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Teacher Shortage in School-Based, Agricultural Education (SBAE): A Historical Review

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Abstract

Ongoing teacher shortages in SBAE have been a concern dating back to the Smith-Hughes Act of 1917 (Hillison, 1987). This historical inquiry identified the longitudinal trends revealed by data derived from the supply and demand studies of SBAE teachers over a 51-year period, and how the studies and their reporting procedures evolved. On average, between 50% and 60% of graduates prepared to teach SBAE nationwide did so during their first year after graduation. The studies' research teams changed eight times, including 12 lead investigators from eight institutions and, in the case of two reports, the National FFA Organization assisted. Reporting cycles also changed over time. Perhaps the long-term graduates-to-entrants trend should be accepted as canon and stakeholders redouble efforts to recruit a larger pool of future teachers and improve the likelihood of graduates who enter the profession also choosing to remain.

***Keywords*:** supply and demand studies; teacher retention; teacher shortage

Introduction

Hillison (1987) reported that even though significant interest existed for offering agricultural education in U.S. public schools, finding enough qualified teachers became a serious problem on passage of the Smith-Hughes Act in 1917. A century later, Smith, Lawver, and Foster (2017) identified some of the problems school-based, agricultural education (SBAE) programs have faced over the years, including funding issues, declines in student enrollment at times, and the profession's persistent shortage of qualified teachers. Regarding the need for reliable data about the supply and demand for agriculture teachers, Camp, Broyles, and Skelton (2002) concluded:

> Leaders of the profession need current, accurate estimates of the numbers of and demand for teachers of Agricultural Education to provide for meaningful policy decisions at all levels. Teacher organizations and teacher educators need current, accurate supply and demand information to use in recruitment activities and in counseling potential teachers of Agricultural Education. (p. 6)

This data has been provided by multiple teacher educators of agricultural education conducting supply and demand studies, and, in some cases, with assistance from the National FFA Organization (Kantrovich, 2010).

The U.S. Department of Education (Cross, 2017) identified the areas of teacher shortages by state, beginning in 1990 and projecting through 2018. Regarding SBAE, specifically, the study listed 21 states with a *high need* for agriculture teachers starting in 1997 and for various school years

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thereafter. Of the 21 states listed, more than one-half experienced multiple years of teacher shortages, and some had as many as 16 school years documented (Cross, 2017).

Teacher shortages in many subject areas are a longstanding concern, especially in high need subjects and in certain communities (Castro, Kelly, & Shih, 2010). SBAE programs are an integral part of many public school systems and serve the learning needs of students while helping to provide the future workforce for the agricultural industry and its allied sectors.

> Agricultural education is an important component of public school instruction in every state of the United States and in five U.S. Territories. There are approximately 1,000,000 agricultural education students in the nation who are taught by nearly 12,000 secondary and two-year postsecondary teachers. It is estimated that the contact hours of in-school instruction in and about agriculture exceed 10 million annually. (National Association of Agricultural Educators [NAAE], 2017, para. 1)

According to the National FFA Organization (2017), the shortage of qualified teachers is the greatest challenge facing SBAE, which echoes a century-long trend. What steps, however, were taken historically to understand and address this phenomenon? Using data provided in the supply and demand studies conducted from 1965 through 2017, along with other relevant sources, a historical review of documentary evidence was conducted to answer this question. Holistically reviewing and compiling the supply and demand studies, along with other supporting evidence, allowed the researchers to examine and present a 51-year trend.

Purpose and Research Questions

During most of its existence, SBAE has experienced a shortage of qualified teachers throughout the United States, which, in some cases, led to the closure of programs or prevented program expansion. Either outcome diminished SBAE's potential for serving prospective students. According to Camp et al. (2002), key stakeholders of agricultural education need reliable estimates of the demand for SBAE teachers along with supply for the same to make evidence-based policy decisions, recruit new teachers, and offer professional development that may reduce teacher attrition. Without a sufficient supply of qualified agricultural educators, our nation's populace is likely to become more disconnected from agriculture and the supply of future generations of agriculturists negatively impacted. In addition, the NAAE stated the high demand for SBAE teachers nationwide is "magnified by many of the best teachers leaving the profession for [other] agriculture careers" (Weaver, 2000, p. 14). A shortage of SBAE teachers, however, is not a new problem and this study sought to document the phenomenon, including its historical trends as well as some of the profession's attempts to address the shortage over time. Three research questions guided this inquiry: (1) How did the reporting of supply and demand for teachers of SBAE change over time? (2) What has been the historical trend for the preparation of SBAE teachers versus the demand expressed for available teaching positions nationwide? and (3) What did stakeholders do over time to address the supply and demand of teachers for SBAE? This study's findings will illuminate SBAE's teacher shortage over time and suggest ways to mitigate it in the future.

Methods and Data Analysis

Historical research methods were used to collect data to answer the study's research questions (McDowell, 2002). Moreover, "[i]n historical analysis there is a systematic gathering and criticism of documents, records, and artifacts to provide a description and interpretation of past events or persons" (McMillan, 2012, p. 15). The *National Study of the Supply and Demand for Teachers of Vocational Agriculture* reports were analyzed as well as the *National Study of the Supply and Demand for Teachers of Agricultural Education* reports as important sources for this historical inquiry. The data available for analysis began with the 1970 report completed by Dr. Ralph Woodin. Thereafter, the 1975 study reported by Dr. David Craig, the multiple studies reported by Dr. William G. Camp and, in the case of

one report, with colleagues, through the more recent reports authored by Dr. David D. Foster, Dr. Rebecca G. Lawver, and Dr. Amy R. Smith (2015, 2016), and by Smith et al. (2017, 2018) were analyzed. The reports beginning in 1996 through 2017 were available on the Teach Ag webpage hosted by NAAE, and the ERIC database was used to access the older reports preceding 1996, as available. As for earlier reports not available as primary sources, data were taken from later reports, including the 1996 to 1998 and the 1999 to 2001 studies completed by Camp (2000) and Camp et al. (2002), respectively, which served as secondary sources. The researchers compiled the data using Microsoft Excel version 15.41 to create tables and figures through the charts and tables functions to display a 51-year trend of supply and demand data for teachers of SBAE nationwide.

A topical historical inquiry analyzes events that have occurred and data already in existence to answer its questions (Mertens, 2010). This involves multiple techniques to select and interpret appropriate historical evidence with a high likelihood of authenticity and accuracy (McDowell, 2002). To guide this study, McDowell's (2002) recommendations were followed, including the use of external and internal criticism regarding its sources. Further, primary and secondary sources were collected, assessed, and synthesized to understand the supply and demand of SBAE teachers over time, i.e., how the phenomenon was reported, by whom, and what the investigators thought their analyses meant. Other sources such as peer-refereed journal articles, magazine articles, commission reports, and books featuring aspects of teacher recruitment and retention also provided the study's data. Online search engines at Oklahoma State University were used to source data. The key search terms included demand for teachers of agriculture, demand for teachers of agricultural education, demand for teachers of SBAE, demand for teachers of vocational agriculture, shortage of agricultural education teachers, shortage of vocational agriculture teachers, supply of agricultural education teachers, supply of vocational agriculture teachers, teacher shortage in SBAE, and teacher shortage in vocational agriculture. The study's sources were organized to develop a chronological outline of the findings to aid in answering its research questions.

Findings

R.Q. #1: How did the reporting of supply and demand for teachers of SBAE change over time?

Juergenson (1964a) may have provided the first somewhat comprehensive national supply and demand study for teachers of agriculture which spanned 1960 through 1964. His study was in response to "members of the 1963 Pacific Regional Conference of Teacher Educators and Supervisors [who] were so concerned about the [agriculture teacher shortage] situation that they made it a major item of consideration for the 1964 conference" (Juergenson, 1964a, p. 8). The study Juergenson conducted in 1964 received data from 36 states in response to his nationwide attempt. Along with the supply and demand data, Juergenson (1964a) also collected information on recruitment strategies to improve the supply of agriculture teachers. The findings presented by Juergenson (1964a) preceded the national annual reporting for teachers of vocational agriculture that began in 1965 under the leadership of Woodin (1970), as authorized by the Agricultural Education Division of the American Vocational Association (AVA).

The supply and demand studies – as sanctioned by AVA and later by the American Association for Agricultural Education (AAAE) – for teachers of agriculture began in 1965 with Dr. Ralph Woodin of The Ohio State University, as the investigator responsible for the initial study (Camp et al., 2002). "The annual study was conducted to determine the national supply and demand for the teachers of vocational agriculture for purposes of planning a nationwide recruitment program" (Woodin, 1970, p. 1). As indicated in Table 1, two gaps occurred in compilation of the reports: for the years 2002 to 2003 and again for the years 2010 to 2013. During the past 51 years, the supply and demand study had 12 different lead investigators or reporters, some of whom served for multiple reporting periods. Over the

years, eight universities provided the reports' investigators, along with the National FFA Organization in the case of two reports. The individuals or teams responsible for conducting the studies changed eight times (see Table 1).

The studies were done annually from 1965 through 1995, but changed to 3-year collections that ended with the reporting period of 2006-2009. In 2014, it was decided by AAAE leaders that the study would be conducted annually and a more comprehensive report prepared every three years (Foster et al., 2015). Minutes from the AAAE's 2013 annual business meeting indicated "the Supply and Demand Study ha[d] not been conducted on a regular basis and . . . proposed that AAAE work with Ellen Thompson at National FFA to collect yearly essential data and every three years to collect more extensive data" (AAAE, 2013, p. 1).

Table 1

Reporting of the AAAE Supply and Demand Study for Teachers of SBAE

Period	# of Reports Conducted	Reporting Period in Years	Preparer(s) of Report	Investigators' Institutions
1965 - 1973	8	1	Dr. Ralph Woodin	The Ohio State Univ. Univ. of Tennessee
1974 - 1984	10	1	Dr. David Craig	Univ. of Tennessee
1985 - 1989	4	1	Dr. William G. Camp	Virginia Tech Univ.
1990 - 1991	1	1	Dr. J. Dale Oliver	Virginia Tech Univ.
1992 - 1998[a]	5	1 and 3[a]	Dr. William G. Camp	Virginia Tech Univ.
1999 - 2001	1	3	Dr. William G. Camp Thomas W. Broyles Natasha Shantz Skelton	Virginia Tech Univ. Virginia Tech Univ. Virginia Tech Univ.
2002 - 2003	0	0	No report prepared	NA
2004 - 2006	1	3	Dr. Adam J. Kantrovich Dr. Thomas W. Broyles	Morehead State Univ. Virginia Tech Univ.
2006[b] - 2009	1	3	Dr. Adam J. Kantrovich Ernie Gill & team	Morehead State Univ. Michigan State Univ. National FFA Organ.

Table 1

Reporting of the AAAE Supply and Demand Study for Teachers of SBAE Continued…

2010 - 2013	0	0	No report prepared	NA
2014[c] - 2020	3	1[c]	Dr. Daniel D. Foster[d] Dr. Rebecca G. Lawver[d] Dr. Amy R. Smith[d]	Penn. State Univ. Utah State Univ. Univ. of Minnesota

Note. [a]At the 1994 AVA convention, the Agricultural Education Division voted to change the study to a 3-year collection period (Camp, 2000). [b]The study included a revised report in May of 2007 regarding the 2006 calendar year, and was followed by a three-year Supply and Demand Study from 2007 to 2009 (Kantrovich, 2010). [c]In 2014, the reports returned to scopes of 1-year (Foster et al., 2015). [d]This team of preparers was charged with conducting the Supply and Demand study through 2020 with order of authorship changing overtime.

Data collected for the supply included sources such as "teacher education programs, graduates, and placements" (Camp, 2000, p. 4), and the demand data documented "numbers of teachers, numbers of replacements hired, sources of replacements hired, types of schools, and kinds of programs" (Kantrovich, 2010, p. 8). "Teacher educators at institutions with Agricultural Education teacher preparation programs were contacted for supply data, while state supervisors/executive secretaries were contacted for demand data" (Foster et al., 2015, p. 4). The survey questionnaires used to gather data were initially postal mailed with a cover letter and return envelope to be completed and returned, and follow-up was done by mail, telephone, or in-person visits (Camp, 2000). Kantrovich (2007) began using electronic mail and FAX as methods to collect information along with traditional postal mail procedures. Beginning with the 2014 report, data were collected online by providing a link to a Qualtrics survey questionnaire, as sent via electronic mail messages (Smith et al., 2017). The data collected were originally sorted by AVA regions, i.e., Central, North Atlantic, Pacific, and Southern (Woodin, 1970), followed later by the AAAE regions, Central, Eastern, Western, and Southern (Camp, 1995), until the report produced by Kantrovich in 2007, which addressed the realignment of AAAE regions, including North-Central, Southern, and Western. The study completed by Foster et al. (2015) collected data based on the AAAE regions and reported it by such and also by National FFA regions: Central, Eastern, Southern, and Western.

The studies also sought to collect teacher demand data from all states and territories with SBAE programs, i.e., similar to how the supply data attempted to include all universities offering teacher preparation programs (Camp, 2000). The oldest data used for this inquiry were derived from the 1970 study by Woodin (1970), which included annual data from the previous five years, 1965-1969.

Table 2 outlines the number of institutions reporting supply data and the number of state departments of education providing demand data beginning in 1970 and continuing through 2016, with a few exceptions. Kantrovich (2007), in his report from 2004 to 2006, changed the practice of using data from past studies to substitute for missing or unreported data. Kantrovich (2007) "realiz[ed] that using data dating back to 1998 [was] not a clean substitute for current information" (p. 5), and could skew the results, therefore, he indicated *missing data* instead.

Over the years, from 72 to 101 institutions provided information about the number of agriculture teachers they prepared (see Table 2). During the same time period, as few as 44 and as many as 50 states and territories offered data about their demand for teachers (see Table 2). All 50 states along with Guam, Puerto Rico, and the Virgin Islands were part of data collection starting in 2006,

making possible a total of 53 sources for demand data (Kantrovich, 2010). Supply and demand data prior to 1994 were not consistently available as a primary source for this inquiry, limiting the collection of data from primary sources to reports from 1970, 1975, and 1994 through 2016, with the exception of 2002 to 2003 and 2010 to 2013, i.e., time periods during which studies were not reported (see Table 2). In 2016, all institutions offering agricultural education teacher preparation programs responded to that year's survey, resulting in 101 respondents representing all states and relevant territories except "Hawaii, Maine, Rhode Island, Vermont and the Virgin Islands [of which the later] currently ha[d] no existing . . . programs" (Smith et al., 2017, p. 5).

Table 2

Sources of Data for the AAAE Supply and Demand Study for Teachers of SBAE: 1965 to 2016

Period	Institutions: Supply Data	States/Territories: Demand Data
1965 - 1969	Not available[a]	Not available
1970	77	50
1971 - 1974	Not available	Not available
1975	75	50
1976 - 1993	Not available	Not available
1994	76	44
1995	84	48
1996 - 1998	79	50
1999 - 2001	82	47
2002 - 2003	No report prepared	No report prepared
2004[b] - 2006	88	48
2006 - 2009	72	46
2010 - 2013	No report prepared	No report prepared
2014	91	47
2015	96	49
2016	101	49

Note. [a]The number of institutions and states or territories reporting were not available to the researchers for all years. [b]If not available for supply and/or demand, the previous year's information was used until 2004 (Kantrovich, 2007); thereafter, the omissions were reported as *missing data.*

R.Q. #2: What has been the historical trend for the preparation of SBAE teachers versus the demand expressed for available teaching positions nationwide?

Hillison (1987) identified several important questions regarding the sources and preparation of agricultural education teachers following enactment of the Smith-Hughes Act of 1917.

> What should be the source of teachers? Should college graduation be a requirement for teaching agriculture or should some other source of teachers be found? What preservice activities should be part of the program? Should preservice include separate teaching methods and student teaching? . . . Should agriculture teachers be prepared by normal schools or land-grant colleges? (Hillison, 1987, p. 8)

SBAE at that time had little formal structure, including the preparation of teachers or its curricula and instructional approaches. For example, "one popular way to teach agriculture in elementary schools was through nature study" (Hillison, 1987, p. 8), but uncertainty existed about the source of teachers to follow that approach or others, and a consensus about such was lacking.

Figure 1 identifies the trend in the number of teaching positions in agricultural education nationwide from 1965 to 2017, i.e., the demand for teachers. The number peaked in 1978 with 12,844 positions (see Figure 1). After 1978, SBAE experienced annual declines in teaching positions until 1992 (see Figure 1). This decline can be attributed to several factors: Teacher attrition rate was an ongoing challenge (Calvin & Pense, 2013). Further, the shrinking of multiple teacher departments to single teacher programs due to reductions in funding (National Research Council [NRC], 1988), especially during the 1980s, exacerbated the downward trend.

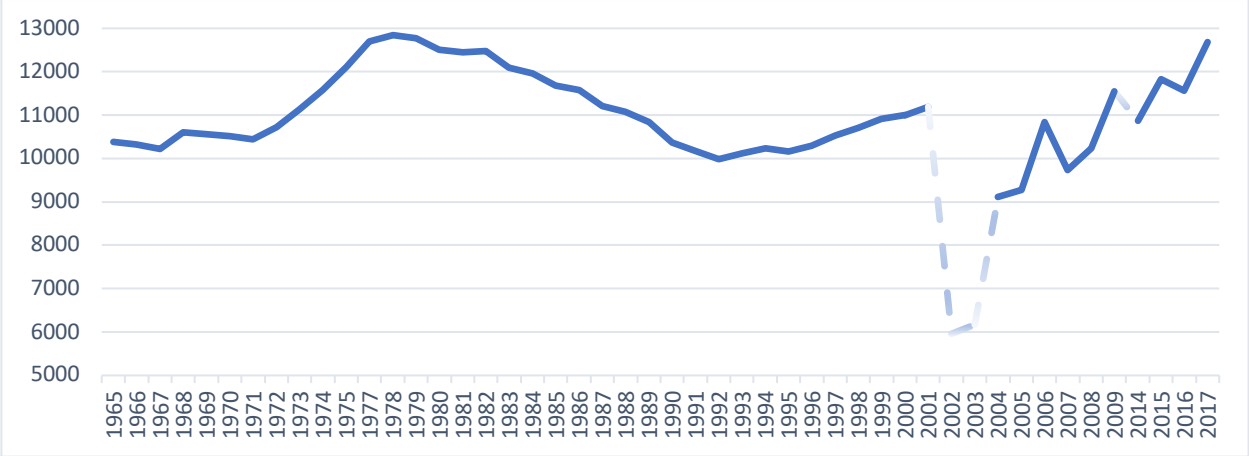

Figure 1. Trend in agricultural education teaching positions nationwide, 1965 to 2017.
Note. Figure 1 highlights two gaps in the provision of data, as identified by a dashed line. The first gap, 2002 to 2004, indicates a lack of reporting by many states' departments of education, and the second gap represents the occurrence of no reporting from 2010 through 2013. In addition, no data were found for 1976 to include in this study.

Allen (2005) provided evidence of the largest teacher attrition rate occurring within the first three years of teaching for all subjects and that it reduces greatly after year five in the profession. SBAE teachers leaving the profession can lead to reduction in the size of programs or even to the closing of programs. After 1992, a continual increase occurred in the number of SBAE teaching positions nationwide until 2002 (see Figure 1). However, of note, the years 2002, 2003, and 2004 saw a lack of participation in the supply and demand study by states' reporting agencies, which resulted in lower numbers overall and in a significant drop in the number of SBAE teaching positions reported nationwide (see Figure 1). The quantities of teachers produced by universities were provided, but data from the states' departments of education identifying the number of teachers in the profession, including positions to be filled, was lacking (Kantrovich, 2007). An increase in teaching positions nationwide was reported from 2006 through 2017 with some fluctuations; this upward trend peaked in 2017 (see Figure 1). The gap in reporting from 2010 through 2013 was because no data were reported for those years (see Figure 1); data collection resumed in 2014 (D. Foster, personal communication, November 12, 2017).

Figure 2 provides a comparison between the number of agricultural education graduates and those who actually entered the agriculture teaching profession nationwide. Over the years, a majority – albeit in some years a slight majority – of graduates of agricultural education teacher preparation programs pursued SBAE as a career, while others took alternative employment. For example, in 1967, Woodin concluded: "[O]f 1,700 persons prepared for teaching vocational agriculture in the United

States in 77 different institutions, . . . 866 became teachers of vocational agriculture, 216 entered the Armed Forces, and 618 were otherwise employed" (p. 19). (Of note, during the late 1960s, the United States had a military draft and was engaged in the Vietnam War.) Regarding the lack of qualified entrants, Weaver (2000) asserted: "Some believe there is not an agriculture teacher shortage [regarding a prospective pool]. The problem is in converting quality agriculture education majors into agriculture teachers" (p. 14).

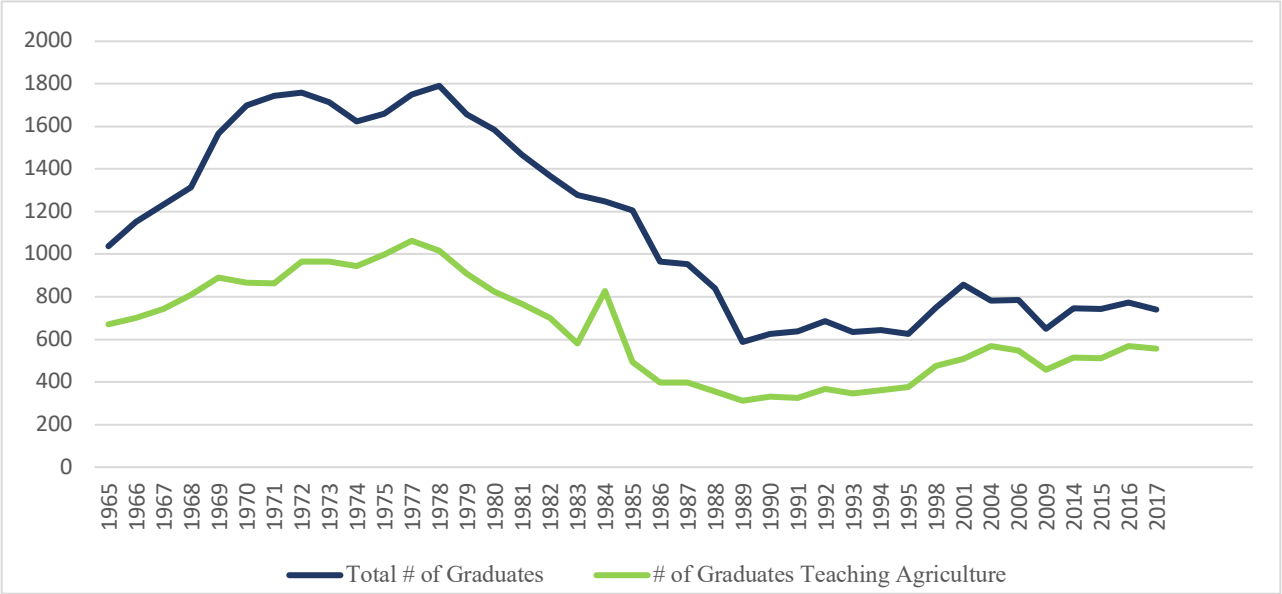

Figure 2. A comparison of agricultural education graduates to the number who started teaching SBAE, 1965 to 2017.

Note. The years are not entirely consecutive due to times of low or no reporting of the supply of SBAE teachers, e.g., from 2002 to 2004 and from 2010 to 2013. In addition, no data were found for 1976 to include in this study. The reporting period changed from annual reports to 3-year reports from 1995 through 2009 and returned to annual reports in 2014.

Graduates of agricultural education teacher education programs have been the major source of SBAE teachers, according to the national supply and demand studies (Camp et al., 2002; Foster et al., 2015, 2016; Kantrovich, 2007, 2010; Smith et al., 2017, 2018; Woodin, 1970). Even though a majority of the individuals who became teachers were graduates of teacher preparation programs in agricultural education, about one-third were not. For instance, Kantrovich (2010), when reporting the supply and demand for 2006 through 2009, stated:

> We are seeing a decrease of newly qualified teachers being prepared while the data still points to a relatively strong need for new teachers. Only 65% of the positions that are filled have been so with those qualified to teach with the remaining coming from outside of agricultural education. (p. 42)

The supply of graduates peaked in 1978 with 1,791 completing a degree in agricultural education with requisite teacher credentialing, and 1,063 of whom started careers as SBAE teachers (see Figure 2). A significant decrease in graduates was reported beginning in 1979 through the 1980s. Both teacher demand and supply were somewhat flat from the late 1980s through most of the 1990s; another spike in graduates occurred with 857 produced in the 1999 to 2000 academic year, but only 509 or 59.4% of those individuals entered the agriculture teaching profession (see Figure 2). Kantrovich (2007) attributed the shortage in teacher supply that began in 2006 (see Figure 2) to the

demand of 78 teachers over that year's supply coupled with the addition of 257 new positions. However, 185 of the entrants he reported had received emergency teacher certification to help meet that year's demand, and 40 departments of SBAE were closed during the same year due to the lack of teachers (Kantrovich, 2007).

The long-term trend for SBAE has been that not enough newly qualified teachers *who will seek to enter teaching* are certified annually to fill all of a given year's vacancies, with a 51-year average of 56.4% (see Figure 2). The average fluctuated slightly over time; for example, the average percentage of graduates who opted to enter teaching was approximately 58% for the years 1989 through 2009 (see Figure 2). The data supports a steady demand for agricultural education teachers, as reported based on teaching positions nationwide, and consistently larger than the year-over-year supply (see Figure 2). This recurring gap or shortfall between supply and demand resulted in the need to recruit SBAE teachers from sources other than the teacher preparation programs of universities. Figure 3 (Camp, 2000, p. 12) identifies the sources relied on to fill the open teaching positions occurring annually. Although a majority of new SBAE teachers came from agricultural education teacher preparation programs, many did not. Camp (personal communication, December 18, 2017) elaborated on his "other sources" category (Camp, 2000) as being *non-traditional routes to certification,* with some of those teachers coming from other subject areas, the agricultural industry, or a variety of different professions to meet the demand for agriculture teachers.

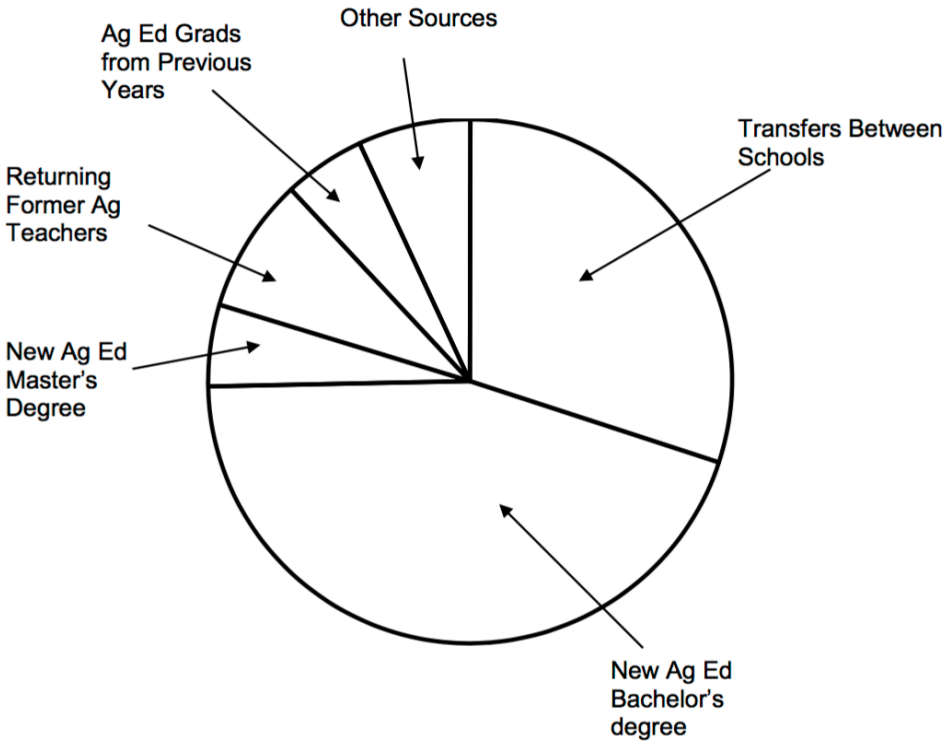

Figure 3. Sources of new SBAE teachers, as proportionately identified by Camp, W. G., 2000, in *A national study of the supply and demand for teachers of agricultural education in 1996–1998.*

R.Q. #3: What did stakeholders do over time to address the supply and demand of teachers for SBAE?

Sources of Teachers. More than 50 years ago, Juergenson (1964b) made it evident that year-over-year shortages of agriculture teachers persisted as an ongoing concern and new approaches to recruiting and retaining qualified teachers were needed. Further, Weaver (2000) asserted that "agricultural education should work to develop systems and approaches to profile, recruit, and retain the most proficient agricultural education teachers" (p. 15). Recruitment is one area on which teacher educators of agricultural education have worked to address the longstanding teacher shortage affecting SBAE (Ball & Torres, 2010). To increase recruitment, "university personnel are encouraged to consider whether or not their recruitment plans and strategies match the ways in which students will approach the decision [to teach] in the first place" (Ball & Torres, 2010, p. 271). Two major considerations Ball and Torres (2010) identified in the recruitment of future agriculture teachers was first, allowing students to complete some general education coursework before making a college major decision, and, second, determining the best communication methods to reach prospective teachers. Along with university faculty working to recruit future teachers, it was recommended that other stakeholders of SBAE also promote the profession (Ball & Torres, 2010), such as agriculture teachers, staff members in colleges of agriculture, and students. Many potential sources of SBAE teachers exist nationwide, with 84 institutions providing agricultural education undergraduate degrees, along with 76 master's degree programs, including teacher certification options (Lawver, Foster, & Smith, 2018).

In 1988, the NRC took the position that "colleges of agriculture should encourage and help recruit talented students to enter the teaching profession. SBAE departments should develop programs to inform school district counselors about career opportunities in the agricultural education profession" (p. 47). The National FFA (2017) and NAAE (2017) acknowledge colleges of agriculture, and state FFA associations, along with other stakeholders have offered incentives such as scholarships to recruit students to pursue degrees in agricultural education and promote the teaching profession. In some cases, stakeholders' efforts have also focused on recruiting individuals to enter the profession via the route of alternate certification (AC). Juergenson (1964b) stated that "teacher educators and others concerned have been thin-skinned about these people, feeling that unless a person was completely dedicated since entering school, he was not a desirable candidate" (p. 16). Nevertheless, in more recent times, Rocca and Washburn (2006) explained that "to meet the demand for teachers, many states have resorted to alternative means of teacher certification in hopes of recruiting more teachers into the field [of agricultural education]" (p. 59). Camp (2000) referred to this pathway as *other sources* of teachers for SBAE (see Figure 3). Individuals taking the AC route usually hold a bachelor's degree of some kind and enter the classroom to begin teaching while receiving support and mentoring from their local school systems (Nagy & Wang, 2007).

AC teachers tend to be at a different point in their work careers, i.e., from 26 to 30 years of age compared to traditionally certified teachers who usually range from 21 to 25 years of age (Robinson & Edwards, 2012). Nagy and Wang (2007) mentioned the reluctance of some school principals to hire AC teachers due to the preparation and mentoring required for them to be successful. Teaching can be difficult and frustrating and look very different when actually in the classroom; such experiences may be why some AC teachers do not remain long in the profession (Nagy & Wang, 2007). Most AC agriculture teachers lacked connections to the agricultural education faculty at the universities in their states and often did not participate in professional development (Rocca & Washburn, 2006). Moreover, in some cases, uncertified individuals were hired to teach agricultural education due to the insufficient number of teachers prepared by their respective states' universities (Roberts & Dyer, 2004), and received alternative certification while teaching. This approach to meeting the shortfall was reported in numerous supply and demand studies for teachers of agriculture (Camp, 1995, 1998, 2000; Camp et al., 2002; Kantrovich, 2007; Woodin, 1970).

After recruiting future SBAE teachers, the next task involves preparing them for their careers. "Since its earliest days, agricultural education has had a close working relationship with 1862 land-

grant universities. This relationship even pre-dated the Smith-Hughes Act of 1917" (Herren & Hillison, 1996, p. 26). "Almost without exception, the land-grant colleges or universities have the largest staffs and the best resources for training instructors of vocational agriculture" (Weston, 1979, p. 2). However, more than 100 universities, including land-grant and non-land-grant institutions, offer degrees in agricultural education nationwide (NAAE, 2017). Of the programs, 59 are at land-grant universities, including 1862 and 1890 institutions (United States Department of Agriculture, 2014). Three types of institutions have historically prepared SBAE teachers: (1) land-grant institutions, (2) non-land-grant institutions, and (3) comprehensive regional institutions (Roberts, Harlin, & Briers, 2009). However, Roberts et al. (2009) indicated that students from land-grant institutions had a higher intention to teach after completing their respective teacher preparation programs than did students at non-land-grant institutions. Although a large number of teacher preparation programs exist nationwide, "one-third of agricultural teacher education programs produced two-thirds (n-1452) of all program completers [from 2014 to 2016]" (Foster, Lawver, & Smith, 2018, p. 606).

Hillison (1987) stated that with the dramatic growth in demand for agriculture teachers during the early years of SBAE, a logical and significant question was where to find them. Land-grant institutions assumed the primary role of preparing agriculture teachers, according to Hillison (1987), but meeting the demand for teachers was a process that developed over time. Other than preparing students for careers as SBAE teachers through bachelor's degree programs, some institutions "began a graduate educational program for individuals who do not have a bachelor's degree in education" (Baker & Radosh, 2000, p. 10). Seventy-six programs nationwide currently offer a master's degree in agricultural education (Lawver et al., 2018). Such programs have the potential to increase the output of teachers by offering a graduate degree in agricultural education and helping to curb the ongoing SBAE teacher shortage. Baker and Radosh (2000) contended "we must approach more students at our secondary and post-secondary institutions to make them aware that they possess the talents and skills to be effective teachers [of agriculture]" (p. 10). Further, Foster et al. (2018) suggested that "focused recruitment efforts [were] necessary to depict agricultural education as a viable, rewarding career for young men [and women]" (p. 607).

Teacher Retention. Recruiting and preparing new entrants is essential to the supply of SBAE teachers, but retaining current teachers also must be a focus of the profession to help address the continual shortage. Walker, Garton, and Kitchel (2004) asserted that the shortage and demand for teachers of agriculture had been well-studied, but teachers' levels of job satisfaction and its impact on whether they stay in the profession was not. According to Cole (1984), teachers left the vocational agriculture classroom due to one or more reasons, including low salary, lack of family time, evening responsibilities, extended hours, and certification requirements. On the other hand, teachers stayed in the profession due to experiences related to student teaching, as well as their positive perceptions of efficacy regarding curriculum development and teaching methods (Cole, 1984).

Professional organizations serve many roles, one of which is to identify and deliver meaningful professional development. To this aim, the NAAE (2017) promotes agricultural education primarily for middle and secondary school teachers, and provides professional development specific to agricultural education while also striving to recruit new entrants to teaching and retain current teachers. "It is generally agreed that the first two or three years after licensure are the most influential in developing the knowledge and skills, effectiveness, and efficacy of a teacher" (Greiman, 2010, p. 183). Greiman (2010) also discussed the importance of continuing professional development (CPD) regarding the retention of SBAE teachers. Teachers fulfilled by their professional careers are more likely to remain in the profession. Greiman (2010) compared the CPD process to the career cycle of an educator with the goal of keeping practitioners in the positive aspects of the cycle to improve overall teacher retention. A number of organizations have historically offered professional development opportunities to SBAE teachers, or for those who may serve as their inservice education providers, along with many of the

universities that prepared them. These organizations include AAAE, the Association for Career and Technical Education (ACTE), formerly AVA, NAAE, the National Association of Supervisors of Agricultural Education (NASAE), the National FFA Organization, and various state affiliates of these groups. "For many years the NAAE, the National Council for Agricultural Education, the FFA and others involved in the training, support, certification, and ongoing development of agriculture teachers have been working to uncover underlying causes of the agriculture teacher shortage" (Weaver, 2000, p.14). "The National Teach Ag Campaign, an initiative of the National Council for Agricultural Education led by NAAE, [is] an effort to combat [the ongoing teacher shortage in SBAE] while celebrating current agricultural educators" (NAAE, 2017, p. 1).

Student teaching has great significance for most future agricultural educators, especially regarding the support structures they develop, which may lead to increased teaching efficacy (Edgar, Roberts, & Murphy, 2009). This support, however, should not end after the teacher aspirants graduate; without the proper care and continuation of mentoring, many early-career teachers become dissatisfied and look for other kinds of employment, which further exacerbates teacher shortages (Joerger & Bremer, 2001). To address this, Joerger and Bremer (2001) offered teacher induction programs as an option to help reduce the rate of teacher attrition in SBAE. Moreover, Touchstone (2015) asserted that "by establishing consensus upon challenges facing beginning agricultural education instructors, Team AgEd can work toward developing appropriate professional development and mentoring activities to assist in preparing new teachers for successful transition into the classroom" (p. 179).

Conclusions, Implications, Recommendations, and Discussion

Half a century ago, Woodin (1967) stressed that "the continuing shortage of vocational agriculture teachers may develop into a major crisis in the United States unless prompt, concentrated action is taken in each state" (p. 10). In 2013, Calvin and Pense echoed Woodin's concern: "[U]nless steps are taken to recruit students into teaching licensure programs at the university, secondary programs of agricultural education will close and the decline of enrollment will continue" (p. 54). This study revealed an ongoing shortage of SBAE teachers based on the supply and demand studies that began in 1965 (Camp, 1995, 1998, 2000; Camp et al., 2002; Craig, 1976; Foster et al., 2015, 2016; Kantrovich, 2007, 2010; Smith et al., 2017, 2018; Woodin, 1970), as well as an inquiry conducted by Juergenson (1964a) in the early 1960s, who concluded:

> [T]he [teacher shortage] problem must receive new vigorous attention from both [*sic*] teacher educators, supervisors, and administration. New avenues of supply and new methods of promotion are needed as never before if the trend is to be reversed so that properly qualified teachers exist for every school that needs them. (p. 10)

Fifty years later, not much has changed regarding the ongoing shortage of SBAE teachers.

The supply and demand studies' research teams changed eight times, including 12 lead investigators from eight institutions and, in the case of two reports, the National FFA Organization (see Table 1). Data sources for the supply of graduates and thereby potential new teacher entrants for SBAE were the nations' institutions of higher education that prepared such, and demand data, in most instances, were provided by states' and territories' respective departments of education (see Table 2). Dr. David Craig of the University of Tennessee and Dr. William G. Camp of Virginia Tech University authored the largest number of supply and demand studies, i.e., 10 each. Twenty-six reports were produced annually, four reports each spanned three years, and beginning in 2014 an executive summary was published with the intent to publish a more comprehensive report every three years. Over the years, data collection was lacking at times, or, in some instances, no studies were conducted (see Table 2). The long-term trends, as based on analysis of the studies' reported data, show an ongoing shortage of graduates of agricultural education *willing to enter the teaching profession*. On average, only between 50% and 60% chose to enter teaching during their first year after graduation. With few exceptions, this

has been the sustained trend for more than 50 years (see Figure 2). Camp (2000) identified *other sources* as making up the shortfall (see Figure 3), but, in some instances, teaching positions went unfilled and SBAE programs were closed (Kantrovich, 2007).

Teacher preparation programs, states' departments of education, and professional organizations all play key roles in the recruitment and retention of SBAE teachers nationwide. Many influences impact the decisions of individuals interested in becoming SBAE teachers, as well as their decisions to remain in the profession for full careers. Some agricultural education teacher educators have asserted that more effort should go toward reducing the attrition of inservice teachers, i.e., improving teacher retention, especially among early-career instructors, including ongoing professional development (Greiman, 2010) and targeted induction programs (Joerger & Bremer, 2001). NAAE (2017), through the Teach Ag Ed initiative, and other stakeholders also sought to improve the retention of teachers over time. Based on historical trends however, a similar demand for SBAE teachers is likely to continue coupled with the ongoing challenges associated with their supply.

The supply and demand studies have provided SBAE's stakeholders important data for more than 50 years. However, the transitions between investigators for the studies may have led to a lack of data collection or, on a few occasions, no gathering of information. It is recommended that when researchers or research teams for the study change, they collaborate to make the transition as seamless and productive as possible. In addition, sufficient funding should be made available to conduct the study. The possibility of stakeholders soliciting corporate sponsorship to support a research team to conduct the study should be considered. Further, the more recent studies are snapshots with valuable data, but the reports are missing some potentially useful information that the older and more detailed studies included, such as figures identifying longitudinal trends. An alternative collection method could be the provision of a webpage for each institution with the capability of graduating agricultural education teachers, so they could enter data in an ongoing way at the end of each academic term. States' departments of education also could be granted access to a similar online collection platform to provide the demand data required for analysis and production of reports, although systematic and consistent collection of their information may be more challenging. These data entry pages could be linked to the AAAE homepage, password-protected, and analytical tools provided to generate reports for use by interested stakeholders at any time.

Numerous challenges continue to face the agricultural education profession, but none more important than the preparation and provision of qualified teachers. And "additional research is needed to best determine a course of action" (Smith et al., 2017, p. 3) to meet the demand for teachers. In this regard, even with the supply and demand studies' reporting gaps, omissions, and inconsistencies over the years, the reports are valuable assets to the profession. Moreover, if SBAE teachers are the frontline for educating future agriculturists and increasing the likelihood of agriculturally literate citizens, recruiting new teachers and retaining current educators must be a priority. The programs' stakeholders have stressed this need dating back to the Smith-Hughes Act (Hillison, 1987), but the approximate 6-in-10 trend of entrants-versus-graduates persists. Perhaps this condition should be accepted as *canon* and efforts redoubled to widen the pool of potential teacher recruits, address teachers' dissatisfaction with their career choice (Walker et al. 2004) to the extent that may be possible, and provide ongoing support through targeted and timely inservice offerings (Greiman, 2010; Joerger & Bremer, 2001). If progress was made as a result of these actions, future supply and demand studies could tell that story.

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