Using the Understanding of Agricultural Crop Geography in the United States as an Assessment for Agricultural Literacy

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Abstract

The primary aim and purpose of this study was to determine the knowledge level and understanding of where important agricultural crops are historically and statistically produced in the United States in a sample population of American citizen adults from ages 18 to 42. Out of a total of 310 potential participants, 190 respondents participated, with a 61.3% response rate. The objectives for this research were to ascertain this sample population's ability to: identify ten agricultural crops which are endemic (native) to the North American continent based on their centers of origin; identify five significant agricultural production areas within one or more states of the United States; identify the historically and statistically leading regions for the production of seven different agricultural crops in the United States; identify the historically and statistically leading states (in their entirety) for the production of eleven different agricultural crops in the United States; and, identify the basic physiographic differences of two states (in their interior) and how these limit the production of agricultural crops. Through this, the secondary aim and purpose of this study was to investigate a different approach in the exploration and development of methods which assess agricultural literacy, to describe the need for strengthening academic curricula which are concerned with agriculture, and to underscore the necessity to address the current rates of agricultural literacy nationally, especially with a consumer-based society which aspires to improve its ethics when it comes to all aspects and concerns of its food, fiber, and fuel production systems. It was found that the mean response rate for all correct answers was 52.7% for all individual answers, including multiple-option questions in the survey, thereby indicating a need for better knowledge and understanding of agricultural geography on behalf of the student as a consumer.

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Dedication

I would like to dedicate this manuscript to my late mother, Diane, who preached to me that knowledge, no matter how seemingly significant or insignificant, should be both authentically and enthusiastically shared with others to make the world a better place for all of us, and who certainly taught me both the humility and modesty of understanding that other people may know something that I do not; to always keep an open heart and an open mind.

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Introduction

Background and Setting

The current agricultural literacy rate is a critical social issue in the United States, and it has negative long-term effects both academically and culturally (Ackerman-Leist, 2012; Kovar and Ball, 2013). As the world population continues to grow astronomically into this century, putting greater demands on our global food systems, there will be an increasing demand for individuals well-versed in agricultural science. Having these agriculturally literate individuals readily available will assist in combatting issues dealing with agricultural biosecurity and food defense, food security, sustainable food production, and environmental degradation, including greater preparation for both the predicted and unpredicted impacts of climate change (Kovar and Ball, 2013). Obviously, not everyone will become an agricultural scientist, but a general awareness of the national agricultural infrastructure is imperative for an agriculturally literate populace, especially in a consumer-based society (Ackerman-Leist, 2012; Kovar and Ball, 2013). To study the agricultural infrastructure of the United States, one must acknowledge the role which geography plays.

Although mostly a social science, geography has many scientific and social aspects and concepts that can be studied and taught in the context of agriculture. Geography is a study which comprises both human and natural elements, (i.e., social sciences and physical sciences, respectively). While the study of geography is important, the study of agricultural geography can highlight many important subdisciplines. Because agricultural animal and crop geography has largely stabilized since the 1950s (Hart, 2001; Liang and Gong, 2015; Ramankutty and Foley, 1999), especially in the United States, these aspects can be studied. While the concept of agricultural geography as an academic discipline has been around since the last century, it has largely been redefined as the “geography of food” (Atkins, 1988; Bowler and Ilbery, 1987; Morris and Evans, 1999; Whatmore, 1991), which accounts for a more cultural and socioeconomic approach to the study (Morris and Evans, 1999; Whatmore, 1991). While this is an imperative area for concerns over global food distribution, food supply, ethics, and fair trade and economics, one must account for the biogeographic and physiographic parameters, which are both important limiting factors that affect our food supply (Robinson, 2003). Stressing the biogeographic and physiographic attributes, which both define agricultural geography as much as the socioeconomic attributes that define the geography of food (Block and DuPuis, 2001; Yeung, Coe, and Kelly, 2007), can thus be integral for agricultural literacy in the education system.

Understanding these aforementioned factors in agricultural geography will translate into better informed, intelligent decision-making by the public on issues of land use and tenure, soil conservation, urban encroachment of abandonment of suitable agricultural-grade land (Benayas, Martins, Nicolau, and Schulz, 2007; Foley et al., 2005), and much more, as well as an appreciation and concern for our national food systems. While we already know that agricultural literacy rates in the United States are at undesirable levels, there will be a necessity for researchers to continue to assess populations and programs which address this issue, as well as continuously identifying new areas of deficiency related to agricultural literacy efforts (Kovar and Ball, 2013). Understanding the awareness and knowledge within the general population, particularly the younger generation—which is already believed to be extremely disconnected from agriculture—of where important agricultural crops are produced within the United States could be another method in the collection and analysis of the data which is used to study the level of agricultural literacy rates.

Statement of Problem

The concept of agricultural literacy is relatively new academically and it is important that educational researchers continue to assess populations and programs while increasing the variety of populations and programs assessed, thereby identifying areas of deficiency in research related to agricultural literacy efforts and continuing these efforts in the future (Kovar and Ball, 2013). An approach that has not been fully examined is exploring the agricultural literacy within a population in terms of geography. Agricultural geography with crop-based systems, (as opposed to animal-based systems), could be used to assess the understanding of where important agricultural crops are historically and statistically produced in the United States.

Purpose of Research

The primary aim and purpose of this research was to determine the knowledge level and understanding of where important agricultural crops are historically and statistically produced in the United States in a sample population of American citizen adults from ages 18 to 42. The question guiding this research was:

> *What is the knowledge level and understanding of where important agricultural crops are historically and statistically produced in the United States in American adults, ages 18 to 42?*

Through this, the secondary aim and purpose of this study are to investigate a different approach in the exploration and development of methods which assess agricultural literacy, to describe the need for strengthening academic curricula which are concerned with agriculture, and to underscore the necessity to address the current rates of agricultural literacy nationally, especially with a consumer-based society which aspires to improve its ethics when it comes to all aspects and concerns of its food, fiber, and fuel production systems.

Research Objectives

The objectives for this research were to ascertain a certain population's (adults ages 18 through 42) ability to: *identify ten agricultural crops which are endemic (native) to the North American continent based on their centers of origin*; *identify five significant agricultural production areas within one or more states of the United States*; *identify the historically and statistically leading regions for the production of seven different agricultural crops in the United States*; *identify the historically and statistically leading states (in their entirety) for the production of eleven different agricultural crops in the United States*; and, *identify the basic physiographic differences of two states (in their interior) and how these limit the production of agricultural crops*.

Definition of Terms

Agricultural geography: A subdiscipline of human geography concerned with agriculture; it is traditionally considered a branch of economic geography that investigates the parts of the land surface that are transformed by humans through primary sector activities.

Agricultural literacy: A term used by academic institutions and organizations to describe programs to promote the understanding which is necessary to synthesize, analyze, and communicate the basic information about agriculture and its importance and impacts on society with students, producers, consumers, and the public.

Biogeographic: Relating to biogeography; the study of the distribution of species and ecosystems in geographic spatially and temporally.

Center of origin: Synonymous with ‘centers of diversity’; a geographical area where a group of organisms, either domesticated or undomesticated, first developed their distinctive characteristics. Specific to the origin of the cultivation of agronomically important plants, they are also called Vavilovian centers, named after the Russian scientist Vavilov who coined the term.

Epistemological: The theory of knowledge or a corps of knowledge, especially in respect to its methods, scope, and validity.

Foodshed: A geographic region which produces the food for a particular population. The term is used to describe a region of food networks, from the area where it is produced, to the place where it is consumed, including the land on which it grows, the route it travels top market, the markets through which it passes, and the consumer with whom it is consumed.

Geography of food: The geography of food is a field of human geography. It focuses on patterns of food production and consumption on the local to global scale.

Pedagogical: Relating to the methods and practices of both formal and informal instruction, especially in specific academic or theoretical subjects.

Physiographic: Relating to physiography; the study of the physical attributes and characteristics of the world, specifically its land surfaces.

Review of Literature

Agricultural Geography: A New Approach to an Ancient Practice

During the past 10,000 to 12,000 years, from an anthropological perspective, agriculture has become a dominant force for human development and distribution across most of the world, but has only been observed from a purely scientific perspective since the latter half of the twentieth century (Rumney, 1984). Because the scientific era of discovery is relatively new as compared to the rest of human history, the concept of agricultural geography was not created in an academic nor scientific sense until the twentieth century (Grigg, 1995a). Agricultural geography itself is a subdiscipline of human geography and can be applied to many other subdisciplines within human geography, such as economic geography and environmental geography (Block and DuPuis, 2001; Grigg, 1995a). Because agriculture is one of the longest established and most important interfaces between humans and their environment, it is not only becoming further integrated with other subdisciplines within the study of geography, but it is also being applied to outside studies.

Agriculture involves living plants and animals that thrive in some physical environments, but flourish less successfully, or not at all, in other environments (Hess, 2011a; McMahon, Kofranek, and Rubatzky, 2011a). For ages, humans have considered these differences and modern humans understand that the physical environment determines spatial variations in agricultural activity, and that regional differences in climate (prevailing atmospheric conditions and soil types) gives rise to distinct agricultural regions (Grigg, 1995b; Grigg, 1995c). Plants have inherent biological characteristics that determine their productivity; they only function efficiently in environments to which they are adapted (Hess, 2011a; McMahon, Kofranek, and Rubatzky, 2011b). Both these factors greatly influence the nature and location of agricultural crop production (Grigg, 1995c), and they have many influences on the spatial dimensions of agricultural cropping systems (Lutgens and Tarbuck, 2010a; Lutgens and Tarbuck, 2010b; Osman, 2013; Rumney, 1984). Based on these circumstances, agricultural geography can be accurately described by science and its patterns can be recorded for several, various purposes.

The Current Trend in Agricultural Geography: The Geography of Food

Although agricultural geography has received more attention over the recent decades in terms of policy and regulation, (Whatmore, 1991), it has had its emphasis realigned and redefined as the “geography of food” (Atkins, 1988; Bowler and Ilbery, 1987), thereby concentrating on areas such as the production, transportation, and retail of food from global socioeconomic perspectives (Ackerman-Leist, 2012; Block and DuPuis, 2001; Yeung, Coe, and Kelly, 2007). In the United States and Europe, far more notice is given to manufacturing industry and the problems of urban areas (Grigg, 1995a). This neglect perhaps reflects the relative unimportance of agriculture in the economies of developed nations, in contrast to its predominance in developing nations and the world (Combes, Mayer, and Thisse, 2008; Grigg, 1995a). Additionally, subsidization of agricultural cropping systems in developed nations has made it nearly impossible for developing nations to compete on the world market (Ackerman-Leist, 2012). Consequently, during the past several years, the agricultural system has come under strong criticism (Ackerman-Leist, 2012; Combes, Mayer, and Thisse, 2008; Grigg, 1995a). Thus, perceptions of the public have been challenged dramatically, calling attention to the lack of public understanding of the economic and ecological repercussions of the decisions which we all collectively make when producing our food and how it affects humanity worldwide (Powell, Agnew, and Trexler, 2008).

Despite this renewed awareness, which has been shown to be confined to niche consumers, (i.e., health and organic food consumers) (Ackerman-Leist, 2012; Dicken, 2003), the greater number of Americans knows little about agriculture upon entering school and shows little improvement in agricultural literacy by the time they graduate high school (King, 2007; Malecki, Israel, and Toro, 2004). Additionally, these aforementioned interests, while important, have upstaged the foundations of agricultural geography: where food is produced and why it is produced there (Grigg, 1995a). Thus, a basic understanding of where important crops are produced in the United States may be hindered despite an increasing consumer interest in our food systems, thereby contributing to agricultural illiteracy in American children, adolescents, and adults. Over several generations, much of the knowledge the public had about the agricultural origins of their food, clothing, and shelter has been lost (Agnew and McJunkin, 2005; Malecki, Israel, and Toro, 2004). As we now move out of the industrial age, and ironically into the information age, even fewer people are aware of the interrelatedness of agriculture and the environment (Agnew and McJunkin, 2005; Combes, Mayer, and Thisse, 2008).

The Relevance of Agricultural Geography to Agricultural Literacy

Since agricultural literacy first became a concern in the late 1980s (Grigg, 1995a; Rumney, 1984), the agricultural education profession has responded by defining what is meant by agricultural literacy, identifying different methods of educational delivery, and developing a knowledge foundation connected to standards with a reliable and valid means of assessment. Efforts to fully articulate and clarify this definition have produced much discussion, although with very limited consensus due to perceived philosophical and epistemological differences.

The National Research Council established the Agricultural Education in Secondary Schools Committee to examine the status and forecast the future of agricultural education. The Committee published its findings in a report called *Understanding Agriculture: New Directions for Education* (1988), and defined agricultural literacy as:

> *"An agriculturally literate person would understand the food and fiber system and this would include its history and its current economic, social and environmental significance to all Americans."*
>
> (National Agriculture in the Classroom, 2016)

Agricultural and educational administrators, practitioners, and researchers, as well as government officials, convened in Washington (District of Columbia), on April 17, 2013, to develop the *National Agricultural Literacy Logic Model*. To support this model, an agriculturally literate person was defined as:

> *"A person who understands and can communicate the source and value of agriculture as it affects our quality of life."*

(National Agriculture in the Classroom, 2016)

The American Farm Bureau Foundation for Agriculture states that "Agricultural literacy can be cultivated in any person, no matter the age or experience" (American Farm Bureau Foundation for Agriculture, 2015b). A basic assessment of the knowledge level in adults of where important agricultural crops are produced is important because agricultural geography is directly connected with several of the pillars of agricultural literacy (National Agriculture in the Classroom, 2016). Furthermore, the American Farm Bureau Foundation for Agriculture once again states, "Agricultural literacy is knowledge. We believe everyone should understand where their food comes from" (American Farm Bureau Foundation for Agriculture, 2015a).

While a broad term, some of the main components of agricultural literacy are geographic in nature: the knowledge and understanding of our food, fiber, and fuel systems, the production of animal and plant products, the important relationships between agriculture and the environment, and the distribution of agricultural products into the consumer marketplace (Spielmaker and Leising, 2013). Agriculture is by far the most important economic activity globally (Ackerman-Leist, 2012), and its geography is important as it uses over one-third of the total land surface and employs approximately 45 percent of the working population (Grigg, 1995a). In the United States, agriculture directly employs only two percent or less of the population, and it contributes a similarly small proportion to the nation income, yet, up to four-fifths of the land surface is used for agriculture purposes (Grigg, 1995a).

Agricultural geography is a discipline that can be conveyed and delivered to students in an academic setting, although it may not seem as conventional as purely agricultural or geographical disciplines (Malecki, Israel, and Toro, 2004). While the use of agricultural statistics in developing nations is still on the rise, developed nations have reliable agricultural statistical services, such as the United States Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS) and its five-year agricultural census, and therefore accurate cropland data maps are not only feasible, but they are readily available to the public (Fritz et al, 2015). It is estimated that the greater extent of (native) vegetation types of North America has been cleared for cultivation (Ramankutty et al., 2008). Geographically, the principal mode of anthropogenic land use has been clearing of natural ecosystems for agriculture (Ramankutty and Foley, 1999). Following a general westward and southward annexation of the wilderness since the colonization of the United States began, agricultural crop areas reached their apex in expansion in the United States, and then stabilized by 1950 (Hart, 2001; Liang and Gong, 2015; Ramankutty and Foley, 1999). Because these long-established agricultural cropping systems exist, these patterns can be used outside of research for the sole purpose of learning.

Agricultural geography is imperative as a study of agricultural science as it will need better understanding to ameliorate the negative impacts with both climate change, as crops will “migrate” to new areas (Dicken, 2003; Padgham, 2009; Vermeulen et al., 2010), as well as deterring against encroachment of urban areas onto land suited best for agricultural use (Hess, 2011b), and thus its study is directly connected to food and economic security. As the world population rises to an approximate estimate of 9 billion people by the year 2050 (Brown, 2009; Miller, 2005), precision agriculture will become more and more important, and the geography of crops will thus become concomitantly more important. Individuals with knowledge and skill of both agricultural and general geography will be in demand (Boryan et al., 2011; Fritz et al., 2015; Rahman, 2007; See et al., 2014). The study of agricultural geography can be used extensively by academic administers and educators, scientists, politicians, and producers on the issues of agricultural biosecurity and food defense, agricultural pathogen and pest epidemiology, bioenergy crop inventory, food security, deforestation, land use change and assessments, pesticide use, soil conservation, and much more (Bockheim, 2014; Han et al., 2014; Luck et al., 2011; Osman, 2013; Randolph, 2012; Waldner et al., 2015).

Agricultural literacy can be best achieved through curriculum infusion from kindergarten through grade 12. Curriculum infusion is the purposeful integration of agricultural topics into the mandated curriculum in urban, suburban, and rural schools. These topics are included as natural interdisciplinary connections through the natural sciences and the social sciences to assist students in better understanding the world in which they live (Malecki, Israel, and Toro, 2004). Thus, formal education, beginning in elementary and through high school, is the logical approach by which to assist people develop agricultural food system understandings that would be a foundation for well-reasoned debate, and a deeper understanding is required (Hess and Trexler, 2011; King, 2007). As public discourse focuses on agricultural food system reform, it becomes increasingly important for citizens to understand this complex system to engage in democratic decision-making processes (Hess and Trexler, 2011).

Conceptual and Theoretical Framework

Incorporating Social Constructivism into Agricultural Literacy and Geography

The aim and purpose of this research was to assess agricultural literacy rates in adults by surveying their understanding of where important agricultural crops are produced in the United States. Social constructivism is the lens that was used for this study, glimpsing what participants either know or do not know about where agricultural crops are produced in the United States. Although the results from the questions in the research instrument, (which was a 30-question survey), did not directly elude to it, the guiding conceptual and theoretical framework of social constructivism enabled thinking critically about where participating respondents had learned and are continuing to learn the information which enabled them to correctly answer the survey questions.

An Overview of Social Constructivism

An overview of social constructivism will allow for better understanding the aim of integrating the research into this conceptual and theoretical framework. Constructivism is a synthesis of multiple theories that are merged into one form (Amineh and Asl, 2015; Kukla, 2000a; Kukla, 2000b). Constructivism is an educational philosophy within a much larger category of philosophies that are described as "rationalism" (Amineh and Asl, 2015; Stam, 2001). A rationalist philosophy is characterized by the belief that, in the minds of people, reason is the primary source of knowledge and that reality is constructed rather than discovered (Smith and Ragan, 2005; Stam, 2001). Constructivism is also the assimilation of both behaviorialist and cognitive ideals (Amineh and Asl, 2015). Basically, a constructivist stance maintains that learning is essentially a process of constructing meaning to what is being learned; "it is how people make sense of their experiences" (Merriam, Caffarella, and Baumgartner, 2007a). People, constantly bombarded and confronted with stimuli, both actively and inadvertently establish cognitive infrastructures which assist them making sense of the world around them (Elias and Merriam, 2005; Nesbit, Leach, and Foley, 2004).

Social constructivism, which draws heavily from the late psychologist Lev Semyonovich Vygotsky (Amineh and Asl, 2015; Liu and Matthews, 2005), maintains that learning is more than what occurs within our minds (Sjøberg, 2007). Social constructivists argue that learning is both an essentially and a fundamentally social process; they hold that culture and context both affect the ways in which we interpret the world around us and therefore the knowledge we construct about it (Nesbit, Leach, and Foley, 2004). Additionally, social constructivism posits that knowledge is constructed when individuals actively engage socially about shared problems (Sjøberg, 2007). Making meaning is thus a dialogic process involving persons-in-conversation, and learning is the process by which individuals are introduced to a culture of more knowledgeable and skilled members (Elias and Merriam, 2005; Merriam, Caffarella, and Baumgartner, 2007b). The one key assumption in social constructivism is that learning is collaborative with meaning "negotiated from multiple perspectives" (Smith and Ragan, 2005).

When considering social constructivism as a component of constructivism, the social processes of conversation, discussion, and negotiation must be taken into account, as these yield learning as a product according to social constructivists (Woo and Reeves, 2007). Not surprisingly, social constructivism also borders on sociology and communication theories because it examines the knowledge that people have of the world around them which is developed jointly through these aforementioned mediums, and thus this theory assumes that understanding, significance, and meaning are developed in coordination with other people through communication (Sjøberg, 2007). One of the most fundamental elements in this theory is the assumption that people rationalize their experiences by creating a model of the world around them and the way in which it functions (Merriam, Caffarella, and Baumgartner, 2007b; Sjøberg, 2007).

Applying Social Constructivism

Social constructivism applies meaning to many of the inquiries and questions which guided this research. The collected data from the survey provided insight on not only how well the sample population understood where important agricultural crops are produced in the United States, but also on where people may be acquiring the information to answer the questions, what people perceive about land-based agriculture and tenure practices, as well as how people have constructed this information, regardless of whether they were correct or incorrect when answering the questions in the survey. Social constructivism applies to this research not only because of the educational landscape from which it is derived, but also because it has allowed exploration of the social landscape to which it can be further applied in the future. This is because formal learning is mostly in a social setting.

Social constructivists maintain that conversation, discussion, and negotiation occurring at any place and at any time are meaningful for learning (Amineh and Asl, 2015; Liu and Matthews, 2005; Kukla, 2000c; Sjøberg, 2007). In fact, they emphasize that learning is situated in social contexts. One important social constructivist notion consists of authentic or situated learning, where the person is involved in activities which are directly relevant to his or her life and which occur within a culture similar to an applied setting (Merriam, Caffarella, and Baumgartner, 2007b; Sjøberg, 2007; Woo and Reeves, 2007). Thus, social constructivism provided the approximate context to examine the research questions and to present recommendations when the data had finally been collected. Perhaps some respondents were knowledgeable because of directly being exposed to agriculture in a social setting, (e.g., a group of high school students on an FFA (Future Farmers of America) field trip to a farm, a grocery shopper discussing a commercial recall of produce produced in a specific area with another grocery shopper, or a pair of airplane passengers discussing the “fly-over country” down below). It was important to think of any and every scenario possible in between, especially since agriculture is both directly and indirectly a part of everyday life for all American citizens.

Analyzing the collected data through the theoretical lens of social constructivism was a logical approach, since the adjacent and conjoined theory in this research is agricultural literacy which posits that “agricultural knowledge and [understanding] is applied to different contexts in the real world, which allows the student to understand the mechanisms of various agricultural activities and their respective systems” (Powell, Agnew, and Trexler, 2008). Moreover, as this current and future research sheds light on where adults are learning their facts based on agricultural geography, it hopefully will inversely shed light on where they are not learning their facts so that professionals can ascertain where these concepts can be applied in learning environments, thus providing suggestions in remedying the issue of current agricultural literacy rates.

Significance and Limitations of Research

Agricultural geography is important for agricultural science and agricultural education for many reasons. The study of agricultural geography is not only an essential foundation for building on more advanced concepts of agricultural sciences, as well as other physical and social sciences, but it is also a powerful force for other disciplines (Malecki, Israel, and Toro, 2004). The agricultural literacy movement is designed to promote awareness of agriculture and the environment and to help connect concepts in science, math, and social studies using agricultural and environmental examples, such as geography (Agnew and McJunkin, 2005; Shelerud, 2016).

In one Californian study, adolescents were asked to describe where production agriculture occurred. No informant described production agriculture on a regional basis. Only 44 percent of the informants described agriculture that occurred in California (Hess and Trexler, 2011). While these results and the results of other studies seem disheartening, the current state of general knowledge in the population about agricultural geography can be improved, as should agricultural literacy in general, largely through awareness and education (King, 2007). While, there is already a wealth of evidence that general agricultural science is needed more in education, we need more evidence for agricultural geography.

The results of the survey will hopefully add to the accruing information which academic administrators and educators can use to build educational approaches that are developed to assist learners construct schemata which are more compatible with modern agricultural production systems (Hess and Trexler, 2011; Kovar and Ball, 2013). By challenging and building on existing schema, connections across multiple domains (e.g., geography, economics, environmental science, etc.) can be leveraged to assist learners in constructing compatible and robust schemata on which to build more complex understandings (Hess and Trexler, 2011). The survey explored the understanding of these aforementioned domains in relation to specific agricultural crops to serve as another method of assessment in order to gauge agricultural literacy in the United States.

This research was limited by the uncertainty of how many participants would respond to the solicitation of participating as a respondent in the survey. The most important solution to this problem was advertising the survey and its accessibility on a variety of electronic platforms. The second most important limitation was balancing the survey. A comprehensive battery of survey questions carefully balanced between those inquiring about agricultural crops versus those inquiring about demographics undoubtedly contributed to the assessment qualities of the survey, but it could not be too time consuming for the participant, and it was therefore limited to 30 survey questions.

Methodology of Research

Design and Instrumentation

This research study was based on a descriptive survey that was distributed to gather information on agricultural literacy, specifically by assessing the understanding of agriculture in terms of agricultural crop geography. It has been recommended that researchers continue to assess populations and programs while increasing the variety of populations and programs assessed. Researchers should also identify areas of deficiency in research related to agricultural literacy efforts and continue these efforts in the future (Kovar and Ball, 2013). This survey was an attempt to answer this call and will hopefully provide value as a different approach to assessing agricultural literacy. Aside from the aforementioned California Study (Hess and Trexler, 2011), there has been relatively little research with combining both agriculture and geography as a means to assess agricultural literacy rates.

The design of this survey was assembled from a composite of information from the United States Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS) which is based both on agricultural crop geography and agricultural crop statistics. It was informed by combining elements of both regional and state historical data pertaining to agricultural crops using the 2012 and 2007 *Census of Agriculture* (United Stated Department of Agriculture, 2014; United Stated Department of Agriculture, 2014; 2009), which informed the building of a set of questions that pertain to specific, highly productive agricultural areas of the United States. Additionally, a single question was carefully constructed to inquire the respondent about his or her knowledge of agricultural crops that are endemic (native) to the North American continent. This survey design ensures a variety of questions which incorporate well-defined, but different geographic elements—areas, regions, and states—with important agricultural crops in order to collect data which can assist in visualizing the true understanding of how well adults (from ages 18 to 42) know where agricultural crops are produced on a national level.

Careful consideration was given to which agricultural crops would be selected for this survey. At first, there were originally over 50 crops from which to select. The final selection is the result of analyzing the strength of the supporting data, especially after validation. Historical crop maps were utilized from USDA-NASS to ensure that all the crops being used for the survey were indeed produced in specific regions and states, regardless of how large or small their monetary value is from agricultural production. Thus, crops such as apples, cherries, and pears were added, as they are in fact from highly concentrated production areas, but may not be as valuable as other crops. Other supporting data were used as well. These other supporting data were used to ensure that the fiber and fuel components were added, and not only the food component. Thus, crops such as cotton and canola were added without regard to their financial contribution to the economy of the United States, but instead for the intrinsic value of their use.

The design for this cross-sectional survey was descriptive in nature, since the data collected can be statistically inferred on a population. It was specifically conducted on the electronic (Internet) platform *Qualtrics*, which is a reliable software program in a questionnaire format. Aside from some dichotomous responses provided by the participant about demographic information, all the questions were standardized. These predefined, multiple-choice and multiple-answer questions, from which the respondent must choose, were based on facts for both regional and state agricultural crop geography. The multiple-choice questions employed forced responses, while the multiple-answer questions employed validation, which varied depending on the number of answers suggested in the posed respective question. These close-ended questions provided anonymity and encouraged honest responses from the sample population (Biemer, 2010; Blom and Korbmacher, 2013; Groves and Lyberg, 2010).

Sampling Strategy and Targeted Sample Population

This research was aimed at adults (from ages 18 to 42; the middle to oldest of Generation X and the middle to youngest of generation Y, according to many sociological definitions) (Merriam-Webster, 2016a; Merriam-Webster, 2016b), and therefore included people who are currently in either their respective academic careers or who are active members of the labor force. To ensure that participants of the desired ages were sampled for data collection, branch logic, or conditional branching, was incorporated into the survey to eliminate undesired participants upon answering demographically based questions (Biemer, 2010; Groves and Lyberg, 2010).

The sampling strategy for the survey was a composite of both convenience and purposive sampling. The survey was dispersed among the sample population via electronic mail to individuals directly acquainted with the surveyor, including both personal and professional organizations, (e.g., agricultural organizations, former military units, former academic institutions, and civilian organizations of employment). While this is not completely accurate for external validity (Groves and Lyberg, 2010), the use of these particular relationships—especially their geographic facets—to reach these participants was anticipated to result in responses collected from several states (Millar and Dillman, 2011). Several current and former armed forces service members who are associated with the surveyor had already entertained this approach by agreeing to participate as a respondent in the survey, with the intent on communicating the amenable and companionable value of doing so, (i.e., incontestably "helping out a fellow soldier" simply for being a former soldier). While the overall value of this transcendental camaraderie is appreciated, its value here translated into the greater number of participating respondents hailing from all over the United States and beyond. The nature of this approach, especially involving current soldiers in the active component in the Unites States Army, elicited responses from participants who had been raised and educated from childhood to adulthood randomly throughout the United States, providing a varied sample population not specific to one centralized location, despite many participants actually *being* in one centralized location.

The survey was entirely anonymous and, therefore, strict confidentiality was both intentionally and inadvertently observed. Participants maintained their anonymity and only basic demographic data was collected. Participation in the survey was entirely voluntary in nature and a statement of consent was included in both the invitation and the survey.

Error in sampling was avoided using clear, concise instructions and proper semantics (Biemer, 2010). Additionally, the survey platform *Qualtrics* automatically calculated standard deviation and errors for each survey question. Moreover, the survey platform *Qualtrics* allows the surveyor to view the number of participants who respond completely and the amount of participants who begin to respond, but who otherwise become disinterested in completing the survey. Therefore, when incomplete responses are detected, answers were not used for comparative and final analysis to ensure the elimination of bias resulting from non-response error (Christian, Dillman, and Smyth, 2007; Groves and Lyberg, 2010).

Data Collection

The process of data collection commenced with the activation of the survey once it was properly programmed into the Internet-based program *Qualtrics* and after the validated survey questions were confirmed by an appropriate collaborator, a member of the student's graduate advisory committee (Groves and Lyberg, 2010). Once distributed after approved by the Institutional Review Board (IRB), the survey was shared via the Internet through electronic mail, disseminated to exactly 310 potential respondents. The electronic mail requests were generalized advertisements that were in keeping with standard IRB protocols. The survey was distributed for data collection in seven-day increments for a total of 21 days.

For the duration of three weeks, when the survey was active in *Qualtrics*, it was expected to achieve at least an approximate 10 percent response rate, and it was reasonable to assume that many more responses can be collected, especially considering the nature of the sample population, which was a sample of convenience. *Qualtrics* accurately displayed response rates and completion rates. Additionally, *Qualtrics* displayed when survey respondents initially began the survey from their end, whether it is either through a computer or a smartphone application (Vannette, 2015). After the 21-day IRB protocol, the survey was deactivated and data analysis commenced. Out of 310 potential respondents, a total of 190 participated.

The results of the survey were analyzed as descriptive statistics in order to assess the understanding of agricultural crop geography. After the responses were collected, the surveyor applied measurement to the responses—in this case the amount of correct and incorrect answers. The survey platform *Qualtrics* automatically prohibits the same IP (Internet Protocol) from accessing the survey after it has been completed, whether from a computer or from a smartphone. Therefore, each respondent could only participate once.

The survey platform *Qualtrics* allowed for cross-tabulation and tests of significance with one-way analysis of variance (ANOVA), Chi-Squire, and T-tests. While cross-tabulation and tests of significance were retroactively initiated with the collected data for further analysis, a basic scoring method was utilized (non-aggregate; for each individual survey question which applies) in order to describe the data.

Results and Discussion

The research question that guided this study was:

> *What is the knowledge level and understanding of where important agricultural crops are historically and statistically grown in the United States in American adults, ages 18 to 42?*

The objectives for this study were to gather information on the ability for participants to: *describe ten agricultural crops which are endemic (native) to the North American continent based on their centers of origin*; *describe five significant agricultural production areas within one or more states of the United States*; *describe the historically and statistically leading regions for the production of seven different agricultural crops in the United States*; *describe the historically and statistically leading states (in their entirety) for the production of eleven different agricultural crops in the United States*; and, *describe the basic physiographic differences of two states (in their interior) and how it limits the production of agricultural crops*.

The sample population used were American citizens ages 18 to 42. Out of a total of 310 potential participants, 190 respondents participated, with a 61.3% response rate. It was found that the mean response rate for all correct answers was 52.7% for all individual answers, including multiple-option questions in the survey. Within the survey, this scoring scheme applies to all results, including the 'Regions' section, where it can be thought of as either an individual score per answer or as an average of all the answers for a given question, but they are conveyed in these summary results as an average. The median was 51.3%, while the mode was 38.9%.

Analysis and Synopsis

Native versus Non-Native Agricultural Crops: ***Identify ten agricultural crops which are endemic (native) to the North American continent based on their centers of origin.***

For native versus non-native agricultural crops, respondents averaged 58.3% for the correct answers. Three crops, blueberries, common or wild strawberries, and sunflowers, received selection rates higher than 70%, and two crops, black or wild raspberries and cucurbits, received selection rates higher than 60%. Despite the accurate selection for many options, many respondents, including some of the same ones who had answered correctly for other crops, selected the inaccurate options. It was found that many respondents chose some of the world's oldest domesticated crops, such as apples, corn, oats, pears, potatoes, rice, and wheat, (many that were domesticated thousands of years ago in Central Asia or the Middle East), for their answers for crops thought to be native to North America.

Figure 1: Native versus Non-Native Agricultural Crops

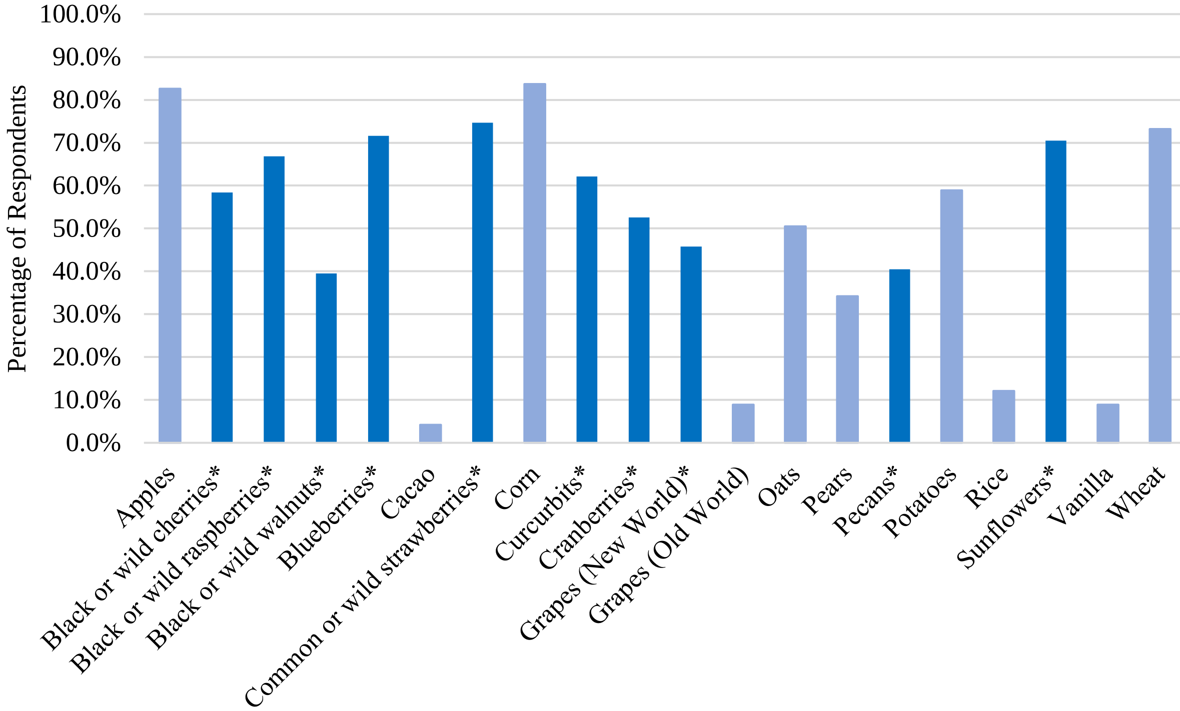

Figure 1: *Results for native versus non-native agricultural crops. Correct answers are marked by an asterisk*.*

Significant Agricultural Crop Production Areas: ***Identify five significant agricultural production areas within one or more states of the United States.***

The questions for the significant agricultural crop production areas were placed in order from what presumably would be the most well-known to the least-known agricultural crop production areas, and the results suggested that this order was correct. However, it is unknown if this order influenced the results. These highly-productive agricultural areas are often fertile valleys and are economically vital to the nation’s total agricultural output, however, some are more well-known than others. Some respondents knew the geographic location of some significant agricultural crop production areas and some respondents did not.

Figure 2: Significant Agricultural Crop Production Areas

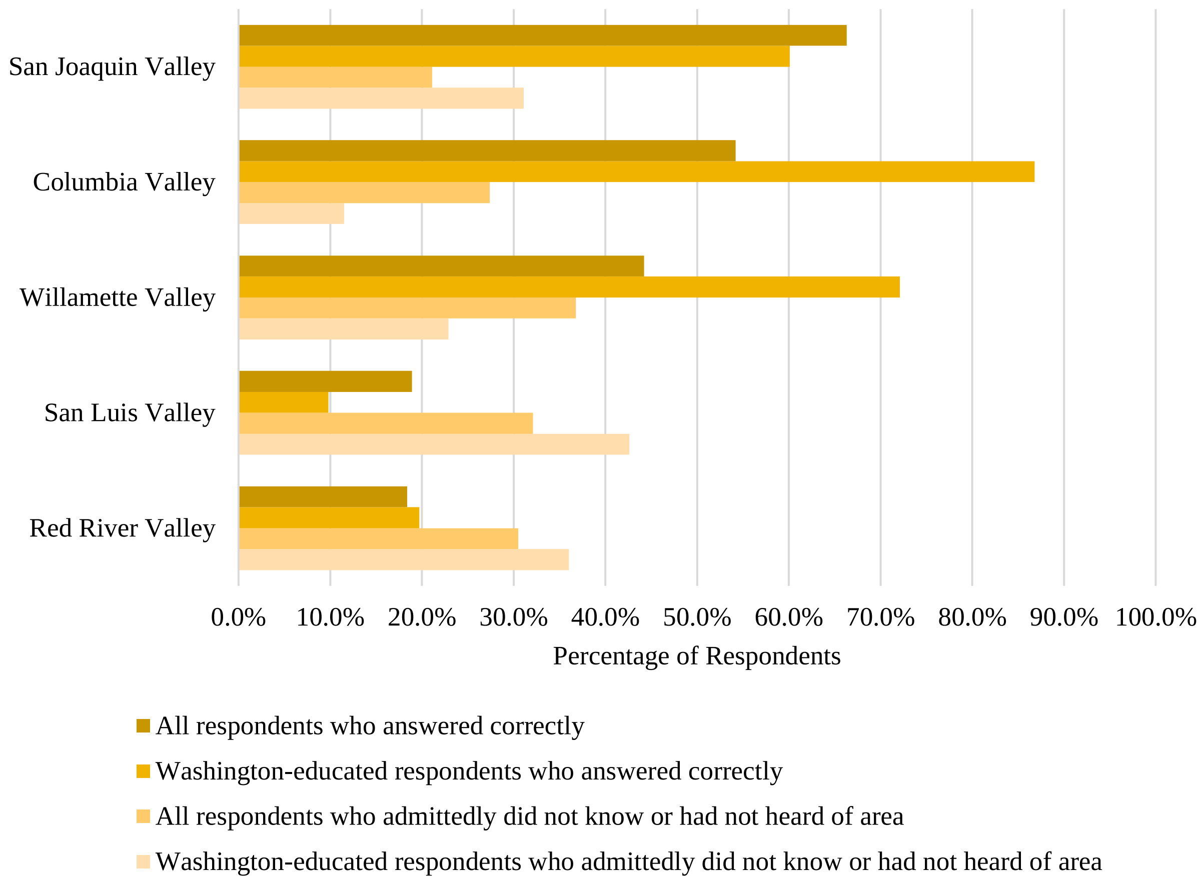

Figure 2: *Results for significant agricultural crop production areas.*

For both the San Joaquin and Columbia valleys, 69.5% and 54.2% of respondents answered these questions correctly with California and with Washington and Oregon, respectively. More respondents who claimed Washington as the state where they either received all or most of their secondary knew the latter more than other respondents. It was after the San Joaquin and Columbia Valleys that there was a noticeable decline in knowledge of significant agricultural crop production areas beginning with the Willamette Valley, where 44.2% of respondents answered this question correctly with Oregon. Additionally, 36.8% of respondents admittedly did not know where the Willamette Valley is located or had never heard of it.

The results indicated that the Willamette Valley is not as well-known as the two aforementioned areas; even 14 out of 61 total respondents who claimed Washington as the state where they either received all or most of their secondary education admittedly did not know where the Willamette Valley is located or had never heard of it. However, they knew more than other respondents. For both the San Luis and Red River valleys, only 18.9% and 18.4% of respondents answered this question correctly with Colorado and with Minnesota and North Dakota, respectively. Additionally, 32.1% of respondents admittedly did not know where the San Luis Valley is located or had never heard of it, while 30.5% of respondents admittedly did not know where the Red River Valley is located or had never heard of it.

Regions: ***Identify the historically and statistically leading regions for the production of seven different agricultural crops in the United States.***

The questions for regions were based on where specific agricultural crops are produced by region, as opposed to by state. Each of these questions were accompanied by a specially-illustrated and specifically-labelled map of the conterminous United States (see Appendix C). For all the questions in this section, respondents were forced to select the minimum amount of answers that were required prior to moving on to the following section of the survey. However, for some questions, they could select an additional answer that was relevant to that question.

Figure 3: Map of the United States for Regions

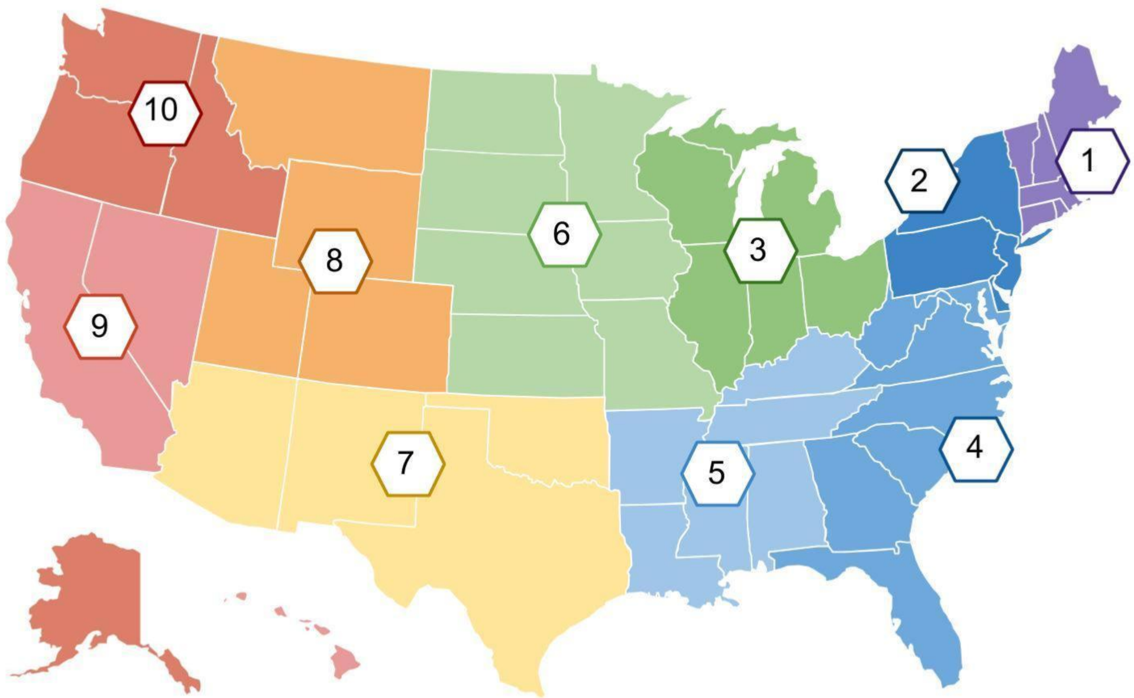

Figure 3: *Map of the United States displaying regions for survey participants to select*.

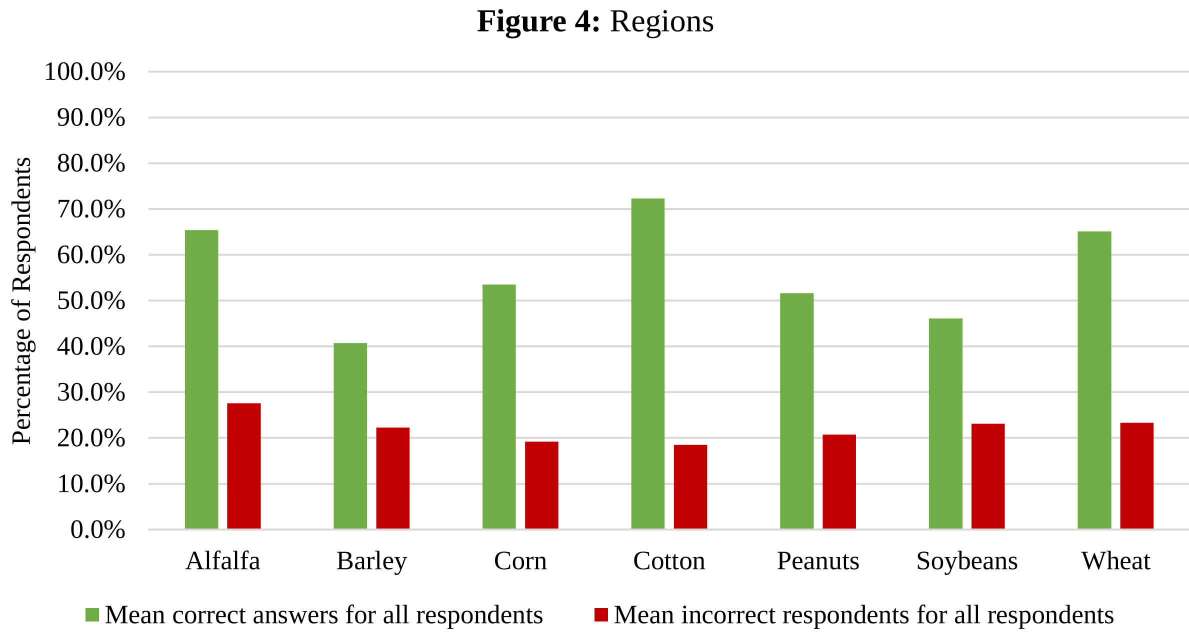

Figure 4: *Result for regions.*

For alfalfa and barley, respondents averaged 65.4% and 40.7% for the correct answers, respectively. Many respondents who claimed many different states as the ones where they either received all or most of their secondary education contributed to these results. While it was the intention to use agricultural crops that are often used for direct human or processed for direct human consumption in the survey, both alfalfa and barley are two agronomically important crops. Alfalfa is a forage crop used for grazing, hay, and silage, thereby feeding hundreds of millions of animals in the agricultural industry.

For corn and soybeans, respondents averaged 53.5% and 46.1% for the correct answers, respectively. Region 5, while selected as an option by many respondents, did not receive as high of a selection rate as the other two correct options, Regions 3 and 6. This suggests that many people do not know that corn and soybeans are grown in the South. Another interesting find, found through cross-tabulation, was that respondents appear to associate corn more with the Great Plains region of the Midwest and not as much with the Great Lakes region.

For cotton (including all varieties) and peanuts (for all purposes), respondents averaged 72.3% and 51.6% for the correct answers, respectively. Additionally, for cotton, Region 5 itself received a selection score of 95.3% and thus 181 out of 190 total respondents fared very favorably with this answer option alone. Many respondents appeared to know that Texas and New Mexico also produce significant amounts of both cotton and peanuts. However, only exactly one-half (50.0%) of respondents who claimed California as the state where they either received all or most of their secondary education, did not know that cotton was grown in their region, Region 9.

For wheat, respondents averaged 65.1% for the correct answers. It was also found that one-half (55.7%) of respondents who claimed Washington as the state where they either received all or most of their secondary education did not select Region 10, and considering the sample population, this may suggest that many people did not know that the Pacific Northwest is a significant production region of wheat. These results are also consistent with people not knowing that barley is produced in this region, which indicates that people do not know that the Pacific Northwest is a significant region in the production of grains.

States (Entirety): ***Identify the historically and statistically leading states (in their entirety) for the production of eleven different agricultural crops in the United States.***

The questions for states (entirety) were based on where specific agricultural crops are produced by state, as opposed to by region. Furthermore, the word 'entirety' is used to denote that the entire states themselves are the focus, as opposed to a part of the state, or interior. Each of these questions was accompanied by a regularly-labelled map of United States (see Appendix C). Some of the answers in this section were comprised of only one state while others were comprised of more than one; there were no more than five states per answer. For all questions in this section, respondents were forced to select the one answer that was required to move to the following section of the survey, however, for some questions, they could select an additional answer that was relevant to that question.

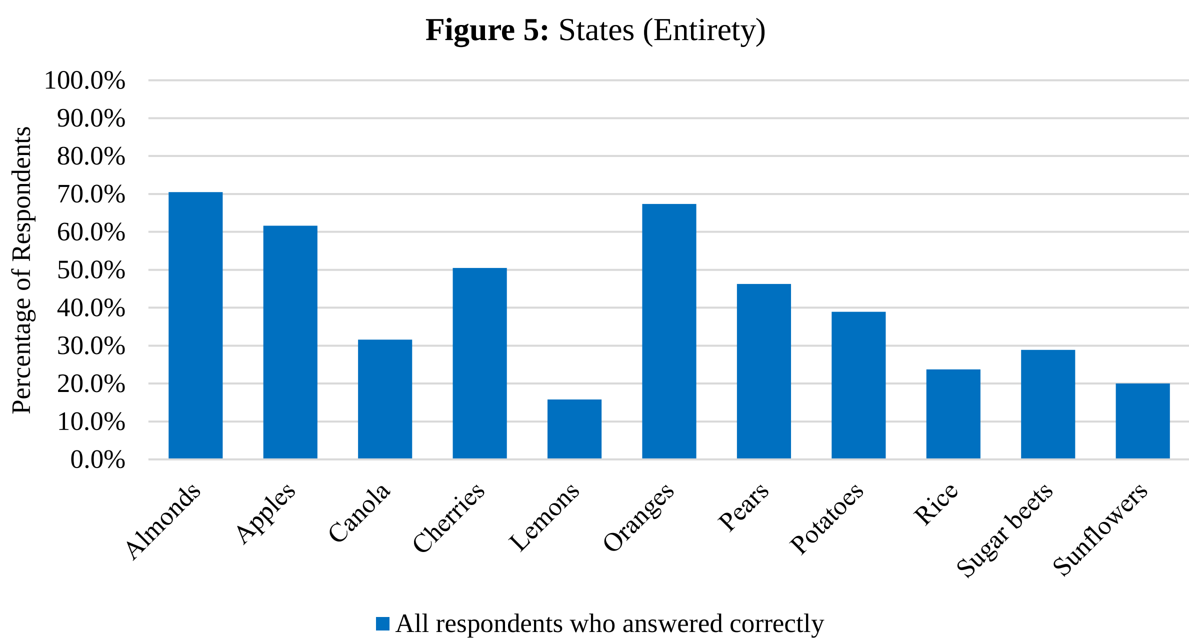

Figure 5: *Results for states in their entirety.*

For the pome and stone fruits on the survey, (almonds, apples, cherries, and pears), selection rates for the correct answers varied considerably; some of these crops have single primary state of production, while others have several. For almonds, 70.5% of respondents selected the correct answer, California. However, out of the 14 respondents who claimed California as the state where they either received all or most of their secondary education, 35.7% of them answered this question incorrectly. For apples, 61.6% of respondents selected correct answer, Washington, New York, Michigan, and Pennsylvania. For cherries (including sweet and tart varieties) and pears, 50.5% and 46.3% of respondents selected the correct answers, respectively.

For canola (for oil), 31.6% of respondents selected the correct answer, North Dakota, and for sugar beets (for sugar), 28.9% of respondents selected the correct answer, Minnesota, North Dakota, Idaho, and Michigan. Additionally, as some questions in the survey were presented with an additional answer that was relevant to that question, (allowing for the respondent to admit that he or she may not know what the respective agricultural crop was), it was found that while most people knew what canola is, 16.8% of respondents admittedly did not know what sugar beets (for sugar) are.

For lemons, only 15.8% of respondents selected the correct answer, California and Arizona. Furthermore, 84.2% of respondents thought that lemons are grown in Florida, when California and Arizona are almost the sole producing states. It is interesting to note that while 60.0% of respondents who claimed Arizona as the state where they either received all or most of their secondary education knew Arizona was a top producer of lemons, one-half (55.5%) of respondents who claimed Florida as the state where they either received all or most of their secondary education thought that Florida produced a significant number of lemons. For oranges, 67.4% of respondents selected the correct answer, Florida, California, and Arizona.

For potatoes (excluding sweet varieties), it was found that one-half (55.7%) of respondents who claimed Washington as the state where they either received all or most of their secondary education did not know that Washington was the nation's top producer of potatoes, only second to Idaho, although they fared better than other respondents, proportionally. For rice, 23.7% of respondents selected the correct answer, Arkansas, California, and Louisiana. Moreover, 16.8% of respondents admittedly did not know that rice is produced in the United States. Finally, for sunflowers (for both oil and seed), 20.0% of respondents selected the correct answer, North Dakota and South Dakota.

States (Interior): ***Identify the basic physiographic differences two states (in their interior) and how it limits the production of agricultural crops.***

The one question for states (interior) was based on where specific agricultural crops are produced within state, as opposed to individual states. Furthermore, the word 'interior' is used to denote that the entire states themselves are the focus, as opposed to the whole of the state, or entirety, thereby encouraging the respondent to focus on the regional, or interior, differences within the state, particularly what physical features may influence where their important agricultural crops can be produced. There were no maps accompanying the question in this section, and only two states and two of their important agricultural crops were listed, Arkansas and Colorado and rice and wheat, respectively. These states were chosen for the dichotomous physiographic characteristics of their interiors, which undoubtedly affect the ability and capacity to produce crops within different geographic areas inside their state boundaries. The correct answer was "In Arkansas, rice is produced in the lower, easternmost areas, near to or at the Mississippi River; in Colorado, wheat is produced in the lower, easternmost areas, away from the Rocky Mountains," with 46.3% of respondents selecting this correct option.

Implications, Recommendations, and Conclusion

Based on the results from the study, it appears that the knowledge and understanding of where important agricultural crops are historically and statistically grown in the United States is significantly low. The data gathered indicate that there are variabilities in both the knowledge and understanding, depending on both the agricultural commodities and geographic locations, and thus there are both high results and low results. Overall, however, the knowledge and understanding of agricultural geography in America needs improvement.

Population and Sample

As this study used a sample of convenience based on the main author, the demographic data were consistent with the attributes of the targeted sample population found within the research's data collection methodology, which was a significantly large number of enlisted military personnel, and therefore was predominantly male. Although many military service members responded, a more inclusive sample population is suggested for future research as civilians were more adept to respond, probably due to access to both more personal time and technology. This would also enable researchers to gather data that is more representative of the entire national population.

Forty-four states and one territory were represented in the sample in the United States, but 32.1% were residents of Washington and where they received all or most their secondary education. This is also unboundedly an indication that this was a convenience sample, as Washington is the main author's home state. Although a significant number of respondents hailed from one state, the associated data collected underlines the possible importance of future research in individual states. This may warrant state-based agricultural literacy studies if researchers use agricultural geography as a means of assessment.

The results for this study indicated that exactly one-tenth of all participants belonged to an agricultural school organization during their secondary education. This is consistent with the general population, as most high school students forego these agricultural school organizations and either participate in other curricular activities, or none (Malecki, Israel, and Toro, 2004). There were no significant differences between these two types of populations in the study, but much larger sample would be needed to extrapolate any information for the disparity in agricultural literacy rates based on agricultural crop geography.

In a previous study by Kovar and Ball (2013), they recommended that researchers continue to assess populations and programs while increasing the variety of populations and programs assessed. Additionally, a larger survey that included more demographics may be warranted in an assessment of agricultural geography, as people of all ages and ethnic groups have a conferred interest in agriculture to become more agricultural literate citizens of the United States and the world (Frick, Birkenholz, Gardner, and Machtmes, 1995; Powell, Agnew, and Trexler, 2008).

Perception, Culture, and Symbolism

There is a perception that the United States is the world's "bread basket," due to the substantial amount of agricultural production, and this perception could have been the reason why there was such a high response rate for many selections in the 'Native versus Non-Native Agricultural Crops' section. The United States is one of the world's largest exporters of agricultural commodities, but these exports are only one-third of its total agricultural production (Norton, Alwang, and Masters, 2015), mostly grains. Realistically, the United States imports many of the crops that respondents thought were native to North America mostly out of necessity, either due to demand or seasonal limitations.

In future studies, it may be advisable to include more crops limited to more specific areas, and therefore more states should be included over regions, especially if there is a concern for brevity in the research instrument. High-value horticultural, or permanent crops, may be more reliable than low-value agricultural, or row crops. In other words, crops such as avocadoes and pistachios could be used not only because of their higher visibility with consumers due to marketing, but because the correct answers would be limited to probably no more than three states, eliminating confusion and increasing reliability.

Perhaps it is not surprising that many respondents answered the survey question for almonds correctly, since California is almost the world's sole producer of almonds (United States Department of Agriculture, 2014; 2009). In recent years there has been new marketing on the health and nutritional benefits of almonds (Almond Board of California, 2016). In future studies, it may be interesting to discern if people are not only aware of the crops that are more visible in the marketplace, but also if they are more visible because of marketing.

While there were no respondents who claimed Hawai'i, Guam, or American Samoa as the states or territories for where they either received all or most of their secondary education, 38.6% of respondents selected these incorrect answers. This suggests that respondents associate rice with warm, tropical locations with traditionally Micronesian and Polynesian cultures. It is also possible that some significant agricultural production areas were confusing because many areas which incorporate Spanish names of origin, are undeniably omnipresent in many states. In future studies, it would be reasonable and highly encouraged to see any correspondence between agricultural geography and cultural factors.

Using cross-tabulation, it was found that all individual respondents who claimed the states which are in Region 3 as the ones where they either received all or most of their secondary education selected Region 3 for their answer for where they thought corn was produced, whereas other respondents selected other answers, mostly Region 6. This may suggest that states such as Nebraska are symbolic of corn and therefore synonymous with corn, even though Illinois has historically and statistically produced more corn for decades. Once again, more research will need to be conducted to ascertain how, when, and where people are provided this information and under what abstractions and concepts they are retaining it.

Academic Implications and Recommendations

The secondary aims of this study were to be a new approach in the exploration and development of methods which assess agricultural literacy, to identify the need for strengthening academic curricula which are concerned with agriculture, and, to underscore the necessity to address the current rates of agricultural literacy nationally, especially with a consumer-based society which aspires to improve its ethics when it comes to all aspects and concerns of its food systems.

Agricultural geography has within an incredible amount of information which can be used to build academic curricula, however, the challenge is to identify basic approaches to the understanding of these varied data, and to identify pedagogical techniques to present them from a more geographical perspective. Agricultural literacy can be best achieved through curriculum infusion in primary and secondary education. Curriculum infusion is the purposeful integration of agricultural subjects and topics into the mandated curriculum in public schools. Thus, formal education, beginning in elementary and through high school, is the logical approach by which to assist people develop an understanding of their agricultural food system; where food is produced and why it is produced there (King, 2007; Hess and Trexler, 2011; Malecki, Israel, and Toro, 2004). Agricultural geography can include the study of both animal-based and crop-based spatial phenomena, the patterns of land tenure and use associated with the many types of agriculture, and both the human (social sciences) and natural (physical sciences) factors that interrelate with crops and animals, including production and distribution. Since agriculture draws from so many subdisciplines and it is an applied study, it becomes necessary to draw from these several subdisciplines for lesson coherence.

According to Spielmaker and Leising (2013), there are five main academic benchmarks related to agricultural literacy. In their National Agricultural Literacy Outcomes, they provide five themes which academic administrators and instructors can use to build agricultural curricula. These themes, in order, are: ‘Agriculture and the Environment’, ‘Plant and Animals for Food, Fiber, and Energy’, ‘Food, Health, and Lifestyle’, ‘Science, Technology, Engineering, and Mathematics’, and, ‘Culture, Society, Economy and Geography’. Out of these five themes, three of them are influenced by geography, which are ‘Agriculture and the Environment’, ‘Plant and Animals for Food, Fiber, and Energy’, and ‘Culture, Society, Economy and Geography’. These themes describe how agriculture has transformed natural ecosystems to meet societal needs, and how it is important to understand the areas, components, and processes within agricultural activities, including the dependence and interactions of living organisms and their environments. They describe how geographic location affects climate, and how this determines what plants will grow where and, historically, what humans and animals will generally eat, as well as what materials will be available for building shelter, for making clothing, and for providing fuel. Additionally, they describe how these agricultural commodities are transported thousands of miles from where they were produced to where they are consumed.

Conclusion

It is both apparent and clear that agricultural geography can be used as a practical tool for the continuous assessment of agricultural literacy, especially here in the United States where a wide variety of historical and statistical agricultural crop data can be used in developing these assessments, because agricultural crop geography has largely stabilized since the 1950s (Hart, 2001; Liang and Gong, 2015; Ramankutty and Foley, 1999).

The agricultural frontier is constantly advancing, and, in more recent times, agricultural production practices have been intensified. This presents economic and environmental challenges as the augmentation of food, fiber, and fuel production are necessary to sustain a growing world population (Benayas, Martins, Nicolau, and Schulz, 2007). Thus, an agriculturally literate society is needed for the continued success of the agricultural industry (Kovar and Ball, 2013; Hess and Trexler, 2011). Knowing and understanding where some of the most important agricultural resources are produced is undoubtedly on of the first steps to improve and revitalize agricultural literacy, especially right here in America.

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Appendices

Appendix A: Survey Questions

*Correct answers are **emboldened**.*

Native versus Non-Native Agricultural Crops

The one following question will ask which agricultural crops come from North America. All plants, and therefore many domesticated agricultural crops, have centers of origin, or places from where they originally evolved. Thus, some plants may be native to some areas, while non-native, (or even invasive), in other areas.

Question 1. Which **ten (10)** agricultural crops are **<u>naturally</u>** native to North America? Please select all which you believe most apply. Note: North America, for this survey, is considered and defined as only the present-day nations of Canada and the United States, and, therefore, excludes present-day Mexico.

- ❑ Apples
- ❑ **Black or wild cherries**
- ❑ **Black or wild raspberries**
- ❑ **Black or wild walnuts**
- ❑ **Blueberries**
- ❑ Cacao
- ❑ **Common or wild strawberries**
- ❑ Corn
- ❑ **Cucurbits (such as pumpkins, squash, and zucchini)**
- ❑ **Cranberries**
- ❑ **Grapes (such as Muscadine, Scuppernong, and other "New World" grapes)**
- ❑ Grapes (such as Aragónez, Cabernet Franc, Gewürztraminer, and other "Old World" grapes)
- ❑ Oats
- ❑ Pears
- ❑ **Pecans**
- ❑ Potatoes
- ❑ Rice
- ❑ **Sunflowers**
- ❑ Vanilla
- ❑ Wheat

Validation was employed. The respondent was forced to select at least ten and no more than ten answers in order to commence with the survey.

Significant Agricultural Crop Production Areas

The following questions will ask where some important agricultural production areas occur in the United States. There exist many highly productive agricultural areas, which are of great significance to the economy of the United States. One of the most common types of these areas occur in natural valleys with deep, rich soil. Overtime, these areas have become famous are, not surprisingly, synonymous with agriculture.

Question 2. In which **one (1)** state is the **San Joaquin Valley** located? Please select the one state which you believe most applies.

- ❍ **California**
- ❍ Arizona
- ❍ New Mexico
- ❍ Texas
- ❍ I do not know, or, I have never before heard of the San Joaquin Valley

Question 3. In which **two (2)** states is the **Columbia Valley** primarily located? Please select the two states which you believe most apply.

- ❍ California and Oregon
- ❍ **Washington and Oregon**
- ❍ Virginia and Maryland
- ❍ Maryland and Pennsylvania
- ❍ I do not know, or, I have never before heard of the Columbia Valley

Question 4. In which **one (1)** state is the **Willamette Valley** located? Please select the one state which you believe most applies.

- ❍ California
- ❍ Pennsylvania
- ❍ **Oregon**
- ❍ Utah
- ❍ I do not know, or, I have never before heard of the Willamette Valley

Question 5. In which **one (1)** state is the **San Luis Valley** located? Please select the one state which you believe most applies.

- ❍ California
- ❍ Washington
- ❍ Texas
- ❍ **Colorado**
- ❍ I do not know, or, I have never before heard of the San Luis Valley

Question 6. Between which **two (2)** states is the **Red River Valley** primarily located? Please select the two states which you believe most apply.

- ❍ **Minnesota and North Dakota**
- ❍ Colorado and Utah
- ❍ Montana and Wyoming

- ❍ Nevada and Utah
- ❍ I do not know, or, I have never before heard of the Red River Valley

Regions

The following questions will ask where some important agricultural crops are produced according to their greatest amount of production by states. These crops may be produced in many areas, but have historically and statistically been produced in specific regions due to factors of climate (prevailing atmospheric conditions and soil type) and economics. Please reference the map of the United States provided. If you cannot decide which answer to select for any given question, then please select the one that you believe is the best answer.

Please note that when the word "historically" is used, it pertains to a time spanning from at least 50 to 100 years. Please consider that historical crops, such as cotton, may have originally been planted in places of importance which are often mentioned in regular history books, but may have been produced in other places within the last 50 to 100 years. Thus, these places may or may not match the answers to the questions in the survey.

Question 7. Which **five (5)** regions historically and statistically produce the most amount of **alfalfa (for hay)** in the United States? Using the corresponding numbers, please select the five regions which you believe most apply using the map of the United States. Note: You may select any option below, thereby answering the original question, or you may select the accessory selection below if you are uncertain about what alfalfa is.

- ❑ Region 1
- ❑ Region 2
- ❑ **Region 3**
- ❑ Region 4
- ❑ Region 5
- ❑ **Region 6**
- ❑ **Region 7**
- ❑ **Region 8**
- ❑ Region 9
- ❑ **Region 10**
- ❑ What is alfalfa?

Validation was employed. The respondent was forced to select at least one and no more than six answers in order to commence with the survey.

Question 8. Which **three (3)** regions both historically and statistically produce the most amount of **barley** in the United States? Using the corresponding numbers, please select the three regions which you believe most apply using the map of the United States. Note: You may select any option below, thereby answering the original question, or you may select the accessory selection below if you are uncertain about what barley is.

- ❑ Region 1

- ❑ Region 2
- ❑ Region 3
- ❑ Region 4
- ❑ Region 5
- ❑ **Region 6**
- ❑ Region 7
- ❑ **Region 8**
- ❑ Region 9
- ❑ **Region 10**
- ❑ What is barley?

Validation was employed. The respondent was forced to select at least one and no more than four answers in order to commence with the survey.

Question 9. Which **three (3)** regions both historically and statistically produce the most amount of **corn (for both grain and seed)** in the United States? Using the corresponding numbers, please select the three regions which you believe most apply using the map of the United States. Note: You may select any option below, thereby answering the original question, or you may select the accessory selection below if you are uncertain about how corn is used for both grain and seed.

- ❑ Region 1
- ❑ Region 2
- ❑ **Region 3**
- ❑ Region 4
- ❑ **Region 5**
- ❑ **Region 6**
- ❑ Region 7
- ❑ Region 8
- ❑ Region 9
- ❑ Region 10
- ❑ What it meant by for "both grain and seed"?

Validation was employed. The respondent was forced to select at least one and no more than four answers in order to commence with the survey.

Question 10. Which **four (4)** regions both historically and statistically produce the most amount of **cotton (including all varieties)** in the United States? Using the corresponding numbers, please select the four regions which you believe most apply using the map of the United States.

- ❑ Region 1
- ❑ Region 2
- ❑ Region 3
- ❑ **Region 4**
- ❑ **Region 5**
- ❑ Region 6

- ❑ **Region 7**
- ❑ Region 8
- ❑ **Region 9**
- ❑ Region 10

Validation was employed. The respondent was forced to select at least four (4) and no more than four answers in order to commence with the survey.

Question 11. Which **three (3)** regions both historically and statistically produce the most number of **<u>peanuts (for all purposes)</u>** in the United States? Using the corresponding numbers, please select the three regions which you believe most apply using the map of the United States.

- ❑ Region 1
- ❑ Region 2
- ❑ Region 3
- ❑ **Region 4**
- ❑ **Region 5**
- ❑ Region 6
- ❑ **Region 7**
- ❑ Region 8
- ❑ Region 9
- ❑ Region 10

Validation was employed. The respondent was forced to select at least three and no more than three answers in order to commence with the survey.

Question 12. Which **three (3)** regions both historically and statistically produce the most number of **<u>soybeans</u>** in the United States? Using the corresponding numbers, please select the three regions which you believe most apply using the map of the United States.

- ❑ Region 1
- ❑ Region 2
- ❑ **Region 3**
- ❑ Region 4
- ❑ **Region 5**
- ❑ **Region 6**
- ❑ Region 7
- ❑ Region 8
- ❑ Region 9
- ❑ Region 10

Validation was employed. The respondent was forced to select at least three and no more than three answers in order to commence with the survey.

Question 13. Which **four (4)** regions both historically and statistically produce the most amount of **<u>wheat</u>** in the United States? Using the corresponding numbers, please select the four regions which you believe most apply using the map of the United States.

- ❑ Region 1
- ❑ Region 2
- ❑ Region 3
- ❑ Region 4
- ❑ Region 5
- ❑ **Region 6**
- ❑ **Region 7**
- ❑ **Region 8**
- ❑ Region 9
- ❑ **Region 10**

Validation was employed. The respondent was forced to select at least four and no more than four answers in order to commence with the survey.

States (Entirety)

The following questions will ask where some important agricultural crops are produced according to their greatest amount of production by states in their entirety. These crops may be produced in many areas, but have historically and statistically been produced in specific regions due to factors of climate (prevailing atmospheric conditions and soil type) and economics. Please reference the map of the United States provided. If you cannot decide which answer to select for any given question, then please select the one that you believe is the best answer.

Please note that when the word "historically" is used, it pertains to a time spanning from at least 50 to 100 years. Please consider that historical crops, such as cotton, may have originally been planted in places of importance which are often mentioned in regular history books, but may have been produced in other places within the last 50 to 100 years. Thus, these places may or may not match the answers to the questions in the survey.

Question 14. Which **one (1)** state both historically and statistically produces the most number of **<u>almonds</u>** in the United States? Please select the one state which you believe most applies using the map of the United States.

- ❍ **California (CA)**
- ❍ Arizona (AZ)
- ❍ Washington (WA)
- ❍ Oregon (OR)

Question 15. Which **four (4)** states both historically and statistically produce the most number of **<u>apples</u>** in the United States? Please select the four states which you believe most apply using the map of the United States.

- Pennsylvania (PA), Oregon (OR), Idaho (ID), and California (CA)
- **Washington (WA), New York (NY), Michigan (MI), and Pennsylvania (PA)**
- Idaho (ID), Oregon (OR), Utah (UT), and California (CA)
- Washington (WA), New York (NY), Michigan (MI), and Missouri (MO)

Question 16. Which **one (1)** state both historically and statistically produces the most amount of **canola (for oil)** in the United States? Please select the one state which you believe most applies using the map of the United States.

- Kansas (KS)
- Alaska (AK)
- **North Dakota (ND)**
- Indiana (IN)
- What is canola?

Question 17. Which **five (5)** states both historically and statistically produce the most number of **cherries (including both sweet and tart varieties)** in the United States? Please select either the state or the set of states which you believe most applies using the map of the United States.

- Washington (WA), Montana (MT), Michigan (MI), New York (NY), and Ohio (OH)
- California (CA), Oregon (OR), Michigan (MI), Ohio (OH), and Pennsylvania (PA)
- Ohio (OH), Pennsylvania (PA), Utah (UT), Virginia (VA), and Maryland (MD)
- **Washington (WA), California (CA), Oregon (OR), Michigan (MI), and Utah (UT)**

Question 18. Which **two (2)** states both historically and statistically produce the most number of **lemons** in the United States? Please select the two states which you believe most apply using the map of the United States.

- **California (CA) and Arizona (AZ)**
- California (CA) and Florida (FL)
- Florida (FL) and Nevada (NV)
- Arizona (AZ) and Florida (FL)

Question 19. Which **three (3)** states both historically and statistically produce the most number of **oranges** in the United States? Please select the three states which you believe most apply using the map of the United States.

- California (CA), Arizona (AZ), and Nevada (NV)
- **Florida (FL), California (CA), and Arizona (AZ)**
- Arizona (AZ), Florida (FL), and Georgia (GA)
- Georgia (GA), South Carolina (SC), and North Carolina (NC)

Question 20. Which **three (3)** states both historically and statistically produce the most number of **pears** in the United States? Please select the three states which you believe most apply using the map of the United States.

- ❍ Washington (WA), California (CA), and Utah (UT)
- ❍ Ohio (OH), Oregon (OR), and Pennsylvania (PA)
- ❍ **Washington (WA), California (CA), and Oregon (OR)**
- ❍ North Carolina (NC), Georgia (GA), and Michigan (MI)

Question 21. Which **two (2)** states both historically and statistically produce the most number of **potatoes (excluding sweet varieties)** in the United States? Please select the two states which you believe most apply using the map of the United States.

- ❍ Idaho (ID) and Iowa (IA)
- ❍ Montana (MT) and Washington (WA)
- ❍ Oregon (OR) and Texas (TX)
- ❍ **Idaho (ID) and Washington (WA)**

Question 22. Which **three (3)** states or territories both historically and statistically produce the most amount of **rice** in the United States? Please select the three states which you believe most apply using the map of the United States.

- ❍ **Arkansas (AR), California (CA), and Louisiana (LA)**
- ❍ Virginia (VA), North Carolina (NC), and South Carolina (SC)
- ❍ Hawai'i (HI), Guam (GU), and American Samoa (AS)
- ❍ Nebraska (NE), Kansas (KS), and Oklahoma (OK)
- ❍ I did not know that rice is produced in the United States

Question 23. Which **four (4)** states both historically and statistically produce the most amount of **sugar beets (for sugar)** in the United States? Please select the four states which you believe most apply using the map of the United States.

- ❍ Minnesota (MN), North Dakota (ND), Michigan (MI), and Ohio (OH)
- ❍ **Minnesota (MN), North Dakota (ND), Idaho (ID), and Michigan (MI)**
- ❍ North Dakota (ND), South Dakota (SD), Michigan (MI), and Ohio (OH)
- ❍ Idaho (ID), Washington (WA), Oregon (OR), and Michigan (MI)
- ❍ What are sugar beets?

Question 24. Which **two (2)** states both historically and statistically produce the most number of **sunflowers (for both oil and seed)** in the United States? Please select the two states which you believe most apply using the map of the United States.

- ❍ North Dakota (ND) and Kansas (KS)
- ❍ Kansas (KS) and Oklahoma (OK)
- ❍ **North Dakota (ND) and South Dakota (SD)**
- ❍ Colorado (CO) and Oklahoma (OK)

States (Interior)

The following single question will ask where two important agricultural crops are produced according to their greatest amount of production by states in their interior. This is based upon their biological limitations and needs as well as the physical limitations of the states in which they are produced due to the factor of climate (prevailing atmospheric conditions and soil type). If you cannot decide which answer to select for the question, then please select the one that you believe is the best answer.

Question 25. Within the states of Arkansas and Colorado, where is all or the greater amount of **rice and wheat** produced, respectively?

- ❍ In Arkansas, rice is produced in the higher, westernmost areas, away from the Mississippi River; in Colorado, wheat is produced in the lower, easternmost areas, away from the Rocky Mountains
- ❍ In Arkansas, rice is produced in the lower, easternmost areas, near to or at the Mississippi River; in Colorado, wheat is produced in the higher, westernmost areas, near to or in the Rocky Mountains
- ❍ In Arkansas, rice is produced in the higher, westernmost areas, away from the Mississippi River; in Colorado, wheat is produced in the higher, westernmost areas, near to or in the Rocky Mountains
- ❍ **In Arkansas, rice is produced in the lower, easternmost areas, near to or at the Mississippi River; in Colorado, wheat is produced in the lower, easternmost areas, away from the Rocky Mountains**

Conclusion and Demographics

The following questions will ask for demographic information. Please answer each question carefully and correctly to ensure accuracy.

Question 26. Which is your age category?

- ❍ Anywhere from 18 to 22 years of age
- ❍ Anywhere from 23 to 27 years of age
- ❍ Anywhere from 28 to 32 years of age
- ❍ Anywhere from 33 to 37 years of age
- ❍ Anywhere from 38 to 42 years of age
- ❍ Anywhere from 43 years of age or older

Conditional branching was employed. If the respondent answered the question with, "Anywhere from 18 to 22 years of age", "Anywhere from 23 to 27 years of age", "Anywhere from 28 to 32 years of age", "Anywhere from 33 to 37 years of age", or "Anywhere from 38 to 42 years of age", then the program automatically sequenced to Question 26. If the respondent answered the question with either, "Anywhere from 33 years of age or older", then the program automatically sequenced to the end of the survey.

Question 27. Do you identify yourself as female or male?

- Female
- Male

Question 28. What is your highest level of education? Please select only the highest level which you have currently attained, even if you are working towards your next degree.

- I am currently still attending high school
- I do not hold a high school degree nor an equivalent (General Educational Development [GED])
- I hold either a high school degree or an equivalent (General Educational Development [GED])
- I hold a vocational degree or certificate
- I hold an associate’s degree
- I hold a bachelor’s degree
- I hold a master’s degree
- I hold a doctorate’s degree or another type of terminal degree

Question 29. While attending high school, do you or did you participate in any one or more agricultural school organizations, such as the FFA, the 4-H, or any other type of agricultural school organizations?

- Yes, I do participate or did participate in one or more agricultural school organizations
- No, I do not participate or did not participate in any agricultural school organizations

Question 30. While attending high school, in what state or territory do you or did you live? If you have lived in different places, please select the state or territory where you attended or have so far attended the most of your high school education. If you cannot decide, then please select the one where you believe in which you learned the most.

- Alabama (AL)
- Alaska (AK)
- Arizona (AZ)
- Arkansas (AR)
- California (CA)
- Colorado (CO)
- Connecticut (CT)
- Delaware (DE)
- Florida (FL)
- Georgia (GA)
- Hawai'i (HI)
- Idaho (ID)
- Illinois (IL)
- Indiana (IN)
- Iowa (IA)
- Kansas (KS)
- Kentucky (KY)

- ❍ Louisiana (LA)
- ❍ Maine (ME)
- ❍ Maryland (MD)
- ❍ Massachusetts (MA)
- ❍ Michigan (MI)
- ❍ Minnesota (MN)
- ❍ Mississippi (MS)
- ❍ Missouri (MO)
- ❍ Montana (MT)
- ❍ Nebraska (NE)
- ❍ Nevada (NV)
- ❍ New Hampshire (NH)
- ❍ New Jersey (NJ)
- ❍ New Mexico (NM)
- ❍ New York (NY)
- ❍ North Carolina (NC)
- ❍ North Dakota (ND)
- ❍ Ohio (OH)
- ❍ Oklahoma (OK)
- ❍ Oregon (OR)
- ❍ Pennsylvania (PA)
- ❍ Rhode Island (RI)
- ❍ South Carolina (SC)
- ❍ South Dakota (SD)
- ❍ Tennessee (TN)
- ❍ Texas (TX)
- ❍ Utah (UT)
- ❍ Vermont (VT)
- ❍ Virginia (VA)
- ❍ Washington (WA)
- ❍ West Virginia (WV)
- ❍ Wisconsin (WI)
- ❍ Wyoming (WY)
- ❍ District of Columbia (DC)
- ❍ American Samoa (AS)
- ❍ Guam (GU)
- ❍ Northern Mariana Islands (MP)
- ❍ Puerto Rico (PR)
- ❍ United States Virgin Islands (US-VI)
- ❍ Outside of the United States

Appendix B: Agricultural Crops Used in Survey

Native versus Non-Native Agricultural Crop Species

Apples, barley, black or wild cherries, black or wild raspberries, black or wild walnuts, blueberries, cacao, common or wild strawberries, corn, cucurbits (pumpkins and squash), cranberries, grapes, oats, pears, pecans, potatoes, rice, sunflowers, vanilla, wheat

Regions

Alfalfa, barley, corn, cotton, peanuts, soybeans, wheat

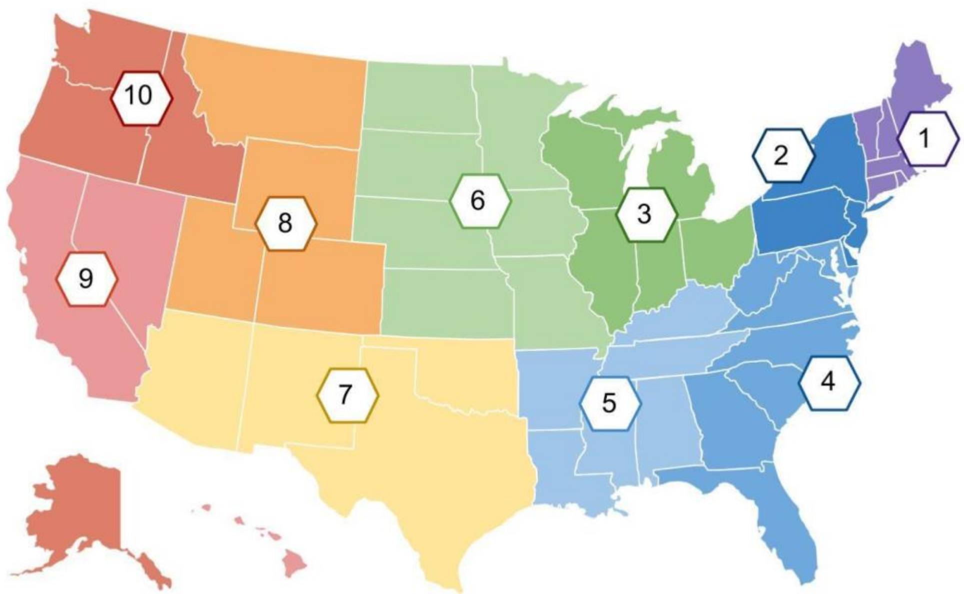
States (Entirety)

Almonds, apples, canola, cherries, lemons, oranges, pears, potatoes, rice, sugar beets, sunflowers

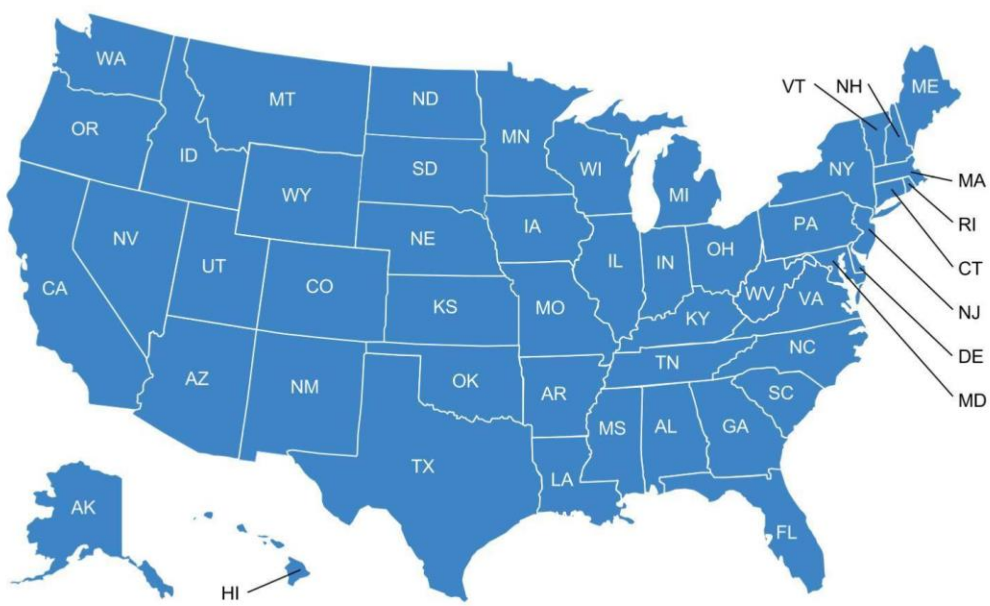
States (Interior)

Rice, wheat

Appendix C: Reference Maps Used in Survey



Appendix C; Item 1: *Map of the United States displaying regions for survey participants to select.*



Appendix C; Item 2: *Map of the United States displaying states for survey participants to select.*

Appendix D: Survey Results

*Correct answers are **emboldened**.*

Question 1. Which **ten (10)** agricultural crops are **naturally** native to North America?

Answer Choices	Percentage	Actual Count
Apples	82.6%	157
Black or wild cherries	**58.4%**	**111**
Black or wild raspberries	**66.8%**	**127**
Black or wild walnuts	**39.5%**	**75**
Blueberries	**71.6%**	**136**
Cacao	4.2%	8
Common or wild strawberries	**74.7%**	**142**
Corn	83.7%	159
Cucurbits	**62.1%**	**118**
Cranberries	**52.6%**	**100**
Grapes (New World)	**45.8%**	**87**
Grapes (Old World)	8.9%	17
Oats	50.5%	96
Pears	34.2%	65
Pecans	**40.5%**	**77**
Potatoes	58.9%	112
Rice	12.1%	23
Sunflowers	**70.5%**	**134**
Vanilla	8.9%	17
Wheat	73.2%	139
Total	100.0%	190

Question 2. In which **one (1)** state is the **San Joaquin Valley** located?

Answer Choices	Percentage	Actual Count
California	**66.3%**	**126**
Arizona	2.1%	4
New Mexico	7.9%	15
Texas	2.6%	5
Admittedly did not know or had never before heard of the San Joaquin Valley	21.1%	40
Total	100.0%	190

Question 3. In which **two (2)** states is the **Columbia Valley** primarily located?

Answer Choices	Percentage	Actual Count
California and Oregon	6.3%	12
Washington and Oregon	**54.2%**	**103**
Virginia and Maryland	9.5%	18
Maryland and Pennsylvania	2.6%	5
Admittedly did not know or had never before heard of the Columbia Valley	27.4%	52
Total	100.0%	190

Question 4. In which **one (1)** state is the **Willamette Valley** located?

Answer Choices	Percentage	Actual Count
California	1.6%	3
Pennsylvania	10.0%	19
Oregon	**44.2%**	**84**
Utah	7.4%	14
Admittedly did not know or had never before heard of the Willamette Valley	36.8%	70
Total	100.0%	190

Question 5. In which **one (1)** state is the **San Luis Valley** located?

Answer Choices	Percentage	Actual Count
California	33.2%	63
Washington	1.6%	3
Texas	14.2%	27
Colorado	**18.9%**	**36**
Admittedly did not know or had never before heard of the San Luis Valley	32.1%	61
Total	100.0%	190

Question 6. Between which **two (2)** states is the **<u>Red River Valley</u>** primarily located?

Answer Choices	Percentage	Actual Count
Minnesota and North Dakota	**18.4%**	**35**
Colorado and Utah	21.6%	41
Montana and Wyoming	14.2%	27
Nevada and Utah	15.3%	29
Admittedly did not know or had never before heard of the Red River Valley	30.5%	58
Total	100.0%	190

Question 7. Which **five (5)** regions historically and statistically produce the most amount of **<u>alfalfa (for hay)</u>** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	4.7%	9
Region 2	15.8%	30
Region 3	**50.5%**	**96**
Region 4	24.2%	46
Region 5	55.8%	106
Region 6	**84.7%**	**161**
Region 7	**71.6%**	**136**

Region 8	**81.1%**	**154**
Region 9	37.4%	71
Region 10	**38.9%**	**74**
Admittedly did not know what alfalfa is	7.4%	14
Total	100.0%	190

Question 8. Which **three (3)** regions both historically and statistically produce the most amount of **barley** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	10.5%	20
Region 2	19.5%	37
Region 3	39.5%	75
Region 4	20.5%	39
Region 5	24.7%	47
Region 6	**57.9%**	**110**
Region 7	29.5%	56
Region 8	**46.8%**	**89**
Region 9	12.1%	23
Region 10	**17.9%**	**34**
Admittedly did not know what barley is	8.9%	17
Total	100.0%	190

Question 9. Which **three (3)** regions both historically and statistically produce the most amount of **corn (for both grain and seed)** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	1.6%	3
Region 2	7.4%	14
Region 3	**47.9%**	**91**
Region 4	10.5%	20

Region 5	**30.0%**	**57**
Region 6	**82.6%**	**157**
Region 7	41.6%	79
Region 8	54.2%	103
Region 9	12.6%	24
Region 10	6.8%	13
Admittedly did not understand what was meant by "for both grain and seed"	3.2%	6
Total	100.0%	190

Question 10. Which **four (4)** regions both historically and statistically produce the most amount of **cotton (including all varieties)** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	10.0%	19
Region 2	20.0%	38
Region 3	24.7%	47
Region 4	**88.4%**	**168**
Region 5	**95.3%**	**181**
Region 6	39.5%	75
Region 7	**77.9%**	**148**
Region 8	13.7%	26
Region 9	**27.4%**	**52**
Region 10	3.2%	6
Total	100.0%	190

Question 11. Which **three (3)** regions both historically and statistically produce the most number of **peanuts (for all purposes)** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	15.8%	30

Region 2	25.3%	48
Region 3	22.6%	43
Region 4	**64.2%**	**122**
Region 5	**53.2%**	**101**
Region 6	22.1%	42
Region 7	**37.4%**	**71**
Region 8	20.0%	38
Region 9	24.7%	47
Region 10	14.7%	28
Total	100.0%	190

Question 12. Which **three (3)** regions both historically and statistically produce the most number of **soybeans** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	10.0%	19
Region 2	14.7%	28
Region 3	**47.4%**	**90**
Region 4	28.4%	54
Region 5	**38.9%**	**74**
Region 6	**52.1%**	**99**
Region 7	26.3%	50
Region 8	34.7%	66
Region 9	27.9%	53
Region 10	19.5%	37
Total	100.0%	190

Question 13. Which **four (4)** regions both historically and statistically produce the most amount of **wheat** in the United States?

Answer Choices	Percentage	Actual Count
Region 1	1.6%	3
Region 2	7.9%	15
Region 3	41.1%	78
Region 4	17.4%	33
Region 5	47.9%	91
Region 6	**84.7**	**161**
Region 7	**66.3%**	**126**
Region 8	**78.9%**	**150**
Region 9	23.7%	45
Region 10	**30.5%**	**58**
Total	100.0%	190

Question 14. Which **one (1)** state both historically and statistically produces the most number of **almonds** in the United States?

Answer Choices	Percentage	Actual Count
California (CA)	**70.5%**	**134**
Arizona (AZ)	7.9%	15
Washington (WA)	7.4%	14
Oregon (OR)	14.2%	27
Total	100.0%	190

Question 15. Which **four (4)** states both historically and statistically produce the most number of **apples** in the United States?

Answer Choices	Percentage	Actual Count
Pennsylvania (PA), Oregon (OR), Idaho (ID), and California (CA)	12.6%	24
Washington (WA), New York (NY), Michigan (MI), and Pennsylvania (PA)	**61.6%**	**117**
Idaho (ID), Oregon (OR), Utah (UT), and California (CA)	7.9%	15

Washington (WA), New York (NY), Michigan (MI), and Missouri (MO)	17.9%	34
Total	100.0%	190

Question 16. Which **one (1)** state both historically and statistically produces the most amount of **canola (for oil)** in the United States?

Answer Choices	Percentage	Actual Count
Kansas (KS)	36.3%	69
Alaska (AK)	3.7%	7
North Dakota (ND)	**31.6%**	**60**
Indiana (IN)	24.7%	47
Admittedly did not know what canola is	3.7%	7
Total	100.0%	190

Question 17. Which **five (5)** states both historically and statistically produce the most number of **cherries (including both sweet and tart varieties)** in the United States?

Answer Choices	Percentage	Actual Count
Washington (WA), Montana (MT), Michigan (MI), New York (NY), and Ohio (OH)	16.3%	31
California (CA), Oregon (OR), Michigan (MI), Ohio (OH), and Pennsylvania (PA)	17.9%	34
Ohio (OH), Pennsylvania (PA), Utah (UT), Virginia (VA), and Maryland (MD)	15.3%	29
Washington (WA), California (CA), Oregon (OR), Michigan (MI), and Utah (UT)	**50.5%**	**96**
Total	100.0%	190

Question 18. Which **two (2)** states both historically and statistically produce the most number of **lemons** in the United States?

Answer Choices	Percentage	Actual Count
California (CA) and Arizona (AZ)	**15.8%**	**30**
California (CA) and Florida (FL)	67.9%	129
Florida (FL) and Nevada (NV)	5.8%	11

Arizona (AZ) and Florida (FL)	10.5%	20
Total	100.0%	190

Question 19. Which **three (3)** states both historically and statistically produce the most number of **oranges** in the United States?

Answer Choices	Percentage	Actual Count
California (CA), Arizona (AZ), and Nevada (NV)	3.7%	7
Florida (FL), California (CA), and Arizona (AZ)	**67.4%**	**128**
Arizona (AZ), Florida (FL), and Georgia (GA)	23.7%	45
Georgia (GA), South Carolina (SC), and North Carolina (NC)	5.3%	10
Total	100.0%	190

Question 20. Which **three (3)** states both historically and statistically produce the most number of **pears** in the United States?

Answer Choices	Percentage	Actual Count
Washington (WA), California (CA), and Utah (UT)	16.3%	31
Ohio (OH), Oregon (OR), and Pennsylvania (PA)	20.0%	38
Washington (WA), California (CA), and Oregon (OR)	**46.3%**	**88**
North Carolina (NC), Georgia (GA), and Michigan (MI)	17.4%	33
Total	100.0%	190

Question 21. Which **two (2)** states both historically and statistically produce the most number of **potatoes (excluding sweet varieties)** in the United States?

Answer Choices	Percentage	Actual Count
Idaho (ID) and Iowa (IA)	55.3%	105
Montana (MT) and Washington (WA)	2.6%	5
Oregon (OR) and Texas (TX)	3.2%	6
Idaho (ID) and Washington (WA)	**38.9%**	**74**
Total	100.0%	190

Question 22. Which **three (3)** states or territories both historically and statistically produce the most amount of **rice** in the United States?

Answer Choices	Percentage	Actual Count
Arkansas (AR), California (CA), and Louisiana (LA)	**23.7%**	**45**
Virginia (VA), North Carolina (NC), and South Carolina (SC)	10.5%	20
Hawai'i (HI), Guam (GU), and American Samoa (AS)	36.8%	70
Nebraska (NE), Kansas (KS), and Oklahoma (OK)	12.1%	23
Admittedly did not know that rice is produced in the United States	16.8%	32
Total	100.0%	190

Question 23. Which **four (4)** states both historically and statistically produce the most amount of **sugar beets (for sugar)** in the United States?

Answer Choices	Percentage	Actual Count
Minnesota (MN), North Dakota (ND), Michigan (MI), and Ohio (OH)	17.4%	33
Minnesota (MN), North Dakota (ND), Idaho (ID), and Michigan (MI)	**28.9%**	**55**
North Dakota (ND), South Dakota (SD), Michigan (MI), and Ohio (OH)	21.1%	40
Idaho (ID), Washington (WA), Oregon (OR), and Michigan (MI)	15.8%	30
Admittedly did not know what sugar beets are	16.8%	32
Total	100.0%	190

Question 24. Which **two (2)** states both historically and statistically produce the most number of **sunflowers (for both oil and seed)** in the United States?

Answer Choices	Percentage	Actual Count
North Dakota (ND) and Kansas (KS)	15.8%	30
Kansas (KS) and Oklahoma (OK)	49.5%	94
North Dakota (ND) and South Dakota (SD)	**20.0%**	**38**
Colorado (CO) and Oklahoma (OK)	14.7%	28

Total	100.0%	190

Question 25. Within the states of Arkansas and Colorado, where is all or the greater amount of **rice and wheat** produced, respectively?

Answer Choices	Percentage	Actual Count
In Arkansas, rice is produced in the higher, westernmost areas, away from the Mississippi River; in Colorado, wheat is produced in the lower, easternmost areas, away from the Rocky Mountains	17.4%	33
In Arkansas, rice is produced in the lower, easternmost areas, near to or at the Mississippi River; in Colorado, wheat is produced in the higher, westernmost areas, near to or in the Rocky Mountains	22.1%	42
In Arkansas, rice is produced in the higher, westernmost areas, away from the Mississippi River; in Colorado, wheat is produced in the higher, westernmost areas, near to or in the Rocky Mountains	14.2%	27
In Arkansas, rice is produced in the lower, easternmost areas, near to or at the Mississippi River; in Colorado, wheat is produced in the lower, easternmost areas, away from the Rocky Mountains	**46.3%**	**88**
Total	100.0%	190

Question 26. Which is your age category?

Answer Choices	Percentage	Actual Count
Anywhere from 18 to 22 years of age	2.1%	4
Anywhere from 23 to 27 years of age	24.2%	46
Anywhere from 28 to 32 years of age	53.2%	101
Anywhere from 33 to 37 years of age	13.2%	25
Anywhere from 38 to 42 years of age	7.4%	14
Total	100.0%	190

Question 27. Do you identify yourself as female or male?

Answer Choices	Percentage	Actual Count
Male	62.6%	119

Female	37.4%	71
Total	100.0%	190

Question 28. What is your highest level of education?

Answer Choices	Percentage	Actual Count
I am currently still attending high school	1.1%	2
I do not hold a high school degree nor an equivalent (General Educational Development [GED])	2.1%	4
I hold either a high school degree or an equivalent (General Educational Development [GED])	32.1%	61
I hold a vocational degree or certificate	8.4%	16
I hold an associate's degree	22.1%	42
I hold a bachelor's degree	27.4%	52
I hold a master's degree	5.8%	11
I hold a doctorate's degree or another type of terminal degree	1.1%	2
Total	100%	190

Question 29. While in school, do you or did you participate in any one or more agricultural school organizations, such as the FFA, the 4-H, or any other type of agricultural school organizations?

Answer Choices	Percentage	Actual Count
Yes, I do participate or did participate in one or more agricultural school organizations	10.0%	19
No, I do not participate or did not participate in any agricultural school organizations	90.0%	171
Total	100%	190

Question 30. While attending high school, in what state or territory do you or did you live?

Answer Choices	Percentage	Actual Count
Alabama (AL)	2.1%	4
Alaska (AK)	0.5%	1

Arizona (AZ)	2.6%	5
Arkansas (AR)	0.5%	1
California (CA)	7.4%	14
Colorado (CO)	7.9%	15
Connecticut (CT)	0.5%	1
Delaware (DE)	0.5%	1
Florida (FL)	4.7%	9
Georgia (GA)	1.1%	2
Hawai'i (HI)	0.0%	0
Idaho (ID)	0.5%	1
Illinois (IL)	3.7%	7
Indiana (IN)	1.1%	2
Iowa (IA)	0.5%	1
Kansas (KS)	0.5%	1
Kentucky (KY)	0.5%	1
Louisiana (LA)	0.0%	0
Maine (ME)	0.5%	1
Maryland (MD)	1.1%	2
Massachusetts (MA)	0.5%	1
Michigan (MI)	1.1%	2
Minnesota (MN)	0.5%	1
Mississippi (MS)	0.0%	0
Missouri (MO)	3.2%	6
Montana (MT)	0.0%	0
Nebraska (NE)	1.1%	2
Nevada (NV)	0.5%	1
New Hampshire (NH)	0.5%	1
New Jersey (NJ)	0.5%	1

New Mexico (NM)	0.5%	1
New York (NY)	2.6%	5
North Carolina (NC)	1.1%	2
North Dakota (ND)	0.5%	1
Ohio (OH)	2.1%	4
Oklahoma (OK)	0.5%	1
Oregon (OR)	0.5%	1
Pennsylvania (PA)	3.2%	6
Rhode Island (RI)	0.5%	1
South Carolina (SC)	0.5%	1
South Dakota (SD)	0.5%	1
Tennessee (TN)	1.6%	3
Texas (TX)	3.2%	6
Utah (UT)	0.0%	0
Vermont (VT)	0.5%	1
Virginia (VA)	1.1%	2
Washington (WA)	32.1%	61
West Virginia (WV)	0.5%	1
Wisconsin (WI)	3.2%	6
Wyoming (WY)	0.0%	0
District of Columbia (DC)	0.0%	0
American Samoa (AS)	0.0%	0
Guam (GU)	0.0%	0
Northern Mariana Islands (MP)	0.0%	0
Puerto Rico (PR)	0.5%	1
United States Virgin Islands (US-VI)	0.0%	0
Outside of the United States	0.5%	1
Total	100%	190