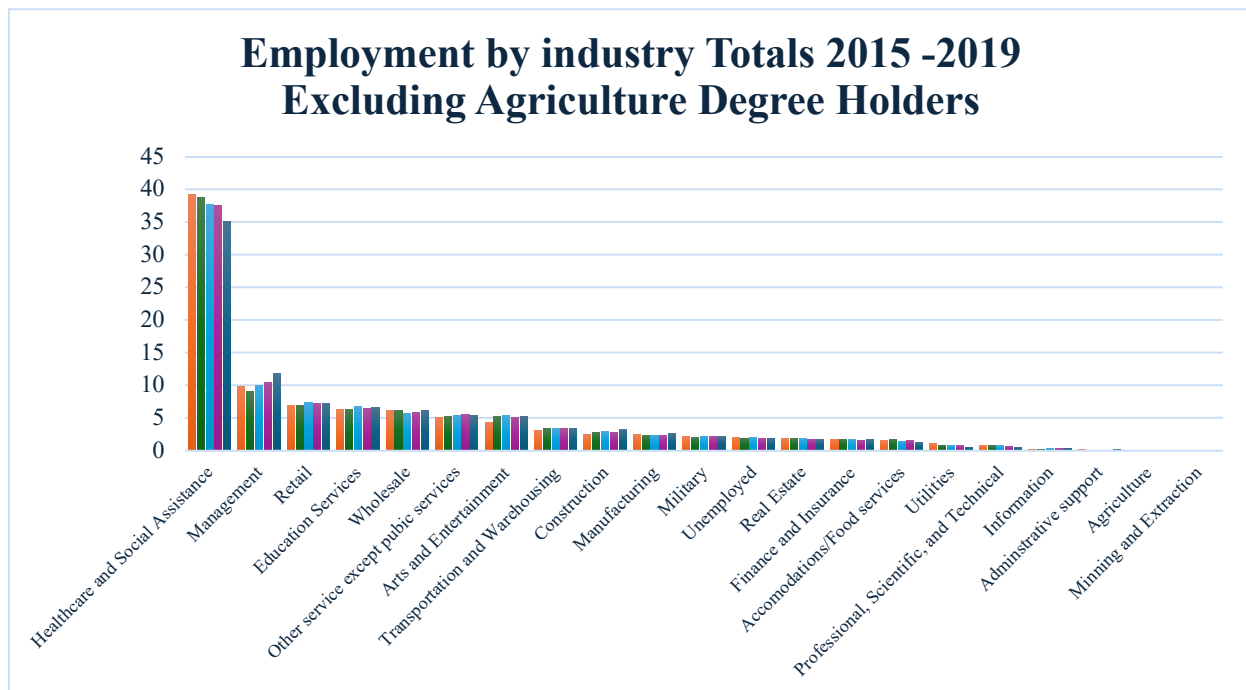


Figure 17

Industry Composition Totals for 2015

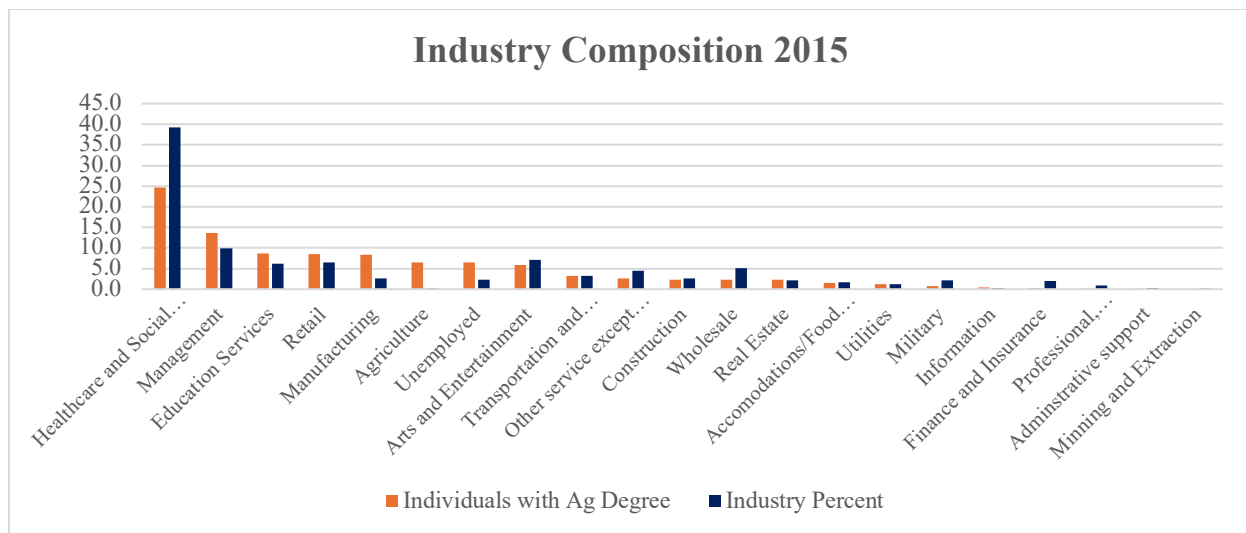


Figure 18

Industry Composition Totals for 2016

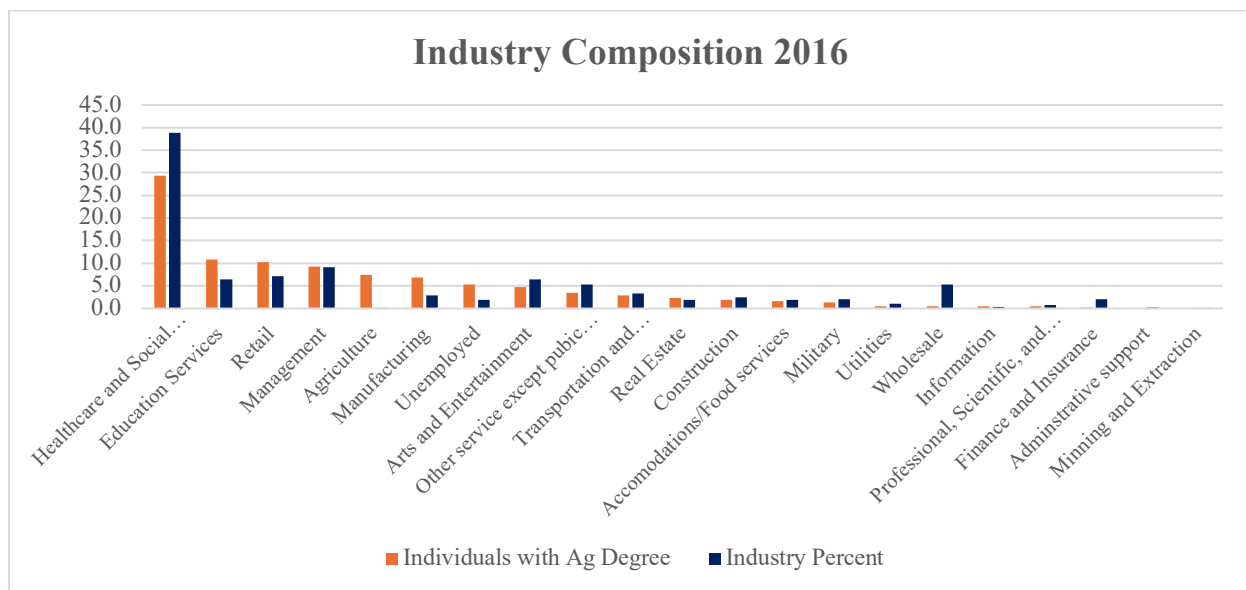


Figure 19

Industry Composition Totals for 2017

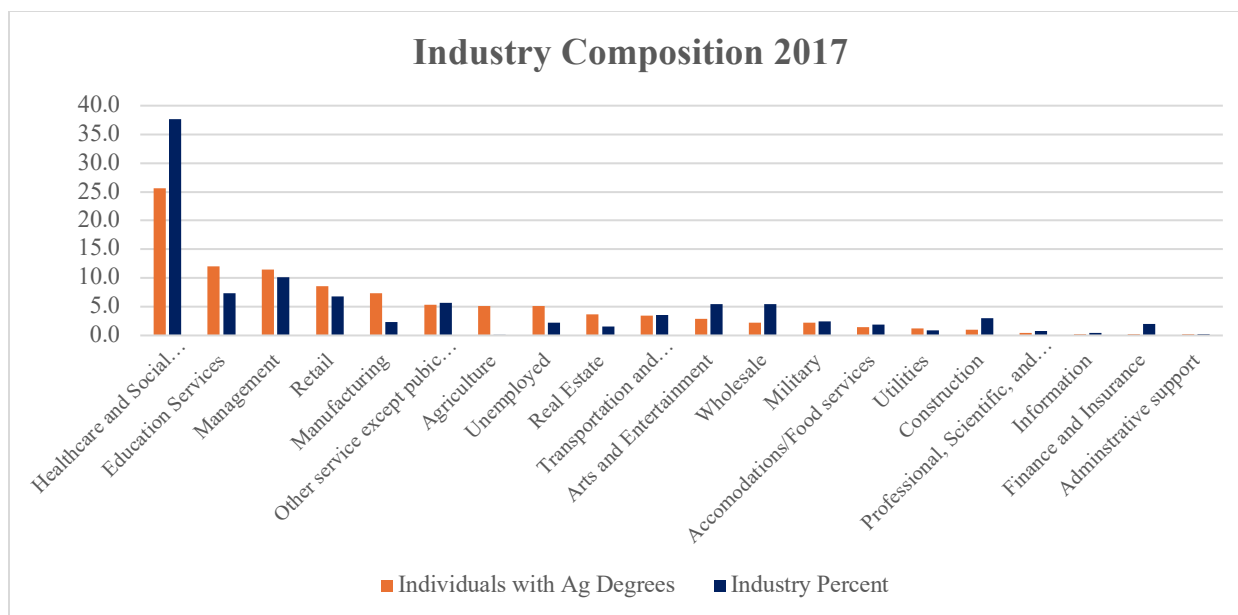


Figure 20

Industry Composition Totals for 2018

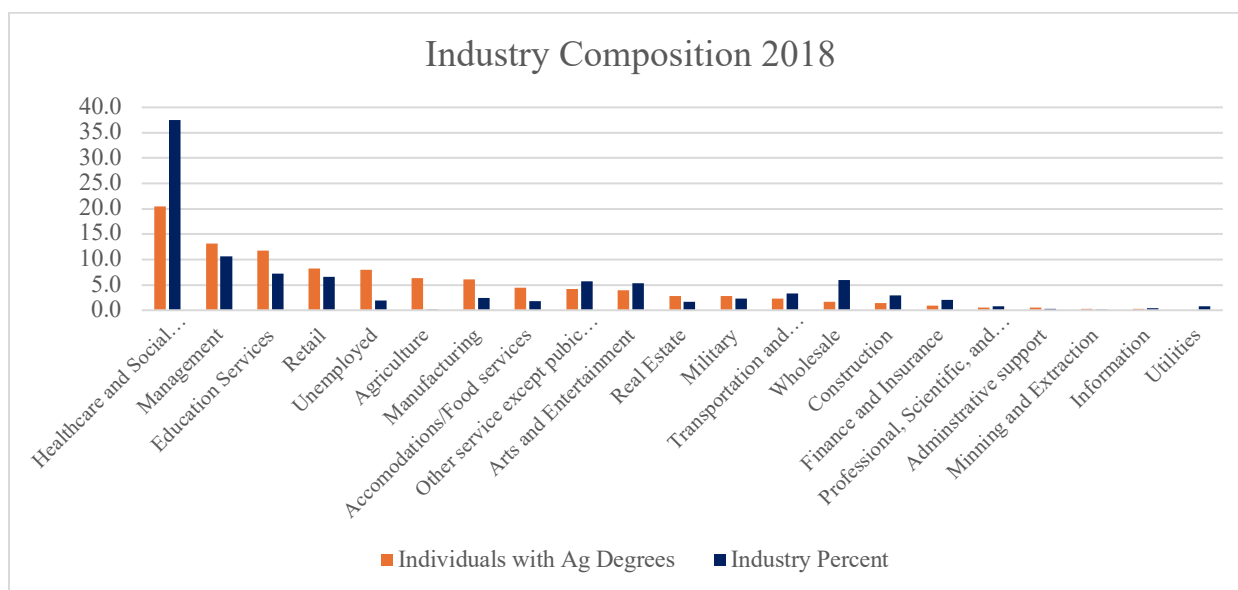


Figure 21

Industry Composition Totals for 2019

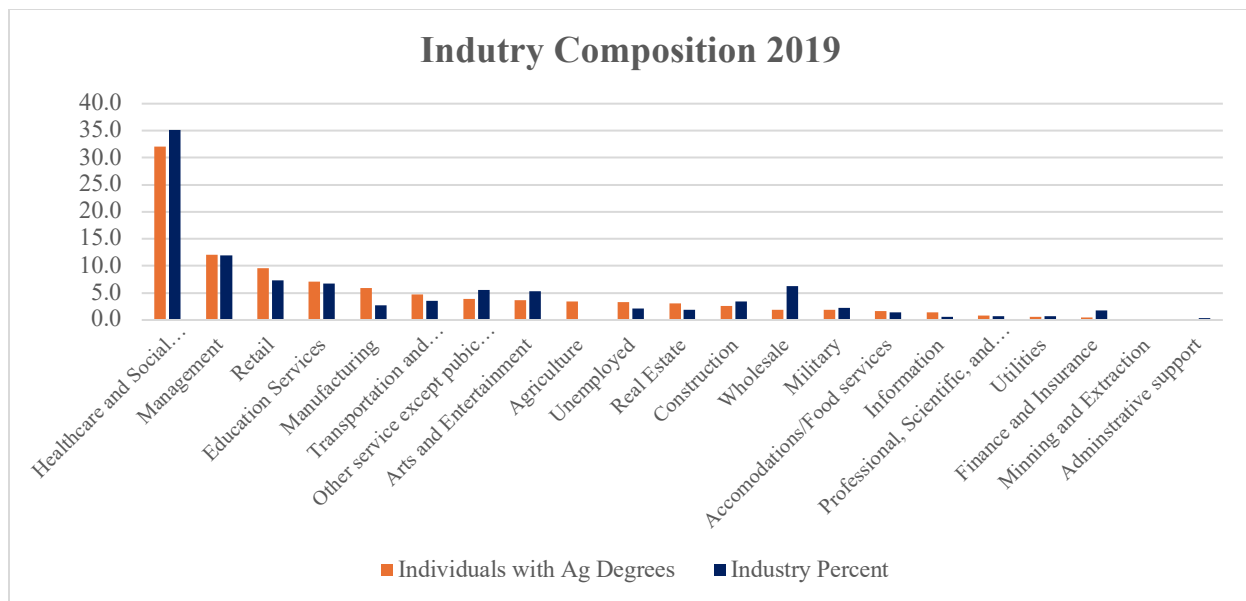


Figure 22

Top 5 NAICS Employment Titles: Over 5 Years

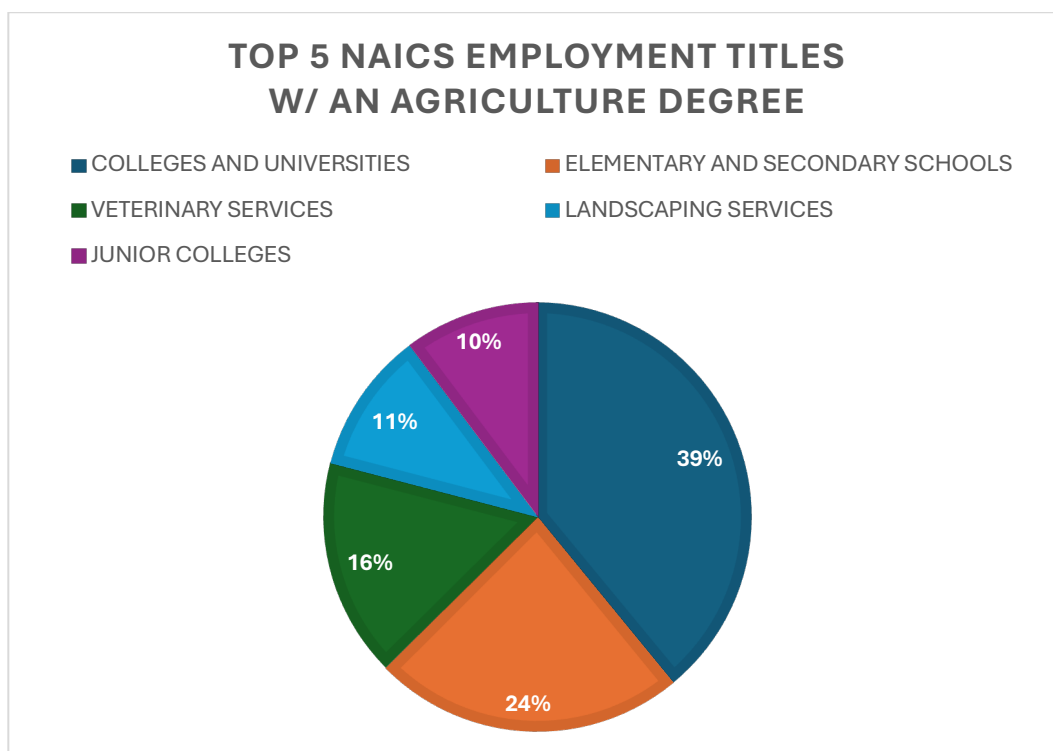


Figure 23

Top 5 NAICS Employment Titles: 5 Year Average – Excluding Ag. CIP's

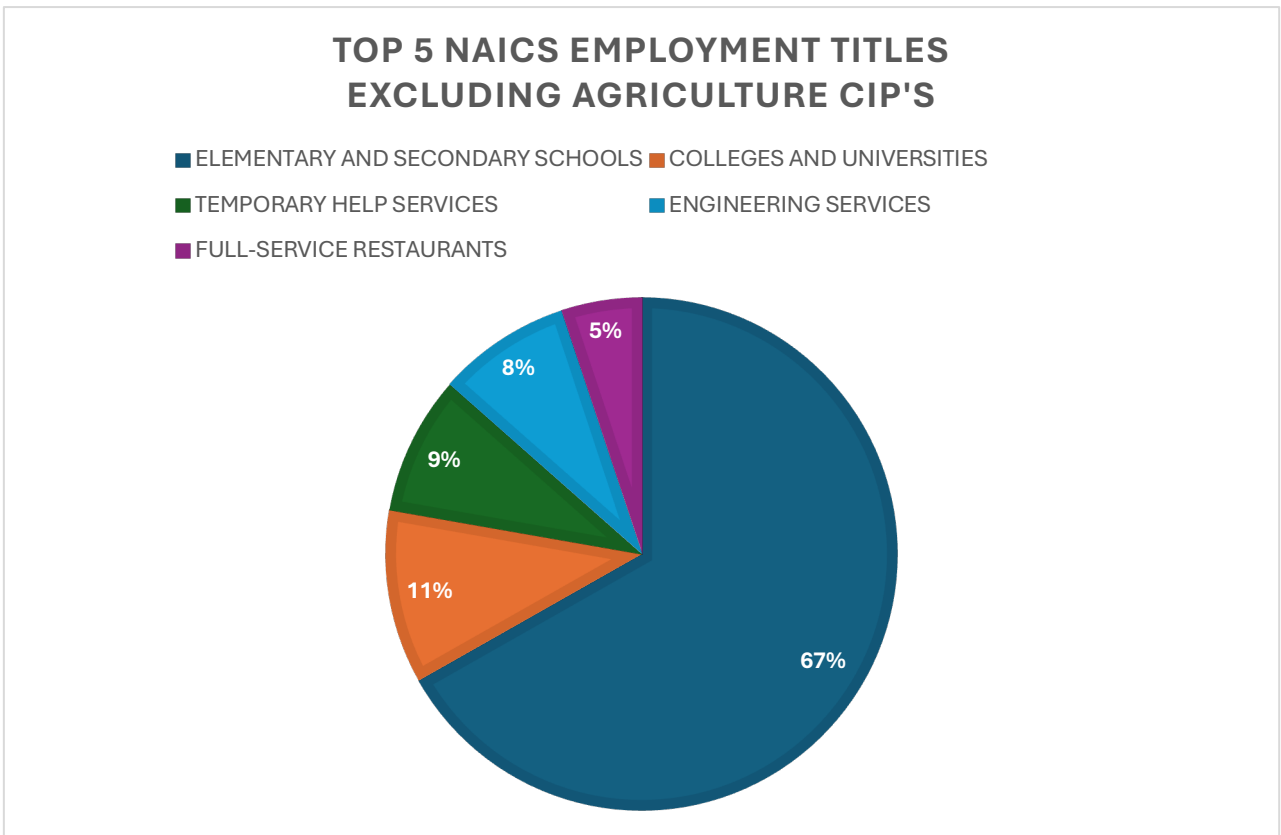
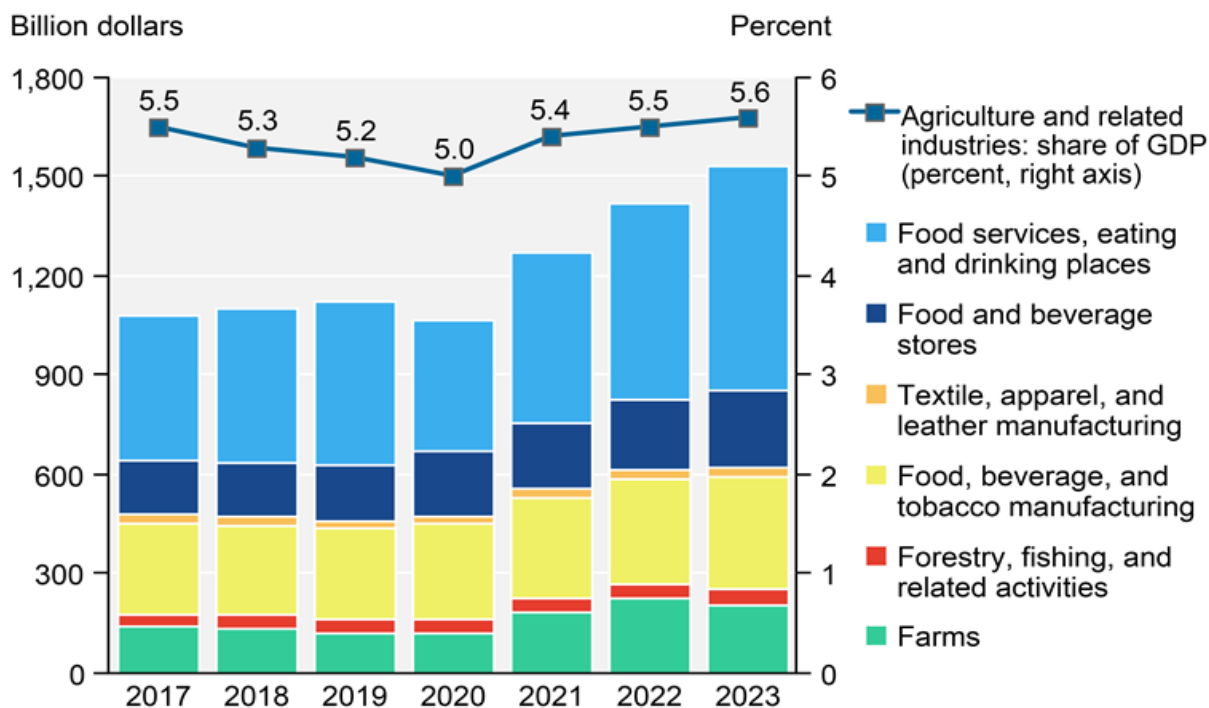


Figure 24

Value Added to U.S. GDP by Agriculture and Related Industries (2017 – 2023)

Value added to U.S. GDP by agriculture and related industries, 2017–23



Note: GDP = Gross Domestic Product.

Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of Economic Analysis, *Value Added by Industry*, March 28, 2024 release.

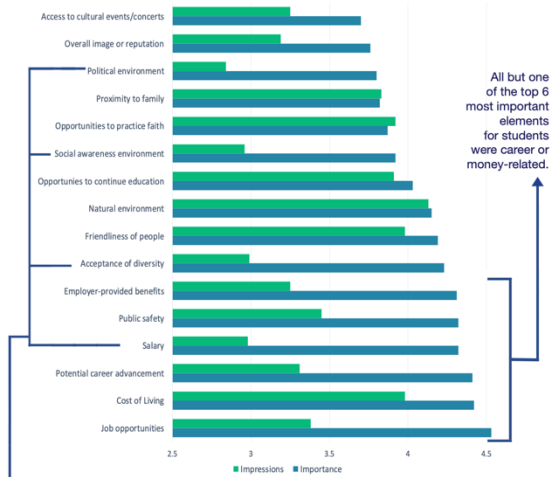
Figure 25

Student Perceptions about the State of Alabama

Learning #3

Students from across the country have the same perceptions of the state—both good and bad.

This graph shows various priorities students have when choosing a place to live after graduation. Blue bars signify how important that item is, while green bars show how well they think Alabama is doing on that metric.



These are the most negative impressions of Alabama. Note that most were related to its social/political environment.

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"Ideally, I would like to live somewhere that is big enough that stores, restaurants, activities, and job opportunities are easily accessible but not so big that one has to deal with constant traffic or very high costs of living. I would like to live somewhere that has access to outdoor activities but isn't extremely remote. I would want to live in a city that has a welcoming culture."

- Out-of-state student

"I think salary is one of the most important factors as it impacts all the others."

- In-state student

"I think we are slowly progressing as a state with our politics and culture so it isn't as polarized. However, we still have a long way to go."

- In-state student

Filling the Gaps

In an ideal world, if a blue bar is all the way over to the right, the green bar would meet it. Where there is a large gap between the two bars, Alabama has a lot of work to do to improve students' perceptions. The largest gaps between impressions and a metric's importance are:

1. Salary
2. Acceptance of people with diverse backgrounds
3. Job opportunities
4. Potential for career advancement
5. Employer-provided benefits
6. Political environment
7. Social awareness environment
8. Public safety

As students are making decisions around post-graduate plans, we recognize the wide variety of priorities at play; the perceptions that span the widest gap between impression and importance are the areas with the most opportunity for growth in Alabama.

Students love Alabama's outdoors, but express concerns about politics.

For almost all racial demographics, Alabama's *outdoor amenities* and *natural environment* were students' favorite aspects of the state. African American respondents, however, cited *educational opportunities* as Alabama's strongest asset. Across the board, students ranked Alabama's *political environment* as the state's most negative characteristic.

7

Source: EDPA. 2021. <https://edaa.org/wp-content/uploads/2021/09/EDPA-Retain-Alabama-Report-FINAL.pdf>