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Aiding Growers' Decisions: Describing Arkansas Blackberry Growers' Resources and Needs Regarding Blackberry Production

Lesley Marie Smith
University of Arkansas, Fayetteville

Aiding Growers' Decisions: Describing Arkansas Blackberry Growers' Resources and Needs Regarding Blackberry Production

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by

Lesley Smith
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This thesis is approved for recommendation to the Graduate Council.

_____
Catherine W. Shoulders, Ph.D.
Thesis Director

_____
Donald M. Johnson, Ph.D.
Committee Member

_____
M. Elena Garcia, Ph.D.
Committee Member

Abstract

This study was a census of blackberry growers who attended the Blackberry Growers Association informal interest meetings held throughout the state during the month of April. The purpose of this study was to describe blackberry operations in Arkansas, describe the ideal blackberry cultivar growers want to produce, describe resources they use to research production information, and describe what changes to current resources growers would like to have. Questionnaire responses regarding blackberry production of 18 blackberry growers in the state of Arkansas were analyzed. Three growers elected to not participate resulting in an 86% response rate. The researcher hopes that this information will be used to better understand who is growing blackberries in Arkansas and to improve upon currently available blackberry production resources.

Dedication

I am overwhelmed with emotion when I think about the series of events that it took to get me to this point. I will forever be grateful for the countless people that constantly encouraged, challenged, and believed in me when even I didn't know what I was capable of. This was a group effort and I am thankful for the teachers, mentors, friends, and family who helped me along the way.

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Chapter I: INTRODUCTION

Need for the Study

As documented in *Chronica Horticulturae,* blackberry production has expanded through North America due to the demand of berries for fresh consumption (Finn & Clark, 2011). This demand has expanded in part due to the stable supply of blackberries at grocery stores and markets most months of the year (Finn & Clark, 2011). This expansion can also be partially atttributed to many food movements such as the promotion of locally grown foods and sustainably produced foods (Pinchot, 2014). Finn and Clark (2011) also detailed the new technologies in production innovations that have aided growers, enabling them to both meet and further drive consumer demand for blackberries. Developments that are more common now, such as high tunnels and newly released cultivars, make production costs easier to accommodate (Finn & Clark, 2011).

Stafne and Clark (2005) documented the boom in 1940 and the bust in 1964 of blackberry production in Arkansas. Despite the difficulties, there is a positive outlook for blackberry production within the state. Stafne and Clark (2005) went on to detail how the development of improved cultivars within the University of Arkansas blackberry breeding program and efficient production technology have contributed to in-state success in blackberry production. Data indicated that in 2004, the state reached an all-time high of 909,909 kg of blackberries produced, averaging 4,500 kg of blackberries produced per acre (Stafne & Clark, 2005).

According to the USDA (2002; 2012), the area devoted to blackberry production in Arkansas increased from 186 acres to 334 acres harvested for sale between 1997 and 2012. This growth makes the need for correct production information and getting that information to

growers essential to the success of growers. One consideration growers have is the kind of product they want to sell. The University of Arkansas has worked to aid growers by releasing 18 of their own cultivars (University of Arkansas Cooperative Extension Service [UACES], n.d.). There are a variety of characteristics to choose from: type of flavor, level of firmness, fresh market, processing, size, disease resistance, thornlessness, required chill hours, potential yield, post-harvest quality, floricane producer, and primocane producer. These characteristics may vary greatly with each grower's preference and the market for which they are producing. A better understanding of the kind of blackberry that growers need would enable researchers and fruit breeders to produce a product better suited for the state's blackberry growers. It is also possible that the characteristics growers seek may determine the resources they use to find a product they want. Certain companies and universities focus their efforts in different areas. This could include organic methods, season extension, and flavor components. For example, if they were looking for primocane fruiting blackberries or resources they would likely seek out University of Arkansas resources because this trait was first introduced in Arkansas (Clark & Perkins-Veazie, 2011).

Problem Statement

Thanks to technology, information regarding fruit production is now more readily available to growers than ever before. "Many years ago, the primary means of sharing information on new cultivars were limited to grower meetings, published factsheets, reports or proceedings, nursery catalogs, and other print sources of media. As internet resources developed, the internet became a primary source of information about new cultivars and recommendations" (Clark, Miller, & Jecmen, 2016, para. 1). Growers have many options to access these resources including smart-phone apps, internet publications, social media, Extension agents, and fellow

growers. There are numerous resources from which growers can choose, but it is unclear which resources growers value or rely on the most. These resources could be perceived as valuable to growers if they provide clear, coherent information that growers need to be successful or if it is a resource that growers rely on to successfully produce their crop. If the most valuable resources could be determined, perhaps money and time could be more efficiently used supplying resources growers need and want the most. With the increase of blackberry production over the last twenty years, the need for adequate information resources have also increased (Rodriguez, Popp, Thomsen, Friedrich, & Rom, 2012). For researchers and those in Extension to provide these resources, the information sources and type of blackberry that growers desire needs to be determined.

Significance

For growers to be successful, they need appropriate resources. All growers are different and may require different tools based on how much they produce, their level of experience, and type of production. So, it is important to know what tools growers find most valuable. The American Association for Agricultural Education's Research Priority Areas document addresses some of these issues (Doerfert, 2011). Priority 2 of the document details how those in research, Extension, and education should adapt to new technologies and consumer demands. The author suggests that they should also work to understand the best types of systems to use and what these consumers need based on their background:

> To achieve positive outcomes in current and future agriculture-related diffusion efforts, related research, education, and outreach activities must continually change to address the new challenges and opportunities brought about by rapidly advancing technologies; evolving consumer demands, needs, and behaviors; and the need to make positive contributions to environmental, human, and animal health. Our social science research must also remain cognizant that the chains of production, distribution, and marketing of agricultural products are complex. We must create transdisciplinary, systems research

> approaches that holistically examine technological adaptation and policy design while accounting for all of the components of agricultural systems, from farm to the market and the consumer and back again. (Doerfert, 2011, p. 8)

Priority 5 also explains the importance on focusing on developing efficient programs to not only educate the public, but to also meet their needs as learners. For this to be successful though, researchers first have to look at current systems to evaluate the effectiveness before they can develop new systems (Doerfert, 2011, p. 10).

In the most recent National Research Agenda, there are two priorities that relate to the objectives of this study. Priority 2 (p.19) is titled, "New Technologies, Practices, and Products Adoption Decisions" and contains two research questions that state, "What methods, models, and practices are most effective in leading change?" and "What methods, models, and practices are most effective in diffusing innovations?" (p. 21). The authors of this section address the need to reach out to farmers to aid in the development of educational materials:

> Additional research on and a better understanding of new technologies, practices, and products will help agricultural educators develop and implement agricultural teaching and learning processes contributing to the development of sustainable agricultural systems needed in the future. Such work requires we focus not only inwardly on universities and colleges and their faculty and students, primary and secondary schools and their teachers and students, Extension Services and outreach institutions and their professionals and clients, but also outwardly toward farmers growing food and fiber, scientists and professionals developing new innovations, people who are not food secure, and political and social systems that contribute to food insecurity. (Lindner, Rodriguez, Strong, Jones, & Layfield, 2016, p. 20)

Additional studies have been conducted to address the need for appropriate resources and perceptions of growers. One study conducted by Trede and Whitaker (2000) had objectives that included identifying perceptions of beginning farmers in Iowa and expanded to include usefulness of educational providers and media. Some recommendations included incorporating a

variety of methods for education and adequately explaining those methods so farmers have a better understanding of those resources (Trede & Whitaker, 2000). Another study called, "Diversification choices in agriculture: a Choice Modelling case study of sugarcane growers" focused on the reasons why farmers diversify their production system. The researchers used different techniques to explore the farmers' decisions and trade-offs they make (Windle & Rolfe, 2005).

Traditionally, extension personnel have communicated through printed sources of information (newsletters, factsheets etc.), workshops, grower meetings, face-to-face meetings with the public, and phone calls with individuals (Oakley, & Garforth, 1985). With the popularity of electronic resources, a push has been made to transition to electronic sources of media such as websites, social media, and electronic versions of previously printed media (Clark, Miller, & Jecmen, 2016). Resources such as eXtension.org have aided in this change. With such transitions, this research aims to address where the Extension Service should focus their valuable resources and identify the resources that are perceived as most popular to producers. This research also hopes to identify resources that best communicate new information in agriculture to producers.

An online search for research extension methods or extension methods of communication yielded that most studies related to these topics are at least 10 years old and a majority of those studies are from 20-30 years ago. While there are conclusions from this research that can still be used today, these materials can be considered to be outdated due to the rapid change in technology and its use. This creates a need for studies to evaluate contemporary communication needs and methods, primarily in extension.

This research was conducted to address these communication needs in respect to Arkansas blackberry growers. Little research has been done to address their needs and preferences. There is also limited information on the characteristics of blackberry operation in Arkansas. This study determined the contemporary resources that Arkansas blackberry growers find valuable, documented blackberry plant and fruit characteristics growers find desirable, and described various characteristics of Arkansas blackberry operations. With this information, Arkansas blackberry growers' preferences and needs can be used to help Arkansas extension, breeding, and research personnel determine what resources and developments should be generated.

Purpose of the Study

The purpose of this study was to describe: blackberry operations in Arkansas, the ideal blackberry cultivar growers want to produce, resources they use to research production information, and what changes to current resources growers would like to have.

Research Objectives

To accomplish the purpose, this study was guided by the following objectives:

1. Determine characteristics of blackberry operations in Arkansas.
2. Describe what characteristics growers perceive as most important to have in a blackberry cultivar.
3. Describe what market the growers target for sales.
4. Describe which communication resources regarding blackberry cultivar information are perceived as most valuable to growers.

5. Describe which communication resources regarding blackberry cultivar information growers would like to have.
6. Describe which communication resources regarding blackberry cultivar information growers would like to see change.

Definition of Terms

Certified naturally grown – Certification process growers go through to verify their products are produced with "natural" methods.

Conventional (or standard) methods of production – Production relying on traditional methods such as conventional (inorganic) fertilizers and pesticides. No certification process is required.

Communication resources – Resources growers utilize to make decisions regarding production. They can be government, state, or privately produced but usually involve informational pamphlets, infographics, videos, workshops etc.

Cultivar – "Cultivated variety", a variety that was selected from for desirable traits and is reproduced to maintain those traits (Haynes, 2008).

County Extension Agent – A person that is hired by the state's land grant university to address agriculture, 4-H, family and consumer science, and community development questions and to develop educational programs related to these topics for the public.

Market – consumer or end goal that growers produce for. This could be fresh berries, frozen berries, processed berries (berries used for a value added product like: jams, jellies,

juices, yogurt etc), or local consumers (farmer's markets, CSAs, roadside stands), retail, and wholesale.

Floricane fruiting blackberry – Traditional, biennial fruiting blackberry plant that produces fruit on its second year's growth.

Primocane fruiting blackberry – Blackberry plant that will produce fruit on its first year's growth. In ideal conditions, it also has the potential to produce two crop loads in one season.

Trellising system – A support structure that is used to hold up and stabilize blackberry canes. These systems are intended to make harvest and maintenance easier.

Assumptions

It was assumed that all respondents answered the survey honestly, to the best of their ability, and that the growers participating in the study use resources to make decisions.

Limitations

This study was subject to the following limitation:

- Non-response error (Lindner, Murphy, & Briers, 2001): It may be difficult to get the entire sample to respond. The survey will take time out of their busy schedule and the respondents may not see the value in completing the survey. Some ways to counteract that could be keeping survey response time to relatively short (no more than 10-15 minutes), ensuring the respondents understand the objectives of the survey, and providing incentives if necessary.

Delimitations

- This study has been limited to blackberry growers in the state of Arkansas, but may also include those who grow other crops in addition to blackberries.

Chapter II: REVIEW OF LITERATURE

Importance of Agriculture in Arkansas

"In 2012, nearly 25 percent of jobs in rural areas were in farming, forestry, mining and manufacturing compared to approximately 11 percent in urban areas" (University of Arkansas Division of Agriculture [UADA], 2015, page 22, para. 5). While the service sector provides the biggest portion of employment in Arkansas, natural resources (agriculture, forestry, and mining) and manufacturing still remain critical to the state's rural economy (UADA, 2015). This document also states that "many of the service sector jobs in rural areas are also agriculture- and forestry-related, which suggests that a strong agriculture and forestry industry remains central to the rural regions of the state" (UADA, 2015, p. 22, para. 5).

Arkansas produces a wide variety of agricultural products. This list includes: rice, broiler chickens, turkeys, soybeans, beef cows, blueberries, hay, blackberries, and even more products (UADA, 2014, p. 8 & 11). Agriculture provides approximately 280,959 jobs for the state's residents (UADA, 2014, p. 7). This accounts for about one in every six jobs in the state of Arkansas (UADA, 2014, p. 7).

Blackberries were not reported to be grown in the state until 1880 (Moore, 1979) and the first cultivar that was released in Arkansas was 'Bauer' in 1890 (Hedrick, 1925). Over 300 ha and 660,087 kg of blackberries were grown in Arkansas in 1900 (U.S. Dept. of Commerce, 1900). Arkansas blackberry production peaked in 1940 when it was reported that almost 1,100 ha and 842,505 kg of blackberries were being grown in the state (U.S. Dept. of Commerce, 1940). This number accounted for 10% of the total production of blackberries east of the Rocky Mountains (Stafne & Clark, 2005). But there was a steep decline in the 1950s and 1960s when

production plummeted to just 2.8 ha and 3,632 kg and of blackberries being grown in the state (U.S. Dept. of Commerce, 1964).

With the hiring of Jim Moore in 1964 (Hightower, 2017), the blackberry breeding program at the University of Arkansas expanded and the production of blackberries in the state began to increase (Stafne & Clark, 2005). Many cultivars were released from 1974-1996 including 'Comanche', 'Cherokee', 'Kiowa', and 'Arapaho' giving Arkansans and other growers many hardy, high quality berries that they could choose from (Stafne & Clark, 2005). When John Clark replaced Moore in 1996 (Stafne & Clark, 2005), he continued to work to release high quality plants that would give growers a variety of types of blackberries and plants to choose from such as 'Osage', 'Prime-Ark 45', and 'Prime-Ark Freedom'. Blackberry production and efficiency has slowly risen over the last 50 years. In 2004, it was reported that 202 ha of production and 909,909 kg of blackberries were produced (Stafne & Clark, 2005).

Blackberry Production

Blackberries are considered to be a native crop through most of Europe, Asia, and North America (Finn & Clark, 2011). Because of their ability to be established in disturbed areas, blackberries have been a food source for thousands of years (Finn & Clark, 2011). The blackberry was primarily gathered from the wild until the mid to late 1800s when people began to colonize the plants by selecting for desirable traits (Finn & Clark, 2011). The development of new hybrids such as 'Logan' and 'Boysen' and other developments such as freezing technology stimulated the growth of fresh production (Finn & Clark, 2011). It was not until 'Marion' was developed and the invention of machine harvesters in the late 1950s increased the production of blackberries for harvesting (Finn & Clark, 2011). Production also began to increase again in the

late 1990s and 2000s for China, parts of Europe, Chile, Mexico, as well as the United States (Finn & Clark, 2011).

The demand for fresh consumption has driven the expansion of blackberry production across North America (Finn & Clark, 2011). This is due to the stable supply of fresh berries most months of the year and the ability to ship to distant markets (Finn & Clark, 2011). Mexico is able to produce blackberries from October to June and the United States is capable of producing blackberries from May to September (Finn & Clark, 2011).

Innovations in Blackberry Production

The utilization of appropriate technologies has allowed for extended production seasons and productions in less favorable climates. The discovery in the 1980s of cultural manipulation allowed for 'Brazos' to produce blackberries without going through a dormancy period (Finn & Clark, 2011). Other cultural manipulations like high tunnels, low tunnels, and greenhouses allow the blackberry production season to be expanded. These structures provide heat and protection from harsh conditions so the season can start earlier and last longer. Trellising systems are also used to allow for easier harvest and maintenance of the plant.

Cultivars have been developed to extend the harvest season and create additional income for growers. There are cultivars that are capable of having two crop loads in one season under ideal conditions, like 'Prime-Ark 45' and 'Prime-Ark Freedom'. Some cultivars are also erect or semi-erect which allows harvest as well as maintenance of the plant to be easier. There are other cultivars that were developed to make harvest easier. There are thornless cultivars such as 'Natchez', 'Osage', and 'Prime-Ark Freedom'. Some cultivars are better suited for fresh market consumption and there are some that are better suited for the processed market. Additionally

there are different cultivars for taste preference. Some blackberry cultivars are extremely firm, acidic, sweet, or low acid. Breeding efforts continue to develop higher quality products that last longer in cold storage (T. Ernst, personal communication, July 2016).

Grower Relations

In 1862 the Morrill Act established land grant universities which allowed these educational institutions to extend their resources and educate the public through non-formal programs (UADA, n.d.). The Extension Service as we have to come to know it, was formalized in 1914 with the Smith-Lever Act which, "established the partnership between the agricultural colleges and the U.S. Department of Agriculture to provide for cooperative extension work" (UADA, n.d., para. 7). The number of farms in the U.S. has declined dramatically from 5.4 million to 2.2 million between 1950 and 2007 (UADA, n.d., para. 14). While the number of farms decreased, the acreage per farm has increased. This, along with advances in technology, caused the number of people fed by one farmer in 1950 to increase from 15.5 to 155 people in 2007 (UADA, n.d., para. 14). Despite the decline in number of farms, the increased productivity was a result of increased mechanization, commercial fertilizers, hybrid plants, and other technologies (UADA, n.d.). Extension education was a key factor in bringing these technologies to farmers and ranchers (UADA, n.d.).

The Arkansas Agriculture Experiment Station and its faculty work to develop programs and research for the state's farmers, related industries, and consumers. There are research stations in Clarksville and Hope where the primary focus is fruit crops, but there are other research stations throughout the state that research a variety of agricultural topics such as rice, soybeans, etc. There are Extension agents throughout the state, usually at least one in each county, to be a local source of information for that area's residents. These agents may host

workshops, provide handouts of information, and post information to social media. There are also a variety of information sources online. A simple Google search can generate information for growers that includes fact sheets as well as research studies from throughout the country and world.

Despite the decreased number of Americans who live on farms and in rural areas, the Extension Service still fills an important role in American life by providing information about crops, home maintenance, and leadership skills through approximately 2,900 extension offices throughout the country (UADA, n.d., para. 5).

In the document "Guide to Extension Training", Oakley and Garforth (1985) identify the various social structures and barriers that need to be considered when attempting to educate those in the field of agriculture. These are things that often hinder the learning process whether that be beliefs, traditions, culture, pride, or age just to name a few. Despite these barriers, the authors also includes different methods that might create the best atmosphere or learning environment for the situation. For individual methods, farm visits which include developing a plan, checklists, recording information, and following up are mentioned. Information sessions can also be offered through office calls or visits. Group methods included group meetings, demonstrations, fields days, and tours (Oakley & Garforth, 1985).

Educating Growers

Adults tend to learn through andragogic methods, which is an informal or non-formal method of instruction unlike that of a standard classroom setting (Robinson, 2017). Andragogy usually takes place through workshops, training sessions, or seminars but can also involve television, newspapers, or books (Robinson, 2017). "Andragogy assumes that learners are ready

to learn those things they ‘need’ because of the developmental phases they are approaching in their roles as workers, spouses, parents, organizational members and leaders, leisure time users, and the like” (Knowles, 1973, p. 47). Andragogy allows adults to talk and share personal experiences during the educational process (Robinson, 2017). Bringing in personal experiences is the primary difference between adults and young learners (Lindner et al., 2016). It is important that educators integrate their students’ personal experiences into the learning environment (Lindner et al., 2016). The desire for adults to learn is usually created by the need to solve a problem:

> Adults tend to have a problem-centered orientation to learning. This difference is primarily the result of the difference in time perspective. The child's time perspective toward learning is one of postponed application…The adult, on the other hand, comes into an educational activity largely because he is experiencing some inadequacy in coping with current life problems. He wants to apply tomorrow what he learns today, so his time perspective is one of immediacy of application. Therefore, he enters into education with a problem-centered orientation to learning. (Knowles, 1973, p. 47)

If educational activities do not meet their needs, adults will not participate or stay (Robinson, 2017).

Conceptual Framework

Just like farmers evaluate their choices and adapt to changing circumstances, those in agricultural education need to assess the effectiveness of their education programs with changing times. An example of this would be the Communication for Technology Transfer in Agriculture (CTTA) Project (Ray, 1986). The mission of this project was to “develop, test, and demonstrate integrated multi-channel communication strategies and methods that increase the impact of extension type programs at costs affordable for sustained use by developing nations” (Ray, 1986, p. 1). “The CTTA communication program is guided by systematic strategies based on careful

technology identification, developmental investigation, and continuous monitoring" (Ray, 1986, p. 3).

The CTTA Communication Process started with identifying available agricultural technologies and studying farmers and rural families in the target region. Then the stage of readiness of accepting information was determined. The technologies from farmers' perspective where then assessed. This included: perceived dependability, economic benefit, risk, and practicality. In this instance, evaluators also considered farmers resource constraints and possible negative consequence of not adopting the new information. Developmental investigation was conducted so they could understand farmers' cultural and social characteristics, vocabulary, receptivity to change, ways of receiving and using new information, practices and adoption levels, and hidden constraints (Ray, 1986).

The next phase of strategy development in the CTTA Communication Process included determining message content and, defining the farmer audience, selecting channels for delivering information, developing a system for coordinated message development, and evaluation. The evaluators would then determine effectiveness in transferring this information to farmers. When informative materials were produced, there would be a check of content accuracy, a pretest of representative materials, and an evaluation for feedback. Continual networking with those involved in areas of technology development and transfer was viewed as important by evaluators. The next phase involved timely delivery of information targeted to specific audience segments through relative channels (Ray, 1986).

According to the model, the success of CTTA relied on the extent of the adoption of new or underutilized technologies and the increase as a result of effective communication support – reception. One of the last phases involves formative evaluation. The evaluators determined if the

messages disseminated have been timely, well-received, understood, and considered to be practical. Additionally they evaluated whether the program elements were functioning as planned. For the cycle to continue, there must be ongoing monitoring. This entails systematic feedback and networking to respond promptly and appropriately to unanticipated situations. When feedback is gained, educators would adjust as needed (Ray, 1986).

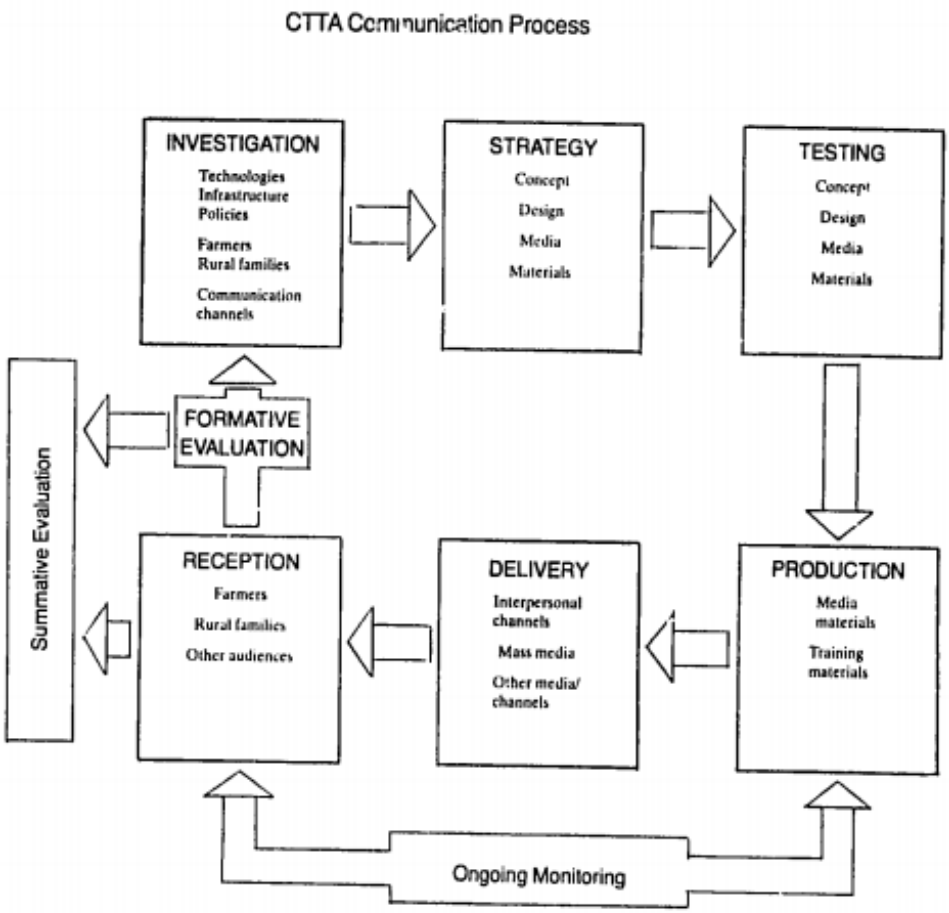

Figure 1. The CTTA Communication Process depicts a continual monitoring system to evaluate resources farmers need and the delivery of those resources by extension workers. Ray, H. E. (1986). Communicating with Farmers. Communication for Technology Transfer in Agriculture. Retrieved from, http://pdf.usaid.gov/pdf_docs/PNABC572.pdf

The CTTA Communication Process model laid out by Ray (1986) could be used to determine usefulness and effectiveness with growers when new programs or technologies are developed and used. This can also be implemented with current program development and evaluation of resources.

Blackwell, Miniard, and Engel's Consumer Decision Model (2001) can be used to explain what happens when growers are in the process of deciding what cultivar to grow or what resources to use. They evaluate what they want, what they need to know, and what they know or have learned from past experiences and other people.

The Technology Acceptance Model (TAM) developed by Davis (1989) can be used to explain growers accepting resources from extension and elsewhere. This could be based on what they have heard from others or just previous opinions based on social and cultural factors. A lot of this will depend upon if the grower thinks the resource will have potential to be useful and easy to use (Davis, 1989). It is viewed as "one of the most popular research models used to predict use and acceptance of information systems by individual users" (Surendran, 2012, p. 175). The updated TAM 2 model would also take into consideration if the grower has any experience using that technology (Surendran, 2012).

Theoretical Framework

The Consumer Decision Model as depicted by Blackwell, Miniard, and Engel (2001) starts when the consumer acknowledges a need between their current state and a desired alternative. The consumer begins to seek information from previous experiences and external sources. During the information process, information passes through five stages of processing before storage and use. These stages include: exposure to the information, attention,

comprehension, acceptance, and retention. The consumer's "situation" could be used to explain time pressure, financial limitations, etc which could inhibit the consumer from purchasing the item. The post-consumption evaluation, which acts as feedback, is used for future external searches and belief formation for decision making. Divestment is acknowledging the product that is purchased is likely to be disposed of at some point after the product is used. This gives a finality to the product and its use.

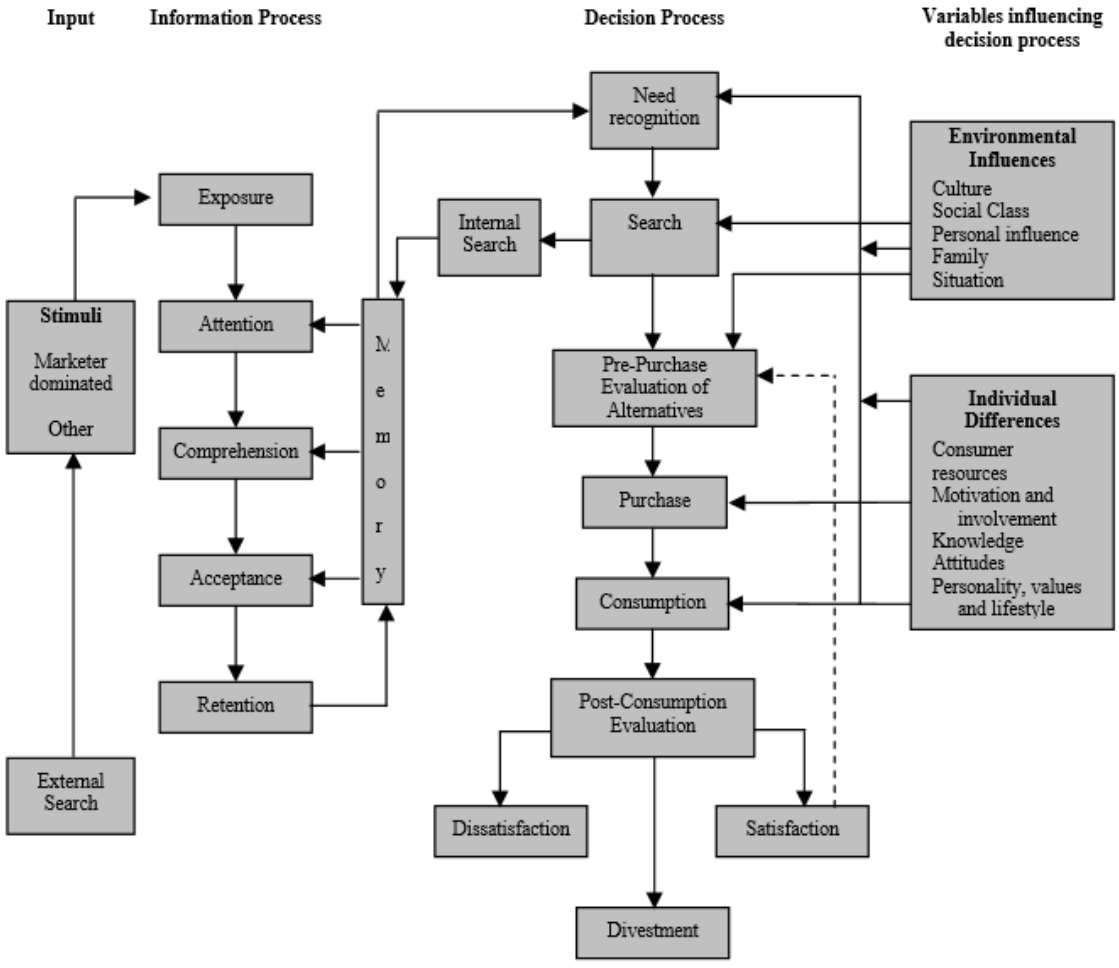

Figure 2. The Consumer Decision Model depicted with a seven point decision process detailing information inputs, alternatives, reflection and divestment. Blackwell, R. D., Miniard, P. W., & Engel, J. F. 2001. Consumer Behavior. 9th ed. Orlando: Harcourt. Image retrieved from http://eprints.bournemouth.ac.uk/10107/1/Consumer_Behaviour_Theory_-_Approaches_%26_Models.pdf

The Technology Acceptance Model depicted by Davis (1989) is used to understand the acceptance of different types of information systems (Surendran, 2012). There are two variables that are part of this model: perceived usefulness and perceived ease of use. According to the model, these are the most important determinants. These variables however are influenced and pre-determined by external variables. These include factors like language, skills, acceptance of others, and political factors (Davis, 1989).

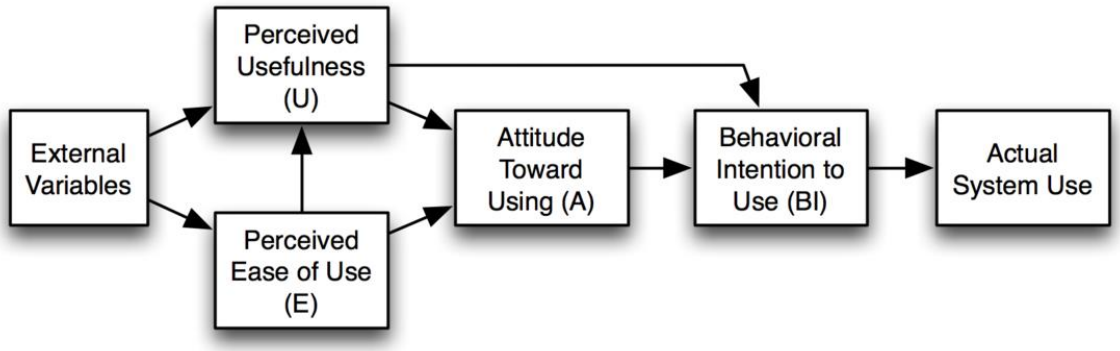

Figure 3. The Technology Acceptance Model depicted with factors that determine if a technology will be used.
Davis, F. D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," MIS Quarterly, 13(3), 1989.

The researcher developed model (Figure 4) depicted shows potentially what process growers go through when deciding which resources to utilize. Growers first recognize the need for a resource. Consumers will acknowledge a need between their current state and a desired alternative (Blackwell, Miniard, & Engel, 2001). Then they begin searching for resources internally through memories and externally through research and recommendations by those around them (Blackwell, Miniard, & Engel, 2001). After searching their alternatives, the grower

will find a potential resource to use (Blackwell, Miniard, & Engel, 2001). Once they identify a potential resource, they evaluate whether they understand how to use the resource and what the resource is explaining (Blackwell, Miniard, & Engel, 2001). If understood, they begin to evaluate its usefulness to them and its ease of use. Davis (1989) defines perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Davis also points out that as a user is determining usefulness, they are also determining how difficult the system is to use and if the benefits outweigh the effort to use the system. He writes that ease of use is "the degree to which a person believes that using a particular system would be free of effort. This follows from the definition of ease: freedom from difficulty or great effort" (Davis, 1989, p. 320). After careful consideration, users then develop an attitude about the resource. This is primarily based on their desirability to use the system (Surendan, 2012). The user will then decide if they actually intend on employing the system. This is the likelihood that the user will actually use the technology (Surendan, 2012). This is when the user actually utilizes the resource. This will also depend on their knowledge, personality, values and lifestyle (Blackwell, Miniard, & Engel, 2001). Lastly, the user will evaluate whether the resource was satisfactory or not (Blackwell, Miniard, & Engel, 2001). This evaluation would then be added to the user's memory for future reference in resource decision making (Blackwell, Miniard, & Engel, 2001).

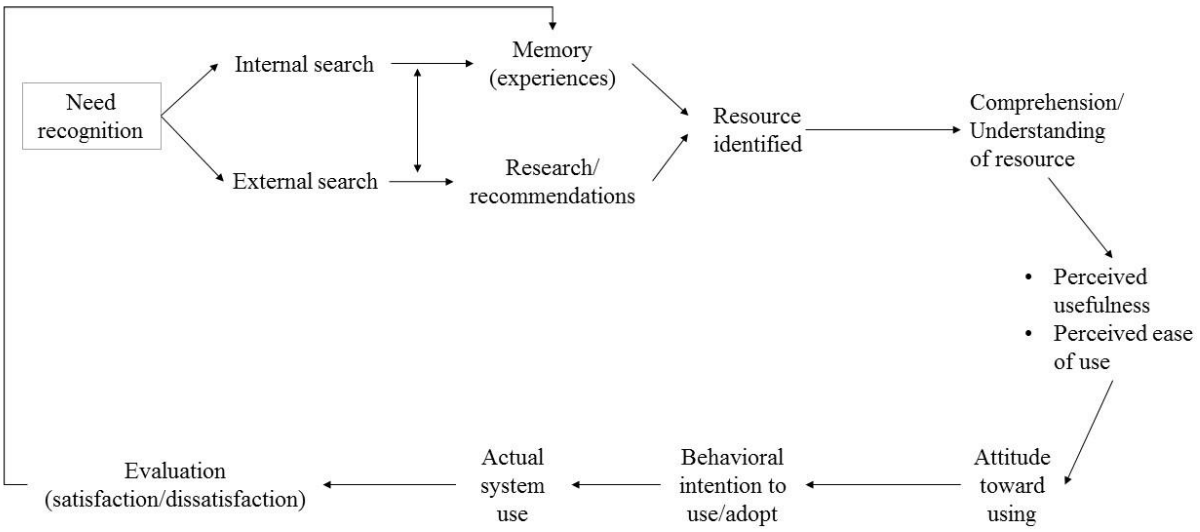

Figure 4. Researcher developed theoretical framework depicting blackberry growers' decision process regarding resource selection.

Chapter III: METHODOLOGY

Purpose Statement (Restated)

The purpose of this study was to describe blackberry operations in Arkansas, describe the ideal blackberry cultivar growers want to produce, describe resources they use to research production information, and describe what changes to current resources growers would like to have. With ever changing technology and the increase in popularity of blackberry production, it is important that growers have the resources they need to excel.

To accomplish the purpose, this study was guided by the following objectives:

1. Determine characteristics of blackberry operations in Arkansas.
2. Describe what characteristics growers perceive as most important to have in a blackberry cultivar.
3. Describe what market the growers target for sales.
4. Describe which communication resources regarding blackberry cultivar information are perceived as most valuable to growers.
5. Describe which communication resources regarding blackberry cultivar information growers would like to have.
6. Describe which communication resources regarding blackberry cultivar information growers would like to see change.

Research Design

This non-experimental, descriptive study utilized a questionnaire to determine Arkansas blackberry growers ideal blackberry cultivar to grow and what resources they find most valuable. The questionnaire was designed to describe grower opinions through a series of questions that address the study's objectives.

Subjects

The population for this study was blackberry growers who attended an Arkansas Blackberry Growers Association Informal Interest Meeting. This questionnaire was a census of blackberry growers (N= 18) in attendance.

Respondent demographics were collected during the study. Growers were asked to provide information regarding their age, completed level of education, years of experience, labor source, farm size, commodities produced, gender, method of production, the market they target for sales, and any additional production systems they utilize.

Institutional Review Board

This study and its methods were approved by the University of Arkansas Institutional Review Board (IRB) before any subjects were asked to partake in this study. All data was kept confidential and all subjects responded on an anonymous basis. The IRB approved the study as "Exempt" with the protocol number 1803108149 (Appendix A).

Instrumentation

A researcher developed survey (Appendix B) was created based on previous surveys conducted by Trede and Whitaker (2000), Windle and Rolfe (2005), and Ford (1995) of a similar nature and with assistance from a panel of four experts in survey research, extension education, and fruit production. This panel was utilized to ensure appropriate vocabulary was used and essential content was addressed to accomplish the objectives. Face and content validity were established by this same panel who reviewed the questions before the survey was distributed. The survey instrument was then reviewed by two growers in cognitive interviews who grow an alternative crop and did not take part in the final survey. They recommended further changes to the questionnaire that involved defining terms, clarification of question phrasing, question

additions, and question removal. Introductory questions were asked to determine details of the growers' operations. Questions about duration of production, size of the farm, other commodities produced, and methods of production were asked. Growers were then asked to rate a variety of blackberry characteristics on a Likert-type scale. They were then also asked to rate their personal views of various education providers and media sources. Then, growers were given the opportunity to suggest new resources and changes to current resources they would like to have. Lastly, the demographic of each grower was established, particularly age, gender, and location.

Data Collection

A paper survey was distributed in-person to growers who attended Blackberry Growers Association informal interest meetings held throughout the state of Arkansas at various locations during the month of April 2018.

Data Analysis

Microsoft Excel was used for data analysis. For each objective, means, standard deviations, and frequencies were used to summarize the data.

Chapter IV: RESULTS AND FINDINGS

Introduction

Chapter IV summarizes the results for this study. The results for this section are organized by objectives. Eighteen surveys were completed throughout the duration of this study. These 18 surveys represent 18 farms and the growers that run them. Some farms were represented by just one person while others were represented by two people, but only one survey was completed. Three growers elected to not fill out the survey and two growers in attendance were from Missouri. There were a total of 21 Arkansas growers and farms represented, resulting in an 86% response rate. The out-of-state growers' information was collected, but not included in the results of this study.

Assessment Demographics

Participant demographic information was collected so trends could be monitored and to gather more information about who is growing blackberries in Arkansas. Most growers that completed the survey were male and over the age of 50. There were six additional women in attendance, but were there with a male family member who completed the survey.

Table 1

Respondents' Age

Item	*f*
26-35	1
36-50	7
50-75	10

Table 2

Respondents' Gender

Item	*f*
Male	17
Female	1

Note. There were 6 more women who attended the workshops with men, but the men filled out the survey.

Most of the participants had some form of post-secondary education, with a majority of growers having a Bachelor's degree or higher.

Table 3

Respondent Highest Level of Completed Education

Item	*f*
High School Diploma	5
Technical Certificate/Education	3
Bachelor's Degree	7
Master's Degree	3

While the growers that participated were scattered throughout the state, they are primarily concentrated in the northern region.

Table 4

Location (County) of Blackberry Operation

Item	*f*
Washington	3
Searcy	2
Fulton	1
Boone	1
Madison	1
Benton	1
Miller	1
Sevier	1
Randolph	1
Greene	1
Independence	1
Pulaski	1
Johnson	1
Cleburne	1
Unknown	1

These growers had a wide range of experience with agriculture and farming and most of them were involved with another agriculture commodity as a source of income.

Table 5

Respondents' Experience with Agriculture and Farming

Item	*f*
1-5 years	6
6-10 years	5
11-20 years	3
20+ years	4

Table 6

Respondents who Produce Other Fruits as a Source of Income

Item	*f*
Yes	12
No	6

Table 7

Other Fruit Commodities Grown [a]

	f	***f***
Item	Currently	Previously
Blueberries	9	0
Strawberries	7	2
Grapes	3	0
Raspberries	3	0
Apples	3	0
Peaches	2	0
Nectarines	2	0
Elderberries	2	0
Figs	1	0
Mayhaw	1	0
Apricots	1	0

[a] Respondents (n = 18) could select multiple responses.

Table 8

Respondents who Produce Vegetables as a Source of Income

Item	*f*
Yes	10
No	8

Table 9

Vegetable Commodities Grown [a]

Item	*f* Currently	*f* Previously
Tomatoes	9	2
Cucumbers	6	2
Squash	6	2
Lettuce	3	2
Potatoes	3	1
Onions	3	1
Okra	3	1
Pumpkin	1	1
Melons	1	1
Corn	1	0
Peas	1	0
Gourds	1	0
Herbs	1	0
Asparagus	1	0
Kale	1	0
Broccoli	1	0
Cabbage	1	0

[a] Respondents (n = 18) could select multiple responses.

Table 10

Respondents who Raise Livestock as a Source of Income

Item	*f*
Yes	10
No	8

Table 11

Type of Livestock Raised

Item	*f* Currently	*f* Previously
Cattle	4	1
Goats	1	1
Chickens	2	2
Pigs	1	2

[a] Respondents (n = 18) could select multiple responses.

A large majority of the group does not participate in any other horticultural associations, but were in attendance because they were interested in learning more information about forming a Blackberry Growers Association.

Table 12

Respondents that Participate in Other Horticultural Associations [a]

Item	*f*
North American Raspberry and Blackberry Association	2
Arkansas State Horticultural Society	1
Arkansas Blueberry Growers Association	1
Mid-American Strawberry Growers Association	1
Arkansas Green Industry Association	1

[a] Respondents (n = 18) could select multiple responses.

Objective One: Determine characteristics of blackberry operations in Arkansas.

These questions were designed to gain information regarding the type of operations in Arkansas that are currently producing blackberries. Most of the growers have only recently entered production. Production in Arkansas is small, all operations being five acres or less and a majority of those being less than an acre. Almost all of the operations operate on a commercial

basis, meaning they sell their blackberries for money. These operations primarily rely on themselves, family, and friends for labor. Most of the growers utilize conventional methods for production. They also primarily implement a V-trellis or some form of it to support their plants. ‘Natchez’ and ‘Ouachita’ were the two most popular varieties grown by the people in attendance.

Table 13

Characteristics of Blackberry Operations

Item	*f*
Duration of Blackberry Production	
Less than 1 year	1
1-5 years	11
6-10 years	5
11-20 years	1
20+ years	0
Plants/Acres of Blackberries Maintained for Production	
1-10 plants	1
11-40 plants	2
Between 41(1300 sq ft.) and 92 plants (1/16 acre)	3
Between 93 (1/16 acre) and 186 plants (1/8 acre)	0
Between 187 (1/8 acre) and 374 plants (1/4 acre)	2
Between 375 (1/4 acre) and 749 plants (1/2 acre)	1
Between 750 (1/2 acre) and 1499 plants (1 acre)	3
1-5 acres	6
6+ acres	0
Type of Operation	
Commercial	16
Hobby	2

Table 13 (Cont.)

Characteristics of Blackberry Operations

Item	*f*
Source of Labor [a]	
Self	17
Family and friends	10
Local people in the community	4
System of Production [a]	
Conventional or standard methods	13
Mixed Systems (Conventional and organic practices)	3
Certified Naturally grown	1
Other (Comment: still deciding, need more info)	1
Methods of Production Utilized [a]	
V- Trellis	10
Rotating cross-arm trellis	3
Single wire	2
T trellis	2
Cross Trellis	1
2 Wire	1
High tunnels	1
Cultivars in Production [a]	
Natchez	13
Ouachita	10
Prime-Ark Freedom	7
Osage	7
Apache	5
Prime-Ark Traveler	4
Arapaho	4
Triple Crown	4

Table 13 (Cont.)

Characteristics of Blackberry Operations

Item	*f*
Prime-Ark 45	2
Kiowa	2
Navaho	2
Unknown variety	2
Tupee	1
Sweetie Pie	1

[a] Respondents (n = 18) could select multiple responses.

Objective Two: Describe what characteristics growers perceive as most important to have in a blackberry cultivar.

Desirable fruit characteristics were determined so interpretations could be made as to what type of cultivar growers find desirable. Primocane fruiting was viewed as "not important" and floricane fruiting was viewed as "no opinion" or "indifferent". The remaining plant characteristics were ranked as "important". Disease and pest resistance were ranked the highest. Tart flavor and fruit shape were ranked as "no opinion/indifferent" by the growers in attendance. The remaining categories were viewed as "important" with sweet flavor ranked the highest of the berry characteristics.

Table 14

Mean Scores and Standard Deviations of Blackberry Cultivar Characteristics

Item	*M*	*SD*
Plant Characteristics		
Disease resistance	4.56	.50
Pest resistance	4.56	.50
Plant yield	4.50	.76
Thornlessness	4.17	.90
Floricane fruiting [a]	3.65	1.03
Primocane fruiting	1.89	1.04
Berry Characteristics		
Sweet Flavor	4.50	.69
Storage Life	4.44	.60
Overall Fruit Flavor [a]	4.35	1.03
Fruit Size	4.28	.56
Fruit Color	4.17	.69
Firmness	4.17	.69
Fruit Shape	3.78	.85
Tart Flavor	3.06	1.22

Note. Response scale: 1 = not important; 2 = some importance; 3 = no opinion/indifferent; 4 = important; 5 = very important

[a] Out of 17 responses

When asked what the primary reasons were for choosing a specific cultivar to grow, growers primarily responded because it was “a thornless variety” and “it has high yields”.

Table 15

Selected Reasons for Choosing Blackberry Cultivars in Production

Item	*f*
It's a thornless variety.	15
It has high yields.	14
It produces a high quality berry.	9
It's disease tolerant.	8
It's a reliable and consistent producer.	7
It's easy to harvest.	6
It has primocane fruiting ability.	5
It's relatively easy to maintain.	5
Other comments:	3
"Kiowa is early, though thorny. Preferably early/mid varieties."	
"Seems as though this will work well in our environment"	
"Freedom (early ripe)"	

Objective Three: Describe what market the growers target for sales.

The purpose of these series of questions was to determine if the growers were growing for a wholesale market, a retail market, or local markets such as farmer's markets and local stores and if the blackberries were sold fresh, frozen, or processed.

The Arkansas growers that attended these meetings primarily sell their berries for fresh consumption. They also usually utilize Farmer's Markets or Pick-Your-Own methods to sell their fruit.

Table 16

Outcome of Berries Sold

Item	*f*
Fresh	16
Frozen	7
Processed (juice, jelly etc)	3

[a] Respondents (*n* = 18) could select multiple responses.

Table 17

Where Blackberries are Sold

Item	*f*
Farmer's market	9
Pick-Your-Own	9
Retail	5
Wholesale	5
Roadside stand	3
Restaurant	2
Other (direct, on farm)	2
Community Supported Agriculture (CSA) Shares	0

[a] Respondents (*n* = 18) could select multiple responses.

Objective Four: Describe which communications resources regarding blackberry cultivar information are perceived as most valuable to growers.

These questions were designed to discover which of the information resources were the most valuable to each farming operation.

Some of the more traditional methods through Extension are still utilized. Arkansas Cooperative Extension Personnel were viewed as the most valuable resource for blackberry cultivar information, closely followed by field days/demonstrations, workshops and conferences,

and internet searches/websites. Only internet searches and YouTube, modern technologies, were rated "valuable". Most of the modern technologies were rated as "slightly valuable" or lower. Out-of-state college courses were ranked the lowest at only "slightly valuable". Additionally a grower commented, "These [resources] are hard to find. Iowa has the easiest to find but the climate difference between Iowa and Arkansas is pretty significant. These resources should be easy to find!"

Table 18

Mean Scores and Standard Deviations of Rated Resources

Item	*M*	*SD*
Arkansas Cooperative Extension Service Personnel	4.22	1.03
Field days/ Demonstrations	4.06	1.13
Workshops and Conferences	4.06	.91
Internet searches/websites	4.06	1.13
Personal sources (Relatives, friends, fellow growers)	4.00	1.15
Farm visits	3.94	.97
Extension Service Pamphlets/Handouts	3.89	1.10
Newsletters	3.50	.76
YouTube	3.50	1.01
Facebook	3.44	1.26
In-State Agencies (NRCS, ATTRA, Farm Bureau etc.)	3.39	1.21
Newspapers/Magazines	3.18	1.11
Webinars	3.06	1.22
Twitter [a]	2.94	1.13
Industry Journals	2.89	1.24
Advertisements	2.72	1.52
Private Consultants	2.67	1.29
Out-of-state Cooperative Extension Service Personnel [a]	2.65	1.00
Out-of-State Agencies (NRCS, ATTRA, Farm Bureau etc.)	2.56	1.12
Blogs	2.44	1.21
Arkansas college courses	2.39	1.21

Table 18 (Cont.)

Mean Scores and Standard Deviations of Rated Resources

Item	*M*	*SD*
Television Programs	2.39	1.06
Other Forms of Social Media (Pinterest, Snapchat, LinkedIn, etc.)	2.33	1.11
Radio Programs, Podcasts	2.33	1.25
Instagram [a]	2.29	1.13
Out-of-state college courses	2.06	1.27

Note. Response scale: 1 = not valuable; 2 = slightly valuable; 3 = no opinion; 4 = valuable; 5 = extremely valuable.
[a] Out of 17 responses

Objective Five: Describe which communications resources regarding blackberry cultivar information growers would like to have.

These questions were created for the growers to add their input and give suggestions on which subjects they would like more information. Growers are primarily interested in learning about different types of production techniques, closely followed by integrated pest management and disease and pest control. They were least interested in business management, overwintering their blackberry crop, and use of cover crops and intercropping.

Table 19

Topics Respondents Indicated Desire for More Information

Item	*f*
Production Techniques (sustainable, organic, conventional)	17
Integrated Pest Management	16
Disease Control	16
Pest Control	16
Production technologies (trellising, tunnels, etc)	14
Cultivar Information	14
Pruning	13
Marketing/Sales	12
Processing/Added value production	10
Climate Information	9
Postharvest	9
Business Management	8
Overwintering	8
Cover crops/Intercropping	7

[a] Respondents (n = 18) could select multiple responses.

Objective Six: Describe which communications resources regarding blackberry cultivar information growers would like to see change.

The final question was a "Comments" section where the growers could address anything additional that the census did not address and provide input on currently available sources and topics. The comments varied from topic to topic, but overall growers want more information that is easier to find. One grower did share their appreciation for the work extension does by commenting, "Thank you for your hard work and being here for us."

Table 20

*Respondent Suggestions for Current Resource Improvements (*n = *4)*

Category	Comments
Cultivar Information	Better producers [cultivars]
Climate information	Charts for winter hardiness and flower low tolerance of temperatures; proper growth techniques
Production techniques	One stop best effort; organic checklist
Marketing/Sales	Advertisement
Integrated Pest Management	SWD [Spotted Wing Drosophila] control
Disease control	Proper fungus protection
Pest control	Best practices
Other	All of the above needs to be easier to find!

Note. Suggestions based on comments from 4 growers.

Chapter V: CONCLUSIONS AND RECOMMENDATIONS

Research Overview

The purpose of this study was to describe who is growing blackberries in Arkansas, describe how they are growing blackberries, describe resources they use to make those decisions, and describe what changes to current resources growers would like to have. With the transitions to electronic based media and resources, this research addressed where the Extension Service should pool their valuable resources and identified those resources that are perceived as most desirable to growers. This research also identified techniques that best communicate new information in agriculture to the public.

This non-experimental, descriptive study was designed to address the objectives through a researcher-made survey distributed to blackberry growers who attended the Blackberry Growers Association informal interest meetings.

Summary of Findings

Assessment Demographics

Most of the growers that completed the survey were over the age of 50 and were male. This indicates that there is an aging grower population. This would be an opportunity to recruit individuals that were under the age of 50 and female. There were six additional women in attendance with their husbands, but the men filled out the survey. This would also be a great recruitment opportunity or a chance to address if there are any barriers preventing these populations from growing blackberries. Additional surveys could be utilized to determine who and how many additional individuals are involved in the management of these growing

operations. All participants obtained at least a high school level education, but most of the growers obtained some form of additional post-secondary education.

While three growers all resided in Washington county, growers are scattered throughout the state, primarily in the northern region. Again, this could be an opportunity to reach out to the southern part of the state to encourage educators and those interested in pursuing blackberry production. The participants had a wide variety of experience with agriculture and farming. Only a few growers were participants in other horticultural associations, two of which involved other fruit crops. Most of the growers produce other crops in addition to blackberries. These crops include blueberries, strawberries, tomatoes, cucumbers, and squash. Some of these growers also rely on livestock as a source of income, mainly cattle. This holds true to Arkansas' long-lasting tradition of involvement in agriculture.

Objective One: Determine characteristics of blackberry operations in Arkansas.

Most of the growers in attendance of the meetings did not have a lot of experience in blackberry production with a majority of the growers having only spent 1-5 years producing blackberries. This group of growers would then be seeking information regularly to assist their production as they work to better understand this crop and to be successful. They would also need more information than a more experienced grower to help them gain new knowledge.

Despite almost all of the growers maintaining a commercial operation, a majority of the growers had less than 1 acre of blackberries in production. This could be due to the fact that they have limited experience growing blackberries. This also explains why growers rely primarily on themselves and friends or family for labor, at this point in their production they do not require a

larger labor force. Future research could be used to determine expansion plans and limitations to expansion.

Most of the growers produce blackberries for a source of income. Thirteen growers rely solely on conventional or standard methods of production, with an additional three utilizing conventional methods in partial capacity. In a later portion of the questionnaire, growers revealed that they wanted more information regarding production methods. A majority of growers utilize the V-trellis or some variation of that trellising. Only three have incorporated the rotating cross-arm trellis and one utilizes a high tunnel to grow blackberries. Many growers are waiting for research regarding cost-effectiveness of these new technologies. Growers also noted later in the questionnaire that they wanted more information about production techniques. This desire for new information indicates that they are considering altering their operation and are open to new ideas. They may also want more information because most of them have limited knowledge and experience growing blackberries.

Natchez (n = 13) and Ouachita (n =10) are overwhelmingly popular in production. These varieties were developed in the University of Arkansas blackberry breeding program and are promoted throughout the state as high quality berries. Despite the popularity of these varieties, cultivar information was also listed frequently as a topic growers wish to have more information about.

Objective Two: Describe what characteristics growers perceive as most important to have in a blackberry cultivar.

Disease and pest resistance were ranked as most important of plant characteristics, followed closely by plant yield. Since most of the growers are producing blackberries for income, it makes sense that they want more information on these topics. Disease and pest control can be expensive and cut into their production budget. Plant yield is important because this can also be a limiting factor to how much money a grower could make. Arkansas experiences a variety of weather conditions, including high humidity and mild winters, which can create frequent disease and pest problems for growers if not controlled properly. Primocane fruiting was ranked as the least important. This could be due to the fact that Arkansas does not experience cool enough temperatures when primocane flowers are blooming to produce desirable berries.

Sweet flavor and storage life were ranked as the most important berry characteristics. These characteristics would be important to the growers because they rely primarily on fresh market and direct sales. Tart flavor was ranked the lowest at only 3.06 or "no opinion/indifferent".

When asked why they chose the particular cultivars they grew, "it's a thornless variety" and "it has high yields" were the most popular responses. Additional comments that were written in regarded the time of season that it ripened was preferable. It is possible that if time of season was listed as an option, it would have generated more responses. These responses correspond to the primary methods the growers sell their berries, farmer's markets and pick-your-own. Both of these methods require high yields to sustain customers in addition to the growers making a profit.

For the pick-your-own method, thornlessness draws in more customers and is more appealing to harvest than a thorny variety.

Objective Three: Describe what market the growers target for sales.

Growers primarily target the fresh market for berry sales. Growers mainly utilize farmer's markets or pick-your-own methods for berry sales. This could be another area to research regarding limitations or desire for expansion to additional markets.

Objective Four: Describe which communications resources regarding blackberry cultivar information are perceived as most valuable to growers.

Growers tend to rely on the traditional methods of gathering information. Arkansas Cooperative Extension Service [CES] Personnel were ranked as the most valuable resource to growers. CES personnel are the primary source of grower information in the state and work hard to disseminate necessary information to growers. Internet searches and YouTube are also popular sources of information. Out-of-state college courses was ranked as the least valuable at 2.06, only "slightly valuable". This and other out-of-state information sources' rankings indicate most of the growers rarely utilize out-of-state resources. Some of the newer technologies available growers have yet to adapt.

Objective Five: Describe which communications resources regarding blackberry cultivar information growers would like to have.

Growers overwhelmingly decided that they would be interested in more information on production techniques (n = 17), integrated pest management (n = 16), disease control (n = 16), and pest control (n = 16). If improperly managed, these areas of production can be extremely

limiting to yield potential and quality. Growers want as much information as possible in these areas so they can have the highest yield and quality of berries possible.

Objective Six: Describe which communications resources regarding blackberry cultivar information growers would like to see change.

Most of the growers that responded to this portion of the survey had suggestions for improvement to content regarding additional information. One grower did suggest that the available resources need to be easier to find. Generally, they wanted more information to be available.

Conclusions

There are many aspects of blackberry production, but the growers who completed this questionnaire have indicated which ones they find valuable and utilize. This information provided insight into Arkansas blackberry production to aid researchers and educators in the work they conduct. With this newly acquired information, resources can be developed to better suit the state's growers. Researchers will also have a better idea of who the growers are, what their operations look like, and what growers need from them.

This information can be used as a guideline for priorities for education and new resources. Based on the survey results, researchers and educators should focus on production technologies, disease and pest control, production technologies, and cultivar information as a place to start for developing educational materials. Growers would prefer that this information be available through Arkansas CES Personnel, Field Days/Demonstrations, and Workshops and Conferences. Since growers do rely on internet searches and their personal sources, growers need to make sure they are utilizing well-informed sources.

These growers indicated that they utilize agriculture for alternative sources of income and want high quality cultivars. Educators and researchers can work to help growers boost their income by providing more educational opportunities and better cultivars that produce higher yields and that can withstand pest and disease pressure.

There is room for expansion in blackberry production in Arkansas. With the aging grower population, there is an opportunity to recruit new individuals to aid and expand blackberry production. Despite this, most growers indicated that they are seeking ways to improve their operation. This is great news for Arkansas blackberry production. With improvements to information and production, and cooperation between researchers, educators, and growers; blackberry production has a great chance to be successful.

Recommendations for Future Research

Based on the results from this study, the researcher has the following recommendations for future studies conducted in this area of research:

- More studies similar to this nature should be replicated with more people to confirm or refute this study's results
- Surveys could be conducted after new resources are created and distributed to determine impact and satisfaction of those new resources
- Attempt to survey the same population again to see how or if views change

Recommendations for Practice

The results from this survey does not include the views from every grower in the state, but it is a reflection of a portion of the population. The researcher hopes the results from this study will be utilized to guide future extension and research endeavors regarding blackberry production. Researchers and educators will need to address the growers' decision process (Figure 4). Very few growers who participated in this study will have experiences to draw information from and will have to rely heavily on external searches. Educators will need to ensure not only that information is available, but also that it is easy to find and understand. With this information in mind, Extension can determine ways to disseminate new information. Professionals in agriculture can use this information as a reference for creating and targeting resources for the appropriate population. They can also look to overcome limitations in blackberry production to increase state yields and to encourage individuals to begin and increase production. Research could be conducted to determine if there is a breakdown in the growers' decision process (Figure 4) that discourages individuals from beginning blackberry production.

While this study has begun to address some of the questions regarding blackberry production and its growers, it has stimulated new interests and inquiries to be expanded on in the future. It is the hope of the researcher that this information will be used to develop better surveys to distribute again to larger populations of growers, and eventually growers of other commodities.

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Appendix A

UNIVERSITY OF ARKANSAS

To:	Lesley Marie Smith
From:	Douglas James Adams, Chair IRB Committee
Date:	04/03/2018
Action:	**Exemption Granted**
Action Date:	04/03/2018
Protocol #:	1803108149
Study Title:	Aiding Growers Decisions: Describing Arkansas blackberry growers resources and needs regarding cultivar selection

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Kate Shoulders, Investigator

Appendix B

Dear Arkansas Blackberry Grower,

I am a graduate student at the University of Arkansas in Fayetteville working towards earning a Master's degree in Agriculture and Extension Education. As a part of my research project for my degree requirements, I am conducting an assessment of Arkansas blackberry growers through a questionnaire. My hope is that you will be willing to take some time out of your busy schedule to complete it. Your contribution of information is critical to accurately evaluating the current state of growers and their resources in the state of Arkansas. The results of this survey will be used to identify: characteristics of blackberry cultivars growers believe are most important, the markets that are targeted for sales, which communication resources growers believe are most valuable, what resources growers would like to have, and which resources growers would like to see change.

The survey may appear lengthy at first, but the questions are easy to answer. Please answer the questions as honestly as possible. Your participation is voluntary and if you decline to participate it will not adversely affect any other relationship you may have with the University of Arkansas. All information collected will be kept confidential to the extent allowed by law and University policy. No identifying information will be used in any reports or publications resulting from the research.

The results of this assessment may be accessed upon completion of the project and will be valuable to you as an individual producer and the Arkansas blackberry industry as a whole. It is my hope that the results of the study will be used utilized by extension and research personnel to develop more pertinent resources and materials for you, the grower.

If you have questions or concerns about your rights as a research participant, please contact Ro Windwalker, the University's Human Subjects Compliance Coordinator, at 479-575-2208 or irb@uark.edu. Your participation is greatly appreciated.

Sincerely,

Lesley Smith
[redacted]

Catherine Shoulders
(Faculty Supervisor)
cshoulde@uark.edu
479-575-3799

Current Growers

1. How long have you grown blackberries?
    - ☐ Less than 1 year
    - ☐ 1-5 years
    - ☐ 6-10 years
    - ☐ 11-20 years
    - ☐ 20+ years

2. How many acres of blackberries do you maintain for production?
    - ☐ Less than 1 acre (less than 1500 plants)
        i. Please specify **approximate** number of plants:
            1. 1-10 plants
            2. 11-40 plants
            3. Between 41(1300 sq ft.) and 92 plants (1/16 acre)
            4. Between 93 (1/16 acre) and 186 plants (1/8 acre)
            5. Between 187 (1/8 acre) and 374 plants (1/4 acre)
            6. Between 375 (1/4 acre) and 749 plants (1/2 acre)
            7. Between 750 (1/2 acre) and 1499 plants (1 acre)
    - ☐ 1-5 acres
    - ☐ 6-10 acres
    - ☐ 11-20 acres
    - ☐ 20+ acres

3. How do you grow blackberries?
    - ☐ Commercially (for sale) (continue to **#4**)
    - ☐ As a hobby (for home use) (redirect to **#7**)

4. What is the final outcome of the blackberries you sell?
    - ☐ Fresh
    - ☐ Frozen
    - ☐ Processed
    - ☐ Other _____

5. Where do you typically sell your blackberries? (Select all that apply)
    - ☐ Farmer's market
    - ☐ Roadside stand
    - ☐ Retail
    - ☐ Wholesale
    - ☐ CSA shares
    - ☐ Pick Your Own
    - ☐ Restaurant
    - ☐ Other _____

Current Growers

6. What is your source of labor? (Select all that apply)
   - ☐ Self
   - ☐ Family and friends
   - ☐ Local people in the community
   - ☐ H-2A or transient workers (temporary, non-immigrant workers)
   - ☐ Students
   - ☐ Other _____

IDEAL BLACKBERRY CHARACTERISTICS

7. As a grower, how important are the following blackberry plant characteristics?:

Response scale: 1=not important; 2=some importance; 3=no opinion/indifferent; 4=important; 5=very important

	1	2	3	4	5
Disease Resistance					
Pest Resistance					
Thornlessness					
Primocane Fruiting					
Floricane Fruiting					
Plant yield					

8. As a grower, how important are the following berry characteristics?:

Response scale: 1=not important; 2=some importance; 3=no opinion/indifferent; 4=important; 5=very important

	1	2	3	4	5
Fruit size					
Fruit color					
Fruit shape					
Firmness					
Overall Fruit flavor					
Tart Flavor					
Sweet Flavor					
Storage Life					

Current Growers

RESOURCES

9. As a grower, how valuable are the following resources regarding blackberry production?:

Please mark the box with the appropriate rating. Response scale: 1=not valuable; 2=slightly valuable; 3=no opinion; 4=valuable; 5=extremely valuable

	1	2	3	4	5
Personal sources (Relatives, friends, fellow growers)					
Arkansas Cooperative Extension Service Personnel					
Out-of-state Cooperative Extension Service Personnel					
In-State Agencies (NRCS, ATTRA, Farm Bureau etc.)					
Out-of-State Agencies (NRCS, ATTRA, Farm Bureau etc.)					
Arkansas college courses					
Out-of-state college courses					
Farm visits					
Field days/ Demonstrations					
Webinars					
Workshops and Conferences					
Newsletters					
Newspapers/Magazines					
Radio Programs, Podcasts					
Television Programs					
Industry Journals					
Private Consultants					
Extension Service Pamphlets/Handouts					
Internet searches/websites					
YouTube					
Facebook					
Twitter					
Instagram					
Other Forms of Social Media (Pinterest, Snapchat, LinkedIn, etc.)					
Blogs					
Advertisements					

Current Growers

NEW RESOURCES

10. Please select all of the various categories of blackberry production listed below that you would like to have more information about:
    - ☐ Cultivar information
    - ☐ Climate information
    - ☐ Production techniques (sustainable, organic, conventional)
    - ☐ Production technologies (trellising, tunnels, etc)
    - ☐ Postharvest
    - ☐ Marketing/Sales
    - ☐ Business Management
    - ☐ Processing/Added value production
    - ☐ Integrated Pest Management
    - ☐ Disease Control
    - ☐ Pest Control
    - ☐ Pruning
    - ☐ Overwintering
    - ☐ Cover crops/Intercropping
    - ☐ Other (please describe) _____

11. Do you have any suggestions for how currently available grower resources could improve?
    - ☐ Yes (continue to **#12**)
    - ☐ No (redirect to **#13**)

12. If so, using the spaces and categories provided, please describe what you would like to see change **AND how** you would like it to change:

- Cultivar information:
- Climate information:
- Production techniques (sustainable, organic, conventional):
- Production technologies (trellising, tunnels, etc):
- Postharvest:
- Marketing/Sales:
- Business Management:
- Processing/Added value production:

Current Growers

- Integrated Pest Management:
- Disease Control:
- Pest Control:
- Pruning:
- Overwintering:
- Cover crops/Intercropping:
- Other:

13. What is the primary system you use to produce blackberries?
    a. Conventional or standard methods
    b. Organic methods
    c. Certified organic
    d. Certified naturally grown
    e. Mixed systems
    f. Other_____

14. Do you use any of these methods to produce your blackberries? (Select all that apply)
    ☐ Trellising systems
        i. Please specify:
            1. V-trellis
            2. Rotating cross-arm trellis
            3. Other _____
    ☐ High tunnels
    ☐ Low tunnels
    ☐ Greenhouses
    ☐ I don't use any of these methods
    ☐ Other _____

Current Growers

15. What blackberry cultivars do you currently have planted? (Select all that apply)
    - ☐ Prime-Ark 45
    - ☐ Prime-Jim
    - ☐ Prime-Jan
    - ☐ Prime-Ark Traveler
    - ☐ Prime-Ark Freedom
    - ☐ Osage
    - ☐ Ouachita
    - ☐ Natchez
    - ☐ Arapaho
    - ☐ Apache
    - ☐ Tupee
    - ☐ Navaho
    - ☐ Obsidian
    - ☐ Onyx
    - ☐ Kiowa
    - ☐ Darrow
    - ☐ Chester
    - ☐ Triple Crown
    - ☐ Other(s) _____

16. Why did you choose to grow those cultivars? (Select all that apply)
    - ☐ It's a thornless variety.
    - ☐ It has primocane fruiting ability.
    - ☐ It has high yields.
    - ☐ It's disease tolerant.
    - ☐ It's relatively easy to maintain.
    - ☐ It produces a high quality berry.
    - ☐ It's easy to harvest.
    - ☐ It's a reliable and consistent producer.
    - ☐ Other _____

17. Which county in Arkansas do you produce blackberries in?

18. How many years of experience do you have with agriculture and farming?
    a. Less than a year
    b. 1-5 years
    c. 6-10 years
    d. 11-20 years
    e. 20+ years

Current Growers

19. Are you a member of any horticulture associations? (Select all that apply)
    - ☐ No
    - ☐ NARBA (North American Raspberry and Blackberry Association)
    - ☐ Arkansas State Horticultural Society
    - ☐ Master Gardeners
    - ☐ Other(s)_____

20. Do you grow or have you previously grown any fruit in addition to blackberries as a **source of income**?
    - ☐ Yes (continue to **#21**)
    - ☐ No (redirect to **#22**)

21. Please check the corresponding boxes if you have grown or currently grow any crops listed below as a **source of income**:

	Currently	Previously
Blueberries		
Grapes		
Raspberries		
Strawberries		
Apples		
Peaches		
Nectarines		
Other (please describe) _____		

22. Do you grow or have you previously grown any vegetables as a **source of income**?
    - ☐ Yes (continue to **#23**)
    - ☐ No (redirect to **#24**)

23. Please check the corresponding boxes if you have grown or currently grow any crops listed below as a **source of income**:

	Currently	Previously
Tomatoes		
Cucumbers		
Squash		
Potatoes		
Onions		
Lettuce		
Other (please describe) _____		

Current Growers

24. Do you raise or have you previously raised any livestock as a source of income?
    a. Yes (continue to **#25**)
    b. No (redirect to **#26**)

25. Please check the corresponding boxes if you have raised or currently raised any livestock listed below as a **source of income**:

	Currently	Previously
Cattle		
Goats		
Pigs		
Chickens		
Turkeys		
Other (please describe) _____		

26. What is your age?

    ☐ Less than 18
    ☐ 18-25
    ☐ 26-35
    ☐ 36-50
    ☐ 50-75
    ☐ 75+

27. What is your gender?
    a. Male
    b. Female
    c. Prefer not to respond

28. What is your highest level of completed education?
    a. GED
    b. High School Diploma
    c. Associates Degree
    d. Technical Certificate/Education
    e. Bachelor's Degree
    f. Master's Degree
    g. Doctoral Degree
    h. Other _____

29. Do you have any additional comments?: