ASSESSING THE IMPACT OF AN AGRICULTURAL ECONOMICS GAME IN SECONDARY AGRICULTURAL EDUCATION CURRICULUM: THE FARM AND RANCH RISK MANAGEMENT (FARRM) GAME

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CHAPTER I

INTRODUCTION

The 2009 National Research Council (NRC) report, *Transforming Agricultural Education for a Changing World,* recently cited an increasing problem for departments of agricultural economics in higher education – a steady decline in undergraduate enrollment (NRC). Additionally, the NRC indicated increased competition from business schools for undergraduate enrollment at land-grant institutions. Typically, agricultural economics departments have relied on curricula focused on applied economics with an emphasis on empirical methods and risk management (NRC, 2009). Therefore, agricultural economic departments need to find a unique niche to attract students to major in agricultural economics.

One strategy for recruiting students has involved partnering with secondary schools. "Over the years, a number of highly successful K-12 programs have provided students and teachers with firsthand knowledge of the broader educational and career opportunities in the agricultural sciences" (NRC, 2009, p. 78). By assisting secondary education with curriculum development, colleges and universities have provided teachers with innovative curriculum and teaching materials. This, in turn, has fostered engaged learners and helped to reinforce the concept of life-long learning (NRC, 2009). Additionally, the curriculum provides students with a preview of what a career in a particular field will entail.

Currently, a lack of agricultural economics curriculum is taught in Oklahoma secondary agricultural education programs. A recent study by Robinson, Krysher, Haynes, and Edwards (in press) analyzed the amount of agricultural education student teachers' time was devoted to instruction by curriculum area. During the course of four academic semesters, student teachers spent the least amount of time (zero to two hours weekly) preparing curriculum and teaching agribusiness and marketing (Robinson, Krysher, Haynes, & Edwards, in press). Therefore, it is important for faculty in agricultural economics to partner with high schools to develop curriculum for agricultural education programs to increase students' awareness about agricultural economics.

Developing curriculum for secondary education can be challenging. Duncan, Ricketts, Peake, and Uesseler (2006) conducted a study surveying secondary agricultural education teachers in Georgia. The study found agricultural education teachers need to integrate current advances in technology into the curriculum to engage students. Currently, high school students are classified as millennials or individuals who have been raised in a global environment and crave multi-media and pop culture stimulation (Hickam & Meixner, 2008). This millennial generation has grown up playing games, especially digital games, and these games have changed the way current students learn (Green & McNeese, 2007). Therefore, to reach the millennial generation, curriculum should incorporate the concept of "edutainment" by using digital games that incorporate visuals and narratives while encouraging learning through critical and creative thinking (Okan, 2003).

The study conducted by Duncan et al. (2006) also reiterated the need to develop curriculum to teach students to become critical and creative thinkers. A method to

facilitate this type of learning is by providing students with hand-on activities or experiences while encouraging critical and creative thinking (Kolb, 1981). The use of games in conjunction with curriculum offers a way to engage students in the curriculum while also providing them real-world applications (Dixit, 2005).

Statement of the Problem

At Oklahoma State University, the Department of Agricultural Economics in the Division of Agricultural Sciences and Natural Resources has experienced a decline (17.9%) in undergraduate student enrollment from 2004 – 2009 (OSU Student Profile, 2009). Consequently, faculty members in the Department of Agricultural Economics at Oklahoma State University are searching for ways to increase undergraduate enrollment by developing agricultural economics curriculum and an interactive game to reinforce curriculum concepts for Oklahoma secondary agricultural education programs.

Purpose of the Study

The purpose of this study was to determine if the use of the Farm and Ranch Risk Management (FARRM) game and associated curriculum improved student awareness about the field of agricultural economics as well as increased the understanding about agricultural economics concepts (i.e., introduction to agricultural economics, resource use, marketing analysis tools, and financial statements) among selected Oklahoma secondary agricultural education students. The study measured students' awareness of agricultural economics by surveying students regarding prior exposure to agricultural economics curriculum, publications, media, and related career options.

The study also tested the knowledge of students regarding agricultural economics after completing six 45-minute class periods using the FARRM game and curriculum developed for this project. Specifically, the study compared the knowledge retention of students using the FARRM game in conjunction with the agricultural economics lectures to students whose curriculum solely consisted of agricultural economics lectures.

The need for the study materialized as a result of secondary agricultural education teachers requesting assistance with the preparation of agricultural economics curriculum and of the declining enrollment of undergraduates in agricultural economics. The participating classes were selected by the agricultural education district program specialists from the Oklahoma Department of Career and Technology Education. The six participating schools in the study represent all five agricultural education districts in Oklahoma. All students in the study were enrolled in a high school agricultural education course, and therefore, were classified as freshmen (ninth grade), sophomores (tenth grade), juniors (eleventh grade), or seniors (twelfth grade).

Research Questions

The following research questions guided the study:

1. What are the general characteristics of selected students enrolled in secondary agricultural education classes in Oklahoma during the 2009 – 2010 academic year?
2. What level of awareness do selected Oklahoma secondary agricultural education students have about agricultural economics, including agricultural economics curriculum, publications, media, and related career options?

3. Do secondary agricultural education students who participated in the agricultural economics curriculum and the FARRM game show greater knowledge gain than the secondary agricultural education students who participated only in the agricultural economics curriculum?

Null Hypotheses

The following null hypotheses guided this study:

Ho1: No difference exists in the level of knowledge about the introduction agricultural economics between the two participant groups.

Ho2: No difference exists in the level of knowledge about resource use in agricultural economics between the two participant groups.

Ho3: No difference exists in the level of knowledge about the use of marketing tools part one in agricultural economics between the two participant groups.

Ho4: No difference exists in the level of knowledge about the use of marketing tools part two in agricultural economics between the two participant groups.

Ho5: No difference exists in the level of knowledge about the use of financial statements in agricultural economics between the two participant groups.

Scope of the Study

The scope of this study was confined to students enrolled in selected secondary agricultural education programs in Oklahoma during the spring 2010 semester. The selected secondary education programs were representative of the five Oklahoma secondary agricultural education program districts. The total number of students tested was 77 with 46 treatment one participants and 31 treatment two participants.

Basic Assumptions

The following assumptions were made during this study:

1. The performance of the four instructors did not differ in treatment group one or treatment group two during the study.
2. The lectures, handouts, and supplemental materials used during the agricultural economics curriculum unit did not differ in treatment group one or treatment group two during the study.
3. The control and treatment group instructors did not discuss the experiment while it was in progress.
4. Each student performed to the best of his or her ability on each pre-test and post-test.

Limitations

The following limitations applied to this study:

1. The instructors for the agricultural economics curriculum only had teaching experience in higher education, adult education, and extension settings. Therefore, instructors had no secondary agricultural education teaching experience. This may have affected the way the material was presented to students.
2. While the agricultural economics curriculum was presented during a series of six, 45-minute class periods, the six class periods were not necessarily consecutive and varied by school. Therefore, the time period for the presentation of the curriculum ranged from six consecutive days to two and a half weeks.

3. The number of students working together on the FARRM game may have varied. For example, some schools had enough computers so only two students were in each group, whereas other schools had up to three students in a group.

Significance of the Study

The results of this study will provide insight into the base level knowledge selected secondary agricultural education students have about agricultural economics. Additionally, the results of this study will help improve the development of secondary agricultural education curriculum. Specifically, the study will explore the use of the FARRM game in conjunction with the agricultural economics curriculum to aid students in knowledge retention. Moreover, the results of this study may potentially provide secondary agricultural education instructors with tools to teach agricultural economics effectively in the classroom. Additionally, this study has the potential to increase student awareness of agricultural economics as a potential major in college. While this particular study places emphasis on agricultural economics curriculum, the results from this study concerning the use of games in conjunction with course curriculum could be applicable to other disciplines and fields of study.

Definitions

Agriculture – The industry engaged in the production of animals and plants as a source of food and fiber, supplies, services, and distribution of agricultural products (Herren, 1991).

Agribusiness – An industry engaged in the production operations of a farm, including the manufacturing and distribution of farm equipment and supplies and the

processing, storage, and distribution of farm commodities (Merriam-Webster, 2010).

Agricultural Economics – The study of allocation, distribution, and utilization of the resources used, along with the commodities produced by, farming (Brittanica, 2010).

Agricultural Education – Discipline focused on instruction in chemistry, botany, zoology, and mechanics as well as the practice of agriculture (Hillison, 1996).

Edutainment – A hybrid game genre that relies heavily on visuals and game formats while fulfilling educational objectives (Okan, 2003).

Experiential Learning – Education that occurs as a result of direct participation in the events of life and includes learning that comes about through reflection about hands-on, everyday experiences (Smith, 2003).

Game Theory – The theory of independent choice where players make decisions in interactive situations by using strategies to produce outcomes (Zagare, 1984).

CHAPTER II

LITERATURE REVIEW

The purpose of this study was to determine if the use of the Farm and Ranch Risk Management (FARRM) game and associated curriculum improved student awareness about the field of agricultural economics as well as increased the understanding about agricultural economics concepts (i.e., introduction to agricultural economics, resource use, marketing analysis tools, and financial statements) among selected Oklahoma secondary agricultural education students. The study measured students' awareness of agricultural economics by surveying students regarding prior exposure to agricultural economics curriculum, publications, media, and related career options.

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This chapter will discuss potential problems facing colleges of agriculture, agricultural education, curriculum integration, the role of agricultural economics in secondary agricultural education, experiential learning, millennials, and the use of games (edutainment) as an addition to curriculum.

Problems Facing Colleges of Agriculture

The Morrill Act of 1862 created land-grant institutions in each state. The intention of the Morrill Act was to create universities focused on research, teaching, and extension or outreach in the sciences of agriculture and mechanics (Herren & Edwards, 2002). Today, many agricultural colleges are struggling as the number of students enrolling in agriculture has continually declined throughout the nation (Diament, 2005). Decreased enrollment in agriculture in higher education could be a result of a lack of awareness about agricultural majors and future career options (Fritz, Husmann, Rees, Stowell, & Powell, 2007). Fritz, Husmann, Rees, Stowell, & Powell (2007) conducted a study gauging the awareness of Nebraska high school seniors about the College of Agricultural Sciences and Natural Resources (CASNR) at the Univeristy of Nebraska-Lincoln. The overall findings of the study showed a lack of awareness about the majors and options available in CASNR. Therefore, the researchers strongly advocated the need to educate high school seniors as this group of students represent a large pool for potential college students (Fritz, Husmann, Rees, Stowell, & Powell, 2007). An additional reason for the decline in enrollment in colleges of agriculture could be the lack of students with rural or farming backgrounds (NRC, 2009). Therefore, students may not be familiar with agricultural issues, industries, or related careers.

Because of the decline in enrollment, colleges of agriculture are in a fight for survival (Diament, 2005). Therefore, educators need to find unique recruiting tools to help boost student enrollment. To combat a decline in enrollment, many colleges of agriculture are expanding course offerings and redeveloping curriculum to meet the emerging needs of industries and, thus, attract more students (Diament, 2005).

As mentioned in chapter one, departments of agricultural economics also are facing a decline in undergraduate student enrollment. These departments face increased competition for students from business colleges as fewer students are entering colleges with rural or farming backgrounds (NRC, 2009). Therefore, agricultural economics faculty members are searching for new ways to recruit undergraduate students. One such way is to partner with secondary agricultural education programs to develop agricultural economics curriculum, contests, and activities (NRC, 2009).

Agricultural Education

In 1917, Congress passed the Smith-Hughes Vocational Education Act. This act allotted federal funding for the establishment of secondary agricultural education programs. Ten years after the passing of the Smith-Hughes Vocational Education Act, the majority of states had developed secondary agricultural education programs. Groups to support students in the agricultural education classes soon began to form. In 1928, the Future Farmers of America, now known as FFA, was formed (The National FFA Organization History, 2010). The FFA bylaws state the organization will "function as an integral part of the organized instructional programs in agricultural education which prepare students for a wide range of career in agriculture, agribusiness, and other agriculture-related occupations" (The National FFA Organization Bylaws, 2010). Faced with the challenge of decreasing membership numbers, the organization is searching for new ways to implement agriculture in the classroom curriculum to expand the nation's view of traditional agriculture (The National FFA Organization History, 2010).

One problem secondary agricultural educators face is the concept of students being "dumped" into agricultural education classes (Warnick, Thompson, & Gummer,

2007). Warnick, et al. (2007) defines the dumped student as students who are "placed" into the agricultural education classroom. These students typically have no interest or background in agriculture, and, thus, do not want to be there. Typically, these students are placed in agricultural education because other classes are full, the student has difficulties learning, or the class is deemed to be easier than other classes (Warnick, et al., 2007). Therefore, agricultural educators have a difficult time motivating these students to participate in class activities (Warnick, et al., 2007). The implementation of a game to illustrate curriculum concepts and engage students in the learning process might be the answer to this problem.

A method for incorporating agriculture into the classroom is to design and teach interdisciplinary curriculum. Agricultural education provides multiple opportunities for secondary agricultural education teachers to teach across the curriculum (Robinson, Krysher, Haynes, & Edwards, in press). A study by Foster, Bell, and Erskine (1995) reported the importance, as ranked by agricultural education instructors, principals, and superintendents, of integrating content through cross-curriculum instruction. Additionally, the study by Robinson, et al. (in press) recommended cross-curriculum integration to better equip early-career teachers with technical knowledge and skills.

Curriculum Integration

The concept of curriculum integration is not new to modern day educators. John Dewey and Francis Parker established the idea of curriculum integration in the late 1890s and early 1900s (Hinde, 2005). Specifically, Dewey pushed for curriculum development to be more applicable to the experiences of the students (Hinde, 2005). Therefore, many

educators are meeting Dewey's objective by teaching across the subjects or integrating the curriculum.

> Parker (2005) provides a clear definition of curriculum integration by defining it as a curriculum approach that purposefully draws together knowledge, perspectives, and methods of inquiry from more than one discipline to develop a more powerful understanding of a central idea, issue, person, or event. The purpose is not to eliminate the individual disciplines but to use them in combination (Parker, 2005, pp. 452-453).

Therefore, curriculum integration takes a holistic approach to education by teaching multiple disciplines in one curriculum unit (Parker, 2005).

The Association for Career and Technical Education (ACTE) advocates the use of the curriculum integration in secondary schools. In the 2006 ACTE report "Reinventing the American High School for the 21st Century," the organization encouraged teachers to include lesson plans with real-world examples from a variety of disciplines. The organization makes a strong case for the use of curriculum integration to bring deeper meaning and relevance to overall student instruction. Furthermore, the report cites the success of integrated curriculum in meeting educational proficiencies and standards.

Agricultural Economics in Secondary Agricultural Education

In the FFA bylaws, agribusiness is a key instructional component for agricultural education (The National FFA Organization Bylaws, 2010). A study conducted by Foster, Bell, and Erskine (1995) supports the inclusion of agribusiness and agricultural economics in secondary agricultural education programs. Foster, Bell, and Erskine (1995) surveyed secondary agricultural education teachers, principals, and

superintendents to determine fields of study critical to the success of agricultural education programs. The teachers, principals, and superintendents all identified agricultural economics as an area of high importance that must be included in the curriculum.

While Foster, et al. demonstrated the need for inclusion of agricultural economics in the curricula, more recent studies have demonstrated the lack of agricultural economics and agribusiness being included in agricultural education curricula development. A recent study by Robinson, Krysher, Haynes, and Edwards (in press) showed student teachers in agricultural education spend the least amount of their time teaching agribusiness and marketing, with less than 30 minutes per week dedicated to agribusiness and marketing. Perhaps this is because of the difficulty associated with teaching this subject. Specifically, instructors in higher education have cited agricultural economics as challenging to teach because the concepts are abstract (Koontz, Peel, Trapp, & Ward, 1995). Furthermore, agricultural economic concepts may be intangible to students who do not have experiences to help them make applications to the curriculum material (Koontz, et al., 1995).

Theoretical Framework: Experiential Learning

One way to make concepts tangible is through experiential learning. Experiential learning is a process that helps to link the education, work, and experiences of a student to make concepts meaningful (Rhykerd, Tudor, Wiegand, Kingman, & Morrish, 2006). Therefore, experiential learning relies on an individual's experiences to translate abstract ideas into concrete realities (Rhykerd, et al. 2006).

John Dewey emphasized the importance of experiential learning (Kolb, 1984). Dewey advocated for a more complete learning process that occurs when students experience, examine, explain, and apply information (Svinicki & Dixon, 1987). Additionally, Dewey contended that an individual learned by a threefold process: 1) characterizing observations from an experience, 2) reflecting on those experiences, and 3) forming conceptualizations based on those reflections and the individual's pre-existing knowledge (Roberts, 2006). Dewey also emphasized the central role experience plays in the learning process (Kolb, Boyatzis & Mainemelis, 1999). Dewey postulated each experience builds on past experiences (Roberts, 2006). Therefore, each new experience presents an opportunity to gain additional knowledge.

The theory of experiential learning was created based on the work of John Dewey, Jean Piaget, and Kurt Lewin. This theory combines pragmatism (Dewey), social psychology (Lewin), and cognitive development (Piaget) to provide a unique perspective on learning and development (Kolb, 1984). To demonstrate this theory, Kolb (1976) developed a model to describe how individuals learn. The model was called the experiential learning model because it maintains that knowledge is created through an individual's experience (Vince, 1998). Furthermore, Kolb's model defines learning as a continuous process based on four stages: concrete experience (CE), observations and reflections (RO), formation of abstract concepts and generalizations (AC), and testing implications of concepts in new situations (AE) (Kolb, 1981). Figure II-1 outlines Kolb's learning cycle.

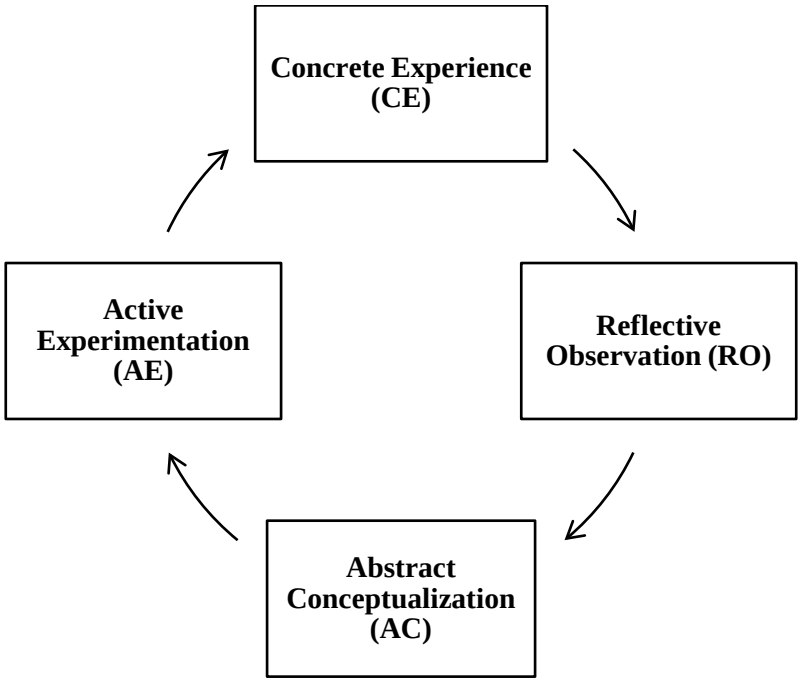

Figure II-1. Model of the Experiential Learning Process (Kolb, 1984).

The experiential learning cycle has four steps that are cyclical in nature. In the first step, concrete experience, Kolb postulates that for an individual to learn the individual must have an immediate concrete experience. A concrete experience (CE) is defined as an activity in which an individual is actively involved. The next step, reflective observation (RO), involves the individual making observations and/or reflections about the activity. The third step in the learning cycle, abstract conceptualization (AC), involves the formation of abstract concepts and conceptualizations. This is the step where the individual creates hypotheses to test his or her thoughts about the previous activity. This step involves making generalizations. The final step, active experimentation (AE) tests the implications of the concepts in new situations. Therefore, these tested hypotheses should serve as guidelines for creating new

experiences. As the individual conducts the test in the last step, another concrete experience is made and the experiential learning cycle continues.

An example of Kolb's experiential learning cycle could be demonstrated using examples from this study. For example, the student would have a concrete experience when beginning the agricultural economics curriculum and the FARRM game. During this first step, the student is introduced to new concepts and materials. For example, the student could have been introduced to the concept of a call option. The second step, reflective observation, is demonstrated when the student begins to digest the information they have been presented about call options by reviewing the information and potentially asking questions. Next, the student will organize the concepts about call options by thinking about the advantages and disadvantages of using a call option during the FARRM game. This process constitutes abstract conceptualization. Finally, based on the student's hypotheses about call options, the student will decide whether or not to employ a call option during the FARRM game. This constitutes the final step of active experimentation. It is important to note, by employing a call option the student may increase or decrease their success in the FARRM game. Based on this observation, the experiential learning cycle may begin again as the student uses this experience to continue throughout the game.

Creating curriculum to help students learn efficiently and effectively is a challenging task for many teachers (Smith & Van Doren, 2004). Teachers need to create curriculum to encourage students to employ higher order thinking skills by integrating experiential learning in the classroom (Doherty, 1998). More specifically, it is critical to have experiential learning because it involves learning by doing and includes the

knowledge and skills acquired outside lecture situations through interactions with others, work scenarios, and other life experiences (Smith & Van Doren, 2004). Hammer (2000) determined student learning significantly increased when students had an experiential learning experience in addition to traditional lecture presentation of course material. Reality-based activities, which focus on expanding student experiences through hands-on activities, prepare students to take what they have learned into a broader world (Smith & Van Doren, 2004). Therefore, teachers must seek to incorporate a variety of activities into their curriculum to enlarge the student learning experience. Thus, agricultural education instructors should consider new approaches to teaching agriculture to students by developing curriculum that incorporates different styles of learning and problem solving (Courts, 2008).

The design of agricultural education is experiential in nature (Roberts, 2006) because it incorporates activities beyond the textbook such as supervised agricultural experiences (SAEs). Therefore, development of agricultural education curricula should incorporate hands-on learning (Roberts, 2006). Hands-on learning allows students to relate agricultural issues to themselves and their society (Poudel, Vincent, Anzalone, Huner, Wollard, Clement, DeRamus, & Blakewood, 2005). Specifically, this type of learning allows the learner use the curriculum to make applications to experiences inside or outside of the classroom. Furthermore, this type of learning provides students with a point of reference to help them formulate solutions to solve everyday problems (Poudel, et al, 2005).

Research indicates instruction is more effective when it extends beyond the textbook and integrates curriculum concepts with real-life issues (Poudel, et al., 2005).

Students engaged in hands-on learning activities are able to recall more information than students who are exposed to demonstration only as a teaching method (Poudel, et al., 2005). A hands-on learning environment requires creative, integrated curriculum to motivate students to learn (Poudel, et al., 2005). One such way to incorporated hands-on learning experiences in the classroom is to engage students in games. In particular, agricultural curriculum has been enhanced by the use of simulations, games, and contests to provide participants' with experiential-learning activities (Rhykerd, Tudor, Wiegand, Kingman, & Morrish, 2006).

Implementing Games into the Curriculum

"Game theory has become a part of the basic framework for economics" (Dixit, 2005, p. 205). Economics instructors often introduce economic applications by involving students in strategic games. The introduction of game theory has been proven to be successful and productive in higher education and in secondary education as well (Dixit, 2005).

As early as 1921, Borel discussed the use of games in a classroom setting. Specifically, Borel defines a game as a "social situation in which the outcome depends on the chance and on the skill of the decision-makers involved in the situation" (Schmidt, 2004, p.251). Furthermore, Borel described the use of a parlor-type game to illustrate military and economic-type situations (Schmidt, 2004). Borel advocated the use of games to illustrate concepts because of the dichotomy between the player's knowledge and mathematical calculations (Schmidt, 2004).

Although others may have proposed the use of games to illustrate concepts and strategies, the credit for the development of game theory is attributed to von Neumann

and Morgenstern in 1953. Mathematicians by trade, the two researchers were interested in the probabilistic nature of social interaction (Leonard, 1995). Therefore, the two men sought ways to engage individuals to study their strategic decision making skills. Specifically, von Neumann and Morgenstern used stories about the fictional character Sherlock Holmes to encourage students to expound mixed strategy equilibria (Dixit, 2005). Based on the successful work of von Neumann and Morgenstern, other researchers in a variety of fields began using games to reinforce concepts and ideas (Cooper, 2007).

Game theory can be used in the classroom to engage students in the decision-making process regarding a variety of interdisciplinary subjects including economics, business, politics, social interactions, and everyday life (Dixit, 2005). It is widely appealing to students because game theory uses examples and classroom games to engage students in the curriculum (Sorenson, 2002). More recently, game theory has been incorporated into online, interactive games created to reinforce key concepts in the curriculum (Lange & Baylor, 2007). In the age of social media and consistent interaction with others through the Internet, the current generation of students is ready to actively engage in class activities involving computerized games that support concepts presented in the curriculum (Lange & Baylor, 2007.) Additionally, the "imaginative use of gameplaying, movies, literature, and such other illustrations makes game theory much more fun to teach" (Dixit, 2005, p. 218).

Advantages to Using Games in Conjunction with Core Curriculum

Adding a game to reinforce the curriculum can offer distinct advantages including engaging and motivating students in the learning process, simulating real-world

situations, fostering higher order thinking, reinforcing curriculum concepts, and reducing the stress level of students by offering a fun alternative to learning (Dixit, 2005; Sardone & Devlin-Scherer, 2010; Leigh, 2003/2004). Dixit (2005) stated, "Playing a few well-designed games in class and watching others play them brings to life the concepts presented in the curriculum" (Dixit, 2005, p. 206). The use of games in conjunction with curriculum offers unique ways to promote higher thinking in the classroom (Leigh, 2003/2004). Games can be used to help students acquire knowledge, connect knowledge to previously learned information, and construct meaning by incorporating information into their own schema (McDonald & Hannafin, 2003). Moreover, games have the ability to get students to think, care, and react to real-world situations, and thus, prepare students to think critically and innovatively (Sardone & Devlin-Scherer, 2010). Adding games to the curriculum engages students' emotions, keeps stress levels low, reinforces the concepts of teamwork, and keeps learning enjoyable (Leigh, 2003/2004). Games can be used effectively to review previously introduced material because they have a motivational component. Additionally, games can remove the boring and monotonous repetition of repeating material during review (Leigh, 2003/2004).

Based on these benefits, using games in conjunction with curriculum provides the instructor with a classroom tool to help students make applications based on the concepts presented in class. More often than not, a game developed to reinforce a class concept can be employed in or out of the classroom. Additionally, the games created can lend themselves to a number of variations and applications (Reiley, Urbancic, & Walker, 2008). This level of flexibility makes using game theory in the classroom a flexible teaching tool.

Curriculum can be enhanced by the addition of games to engage students in making applications from curriculum concepts. Dixit (2005) outlines a series of steps to successfully implement the use of games into the core curriculum. First and foremost, the instructor should determine which course concepts need to be reinforced. This will help to determine the types of applications needed to be made through the use of the game. Secondly, the instructor should develop games to tell a simple story and are based on the skill level of the players. The game should be simple so the main conceptual point is not lost. Additionally, the game should focus primarily on the skill level of the players and not luck. Basing a game on skill level encourages students to use the knowledge they have gained from the curriculum to implement strategies in the game to achieve success. Finally, instructors should facilitate discussions about the game and the gaming process. This allows students to tie the game to course concepts and make successful conclusions (Dixit, 2005). These steps, as outlined by Dixit (2005), parallel the steps in Kolb's model of the experiential learning cycle.

Several educators have successfully implemented games into their curriculum (Reiley, Urbancic, & Walker, 2008). The benefit to using games in curriculum is they can be created to fit a variety of subject areas. For example, stripped-down poker was used by Reiley, Urbancic, and Walker (2008) to demonstrate the decision making under pressure and the importance of formulating strategies. Applications were made to a variety of curriculum areas including business law with a focus on litigation, political science with a focus on campaign management, accounting with a focus on tax evasion, and diplomacy with a focus on both the domestic and international segments (Reiley, et al., 2008).

In this age of technology, several educators are incorporating computer-based games into the curriculum. These games have had moderate success as a learning tool. McDonald and Hannafin (2003) conducted a study using web-based computer games to prepare elementary students for standardized tests in Virginia. While these games did not improve students' scores, the games did increase student interaction, engagement, and motivation. Researchers found the use of the computer games in conjunction with the curriculum facilitated student learning inside and outside of the classroom as students could play the games in the classroom or at home (McDonald & Hannafin, 2003). Moreover, the researchers found students who played the games in conjunction with the curriculum participated more frequently in class discussions, gained a deeper understanding of the material, and wanted to spend more time discussing each subject (McDonald & Hannafin, 2003). Additionally, these students sought additional information by asking questions until they were satisfied (McDonald & Hannafin, 2003).

Other studies analyzing the success of computer-based games support the inclusion of the games in conjunction with the curriculum. A study by Kulik and Kulik (1991) concluded computer-based instruction generally increased the achievement levels of students. The study also found less instruction was needed and students had a more positive attitude toward courses that included computer instruction (Kulik & Kulik, 1991). Additionally, Hogle (1996) reported significant benefits to using computer-based games in conjunction with the curriculum. Hogle (1996) conducted a study that demonstrated when computer games are used in conjunction with the curriculum, students are more motivated, have increased retention of information, demonstrate improved reasoning skills, and have a greater level of higher order thinking.

Additionally, the study concluded computer games have the potential to reduce students' anxiety about a subject, promote memory skills, and develop the students' ability to guess intelligently.

Adversely, other studies have found no significant difference in students' performance when games were used in conjunction with the curriculum. Cherryholmes (1966) studied simulation games and argued simulations do not always reinforce the specific knowledge the games are designed to teach. To add to this stance, Randel, Moris, Wetzel, and Whitehill (1992) conducted a meta-analysis of 68 studies that compared student performance using games as instructional methods with classmates learning from traditional instruction methods. Of the 68 studies, 38 of the studies reported no advantage in student performance for the students taught using the games. However, students who were taught using games did demonstrate an increased interest in the materials when taught using a game format. Furthermore, Clark (1983) conducted a study showing computer-based instruction did not increase achievement levels, rather the increase in students' achievement was based on instructional method, content of the lesson, or a novel effect caused by using something new.

The use of games in agricultural curricula also however proven to be successful. In particular, simulated farming systems have allowed students to become more confident and competent in the decision-making process (Stewart, Marsh, Kingwell, Pannell, Abadi, & Schilizzi, 2000). One such example is the Packer-Feeder Game used in an agricultural economics class at Oklahoma State University (Koontz, Peel, Trapp, & Ward, 1995). Faculty members noticed a disconnect between the students and the agricultural economics curriculum. The faculty members searched for a way to engage

students and help them understand the abstract nature of the topics presented in the agricultural economics course (Koontz, et al., 1995). Therefore, the Packer-Feeder Game was created to allow students to experience the principles and concepts of the beef production.

The researchers found the students who participated in the game were able to apply classroom curricula to make decisions. This allowed for greater concept understanding (Koontz, et al., 1995). Most importantly, the simulation game offered the instructors opportunities for "teachable moments." A teachable moment is defined as "events that have been lived by the participants, but have arisen without prompting by the instructor" (Koontz, et al., 1995). The teachable moments serve as mini case studies and allow the instructor and students to discuss what happened and why something happened.

Additionally, the implementation of the Packer-Feeder game generated a high level of enthusiasm and involvement from the students. Based on the discussion and assignments that followed the game, it was evident students gained a high level of understanding about economic and business concepts. Students quickly realized that in order to succeed in the simulation game, they needed to know key course concepts. Therefore, students were self motivated to review course material and ask questions. One of the major benefits to the implementation of the game into the course curriculum was participants could see the tangible benefits of agricultural economics (Koontz, et al. 1995).

As demonstrated in the stripped-down poker game and the Packer-Feeder game, implementing games into the curriculum can create student enthusiasm about the

curriculum. Therefore, implementing a game into secondary agricultural education settings could prove to engage students in the learning material.

Millennials

Current high school students are classified as members of the millennial generation. The millennial generation is defined as individuals who are born after 1982 (Holliday & Li, 2004). This generation of 74 million people, as estimated in 2008, are between the ages of 13 and 35 (Henrie & Taylor, 2008), and are individuals who have grown up using computers, the Internet, and an assortment of digital technologies including cell phones, text messaging, video games, and social media (Considine, Horton, & Moorman, 2009).

Prensky (2001) used the term digital natives to describe students who have always used technology in every day practices. Moreover, Prensky (2001) described instructors as digital immigrants, or individuals who have had to adopt the use of new technology into every day practices. Prensky (2001) further stated many digital immigrants are instructors who are "struggling to teach a digital native population who speaks an entirely new language" (Prensky, 2001, p.2).

Digital natives are interested and curious about new technologies (Considine, Horton, & Moorman, 2009). A 2005 study conducted by the Pew Internet and American Life project interviewed 1,100 American teenagers and found 87 percent of teenagers use the Internet, 84 percent of teenagers own one or more personal media device, and 51 percent of the teenagers go online daily (Lenhart, Madden, & Hitlin, 2005). Lenhart et al. (2005) report the use of technology by millennials to interact and communication with others.

"Millennials see themselves as consumers of education and want customization and choice in their educational offerings. They tend to be visual learners and multitaskers, getting bored quickly with the more traditional 'sage on the stage' lecture style" (Holliday & Li, 2004, p. 357). Therefore, millennials expect to be given the challenge of finding information, though this generation expects to find it the "Google way" by typing in search terms and obtaining instant results or feedback (Holliday & Li, 2004). Most education environments are not prepared to take advantage of the technical skills millennial students bring into the classroom, and, thus, students perceive school as boring and largely irrelevant to preparation for life in the real-world (Considine, et al., 2009). Therefore, high school teacher are challenged to provide students with curriculum content while including technology to prepare students for the 21st century (Prensky, 2001).

Summary

The enrollment of higher education students in the field of agriculture is declining. Therefore, colleges of agriculture are seeking new ways to recruit students to enroll in agricultural majors and take agricultural classes. One way to boost student enrollment is to create a level of awareness about agriculture with secondary education students.

Agricultural education programs are encouraged to teach across the curriculum. The concept of curriculum integration dates back to John Dewey, who urged educators to develop more practical curriculum to prepare students for the real-world. By partnering with agricultural education classrooms, faculty members in agricultural economics have the potential to teach across the curriculum. Furthermore, agricultural economists should

work to partner with secondary agricultural education programs to develop curriculum, create contests, and design activities to help increase high school students' level of awareness about agribusiness and agricultural economics.

Kolb's experiential learning cycle serves as a conceptual framework for this study. This cycle was created using the works of Dewey, Piaget, and Lewin to explain how individuals learn through experiences. Additionally, the cycle looks at the decision-making process based on an individual's experience.

The use of games in conjunction with curriculum was discussed. Games can serve to motivate and encourage students to use course concepts to make strategic decisions. Additionally, the implementation of games can serve to engage students to take an active role in the learning process by encouraging them to review course concepts to make successful decisions. Multiple studies demonstrate the outcomes of using games in the classroom.

Finally, the millennial generation was defined as any student born after 1982. These individuals view themselves as consumers of education. Therefore, as digital natives, these students are confident in their abilities to use technology and find information (Holladay & Li, 2004). Consequently, millennial students are challenging teachers to provide curriculum infused with new technology to engage students in the classroom.

CHAPTER III

METHODOLOGY

Introduction

Chapter I discussed the decline in undergraduate enrollment in agricultural economics. Moreover, Chapter I cited the lack of agricultural economics curriculum being taught in secondary agricultural education classesby teachers. It also addressed the need for collaboration between agricultural economics faculty and secondary agricultural education programs to create agricultural economics curriculum.

A review of literature was conducted in Chapter II. Specifically, it provided a conceptual framework for research about experiential learning. It also addressed the use of games in conjunction with the curriculum, which advocates using well-designed games to engage students in making applications using course concepts and strategies.

The purpose of Chapter III is to describe the methods and procedures used in the research design, data collection, and data analysis for this study. This chapter also addresses IRB approval for the study, the population, the research design, instrumentation, validity, and reliability.

The purpose of this study sought to determine if the use of the Farm and Ranch Risk Management (FARRM) game and associated curriculum improved student awareness about the field of agricultural economics as well as increased the

understanding about agricultural economics concepts (i.e., introduction to agricultural economics, resource use, marketing analysis tools, and financial statements) among selected Oklahoma secondary agricultural education students. The study measured students' awareness of agricultural economics by surveying students regarding prior exposure to agricultural economics curriculum, publications, media, and related career options.

The study addressed the following questions:

1. What are the general characteristics of selected students enrolled in secondary agricultural education classes in the state of Oklahoma during the 2009 – 2010 academic school year?
2. What level of awareness do Oklahoma secondary agricultural education students have about agricultural economics including agricultural economics curriculum, publications, media, and related career options?
3. Do secondary agricultural education students who participated in the agricultural economics curriculum and the FARRM game show greater knowledge gain than the secondary agricultural education students who participate the lecture only agricultural economics curriculum?

Null Hypotheses

The following null hypotheses guided this study:

Ho1: No difference exists in the level of knowledge about the introduction agricultural economics between the two participant groups.

Ho2: No difference exists in the level of knowledge about resource use in agricultural economics between the two participant groups.

Ho3: No difference exists in the level of knowledge about the use of marketing tools part one in agricultural economics between the two participant groups.

Ho4: No difference exists in the level of knowledge about the use of marketing tools part two in agricultural economics between the two participant groups.

Ho5: No difference exists in the level of knowledge about the use of financial statements in agricultural economics between the two participant groups.

Institutional Review Board

"Oklahoma State University (OSU) is committed to and guided by the ethical principles regarding all research involving human subjects as set forth in the report of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, titled Ethical Principles and Guidelines for the Protection of Human Subject of Research, often referred to as the Belmont Report" (OSU IRB, 2010). Therefore, Oklahoma State University, as well as federal regulations, requires a review before any research study involving human subjects can be conducted. The Oklahoma State University Office of University Research Services and the Institutional Review Board conduct a review to protect the rights and welfare of human subjects involved in biomedical and behavioral research. To meet this requirement, a proposal for this study was presented to the OSU IRB for review. The study was approved and the researcher was granted permission to collect data using human subjects. The IRB application number assigned to this study was AG1015. A copy of the IRB approval form is presented in Appendix A.

Population

High school students (grades 9-12) enrolled in Oklahoma agricultural education classes served as the population for this study. A sample was selected purposely from this population.

Sample

The sample for this study consisted of purposely selected agricultural education classes. This study was a collaboration between the Department of Agricultural Economics at Oklahoma State University and the Oklahoma Department of Career and Technology Education (ODCTE) Agricultural Education Department. This collaboration was necessary as the ODCTE coordinates secondary agricultural education teaching efforts in Oklahoma. Therefore, the participating classes were selected by the ODCTE agricultural education district program specialists. Additionally, selected schools were within a 100-mile driving distance from Oklahoma State University to allow the agricultural economics faculty time to commute to the schools.

A solicitation e-mail was sent in February 2010 to secondary agricultural education teachers within a 100-mile driving distance from the Oklahoma State University campus. Initially, eight teachers responded to the e-mail indicating interest in participating in the study. Of the eight teachers, only six of the teachers could accommodate the time requirements for the agricultural economics curriculum. The six participating teachers were contacted by the researcher via phone and e-mail to secure dates to present the agricultural economics curriculum. One of the participating teachers did not respond to communications from the researcher. Therefore, the researcher

contacted the ODCTE to ask for assistance in recruiting another school. A replacement school was secured for the study in April 2010. Therefore, a total of six classes, three in the treatment one group and three in the treatment two group, were involved in the study. The study was conducted in high school (grades 9-12) agricultural education classes at six different schools in Oklahoma during the spring 2010 semester.

One class from each of the selected schools for the study were randomly assigned to the treatment one group or the treatment two group. The high schools varied in student enrollment with school A having 126 students, school B having 489 students, school C having 96 students, school D having 63 students, school E having 84 students, and school F having 77 students. It is important to note school B had the largest student enrollment. Therefore, this class also had the largest agricultural education class enrollment. School B was the substitution school, and therefore, the researcher was limited in selection criteria.

Participating classes varied in size from nine to 19 students and were comprised of students classified as freshmen, sophomores, juniors, and seniors in high school. While the courses were all agricultural education classes, the classes included agricultural education II, agricultural production, and animal science. Students in the treatment one group were taught the agricultural economics curriculum, while students in the treatment two group were taught the agricultural economics curriculum and used the FARRM game to apply agricultural economics concepts. The participating classes from each of the six schools were divided into two groups, with three classes in the treatment one group and three classes in the treatment two group:

Group 1. The students in this group participated in a unit (six class periods) of agricultural economics curriculum in which the material was presented by using lectures only (i.e., treatment one group of students).

Group 2. The students in this group participated in a unit (six class periods) of agricultural economics curriculum in which the material was presented by using lectures and the FARRM game (i.e., treatment two group of students).

Overall, student participants had the opportunity to complete a series of five pre- and post-tests related to the agricultural economics curriculum topics and a student questionnaire. Because of school-sanctioned activities, state testing make-up days, student illness, and student disciplinary action, the total number of participants varied by lesson topic. Overall, 77 participants completed the student questionnaire with 46 students in the treatment one group and 31 students in the treatment two group. Of the 73 participants who completed the introduction to agricultural economics lesson, 46 were in the treatment one group and 27 were in the treatment two group. Sixty-three participants completed the resource use in agricultural economics lesson with 36 students in the treatment one group and 31 students in the treatment two group. Of the 64 participants who completed the marketing tools part one lesson, 39 were in the treatment one group and 25 were in the treatment two group. The lesson over marketing tools part two had a total of 67 participants with 43 in the treatment one group and 24 in the treatment two group. The last lesson over financial statements had 70 participants with 44 participants in the treatment one group and 26 participants in the treatment two group.

Because the students involved in the study were minors, parents were given an assent form to be returned to the researcher if they did not want their child to participate

in the study (see Appendix A). Additionally, students were told their involvement in the study was strictly voluntary and were asked to sign a consent form on the first day of the agricultural economics curriculum unit.

Four agricultural economics faculty members from Oklahoma State University served as the instructors for the agricultural economics curriculum unit. All four instructors attended a training session with the researcher to ensure the exact same material was being taught in all six schools. To ensure fidelity of the treatment, the agricultural education teacher from each school observed the six lessons and completed a checklist monitoring and recording what material was taught in each lesson (see Appendix B).

Each school had different technology available to the student participants. Also, the classroom environment varied as some classrooms were located within the high school while other classrooms were located in a building separate from the high school. While the researcher could not control the classroom location and set up, the researcher did make adjustments to ensure each group of student participants were provided with the same technology. Therefore, the researcher coordinated with each of the six secondary agricultural education instructors to provide the same model of laptop computers, a projector, a screen, and PowerPoint presentations for each of the lessons in the agricultural economics curriculum unit.

Teachers

Four faculty members from the Department of Agricultural Economics at Oklahoma State University developed the agricultural economics curriculum and the FARRM game to be used in this study. Additionally, these four faculty members served

as the instructors for the agricultural economics unit taught in the six secondary agricultural education classrooms. Each faculty member had at least 15 years experience in the field of agricultural economics. Moreover, each faculty member had some teaching experience in a higher education setting. For the purpose of this study, the faculty members were divided into two groups:

Group 1. These faculty members taught the agricultural economics curriculum unit using traditional teaching methods (i.e., treatment one group).

Group 2. These faculty members taught the agricultural economics curriculum unit using traditional teaching methods in conjunction with the FARRM game (i.e., treatment two group).

The faculty members taught six total lessons about agricultural economics. The topics presented included introduction to agricultural economics, resource use in agricultural economics, marketing tools part one, marketing tools part two, and the use of financial statements in agricultural economics. Each lesson was designed to last a total of 45 minutes. If the lesson ended before the scheduled class time, student participants were given free time.

Research Design

In educational research, situations exist where it is not possible to conduct a true experiment because of the lack of ability to randomly assign subjects (Ary, Jacobs, & Razavieh, 1996). This study was conducted in classroom settings. Therefore, it was not possible for the researcher to randomly assign students to groups because randomly assigning students to groups would disrupt the learning process (Creswell, 2008). Campbell and Stanley (1966) report quasi-experiments to be “well worth employing

where more efficient probes are unavailable" (Campbell & Stanley, 1966, p. 205) because the quasi-experimental design allows the researcher to still make reasonable conclusions (Ary et al., 1996).

Therefore, this study uses a quasi-experimental design. Intact groups (i.e., classrooms) were used and treatments were randomly assigned to the groups. The treatments used included: 1) introduction of agricultural economics curriculum using lecture methods with PowerPoint presentations and 2) introduction of agricultural economics curriculum using lecture methods with PowerPoint presentations and the FARRM game.

The study followed a variation of the nonequivalent control group design as outlined by Campbell and Stanley (1963). A nonequivalent control group design is defined as "a type of experiment in which research participants are not randomly assigned to the experimental and control groups, and in which each group takes a pre-test and a post-test" (Gall, Borg, & Gall, 1996, p. 764).

Each in-tact class was randomly assigned to either the treatment one group or the treatment two group, and the unit of analysis was each treatment groups' performance on the pre- and post- tests. The treatment one group was taught the agricultural economics curriculum in a traditional manner, which included lectures and PowerPoint presentations. The treatment two group was taught the same agricultural economics curriculum using lectures and PowerPoint presentations in conjunction with the FARRM game. Comparisons were made between group means on each of the post-tests and the differences between each of the pre-test and post-test measures following the administration of the treatment. These comparisons allowed the researcher to measure if

the treatments made a significant difference in the performance of the student participants. The research design is described in Figure III-1.

Group	Pre-test	Independent Variable	Post-test
T1	Y^1	X	Y^2
T2	Y^1	_____	Y^2

Figure III-1. Pre-test Post-test Design (Ary, et al., 1996).

The nonequivalent control group research design controls all of the threats to internal validity except regression and interaction (Campbell & Stanley, 1963). Because this study used multiple classroom settings at different schools, the threat of interaction is reduced (Gall, Borg, & Gall, 1996). The threat of regression is reduced because none of the treatment groups were selected because of extreme scores of any kind (Gall, Borg, & Gall, 1996).

The pre- and post-test design poses some threats to the external validity of the study. Table III-1 outlines the proposed threats to external validity in the quasi-experimental design and provides prevention methods for these threats (Cook & Campbell, 1979; Creswell, 2008; Tuckman, 1999; Bracht & Class, 1968).

A panel of experts (Appendix C) reviewed the pre- and post-tests used in the curriculum unit. The panel of experts consisted of three graduate students in the Department of Agricultural Education, Communications, and Leadership at Oklahoma State University. The panel was selected for its knowledge of agricultural education, the target population, and desired content of the study. Moreover, each panel member had recent (within the last three years) experience teaching in secondary agricultural

Table III-1. Proposed Threats to External Validity and Prevention Methods

External Validity	Control
Hawthorne Effect	Participants were not aware of the research hypotheses.
Interaction of Selection and Treatment	The experiment was conducted during the normal scheduled class period. Therefore, participation in the experiment was as convenient as possible for the individuals in the population.
Interaction of Setting and Treatment	All participants attended public schools in the state of Oklahoma. Researcher compensated for technological differences in classroom by providing the same equipment to each school including a projector, screen, and laptop computer.
Experimenter Effect	The instructors strictly followed the lesson plans and lecture notes during the experiment. An independent observer completed a checklist to ensure the fidelity of the treatment.

education and had at least five years of teaching experience in secondary agricultural education. The panel consisted of two males and one female, which helped to avoid gender bias. The panel's review helped establish face and content validity. The panel found the pre- and post-tests to be valid for this study. Reliability measures were calculated using the Kuder-Richardson 20 formula for dichotomous items and Cronbach's alpha for scaled items.

Curriculum Development Meetings

The agricultural economics faculty members participated in three curriculum implementation meetings. The purpose of the curriculum meetings was four-fold: 1) determine the curriculum unit content, 2) develop lesson plans for each of the six lesson units (Appendix D), 3) create lecture notes and PowerPoint slides to be used during the curriculum unit, and 4) write a series of pre- and post-tests (Appendix E) for each lesson.

All four agricultural economics faculty members attended the three curriculum development meetings.

During the first curriculum meeting, faculty members determined what agricultural economics concepts should be included in the curriculum. Based on the literature, it was determined the secondary agricultural education students would have limited, if any exposure, to agricultural economics (Robinson et al., 2010). Therefore, the curriculum unit was designed around simplistic, baseline agricultural economics concepts. After extensive discussion, the group agreed the lessons should focus on the following: 1) introduction to agricultural economics, 2) resource use, 3) marketing tools part one, 4) marketing tools part two, 5) and financial statements. Each faculty member was assigned a lesson area (introduction to agriculture, resource use, marketing tools, financial statements) based on the individual's professional and teaching background.

Moreover, it was determined a lesson plan, lecture notes, and a PowerPoint presentation would need to be created for each lesson. The researcher created a presentation regarding the development of lesson plans and objectives for secondary education students. Each faculty member was provided with example lesson plans and a lesson plan template and was charged with the task of developing a draft lesson plan, PowerPoint presentation, and lecture notes before the next curriculum meeting.

The use of the FARRM game in conjunction with the agricultural economics curriculum also was discussed. All four faculty members had prior experience using the FARRM game in conjunction with adult education or youth leadership programs. The group reviewed the FARRM game and determined how many years of production to run during this study. It was determined the treatment two groups would play the FARRM

game during the agricultural economics curriculum so students could apply concepts learned through the agricultural economics curriculum. Each faculty member was provided with an electronic copy (flash drive) of the FARRM game and asked to work through the modules to ensure the game reinforced the content of the agricultural economics curriculum.

The second curriculum meeting was conducted two weeks later. Group members reported their experience with the FARRM game. It was determined the FARRM game would reinforce the agricultural economics curriculum. No adjustments were made to the FARRM game.

Group members also reviewed the draft lesson plans, PowerPoint presentations, and lecture notes. After the completion of the rough draft lesson plans, it was determined some of the content was too time consuming for the allotted teaching time. Therefore, the content for each lesson plan was tweaked to fit in a 45-minute class period. The remainder of the meeting was spent critiquing and refining the lecture materials including handouts and PowerPoint presentations. Finalized lesson plans and lecture materials were collected by the researcher. These materials were then reviewed by a panel of experts, consisting of agricultural education doctorial students, for content and standardized formatting to ensure the lessons met the objectives of the curriculum. Additionally, each faculty member was assigned the task of creating a short test (four to five questions) for his assigned topic to be used as a pre- and post-test instrument. The researcher made a presentation regarding the development of effective test questions for secondary education students. The group determined that all test questions would be multiple-choice questions, which would provide the student with four options and only

one correct answer. It was determined the rough drafts of the pre- and post-tests would be discussed at the final curriculum meeting.

The third and final curriculum meeting was held in March 2010. The faculty members discussed and finalized the pre- and post-tests. Additionally, a practice run of all curriculum materials was presented to ensure the materials flowed smoothly and all faculty members understood how to present each lesson. The pre- and post-tests were corrected and finalized. The researcher presented each faculty member with a timeline for implementing the curriculum as well as teaching assignments for each faculty member.

After the completion of the curriculum meetings, the researcher compiled the finalized curriculum materials, which included the lesson plans, PowerPoint presentations, lecture notes, handouts, and pre- and post-tests. Each faculty member was provided with an electronic and hardcopy of the curriculum during late March 2010.

Treatment

The treatment one group for this study was taught the agricultural economics curriculum by traditional teaching methods during six class periods. These teaching methods included using lecture, PowerPoint presentations, and handouts. Students were administered a pre-test before each lecture. After the completion of the lecture, students were given a post-test. No interaction occurred between the instructor and the students during the pre- and post-tests. Therefore, neither formal feedback nor answers were provided to the students.

The second treatment for this study was defined as the FARRM game. The FARRM game is an interactive, computerized game developed by the faculty in the

Department of Agricultural Economics at Oklahoma State University. The game was developed to simulate the management of 620 acres of owned farmland and 620 rented (sharecrop) acres for the production of wheat, stocker cattle, cotton, and/or sorghum production for a period of 15 years. The game simulation follows a calendar year, forcing players to make economic decisions based on actual commodity prices, yields, and costs. Furthermore, players must make decisions based on agricultural economic concepts such as the use of financial statements, resource use, and marketing tools as they relate to farm and ranch risk management. The FARRM game maintains financial records for each player and includes information relating to annual prices, yields, production numbers, cost of production, and net return. At the end of each simulated fiscal year, annual cash flow and net worth statements are produced for the player. This allows the player to evaluate his or her overall farm and ranch risk management success. The instruction manual for the FARRM game is provided in Appendix F.

The agricultural economics faculty members used the agricultural economics curriculum in conjunction with the FARRM game to teach the treatment two group. Students in the treatment two group were presented with an agricultural economics lesson. Following the lesson, these students worked through a module of the FARRM game, making agricultural economic decisions based on the material presented in class. Students were randomly assigned to groups of two to three students, depending on the size of the class. Each group was provided with the same model of Dell laptop on which the FARRM game was installed. Students were provided with approximately 20 minutes of class time to complete the modules in the FARRM program. Additionally, students were provided with instant feedback as they could see the impact of their decisions on the

productivity of the simulated farm/ranch. Moreover, the results of the game were posted in the classroom so student participants could compare their performance with the performance of their classmates. This created an environment of competition. The treatment group completed six rounds of the FARRM game, which is equivalent to approximately 15 years of agricultural production. These six modules were completed in conjunction with each of the six lesson plans. The agricultural economics instructor was available to answer technical questions the students had about running the program. However, the instructor did not assist students with decision making during the modules. Table III-2 provides an overview of the treatment.

Data Collection

Data collection occurred during the spring 2010 semester. Prior to the study, students received participant information sheets as well as consent forms (see Appendix A). The agricultural education teacher for each classroom also was provided an assent letter to send to the parents of each student as well as a description of the study (see Appendix A). Furthermore, each school's principal signed a consent form to allow the class to participate in the agricultural economics curriculum and research study (see Appendix A).

The agricultural economics faculty members spent a class period administering a student questionnaire to gather descriptive information about the participants (Appendix

Table III-2. Overview of the Treatment

Lesson 1. Introduction to Agricultural Economics
Traditional Lecture: • Define agricultural economics and discuss careers in agricultural economics • Determine economic decisions for farms and ranches • Discuss margins and diminishing marginal returns FARRM game: • Complete decisions for years 1, 2, 3, and 4 • Make decisions using margins and economic decision making concepts
Lesson 2. Resource Use Decisions
Traditional Lecture: • Discuss the use of crop and livestock enterprise budgets and how to construct • Provide definitions and examples of variable and fixed costs • Demonstrate the importance of enterprise budgets as management tools FARRM game: • Complete decisions for years 5, 6, and 7 • Apply concepts by making decisions using enterprise budgets and evaluate fixed/variable costs
Lesson 3. Marketing Risk Management Tools—Part One
Traditional Lecture: • Identify price risk management tools to enhance market prices • Determine local cash price and cash price received FARRM game: • Complete decisions for years 8, 9, and 10 • Use price risk management tools to enhance prices for higher profits
Lesson 4. Marketing Risk Management Tools—Part Two
Traditional Lecture: • Identify price risk management tools • Use basis to determine the expected price • Determine cash price received and the net price FARRM game: • Complete decisions for years 11, 12, and 13 • Calculate cash price received, net price received, and expected price using the basis
Lesson 5. Financial Statements
Traditional Lecture: • Define assets, liabilities, and net worth • Discuss the use of balance sheets and cash flow statements FARRM game: • Complete decisions for years 14 and 15 • Determine assets, liabilities, and net worth of group's farm using statements

G). This questionnaire was administered before the agricultural economics curriculum unit began. All participants were assigned a random code and were asked to write their

code on the questionnaire as well as each pre- and post-test. This protected the identity of each participant. Codes were kept by the agricultural education instructor and destroyed at the end of the research study. The pre- and post-test scores were only available to the researcher. Therefore, none of the test scores affected the grades of the participants.

A series of five pre-tests and post-tests were developed and given in conjunction with the five basic concepts presented in the agricultural economics curriculum unit: introduction to agricultural economics, resource use, marketing tools part one, marketing tools part two, and financial statements. Students were given the pre-test before the lesson began and completed the post-test after the lesson ended. All tests were a series of multiple-choice questions with only one correct answer. The number of test questions ranged from four to eight test questions. The instruments are provided in Appendix E.

Data Analysis

Selected characteristics of student participants were calculated and summarized using frequencies, percentages, means, and standard deviations. Each lesson's pre-test was correlated with the post-test to determine the relationship between the two instruments. Furthermore, to measure the level of knowledge student participants acquired during the study, a one-way ANOVA test was run on all five post-tests as well as the difference between the five pre- and post-tests. Additionally, the effect size of the treatments was calculated using eta squared. All of the data was analyzed using SPSS 16.

CHAPTER IV

FINDINGS AND DISCUSSION

Introduction

The purpose of this study was to determine if the use of the Farm and Ranch Risk Management (FARRM) game and associated curriculum improved student awareness about the field of agricultural economics as well as increased the understanding about agricultural economics concepts (i.e., introduction to agricultural economics, resource use, marketing analysis tools, and financial statements) among selected Oklahoma secondary agricultural education students. The study measured students' awareness of agricultural economics by surveying students regarding prior exposure to agricultural economics curriculum, publications, media, and related career options.

The study also tested the knowledge of students regarding agricultural economics after completing six 45-minute class periods using the FARRM game and curriculum developed for this project. Specifically, the study compared the knowledge retention of students using the FARRM game in conjunction with the agricultural economics lectures to students whose curriculum solely consisted of agricultural economics lectures.

Research Questions

The following research questions guided this study:

1. What are the selected characteristics of students enrolled in secondary agricultural education classes in the state of Oklahoma during the 2009 – 2010 academic school year?
2. What level of awareness do Oklahoma secondary agricultural education students have about agricultural economics including agricultural economics curriculum, publications, media, and related career options
3. Do secondary agricultural education students who participated in the agricultural economics curriculum and the FARRM game show greater knowledge gain than the secondary agricultural education students who participate the lecture only agricultural economics curriculum?

Null Hypotheses

The following null hypotheses guided this study:

Ho1: No difference exists in the level of knowledge about the introduction agricultural economics between the two participant groups.

Ho2: No difference exists in the level of knowledge about resource use in agricultural economics between the two participant groups.

Ho3: No difference exists in the level of knowledge about the use of marketing tools part one in agricultural economics between the two participant groups.

Ho4: No difference exists in the level of knowledge about the use of marketing tools part two in agricultural economics between the two participant groups.

Ho5: No difference exists in the level of knowledge about the use of financial statements in agricultural economics between the two participant groups.

The research questions and null hypotheses served as a guide for presenting the findings of this study. The findings related to each question will be presented according to the research questions.

General Description of Participants

Students from six secondary schools in the state of Oklahoma provided the data described in the findings of this study.

Selected Characteristics of Participants

During the spring 2010 semester, student participants were asked to respond to pre-treatment questionnaire containing questions about their personal characteristics and their general level of awareness about agricultural economics. The questionnaire contained dichotomous, multiple choice, and Likert scaled questions (see Appendix G). Post-hoc reliability statistics were run to determine the overall reliability of the questionnaire. A Kuder-Richardson Formula 20 (KR-20) measured the internal reliability of the dichotomous and multiple choice questions. The KR-20 analysis produced a reliability coefficient of 0.80. Cronbach's alpha was run to measure the internal reliability of the scaled items. The analysis yielded a reliability coefficient of 0.84. Both reliability measures indicated a homogenous test.

A total of 77 student participants completed the pre-treatment questionnaire (treatment one group n = 46; treatment two group = 31), 58.8 percent were male and 37.5 percent were female (see Table IV-1). The treatment one group (n = 46) consisted of 57.1 percent male and 36.7 percent female. The treatment two group (n = 31) consisted of 61.3 percent male and 38.7 percent female (see Table IV-2).

Table IV-1. Gender of Overall Student Participants (N = 77)

Gender	N	Percent
Male	47	58.8
Female	30	37.5

Table IV-2. Gender of Student Participants by Group (N = 77)

Gender	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Male	28	57.1	19	61.3
Female	18	36.7	12	38.7

All participants in the study were enrolled in high school agricultural education classes. Therefore, participants were classified as freshman (ninth grade), sophomore (tenth grade), junior (eleventh grade), or senior (twelfth grade) level. Regarding the students' current high school grade classification, 28.8 percent identified themselves as freshmen, 20.0 percent stated they were sophomores, 25.0 percent indicated they were juniors, and 22.5 percent stated they were seniors (see Table IV-3). The treatment one group (n = 46) consisted of 46.9 percent freshmen, 28.6 percent sophomores, 8.2 percent juniors, and 10.2 percent seniors (see Table IV-4). The treatment two group (n = 31) consisted of no (0%) freshmen students. However, 6.5 percent of the treatment two group indicated they were sophomores, with 51.6 percent stating they were juniors, and 41.9 percent classifying themselves as seniors (see Table IV-4). It should be noted the grade classification of students was not equally divide among the two treatment groups, and, thus, the treatment one group had more participants classified as freshmen and sophomores, whereas, the treatment two group had more participants classified as juniors and seniors. Classes were randomly

assigned to treatment group one and treatment group two. Therefore, the researcher was unaware of the uneven grade distribution until after the data collection.

Participants were asked to report the total number of years they had taken agricultural education classes. The total group of participants (N = 77) reported enrollment in agricultural education classes for an average of 2.72 years with 22.5 percent enrolled for one year, 25.0 percent enrolled for two years, 30.0 percent enrolled for three years, 7.4 percent enrolled for four years, and 8.8 percent enrolled for five years (see Table IV-5).

Table IV-3. Grade Classification of Overall Student Participants (N = 77)

Grade Classification	N	Percent
Freshman	23	28.8
Sophomore	16	20.0
Junior	20	25.0
Senior	18	22.5

Table IV-4. Grade Classification of Student Participants by Group (N=77)

Grade Classification	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Freshman	23	46.9	0	0.0
Sophomore	14	28.6	2	6.5
Junior	4	8.2	16	51.6
Senior	5	10.2	13	41.9
No Response	3	6.1	0	0.0

It should be noted that the wording of the question regarding the number of years students had taken agricultural education classes was problematic. It was an open-ended

question that allowed students to list the number of years. Instead of listing whole numbers five students listed increments. Specifically, one student (1.2%) listed 4.5 years, one student (1.2%) listed 4.75 years, and three students (3.8%) listed 5.5 years (see Table 7). Also, two students (2.5%) listed taking agricultural education classes for nine years. This answer is not probable as students cannot enroll in agricultural education classes until they are in eighth grade.

Table IV-5. Overall Participant Enrollment in Agricultural Education Classes (N = 77)

Number of Years	N	Percent
1	18	22.5
2	20	25.0
3	24	30.0
4	4	5.0
4.5	1	1.2
4.75	1	1.2
5	4	5.0
5.5	3	3.8
9	2	2.5

Participants in the treatment one group (n = 46) reported being enrolled in agricultural education classes an average of 2.43 years with students taking classes for one year (22.4%), two years (38.8%), three years (24.5%), four years (2.0%), and five years (2.0%), and nine years (4.1%) (see Table IV-6). Students in the treatment two group (n = 31) reported taking agricultural education classes for an average of 3.15 years

with students taking classes for one year (22.6%), two years (3.2%), three years (38.7%), four years (16.1%), four and half years (3.2%), four and three-quarter years (3.2%), five years (19.4%), and five and half years (9.7%) (see Table IV-6).

Table IV-6. Participant Enrollment in Agricultural Education Classes by Group (N = 77)

Number of Years	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
1	11	22.4	7	22.6
2	19	38.8	1	3.2
3	12	24.5	12	38.7
4	1	2.0	3	9.7
4.5	0	0.0	1	3.2
4.75	0	0.0	1	3.2
5	1	2.0	3	9.7
5.5	0	0.0	3	9.7
9	2	4.1	0	0.0

Additionally, all participants (N = 77) were asked if they were involved with the FFA chapter, and 77.5 percent of the participants stated they were involved with the FFA chapter, while 18.8 percent reported they were not involved with the FFA chapter (see Table IV-7). Furthermore, 71.5 percent of the participants in the treatment one group (n = 46) reported being involved in the FFA chapter, while 87.1 percent of the participants in the treatment two group (n = 31) indicated their involvement in the FFA chapter (see Table IV-8). After completion of the study, the researcher learned all Oklahoma students

enrolled in secondary agricultural education classes are members of FFA as the state of Oklahoma is one of the three states with 100 percent membership in FFA (Short, 2010).

Table IV-7. Overall Participant Involvement in the FFA Chapter (N = 77)

Involved in the FFA Chapter	N	Percent
Yes	62	77.5
No	15	18.8

Table IV-8. Participant Involvement in the FFA Chapter by Group (N = 77)

Involved in FFA Chapter	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Yes	35	71.4	27	87.1
No	11	22.4	4	12.9

The overall participants (N = 62) who reported being involved with the FFA chapter were asked to report the number of years involved in the FFA chapter. These participants indicated involvement with the FFA chapter for one year (16.2%), two years (20.0%), three years (27.5%), four years (2.5%), and five years (5.0%) (see Table IV-9).

It should be noted that the wording of the question regarding the number of years students were involved with FFA was also problematic. It was an open-ended question that allowed students to list the number of years. Similar to the question regarding the number of years students were enrolled in agricultural education classes, student participants listed increments instead of whole numbers. Specifically, one student (1.2%) listed 4.5 years, one student (1.2%) listed 4.75 years, and three students 3.8%) listed 5.5 years (see Table IV-9).

Regarding the number of years involved in FFA, the participants in the treatment one group (n = 35) indicated involvement in the FFA chapter for one year (14.3%), two years (32.7%), three years (31.4%), and five years (2.9%) (see Table IV-10). The participants in the treatment two group (n = 27) reported being involved in the FFA chapter for one year (19.4%), two years (35.5%), four years (6.5%), four and half years (3.2%), four and three-quarter years (3.2%), five years (9.7%), and five and half years (9.7%) (see Table IV-10).

Table IV-9. Number of Years in FFA for Overall Participants (N = 62)

Number of Years in FFA	N	Percent
1	13	16.2
2	16	20.0
3	22	27.5
4	2	2.5
4.5	1	1.2
4.75	1	1.2
5	4	5.0
5.5	3	3.8

When questioned about their place of residence at the time of the experiment, 10.0 percent of the participants responded they lived in town without a garden or livestock, 21.2 percent said they lived in town with a garden and/or livestock, 18.8 percent reported to live in a rural residence without crops or livestock, 28.8 percent stated they lived in a rural residence with a garden and/or livestock but not for farming, and

Table IV-10. Number of Years in FFA by Group (N=61)

Number of Years in FFA	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
1	7	14.3	6	19.4
2	16	32.7	0	0.0
3	11	22.4	11	35.5
4	0	0.0	2	6.5
4.5	0	0.0	1	3.2
4.75	0	0.0	1	3.2
5	1	2.0	3	9.7
5.5	0	0.0	3	9.7

17.5 percent indicated they lived in a rural residence on a working farm (see Table IV-11).

Table IV-11. Place of Residence for Overall Participants (N=77)

Place of Residence	N	Percent
In Town—no garden/livestock	8	10.0
In Town—with garden/livestock	17	21.2
Rural Residence—no crops or livestock	15	18.8
Rural Residence—with garden and/or livestock	23	28.8
Rural Residence—on a working farm	14	17.5

In the treatment one group (n = 46), 8.2 percent stated they lived in town without a garden or livestock, 20.4 percent said they lived in town with a garden and/or livestock,

22.4 percent reported to live in a rural residence without crops or livestock, 32.7 percent stated they lived in a rural residence with a garden and/or livestock but not for farming, and 10.2 percent indicated they lived in a rural residence on a working farm (see Table IV-12).

Table IV-12. Place of Residence for Participants by Group (N = 77)

Place of Residence	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
In Town—no garden/livestock	4	8.2	4	12.9
In Town—with garden/livestock	10	20.4	7	22.6
Rural Residence—no crops or livestock	11	22.4	4	12.9
Rural Residence—with garden and/or livestock	16	32.7	7	22.6
Rural Residence—working farm	5	10.2	9	29.0

In the treatment two group (n = 31), 12.9 percent stated they lived in town without a garden or livestock, 22.6 percent said they lived in town with a garden and/or livestock, 12.9 percent reported to live in a rural residence without crops or livestock, 22.6 percent stated they lived in a rural residence with a garden and/or livestock but not for farming, and 29.0 percent indicated they lived in a rural residence on a working farm (see Table IV-12).

Participant Level of Awareness Regarding Agricultural Economics

Participants were asked a variety of questions pertaining to their general awareness of agricultural economics, including agricultural economics curriculum, agricultural economics Career Development Events (CDEs), publications, media, and related career options. Of the total participants (N = 77), 52.5 percent of the participants reported having no previous lessons in agricultural economics while 42.5 percent of the participants reported having some lessons in agricultural economics (see Table IV-13).

Table IV-13. Participation in Agricultural Economics Lessons for Overall Participants (N = 77)

Lessons in Agricultural Economics	N	Percent
Yes	34	42.5
No	42	52.5
No Response	1	1.25

In the treatment one group (n = 46), 49.0 percent indicated no previous lessons in agricultural education, while 42.9 percent of the treatment one group reported having had lessons in agricultural economics. One participant in the treatment one group did not respond to this question (see Table IV-14). The treatment two group participants (n = 31) stated 58.1 percent had no prior agricultural economics lesson while 41.9 percent of the participants reported having had lessons in agricultural economics (see Table IV-14).

Table IV-14. Participation in Agricultural Economics Lessons by Group (N = 77)

Lessons in Agricultural Economics	Treatment 1 Group N	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Yes	21	42.9	13	41.9
No	24	49.0	18	58.1
No Response	1	2.0	0	0.0

To further determine participants' exposure to agricultural economics, participants were asked if they had any experience with or exposure to the Department of Agricultural Economics at Oklahoma State University. Specifically, participants were asked if they had visited the website for the Department of Agricultural Economics at OSU. Overall, 95.0 percent of the total respondents (N = 77) indicated they had not visited the website (see Table IV-15). Furthermore, 91.8 percent of the treatment one group (n = 46) and 100.0 percent of the treatment two group (n = 31) stated they had not visited the OSU Department of Agricultural Economics website (see Table IV-15).

Table IV-15. Visits by Participants to the OSU Department of Agricultural Economics Website (N = 77)

Visited OSU AG ECON Website	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Yes	1	1.2	1	2.0	0	0.0
No	76	95.0	45	91.8	31	100.0

When asked if they had participated in an Agricultural Economics Career Development Event (CDE) at OSU, 20.0 percent of the total respondents (N = 77) confirmed their participation, with 18.4 percent of the treatment one group (n = 46) and 22.6 percent of the treatment two group (n = 31) stating they did participate in the CDE hosted by the OSU Department of Agricultural Economics (see Table IV-16).

Table IV-16. Overall Participation in Agricultural Economics Career Development Event (N = 77)

Participated in CDE	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Yes	16	20.0	9	18.4	7	22.6
No	61	76.2	37	75.5	24	77.4

To measure exposure to agricultural economics related publications, participants were asked if they had ever used any of the Fact Sheets produced by the OSU Department of Agricultural Economics. Of the total participants (N = 77), 5.0 percent had used Fact Sheets with 91.2 percent never having used Fact Sheets (see Table IV-17). Furthermore, of the participants in the treatment one group (n = 46), 89.8 percent had never used a Fact Sheet with only 4.1 percent had used Fact Sheets (see Table 19). The results were similar in the treatment two group (n = 31) with only 6.5 percent using the Fact Sheets and 93.5 percent never using the Fact Sheets (see Table IV-17).

Table IV-17. Participant Use of Fact Sheets (N = 77)

Used Fact Sheet	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Yes	4	5.0	2	14.9	2	6.5
No	73	91.2	44	89.8	29	93.5

Participants were asked a series of questions regarding their exposure to agricultural economics media including agricultural economics publications and agricultural economics segments on statewide agricultural television programs. When participants were asked if they ever sought information from publications pertaining to agricultural economics including the *High Plains Journal, Feedstuff, Southwest Farm Press, and the Farm Journal,* 54 of the total participants (69.2%) said they did not seek information from any of the publications (see Table IV-18). Of the participants in the treatment one group only 23.4 percent sought information in one or more of the publications, with 68.1 percent not seeking information in any of the publications (see Table IV-18). Four (8.5%) of the control participants did not respond to the question. Nine (29.0%) of the participants in the treatment two group (n=31) reported to have sought information in one or more of the publications, while 22 (71.0%) of the participants had never sought information in the publications (see Table IV-18).

Table IV-18. Sought Information from Agricultural Economics Publication(s) (N = 77)

Used Publication(s)	Group N	Group Percent	Treatment one group n	Treatment one group Percent	Treatment two group n	Treatment two group Percent
Yes	20	25.6	11	23.4	9	29.0
No	54	69.2	32	68.1	22	71.0
No Response	3	5.1	3	8.5	0	0.0

In Oklahoma, there are two agricultural television programs: *SUNUP* and *Oklahoma Horizons*. Each of these television programs run segments relating to agricultural economics. Therefore, participants were asked if they watched any of the agricultural economics segments on either program. The majority of participants (N = 77) did not watch *SUNUP* (see Table IV-19) or *Oklahoma Horizons* (see Table IV-20). Four (5.1%) of the participants indicated watching *SUNUP* (see Table IV-19) and 15 of the participants (19.2%) reported watching *Oklahoma Horizons* (see Table IV-20). Furthermore, 2.0 percent of the participants in the treatment one group (n = 46) reported to watch *SUNUP* (see Table IV-19) and 18.4 percent of the treatment one group participants reported watching *Oklahoma* Horizons (see Table IV-20), while 9.7 percent of the treatment two group (n = 31) reported watching *SUNUP* (see Table IV-19) and 19.4 percent of the treatment two group stated they had watched *Oklahoma Horizons* (see Table IV-20)

Table IV-19. Participants Watching Agricultural Economics Segments on SUNUP (N = 77)

Watched SUNUP	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Percent	Treatment 2 Group n	Treatment 2 Percent
Yes	4	5.0	1	2.0	3	9.7
No	73	91.2	45	91.8	28	90.3

Table IV-20. Participants Watching Agricultural Economics Segments on Oklahoma Horizons (N = 77)

Watched Oklahoma Horizons	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Percent	Treatment 2 Group n	Treatment 2 Percent
Yes	15	18.8	9	18.4	6	19.4
No	60	75.0	35	71.4	25	80.6
No Response	2	2.6	2	4.3	0	0.0

A series of Likert scale questions were asked to determine students' knowledge about agricultural economics. The questions were based on a scale of one to five, with one representing strongly disagree, two representing disagree, three representing unsure, four representing agree, and five representing strongly agree. These questions were analyzed by calculating frequencies, percentages, means, and standard deviations.

When asked if they could correctly define agricultural economics, 13.8 percent of the total participants (N = 77) strongly disagreed, 11.2 percent disagreed, 23.8 percent were unsure, 45.0 percent agreed, and 2.5 percent strongly agreed (see Table IV-21).

Table IV-21. Participants' Ability to Correctly Define Agricultural Economics (N = 77)

Define Agricultural Economics	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Strongly Disagree	11	13.8	6	12.2	5	16.1
Disagree	9	11.2	5	10.2	4	12.9
Unsure	19	23.8	14	28.6	5	16.1
Agree	36	45.0	21	42.9	15	48.4
Strongly Agree	2	2.5	0	0.0	2	6.5

The mean for the overall group of student participants was 3.12 with a standard deviation of 1.12 (see Table IV-26). Regarding correctly defining agricultural economics, 12.2 percent of the treatment one group (n = 46) strongly disagreed, 10.2 percent disagreed, 28.6 percent were unsure, and 42.9 percent agreed (see Table IV-21). None of the participants in the treatment one group strongly agreed (see Table

IV-21). The mean for the treatment one group was 3.09 (see Table IV-27). When asked the same question, 16.1 percent of the treatment two group (n = 31) strongly disagreed, 12.9 percent disagreed, 16.1 percent were unsure, 48.4 percent agreed, and 6.5 percent strongly agreed (see Table IV-21). The mean for the treatment two group was 3.16 (see Table IV-27).

Participants were asked questions regarding their level of knowledge about industries associated with agricultural economics. Of the overall participants (N = 77) had a variety of 11.2 percent strongly disagreed, 15.0 percent disagreed, 47.5 percent were unsure, 21.2 percent agreed, and 1.2 percent strongly agreed (see Table IV-22). The mean for the overall groups' level of knowledge about industries associated with agricultural economics was 2.86 with a standard deviation of 0.942 (see Table IV-26).

Participants in the treatment one group (n = 46) responded about their level of knowledge about industries associated with agricultural economics, with 10.2 percent strongly disagreed, 16.3 percent disagreed, 53.1 percent were unsure, 12.2 percent agreed, and 2.0 percent strongly agreed (see Table IV-22). The mean for the treatment one group was 2.78 (see Table IV-27). When asked the same question, participants in the treatment two group (n = 31) indicated 12.9 percent strongly disagreed, 12.9 percent disagreed, 38.7 percent were unsure, and 35.5 percent agreed (see Table IV-22). None of the participants in the treatment two group strongly agreed (see Table IV-22). The mean was 2.97 (see Table IV-27).

Table IV-22. Participants' Level of Knowledge Regarding Agricultural Economics Industries (N = 77)

Identify Industries	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Strongly Disagree	9	11.2	5	10.2	4	12.9
Disagree	12	15.0	8	16.3	4	12.9
Unsure	38	47.5	26	53.1	12	38.7
Agree	17	21.2	6	12.2	11	35.5
Strongly Agree	1	1.2	1	2.0	0	0.0

When asked if they could identify careers associated with agricultural economics, 12.5 percent of the total participants (N = 77) strongly disagreed, 17.5 percent disagreed, 30.0 percent were unsure, 35.0 percent agreed, and 1.2 percent strongly agreed (see Table IV-23).

Table IV-23. Participants' Ability to Indentify Careers Associated with Agricultural Economics (N = 77)

Identify Careers	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Strongly Disagree	10	12.5	6	12.2	4	12.9
Disagree	14	17.5	9	18.4	5	16.1
Unsure	24	30.0	20	40.8	4	12.9
Agree	28	35.0	10	20.4	18	58.1
Strongly Agree	1	1.2	1	2.0	0	0.0

The mean for the overall group of participants was 2.95, with a standard deviation of 1.06 (see Table IV-26).

Regarding identifying careers associated with agricultural economics, 12.2 percent of the treatment one group (n = 46) strongly disagreed, 18.4 percent disagreed, 40.8 percent were unsure, and 20.4 percent agreed, and 2.0 percent strongly agreed (see Table IV-24). The mean for the treatment group was 2.8 (see Table IV-27). When asked the same question, 12.9 percent of the treatment two group (n = 31) strongly disagreed, 16.1 percent disagreed, 12.9 percent were unsure, and 58.1 percent agreed (see Table IV-23). None of the respondents in the treatment two group strongly agreed (see Table IV-23). The mean for the treatment two group was 3.16 (see Table IV-27).

Participants were asked if they made agricultural economics related decisions on a monthly basis. The overall participants (N = 77) responded with 5.0 percent strongly agreeing, 17.5 percent agreeing, 38.8 percent were unsure, 21.2 percent disagreeing, and 13.8 percent strongly disagreeing (see Table IV-24). The mean was 2.78 for the overall participants, with a standard deviation of 1.07 (see Table IV-26).

Regarding making agricultural economic decisions on a monthly basis, participants in the treatment one group (n = 46) responded with 2.0 percent strongly agreeing, 6.1 percent agreeing, 49.0 percent were unsure, 22.4 percent disagreeing, and 14.3 percent strongly disagreeing (see Table IV-24). The mean for the treatment one group was 2.57 (see Table IV-27). Finally, participants in the treatment two group (n = 31) indicated 9.7 percent strongly agreed, 35.5 percent agreed, 22.6 percent were unsure, 19.4 percent disagreed, and 12.9 percent strongly disagreed (see Table IV-24). The mean for the treatment two group was 3.1 (see Table IV-27).

Table IV-24. Participants' Level of Making Agricultural Economic Decisions on a Monthly Basis (N = 77)

Make AGECON Decisions	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Strongly Disagree	11	12.8	7	14.3	4	12.9
Disagree	17	21.2	11	22.4	6	22.6
Unsure	31	38.8	24	49.0	7	22.6
Agree	14	17.5	3	6.1	11	35.5
Strongly Agree	4	5.0	1	2.0	3	9.7

Participants were asked to indicate if they were interested in pursuing a career associated with agricultural economics. The total participant (N = 77) responses indicated 15.0 percent strongly disagreed, 21.2 percent disagreed, 40.0 percent were unsure, 18.8 percent agreed, and 1.2 percent strongly agreed (see Table IV-25). The mean for this question was 2.69, with a standard deviation of 1.0 (see Table IV-26).

Table IV-25. Participants' Interest Pursuing a Career Associated with Agricultural Economics (N = 77)

AGECON Career	Group N	Group Percent	Treatment 1 Group n	Treatment 1 Group Percent	Treatment 2 Group n	Treatment 2 Group Percent
Strongly Disagree	12	15.0	6	12.2	6	19.4
Disagree	17	21.2	10	20.4	7	22.6
Unsure	32	40.0	21	42.9	11	35.5
Agree	15	18.8	8	16.3	7	22.6
Strongly Agree	1	1.2	1	2.0	0	0.0

When asked if they were interested in pursuing a career associated with agricultural economics, treatment one group participants (n = 46) reported 12.2 percent strongly disagreed, 20.4 percent disagreed, 42.9 percent unsure, 16.3 percent agreed, and 2.0 percent strongly agreed (see Table IV-25). The mean for the treatment one group was 2.79 (see Table IV-27). Participants in the treatment two group (n = 31) stated 19.4 percent strongly disagreed, 22.6 percent disagreed, 35.5 percent were unsure, and 22.6 percent agreed (see Table IV-25). None of the respondents in the treatment two group strongly agreed (see Table IV-25). The mean for the treatment group two was 2.61 (see Table IV-27).

Participants Performance on the Pre- and Post-tests

In order to measure the level of knowledge student participants acquired during the study, several techniques were used including correlations and one-way ANOVA. The student pre-test was correlated with the post-test to determine the relationship between the two instruments (see Table IV-28). The various lessons pre- and post- test analysis produced the following: introduction to agricultural economics pre- and post-test analysis produced an r value of .097, resource use produced an r value of .638, marketing tools part one produced an r value of .139, marketing tools part two produced an r value of .301, and the use of financial statements produced an r value of .303 (see Table IV-28). Trochim (2001) states a moderate or low correlation ($r = < .7$) will allow the researcher to remove the pre-test and thus, conduct a one-way ANOVA to determine the effect of the treatment groups on the post-test score. All pre- and post-tests

demonstrated moderated to low correlations (see Table IV-28). Therefore, a one-way ANOVA was conducted for each of the five post-tests.

Table IV-26. Means for Overall Students' Level of Knowledge/Interest in Agricultural Economics (N = 77)

	Mean	*SD*
Knowledge about Industries Associated with Agricultural Economics	2.86	.942
Identify Careers Associated w/Agricultural Economics	2.95	1.06
Correctly Define Agricultural Economics	3.12	1.12
Make Monthly Agricultural Economic Decisions	2.78	1.07
Plan to Pursue a Career Associated with Agricultural Economics	2.69	1.00

Table IV-27. Means for Students' Level of Knowledge/Interest in Agricultural Economics by Treatment Group (N = 77)

	Treatment 1 Group Mean	Treatment 2 Group Mean
Knowledge about Industries Associated with Agricultural Economics	2.78	2.97
Identify Careers Associated w/Agricultural Economics	2.80	3.16
Correctly Define Agricultural Economics	3.09	3.16
Make Monthly Agricultural Economic Decisions	2.57	3.10
Plan to Pursue a Career Associated with Agricultural Economics	2.79	2.61

Table IV-28. Student Pre-test and Post-Test Correlations

Pre- and Post-test Topic	n	*r*	*p*
Introduction to Agricultural Economics	73	.097	.207
Resource Use	63	.638	.000
Marketing Tools Part One	64	.139	.136
Marketing Tools Part Two	67	.301	.007
Financial Statements	70	.303	.005

Analysis of Post-Tests and Pre- and Post-Tests

Ho1: No difference exists in the level of knowledge about the introduction agricultural economics between the two participant groups.

To address null hypothesis one, student participants in both treatment groups (treatment one group and treatment two group) were given a post-test testing their knowledge about the introduction to agricultural economics. The treatment one group mean score was 3.3261 with a standard deviation of .76170, and the treatment two group mean score was 3.0741 with a standard deviation of 1.14105 (see Table IV-29). A one-way ANOVA comparison of this measure revealed no significant difference in the participants' knowledge after the treatment (p = .262) at an *a priori* determined alpha level of .05 (see table 32). Effect size was calculated using eta squared ($\acute{\eta}^2$). Green, Salking, & Akey (2000) interpret $\acute{\eta}^2$ as the proportion of variance of the dependent variable related to factor. Furthermore, Green et al. (2000) define $\acute{\eta}^2$ values of .01, .06,

and .14 as small, medium, and large size effects. Therefore, the size effect ($\acute{\eta}^2 = .018$) for the introduction to agricultural economics post-test is classified as a small size effect.

Table IV-29. Descriptive Statistics for Student Performance by Group on the Introduction to Agricultural Economics Post-Test

	n	Mean	*SD*	Minimum	Maximum
Treatment 1 Group	46	3.3261	.76170	2.00	4.00
Treatment 2 Group	27	3.0741	1.14105	0.00	4.00
Total	73	3.2329	.92076	0.00	4.00

To further investigate this hypothesis, a one-way ANOVA test was conducted on the difference in participants' performance between the introduction to agricultural economics pre- and post-tests (see Table IV-31). An ANOVA comparison of this measure revealed a significant difference in the performance ($p = .0000$) of participants' between the pre- and post-test at an *a priori* determined alpha level of .05 (see Table IV-31). Effect size was calculated using eta squared ($\acute{\eta}^2 = .165$), which is classified as a large effect size (Green, et al., 2000). Based on this analysis, the researcher rejected the null hypothesis.

Table IV-30. Comparative Analysis of Participant Performance on the Introduction to Agricultural Economics Post-test by Group

Source	SS	df	MS	F	p	$\acute{\eta}^2$
Between Groups	1.081	1	1.081	1.279	.262	.018
Within Groups	59.961	71	.845			
Total	61.041	72				

*$p < .05$

Table IV-31. Comparative Analysis of Participant Performance on the Introduction to Agricultural Economics Pre- and Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	17.510	1	17.510	14.384	.000*	.165
Within Groups	86.435	71	1.217			
Total	103.945	72				

*$p < .05$

Ho2: No difference exists in the level of knowledge about resource use in agricultural economics between the two participant groups.

To address null hypothesis two, student participants in both groups, treatment group one and treatment group two, were tested on their knowledge about resource use in agricultural economics using a post-test. The treatment one group mean was 3.5833 with a standard deviation of 1.13074, and the treatment two group mean score was 4.0370 with a standard deviation of .97985 (see Table IV-32). A one-way ANOVA comparison of this measure revealed no significant difference in participants' knowledge about resource use in agricultural economics after the treatment ($p = .101$) at an *a priori* determined alpha of .05 (see Table IV-33). Effect size was calculated using eta squared ($\acute{\eta}^2 = .0436$) which is considered to be a small effect size (Green, et al., 2000).

To further investigate this hypothesis, a one-way ANOVA test was conducted on the difference in participants' performance between the resource use in agricultural economics pre- and post-tests (see Table IV-4). An ANOVA comparison of this measure revealed no significant difference in the performance (*p*

= .101) of participants' between the pre- and post-test at an *a priori* determined alpha level of .05 (see Table IV-34). Effect size was calculated using eta squared ($\acute{\eta}^2$ = .000), which is classified as a small effect size (Green, et al., 2000). The null hypothesis was not rejected based on this analysis.

Ho3: No difference exists in the level of knowledge about the use of marketing tools part one in agricultural economics between the two participant groups.

To address null hypothesis three, student participants in both treatment group one and treatment group two were tested on their knowledge about marketing tools part one in agricultural economics. The treatment one group mean was 3.1538 with a standard deviation of 1.22557, and the treatment two group mean was 3.6400 with a standard deviation of 1.15036 (see Table IV-35). A one-way ANOVA comparison of this measure revealed no significant difference in the participants' knowledge level following the treatment (p = .118) at an *a priori* determined alpha level of .05 (see Table IV-36). Effect size was calculated using eta squared ($\acute{\eta}^2$ = .0390) which is considered to be a small effect size (Green, et al., 2000).

Table IV-32. Descriptive Statistics for Student Performance by Group on the Resource Use Post-Test

	n	Mean	*SD*	Minimum	Maximum
Treatment 1 Group	36	3.5833	1.13074	1.00	5.00
Treatment 2 Group	27	4.0370	.97985	2.00	5.00
Total	63	3.7778	1.08426	1.00	5.00

Table IV-33. Comparative Analysis of Participant Performance on the Resource Use Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	3.176	1	3.176	2.779	.101	.0436
Within Groups	69.713	61	1.143			
Total	72.889	62				

*$p < .05$

Table IV-34. Comparative Analysis of Participant Performance on the Resource Use Pre- and Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	.000	1	.000	.000	1.000	0.00
Within Groups	71.556	61	1.173			
Total	71.556	62				

*$p < .05$

To further investigate this hypothesis, a one-way ANOVA test was conducted on the difference in participants' performance between the resource use in agricultural economics pre- and post-tests (see Table IV-37). An ANOVA comparison of this measure revealed no significant difference in the performance ($p = .515$) of participants' between the pre- and post-test at an *a priori* determined alpha level of .05 (see Table IV-37). Effect size was calculated using eta squared ($\acute{\eta}^2 = .007$), which is classified as a small effect size (Green, et al., 2000). The null hypothesis was not rejected based on this analysis.

Table IV-35. Descriptive Statistics for Student Performance by Group on the Marketing Tools Part One Post-Test

	n	Mean	*SD*	Minimum	Maximum
Treatment 1 Group	39	3.1538	1.22557	0.00	6.00
Treatment 2 Group	25	3.6400	1.15036	2.00	6.00
Total	64	3.3438	1.21131	0.00	6.00

Table IV-36. Comparative Analysis of Participant Performance on the Marketing Tools Part One Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	3.601	1	3.601	2.513	.118	.039
Within Groups	88.837	62	1.433			
Total	92.438	63				

*$p < .05$

Table IV-37. Comparative Analysis of Participant Performance on the Marketing Tools Part One Pre- and Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	1.134	1	1.134	.428	.515	.007
Within Groups	164.304	62	2.650			
Total	165.437	63				

*$p < .05$

Ho4: No difference exists in the level of knowledge about the use of marketing tools part two in agricultural economics between the two participant groups.

To address null hypothesis four, student participants in both treatment one group and the treatment two group were tested on their knowledge about marketing tools part two in agricultural economics using a post-test after treatment. The treatment group one mean score was 4.8837 with a standard deviation of 1.77562, and the treatment group two mean score was 5.3333 with a standard deviation of 1.60615 (see Table IV-38). A one-way ANOVA comparison of this measure revealed no significant difference in the level of knowledge about marketing tools part two following the treatment (p = .308) at an *a priori* level of .05 (see Table IV-39). Effect size was calculated using eta squared ($\acute{\eta}^2$ = .0160) which is considered to be a small effect size (Green, et al., 2000).

To further investigate this hypothesis, a one-way ANOVA test was conducted on the difference in participants' performance between the resource use in agricultural economics pre- and post-tests (see Table IV-40). An ANOVA comparison of this measure revealed no significant difference in the performance (p = .433) of participants' between the pre- and post-test at an *a priori* determined alpha level of .05 (see Table IV-40). Effect size was calculated using eta squared ($\acute{\eta}^2$ = .009), which is classified as a small effect size (Green, et al., 2000). The null hypothesis was not rejected based on this analysis.

Table IV-38. Descriptive Statistics for Student Performance by Group on the Marketing Tools Part Two Post-Test

	n	Mean	*SD*	Minimum	Maximum
Treatment 1 Group	43	4.8837	1.77562	1.00	8.00
Treatment 2 Group	24	5.3333	1.60615	2.00	8.00
Total	67	5.0448	1.71829	1.00	8.00

Table IV-39. Comparative Analysis of Participant Performance on the Marketing Tools Part Two Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	3.114	1	3.114	1.055	.308	.0160
Within Groups	191.752	65	2.950			
Total	194.866	66				

*$p < .05$

Ho5: No difference exists in the level of knowledge about the use of financial statements in agricultural economics between the two participant groups.

To address null hypothesis five, student participants in both treatment one group and the treatment two group were tested on their knowledge about the use of financial statements in agricultural economics using a post-test after treatment. The treatment group one

Table IV-40. Comparative Analysis of Participant Performance on the Introduction to Marketing Tools Part Two Pre- and Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	2.563	1	2.563	.596	.443	.009
Within Groups	279.377	65	4.298			
Total	281.940	66				

*$p < .05$

mean score was 1.4773 with a standard deviation of 1.1511, and the treatment group two mean score was 2.6154 with a standard deviation of 1.60192 (see Table IV-41). A one-way ANOVA comparison of this measure revealed a significant difference in the level of knowledge about marketing tools part two following the treatment ($p = .001$) at an *a*

priori level of .05 (see Table IV-42). Effect size was calculated using eta squared ($\acute{\eta}^2$ = .0148) which is considered to be a small effect size (Green, et al., 2000). The researcher rejected the null hypothesis based on this analysis.

To further investigate this hypothesis, a one-way ANOVA test was conducted on the difference in participants' performance between the resource use in agricultural economics pre- and post-tests (see Table IV-43). An ANOVA comparison of this measure revealed no significant difference in the performance (p = .069) of participants' between the pre- and post-test at an *a priori* determined alpha level of .05 (see Table IV-43). Effect size was calculated using eta squared ($\acute{\eta}^2$ = .048), which is classified as a small effect size (Green, et al., 2000). Based on this analysis, the researcher failed to reject the null hypothesis.

Table IV-41. Descriptive Statistics for Student Performance by Group on the Financial Statements Post-Test

	n	Mean	*SD*	Minimum	Maximum
Treatment 1 Group	44	1.4773	1.15111	0.00	4.00
Treatment 2 Group	26	2.6154	1.60192	0.00	5.00
Total	70	1.90000	1.43608	0.00	5.00

Table IV-42. Comparative Analysis of Participant Performance on the Financial Statements Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	$\acute{\eta}^2$
Between Groups	21.169	1	21.169	11.884	.001*	.148
Within Groups	121.131	68	1.781			
Total	142.300	69				

*$p < .05$

Table IV-43. Comparative Analysis of Participant Performance on the Financial Statements Pre- and Post-test by Group

Source	*SS*	*df*	*MS*	*F*	*p*	*ή²*
Between Groups	7.099	1	7.099	3.402	.069	.048
Within Groups	141.886	68	2.087			
Total	148.986	69				

*$p < .05$

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, DISCUSSION, AND RECOMMENDATIONS

Summary

The purpose of this study was to measure the baseline awareness secondary agricultural education students have about agricultural economics. Additionally, the study tested the knowledge retention selected Oklahoma secondary agricultural education students have about agricultural economics after completing a six class period unit using the Farm and Ranch Risk Management (FARRM) game curriculum. The assumptions of this study were twofold: 1) secondary agricultural students in the state of Oklahoma have limited awareness about agricultural economics, and 2) students who were taught the agricultural economics curriculum in conjunction with the FARRM game would demonstrate greater knowledge retention than students who were taught the material by lecture only.

Research Questions

The following research questions guided this study:

1. What are the selected characteristics of students enrolled in secondary agricultural education classes in the state of Oklahoma during the 2009 – 2010 academic school year?
2. What level of awareness do Oklahoma secondary agricultural education students have about agricultural economics including agricultural economics curriculum, publications, media, and related career options
3. Do secondary agricultural education students who participated in the agricultural economics curriculum and the FARRM game show greater knowledge gain than the secondary agricultural education students who participate the lecture only agricultural economics curriculum?

Null Hypotheses

The following null hypotheses guided this study:

Ho1: No difference exists in the level of knowledge about the introduction agricultural economics between the two participant groups.

Ho2: No difference exists in the level of knowledge about resource use in agricultural economics between the two participant groups.

Ho3: No difference exists in the level of knowledge about the use of marketing tools part one in agricultural economics between the two participant groups.

Ho4: No difference exists in the level of knowledge about the use of marketing tools part two in agricultural economics between the two participant groups.

Ho5: No difference exists in the level of knowledge about the use of financial statements in agricultural economics between the two participant groups.

Population

High school students (grades 9-12) enrolled in secondary Oklahoma agricultural education classes served as the population for this study. A sample was selected from this population.

Sample

The sample for this study consisted of selected secondary Oklahoma agricultural education classes. This study was a collaboration between the Department of Agricultural Economics at Oklahoma State University and the Oklahoma Department of Career and Technology Education (ODCTE) Agricultural Education Department. This collaboration was necessary as the ODCTE coordinates secondary agricultural education teaching efforts in Oklahoma. Therefore, the participating classes were selected by the Oklahoma Department of Career and Technology Education (ODCTE) agricultural education district program specialists based on willingness of teacher participation. Additionally, selected schools were within a 100 mile driving distance from Oklahoma State University to allow the agricultural economics faculty time to commute back and forth from the classes.

A solicitation email was sent in February 2010 to secondary agricultural education teachers within a 100 mile driving distance from the Oklahoma State University campus. Initially, eight teachers responded to the email indicating interest in participating in the study. Of the eight teachers, only six of the teachers could accommodate the time requirements for the agricultural economics curriculum. The six participating teachers were contacted by the researcher via phone and email to secure

dates to present the agricultural economics curriculum. One of the participating teachers did not respond to communications from the researcher. Therefore, the researcher contacted the ODCTE to ask for assistance in recruiting another school. A replacement school was secured for the study in April 2010. Therefore, a total of six classes, three in the treatment one group and three in the treatment two group, agreed to be involved in the study. The study was conducted in high school (grades 9-12) agricultural education classes at six different schools in the state of Oklahoma during the spring 2010 semester.

The selected schools for the study were randomly assigned to the treatment one group or the treatment two group. The high schools varied in student enrollment with school A having 126 students, school B having 489 students, school C having 96 students, school D having 63 students, school E having 84 students, and school F having 77 students. It is important to note school B had the largest student enrollment. Therefore, this class also had the largest agricultural education class enrollment. School B was the substitution school, and therefore, the researcher was limited in selection criteria.

Participating classes varied in size from nine to 19 students and were comprised of students classified as freshmen, sophomores, juniors, and seniors in high school. While the courses were all agricultural education classes, the classes included agricultural education II, agricultural production, and animal science. Students in the treatment one group were taught the agricultural economics curriculum, while students in the treatment two group were taught the agricultural economics curriculum and used the FARRM game to apply agricultural economics concepts. The participating classes from each of the six

schools were divided into two groups, with three classes in the treatment one group and three classes in the treatment two group:

Group 1. The students in this group participated in a unit (six class periods) of agricultural economics curriculum in which the material was presented by using lectures only (i.e., treatment one group of students).

Group 2. The students in this group participated in a unit (six class periods) of agricultural economics curriculum in which the material was presented by using lectures and the FARRM game (i.e., treatment two group of students).

Overall, student participants had the opportunity to complete a series of five pre- and post-tests related to the agricultural economics curriculum topics and a student questions. Because of school sanctioned activities, state testing make up days, student illness, and student disciplinary action, the total number of participants varied by lesson topic. Overall, 77 participants completed the student questionnaire with 46 students in the treatment one group and 31 students in the treatment two group. Of the 73 participants who completed the introduction to agricultural economics lesson, 46 were in the treatment one group and 27 were in the treatment two group. Sixty-three participants completed the resource use in agricultural economics lesson with 36 students in the treatment one group and 31 students in the treatment two group. Of the 64 participants who completed the marketing tools part one lesson, 39 were in the treatment one group and 25 were in the treatment two group. The lesson over marketing tools part two had a total of 67 participants with 43 in the treatment one group and 24 in the treatment two group. The last lesson over

financial statements had 70 participants with 44 participants in the treatment one group and 26 participants in the treatment two group.

Research Design

This study utilized a quasi-experimental design with a variation of the nonequivalent control group design as outlined by Campbell and Stanley (1963). A nonequivalent control group design is defined as "a type of experiment in which research participants are not randomly assigned to the experimental and control groups, and in which each group takes a pre-test and a post-test" (Gall, Borg, & Gall, 1996, p. 764). . Therefore, intact groups (i.e., classrooms) were used and treatments were randomly assigned to the groups. The treatments used included: 1) introduction of agricultural economics curriculum using lecture methods with PowerPoint presentations and 2) introduction of agricultural economics curriculum using lecture methods with PowerPoint presentations and the FARRM game.

The randomly assigned classrooms completed a series of five pre- and post-tests over the topics introduced in the agricultural economics curriculum: introduction to agricultural economics, resource use in agricultural economics, marketing analysis tools part one, marketing analysis tools part two, and the use of financial statements in agricultural economics. Comparisons were made between group means on each of the post-tests and the differences between each of the pre-test and post-test measures following the administration of the treatment. These comparisons allowed the researcher to measure if the treatments made a significant difference in the performance of the student participants. The study's research design is illustrated in Figure V-1.

Group	Pre-test	Independent Variable	Post-test
T1	Y^1	X	Y^2
T2	Y^1	_____	Y^2

Figure V-1. Research Design Pre-test Post-test Design (Ary, et al., 1996).

Treatment

The treatment one group for this study consisted of teaching the agricultural economics curriculum by traditional teaching methods during the course of six class periods. These teaching methods included using lecture, PowerPoint presentations, and handouts. Students were administered a pre-test before each lecture. After the completion of the lecture, students were given a post-test. There was no interaction between the instructor and the students during the pre- and post-tests. Therefore, neither formal feedback nor answers were provided to the students.

The second treatment for this study was defined as the FARRM game. The FARRM game is an interactive, computerized game developed by the faculty in the Department of Agricultural Economics at Oklahoma State University. The game was developed to simulate the management of 620 acres of owned farmland and 620 rented (sharecrop) acres for the production of wheat, stocker cattle, cotton, and/or sorghum production for a period of 15 years. The game simulation follows a calendar year, forcing players to make economic decisions based on actual commodity prices, yields, and costs. Furthermore, players must make decisions based on agricultural economic concepts such as the use of financial statements, resource use, and marketing tools as they relate to farm and ranch risk management. The

FARRM game maintains financial records for each player and includes information relating to annual prices, yields, production numbers, cost of production, and net return. At the end of each simulated fiscal year, annual cash flow and net worth statements are produced for the player. This allows the player to evaluate their overall farm and ranch risk management success. The instruction manual for the FARRM game is provided in Appendix F.

The agricultural economics faculty members used the agricultural economics curriculum in conjunction with the FARRM game to teach the treatment two group. Students in the treatment two group were presented with an agricultural economics lesson. Following the lesson, these students worked through a module of the FARRM game, making agricultural economic decisions based on the material presented in class. Students were randomly assigned to groups of two to three students, depending on the size of the class. Each group was provided with the same model of Dell laptop installed with the FARRM game. Students were provided with approximately 20 minutes of class time to complete the modules in the FARRM program. Additionally, students were provided with instant feedback as they could see the impact of their decisions on the productivity of the simulated farm/ranch. Moreover, the results of the game were posted in the classroom so student participants could compare their performance with the performance of their classmates. This created an environment of competition. The treatment group completed six rounds of the FARRM game, which is equivalent to approximately 15 years of agricultural production. These six modules were completed in conjunction with each of the six lesson plans. The agricultural economics instructor was available to answer technical questions the students had about running the program. However, the instructor did not assist students with decision making during the modules. Table V I provides an overview of the treatment.

Table V-1. Overview of the Treatment

Lesson 1. Introduction to Agricultural Economics
Traditional Lecture: • Define agricultural economics and discuss careers in agricultural economics • Determine economic decisions for farms and ranches • Discuss margins and diminishing marginal returns FARRM game: • Complete decisions for years 1, 2, 3, and 4 • Make decisions using margins and economic decision making concepts
Lesson 2. Resource Use Decisions
Traditional Lecture: • Discuss the use of crop and livestock enterprise budgets and how to construct • Provide definitions and examples of variable and fixed costs • Demonstrate the importance of enterprise budgets as management tools FARRM game: • Complete decisions for years 5,6, and 7 • Apply concepts by making decisions using enterprise budgets and evaluate fixed/variable costs
Lesson 3. Marketing Risk Management Tools—Part One
Traditional Lecture: • Identify price risk management tools to enhance market prices • Determine local cash price and cash price received FARRM game: • Complete decisions for years 8, 9, and 10 • Use price risk management tools to enhance prices for higher profits
Lesson 4. Marketing Risk Management Tools—Part Two
Traditional Lecture: • Identify price risk management tools • Use basis to determine the expected price • Determine cash price received and the net price FARRM game: • Complete decisions for years 11, 12, and 13 • Calculate cash price received, net price received, and expected price using the basis
Lesson 5. Financial Statements
Traditional Lecture: • Define assets, liabilities, and net worth • Discuss the use of balance sheets and cash flow statements FARRM game: • Complete decisions for years 14 and 15 • Determine assets, liabilities, and net worth of group's farm using statements

Data collection occurred during the spring 2010 semester. Prior to the study, students were provided with participant information sheets as well as consent forms (see Appendix A). The agricultural education teacher for each classroom also provided an assent letter to the parents of each student as well as a description of the study (see Appendix A). Furthermore, each school's principal signed a consent form to allow the class to participate in the agricultural economics curriculum and research study (see Appendix A).

The agricultural economics faculty members spent a class period administering a student questionnaire to gather descriptive information about the participants (Appendix F). This questionnaire was administered before the agricultural economics curriculum unit began. All participants were assigned a random code and were asked to write their code on the questionnaire as well as each pre- and post-test. This protected the identity of each participant. Codes were kept by the agricultural education instructor and destroyed at the end of the research study. The pre- and post-test scores were only available to the researcher. Therefore, none of the test scores affected the grades of the participants.

A series of five pre-tests and post-tests were developed and given in conjunction with the five basic concepts presented in the agricultural economics curriculum unit: introduction to agricultural economics, resource use, marketing tools part one, marketing tools part two, and financial statements. Students were given the pre-test before the lesson began and completed the post-test after the lesson ended. All tests were a series of multiple-choice questions with only one correct answer. The number of test questions ranged from four to eight test questions. The instruments are provided in Appendix E.

Data Analysis

Selected characteristics of student participants were calculated and summarized using frequencies, percentages, means, and standard deviations. Each lesson's pre-test was correlated with the post-test to determine the relationship between the two instruments. Furthermore, to measure the level of knowledge student participants acquired during the study, a one-way ANOVA test was run on all five post-tests as well as the difference between the five pre- and post-tests.

The *Statistical Package for the Social Sciences version 16* was utilized to complete all of the study's statistical analysis.

Results

The student pre-treatment questionnaire revealed the majority of participants were male (58.8%). Additionally, all participants were enrolled in a high school agricultural education class and were classified as freshmen (28.8%), sophomores (20.0%), juniors (25.0%), seniors (22.5%). The majority (65.1%) of participants reported living in rural residences.

Participants had been enrolled in agricultural education classes for an average of 2.74 years with 77.5 percent of the students having taken agricultural education classes for three years or less. The participants had a strong tie to FFA as 77.5 percent of the participants reported involvement with the FFA chapter; however, it should be noted student participant involvement in FFA should have been 100 percent as Oklahoma FFA reports 100 percent membership (Short, 2010).

The student questionnaire also reported findings relating to participants' level of awareness about agricultural economics. The findings were specifically related to participants' exposure to agricultural economics curriculum, publications, media, and related career options. Less than half (42.5%) of the participants had prior experience with lessons in agricultural economics. Therefore, it was not surprising that almost half (48.8%) of the participants strongly disagreed, disagreed, or were unsure if they could correctly define agricultural economics.

The majority of participants did not report prior uses of external sources such as websites, journal publications, or television segments to gain more information about agricultural economics. It is important to note only one participant (1.2%) had visited the OSU Department of Agricultural Economics website. Furthermore, participants reported limited use of Fact Sheets related to agricultural economics with only four participants (5%) reporting the use of Fact Sheets, while only 20 participants (25.6%) had sought information from agricultural economics publications such as the *High Plains Journal, Feedstuff, Southwest Farm Press*, and the *Farm Journal*. Additionally, participants indicated limited viewing of agricultural economics segments on Oklahoma-based agricultural programs such as *SUNUP* and *Oklahoma Horizons*, with just four participants (5.0%) stating they had watched *SUNUP* and 15 participants (18.8%) stating they had watched *Oklahoma Horizons.*

A series of Likert scale questions were asked to determine students' knowledge about agricultural economics. The questions were based on a scale of one to five, with one representing strongly disagree, two representing disagree, three representing unsure,

four representing agree, and five representing strongly agree. These questions were analyzed by calculating frequencies, percentages, means, and standard deviations.

Overall, participants indicated limited knowledge and interest about industries and careers related to agricultural economics. When asked if they could identify industries associated with agricultural economics, the mean for the overall group level of knowledge about industries associated with agricultural economics was 2.86. Consequently, a mean of 3.16 was calculated regarding the participants' ability to identify careers associated with agricultural economics with more than a quarter of the participants (40.8%) unsure if they could identify careers associated with agricultural economics, while 30.6 percent of the participants disagreed or strongly disagreed. Participants were asked if they made agricultural economics related decisions on a monthly basis. The overall participants (N = 77) mean was 2.78 responded with 5.0 percent strongly agreeing, 17.5 percent agreeing, with 38.8 percent were unsure, 21.2 percent disagreeing, and 13.8 percent strongly disagreeing. Finally, it was determined students participants were not interested in pursuing a career in agricultural economics. When asked if they were interested in pursuing a career associated with agricultural economics, a mean of 2.69 was calculated with 77.3 percent of the participants unsure, disagreed, or strongly disagreed.

To measure the level of knowledge student participants acquired during the study, several techniques were used including correlations and one-way ANOVA. The student pre-test was correlated with the post-test to determine the relationship between the two instruments. The various lessons pre- and post- test analysis produced the following: introduction to agricultural economics pre- and post-test analysis produced an r value of

.097, resource use produced an r value of .638, marketing tools part one produced an r value of .139, marketing tools part two produced an r value of .301, and the use of financial statements produced an r value of .303. Trochim (2001) states a moderate or low correlation (r = < .7) will allow the researcher to remove the pre-test and thus, conduct a one-way ANOVA to determine the effect of the treatment groups on the post-test score. All pre- and post-tests demonstrated moderated to low correlations. Therefore, a one-way ANOVA was conducted for each of the five post-tests.

Only two of the five null hypotheses, regarding the introduction to agricultural lesson and the use of financial statements, were rejected based on the data analysis (p = .0000; p = .001). However, the none of the other three hypotheses related to the students' post-test scores of the difference between the pre- and post-test scores were rejected based on the data analysis. In these instances, no significant differences ($p < .05$) were found between the two treatment groups. Effect size was calculated using eta squared. Accordingly, a large effect size ($\acute{\eta}^2$ = .165) was revealed for the introduction to agricultural economics pre- and post-tests (Green, Salking, & Akey, 2000). However, all other lesson areas revealed small effect sizes, including resource use ($\acute{\eta}^2$ = .0436; $\acute{\eta}^2$ = .000), marketing analysis tools part one ($\acute{\eta}^2$ = .0390; $\acute{\eta}^2$ = .007), marketing analysis tools part two ($\acute{\eta}^2$ = .016; $\acute{\eta}^2$ = .009), and financial statements ($\acute{\eta}^2$ = .148; $\acute{\eta}^2$ = .048) (Green, Salking, & Akey, 2000).

Conclusions

The analysis of data regarding each of the study's research questions formed the basis for the following conclusions:

1. What are the selected characteristics of students enrolled in secondary agricultural education classes in the state of Oklahoma during the 2009 – 2010 academic school year?

Concerning research question one, this study found that the student participants were mostly male. All participants were classified as high school students (grades 9-12). Additionally, the majority of participants reported being enrolled in agricultural education classes for three or less years, and the majority of participants were members of FFA.

2. What level of awareness do Oklahoma secondary agricultural education students have about agricultural economics including agricultural economics curriculum, publications, media, and related career options?

Concerning question two, student participants reported mid to low levels of awareness about agricultural economics. These results could be a result of lack of student exposure to agricultural economics and is supported by the research conducted by Robinson, Krysher, Haynes, and Edwards (in press) that reported student teachers spent the least amount of time on topics related to agribusiness and marketing. Additionally, only half of the student participants could correctly define agricultural economics. Students did not seek sources of information about agricultural economics from publications, Fact Sheets, and television. Additionally, only one participant had visited the OSU Department of Agricultural Economics website and only 16 participants (20%) had participated in an agricultural economics Career Development Event. Finally, students reported mid to low levels of knowledge about industries and careers related to agricultural economics. This finding is consistent with the study conducted by Fritz,

Husmann, Rees, Stowell, and Powell (2007) who found students had a lack of awareness of agricultural majors and career options. It is not surprising, therefore, that student participants' level of interest in pursuing a career associated with agricultural economics was low.

3. Do secondary agricultural education students who participated in the agricultural economics curriculum and the FARRM game show greater knowledge gain than the secondary agricultural education students who participate the lecture only agricultural economics curriculum?

Concerning question three, this study found only two significant difference s($p < .05$) in the effect of the treatment on the students' performance during the pre- and post-tests. The students' performance between the pre- and post-test for the lesson on the introduction to agricultural economics was found to be significant ($p = .000$) as well as the students' performance on the post-test for the lesson on financial statements ($p = .001$). However, the treatments did not make any significant difference on any of the other lesson pre- and post-tests including resource use ($p = .101$; $p = 1.00$), marketing analysis tools part one ($p = .118$; $p = .515$), and marketing analysis tools part two ($p = .308$; $p = .443$).

In conclusion, analysis of the data resulted in the researcher rejecting two of the null hypotheses related the introduction to agricultural economics and the use of financial statements. Three of the null hypotheses regarding resource use, marketing analysis tools part one, and marketing analysis tools part two, were not rejected based on the analyses.

Therefore, the FARRM game made difference in two of the lesson topics (i.e., introduction to agricultural economics and the use of financial statements). However, the

game did not make an impact on the other three lesson topics (resource use, marketing analysis tools part one, and marketing analysis tools part two). These results support the research of Randel, Morris, Wetzel, and Whitehill (1992) who conducted a meta-analysis of 68 studies that compared student performances when using games as instructional methods with classmates learning from traditional instruction methods. Of the 68 studies, 38 of the studies reported no advantage in student performance for the students taught using the games.

Additionally, the FARRM game can be classified as a simulation game. Cherryholmes (1966) studied simulation games and postulated that simulations games did not reinforce the specific knowledge the games were designed to teach. Instead, these games often focused on and reinforced problem-solving skills. Therefore, the FARRM game might have emphasized the development of problem-solving skills instead of agricultural economic concepts.

Recommendations

Recommendations for Research

This study provides baseline information for future research. Therefore, future investigations should be conducted with Oklahoma secondary agricultural education programs to determine the effectiveness of the agricultural economics curriculum and the FARRM game. Future researchers should attempt to recruit classes that will provide an even distribution of freshmen, sophomore, junior, and senior students in both the treatment one group and the treatment two group. Furthermore, research should be conducted to determine what age level or grade classification is most appropriate for this

curriculum unit. For example, students classified as juniors and seniors may be a more appropriate group than freshmen or sophomores for this curriculum because they are more mature or they have had more classes and richer personal experiences to apply to the curriculum.

The student questionnaire, administered before both treatments, provided descriptive characteristics about the student participants. However, the additional questions should be added to the questionnaire regarding participants' age, self reported GPA, ACT score, and ethnicity. This information will help to provide a richer, more accurate description of the student participants.

Special consideration should be given to the development of the curriculum unit. While the lessons on the introduction to agricultural economics and the financial statements provided the only significant ($p < .05$) findings in this study, further curriculum development should be conducted to meet the needs of the students. Additional attention should be given to further curriculum development regarding resource use in agricultural economics and the use of marketing analysis tools parts one and two, as these three areas did not prove to be significant.

Because the FARRM game was originally designed for adult education, it should be evaluated by a panel of experts. This panel should consist of higher education faculty members in agricultural education, district agricultural education specialists from the Oklahoma Department of Career and Technology Education, and current Oklahoma secondary agricultural education teachers. The game should be evaluated to ensure all the concepts from the agricultural economics curriculum unit are reinforced. Additionally, a focus group of Oklahoma secondary agricultural education students

should discuss the use of the FARRM game in conjunction with the curriculum. This group could provide recommendations for improving the game including ease of use, new technology (i.e., videos or web-based updates), and the addition of new game functions.

Six class days were used to administer the agricultural economics curriculum unit. Based on informal communication with the agricultural economics faculty members and the student participants, the time frame for the curriculum unit should be re-evaluated. Specifically, researchers should consider lengthening the curriculum unit. Students informally reported feeling rushed and lost because the allotted class time did not allow the agricultural economics faculty members to expand on topics. Therefore, future research should consider using two class periods to cover each topic, for a total of ten class periods. Future research should also analyze the amount of time allocated for students to play the game. Additional time could be allotted to allow to students to make more informed decisions. Moreover, future studies should implement the curriculum during consecutive class days. By offering the lessons consecutively, students will be able to make connections between the lessons without being introduced to topics outside of the field of agricultural economics.

Moreover, this study should not be conducted in the spring because of student mortality. According to Robinson, Krysher, Haynes, & Edwards (in press) the spring semester is a busy time of year in Oklahoma. Activities such as FFA convention, state FFA interscholastics, CDEs, and state livestock exposition all occur during the spring semester (Robinson, et al., in press). While the spring semester is congested or overloaded with FFA activities, the student participants in this study missed days of the

agricultural economics curriculum unit because of sporting events (i.e. baseball), illness, make-up days for state testing, and suspension from school. Therefore, conducting this study in the fall semester might help alleviate the absence of participants.

It is not feasible for faculty members from the OSU Department of Agricultural Economics to serve as instructors for this curriculum unit in multiple Oklahoma secondary agricultural education programs. Therefore, secondary agricultural educators should receive training on how to implement the agricultural economics curriculum. Training workshops (i.e., continuing education or in-service workshops) could be coordinated through the OSU Department of Agricultural Education, Communications, and Leadership or the Oklahoma Department of Career and Technology Education agricultural education department. Additionally, training might be provided to student teachers. This would allow student teacher the opportunity to learn more about agricultural economics while potentially training future teachers to implement the agricultural economics curriculum. Providing yearly training for secondary agricultural educators and student teachers would allow the incorporation of the agricultural economics curriculum into multiple Oklahoma secondary agricultural education programs.

Finally, future research regarding the implementation of the agricultural economics curriculum and the FARRM game should incorporate the collection of qualitative data. Specifically, qualitative data should be conducted following the agricultural economics curriculum unit. As series of qualitative questions should ask student participants about their experiences with the FARRM game and what they

learned from the agricultural economics curriculum. This would provide rich, insightful data to be included in the study.

Recommendations for Practice

Secondary agricultural educators should consider the use of games in conjunction with the curriculum. Although no significant differences were detected for three of the study's null hypotheses, the researcher did informally observe more student engagement in the treatment two group, or the classes using the FARRM game in conjunction with the agricultural economics curriculum. During study, the student participants in the treatment two group asked more questions and contributed more to class discussion than the students in the treatment one group, or the classes using the agricultural economics curriculum only. This supports the literature by (Koonts, et al., 1995) who noticed more engagement by students when playing the Packer Feeder game.

The researcher informally observed student participants in treatment group two embracing the environment of competition as they consistently evaluated their performance during the FARRM game to the performance of their peers. This supports the research of McDonald & Hannafin (2003) who postulated the greatest educational benefit of games is the increase in student motivation and improvement in the students' attitudes towards learning.

Additionally, the researcher informally witnessed a level of excitement when student participants in treatment group two were allotted time to use the computers to play the FARRM game. Perhaps this is because these students are classified as millennials and crave the use of technology in conjunction with traditional curriculum (Prensky, 2001). Moreover, Lenhart, et al. (2005) report 81 percent of teen internet users

play online games. Therefore, the FARRM curriculum works to "build a bridge between the technological world millennials live in and the classrooms we expect them to learn in (Considine, Horton, & Moorman, 2009).

Teacher educators should build curriculum that employs the Kolb's experiential learning cycle. The use of financial statements in agricultural economics was a lesson plan area that proved to be significant ($p < .001$). However, it is important to note that the student participants who played the FARRM game had to repeatedly use financial statements to make decisions during the game. Therefore, these students relied on their previous experiences to continually improve their performance on the FARRM game. By having continual hands-on experience with financial statements, students in the treatment two group were able to better understand the concepts presented in the financial statements lesson. Research by Sardone & Devlin-Scherer (2010) advocated experiential learning by employing games because games encourage students to think, care, and react to real world situations. Additionally, games can prepare students to think critically and innovatively.

The results of this study should be shared with practicing secondary agricultural education teachers. Professional development opportunities should be provided to allow secondary agricultural educators to learn more agricultural economics and the agricultural economics curriculum. Warnik, Thompson, & Gummer (2007) conducted a study that found curriculum development for agricultural educators was a problem, primarily because the educators did not have the time to develop it nor did they have the resources to buy it. Therefore, collaboration between the agricultural economics faculty and secondary agricultural educators could be a win-win situation.

Implications and Discussion

The data collected during this study detected significant difference in the introduction to agricultural economics ($p < .000$) and the use of financial statements in agricultural economics ($p < .001$). Although, no significant difference was detected for the study's null hypotheses regarding resource use, marketing analysis tools part one, and marketing analysis tools part two, the researcher did informally observe more student engagement by participants in treatment group two (group with the FARRM game). These results support the value of the use of the FARRM game in conjunction with the agricultural economics curriculum as endorsed by other researchers and scholars (Dixit, 2005; Leonard, 1995; Cooper, 2007; Sardon & Devlin-Scherer, 2010; Leigh, 2003/2004; McDonald & Hannafin, 2003; Reiley, Urbancic, & Walker, 2008; kulik & kulik, 1991; Hogle, 1996; Stewart, Marsh, Kingwell, Pannell, Abadi, & Schilizzi, 2000; Koontz, Peel, Trapp, & Ward, 1995).

In addition, this study also supports the findings of Hammer (2000) whose study determined student learning significantly increased when students had an experiential learning experience in addition to traditional lecture presentation of course material. The experiential learning cycle was employed by student participants during the decision making process of the FARRM game. For example, the student had a concrete experience when beginning the agricultural economics curriculum and the FARRM game. During this first step, the student was introduced to new concepts and materials. For example, the student was introduced to the concept of a call option. The second step, reflective observation, was demonstrated when the student began to digest the information they had been presented about call options by reviewing the information and

potentially asking questions. Next, the student organized the concepts about call options by thinking about the advantages and disadvantage of using a call option during the FARRM game. This process constitutes abstract conceptualization. Finally, based on the student's hypotheses about call options, the student decided whether or not to employ a call option during the FARRM game. This constitutes the final step of active experimentation. It is important to note, by employing a call option the student may have increased or decreased their success in the FARRM game. Based on this observation, the experiential learning cycle began again as the student used this experience to continue playing throughout the game. The use of experiential learning supports the research of other scholars (Kolb, 1984; Rhyker, Tudor, Wiegand, Kingman, & Morrish, 2006; Svinicki & Dixon, 1987; Roberts, 2006; Kolb, Boyatzis, & Mainemelis, 1999).

REFERENCES

Agribusiness. 2010. *Merriam-Webster Online Dictionary*. Retrieved July 12, 2010, from http://www.merriam-webster.com/dictionary/agribusiness

Agricultural economics. 2010. *Encyclopedia Britannica*. Retrieved July 12, 2010, from http://www.britannica.com/EBchecked/topic/9573/agricultural-economics

Akella, D. (2010). Learning together: Kolb's experiential theory and its application. *Journal of Management and Organization, 16,* 100-112.

Anderson, L.R. & Stafford, S.L. (2000, July). Choosing winners and losers in a classroom permit trading game. *Southern Economic Journal, 67*(1), 212-219.

Ary, D., Jacobs, L.C., Razavieh, A., & Sorensen, C.K. (1996). *Introduction to research in education* (6th ed.).Belmont, CA: Wadsworth/Thomson Learning.

Association for Career and Technical Education. (2006). *Reinventing the American high school for the 21st Century.* Retrieved July 18, 2010 from http://www.acteonline.org/puploadedFiles/Issues_and_Advocacy/files/ACTEHSReform_Full.pdf

Campbell, D.T., & Stanley, J.C. (1963). *Experimental and quasi-experimental designs for research.* Chicago, IL: Rand McNally.

Cherryholmes, C.H. (1966). Some current research on effectiveness of educational simulations: Implications for alternative strategies. *American Behavioral Scientist, 10*(2), 4-7.

Clark, R.E. (1983). Reconsidering research on learning from media. *Review of Educational Research, 53*(4), 445-459.

Considine, D., Horton, J., & Moorman, G. (2009). Teaching and reading the millennial generation through media literacy. *Journal of Adolescent & Adult Literacy 52*(6), 471-481.

Cooper, D.J. (2007). An introduction to the symposium on behavioral game theory. *Economic Theory, 33*(1), 1-10.

Coorts, G.D. (2008). Updating today's college curriculum for tomorrow's agriculture. *NACTA Journal, June,* 58-59.

Creswell, J.W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Upper Saddle River, NJ: Pearson Education, Inc.

Cubitt R.P., & Sugden, R. (2003). Common knowledge, salience and a convention: A reconstruction of David Lewis' game theory. *Economics and Philosophy, 19,* 175-210.

Dewey, J. (1938). *Experience and Education.* New York:Macmillan. Diament, M. (2005). Diversifying their crops. *Chronicle of Higher Education, 51*(35), A32-A34.

Dixit, A. (2005, Summer). Restoring fun to game theory. *Journal of Economic Education, 36*(3), 205-219.

Doherty, E. (1998, October). Creation of a learning organization laboratory in the classroom: Expected and unexpected lessons. *Journal of Management Education, 22*(5), 604-617.

Duncan, D.W., Ricketts, J.C., Peake, J.B., & Uesseler, J. (2006). Teacher preparation and in-service needs of Georgia agriculture teachers. *Journal of Agricultural Education, 47*(2), 24-35.

Foster, R., Bell, L., & Erskine, N. (1995). The importance of selected instructional areas in the present and future secondary agricultural education curriculum as perceived by teachers, principals, and superintendents in Nebraska. *Journal of Agricultural Education, 36*(3), 1-7.

Fritz, S., Husmann, D., Rees, D., Stowell, R., & Powell, L. (2007). High school students' perceptions of a college of agricultural sciences and natural resources. *NACTA Journal*, September, 44-49.

Gall, M.D., Borg, W.R., & Gall, J.P. (1996). *Educational research in education* (6th ed.). White Plains, New York: Longman.

Green, M. & McNeese, M.N. (2007). Using edutainment software to enhance online learning. *International Journal on E-Learning, 6*(1), 5-16.

Green, S.B., Salkind, N., & Akey, T. (2000) *Using SPSS for windows: Analyzing and understanding data* (2nd ed.). Boston: Prentice-Hall.

Hamer, L.O. (2000, April). The additive effects of semi structured classroom activities on student learning: An application of classroom-based experiential learning techniques. *Journal of Marketing Education, 22*(April), 25-44.

Henrie, K.M. & Taylor, D.C. (2009). Use of persuasion knowledge by the millennial generation. *Young Consumers, 10*(1), 71-81.

Herren, R.V. & Donahue, R.L. (2000). *Delmar's Agriscience Dictionary.* Albany, NY: Delmar Publishers.

Herren, R.V. & Edwards, M.C. (2002). Whence we came: The land-grant tradition – origin, evolution, and implications for the 21st century. *Journal of Agricultural Education, 43*(4), 88-98.

Hickam, B., & Meixner, C. (2008, Fall). Transforming leadership: Film as a vehicle for social change. *Journal of Leadership Education, 7*(2), 41-46.

Hillison, J. (1996). The origins of agriscience: Or where did all that scientific agriculture come from? *Journal of Agricultural Education, 34*(4), 8-13.

Hinde, E.R. (2005). Revisiting curriculum integration: A fresh look at an old idea. *The Social Studies, 96*(3), 105-111.

Hogle, J. (1996). Considering games as cognitive tools: In search of effective "edutainment." Retrieved July 12, 2010 from http://twinpinefarm.com/pdfs/games.pdf.

Holliday, W. & Qin, L. (2004). Understanding the millennials: Updating our knowledge about students. *Reference Services Review, 32*(4), 356-366.

Kolb, D. (1976). Management and the learning process. *California Management Review, 18*(3), 21-31.

Kolb, D. (1981, April). Experiential learning theory and the learning style inventory: A reply to Freedman and Stumpf. *Academy of Management: The Academy of Management Review, 6*(02), 289-296.

Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.

Kolb, D. A., Boyatzis, R.E., & Mainemelis, C. (1999). Experiential learning theory: Previous research and new directions. In Sternberg, R.J. & Zhang, L.F. (Eds.), *Perspectives on cognitive, learning, and thinking styles* (pp. 193-210). NJ: Lawrence Erlbaum.

Koontz, S.R., Peel, D.S., Trapp, J.N., & Ward, C.E. (1995). Teaching agricultural economics with an experiential learning tool: The packer-feeder game. *NACTA Journal, June*, 23-28.

Kulik, C., & Kulik, J. (1991) Effectiveness of computer-based instruction: An updated analysis. *Computers in Human Behavior, 7*, 75-94.

Lange, C. & Baylor, A.L. (2007, Fall). Teaching the repeated prisoner's dilemma with a computerized tournament. *Journal of Economic Education, Fall*, 407-418.

Leigh, C. (2003/2004). It's all in the game. *Childhood Education*, *80*(2), 59-64.

Lenhart, A., Madden, M., Hitlin, P. (2005). *Teens and technology: Youth are leading the transition to a fully wired and mobile nation.* Pew Internet & American Life Project. Retrieved July 22, 2010, from www.pewinternet.org/~/media/Files/Reports/2005/PIP_Tennes_Tech_July2005web.pdf.pdf

Leonard, R.J. (1995, June). From parlor games to social science: von Neumann, Morgenstern, and the creation of game theory. *Journal of Economic Literature, 33*(2), 730-761.

McDonald, K.K. & Hannafin, R.D. (2003). Using web-based computer games to meet the demands of today's high-stakes testing: A mixed method inquiry. *Journal of Research on Technology in Education, 35*(4), 459-472.

National FFA Organization. (2010). *National FFA Alumni Association Bylaws*. Retrieved July 12, 2010 from http://www.ffa.org/documents/alum_bylaws_adopted05.pdf

National FFA Organization. (2010). *History of FFA.* Retrieved July 12, 2010 from http://www.ffa.org/index.cfm?method=c_about.history

National Research Council. (2009). Transforming agricultural education for a changing world. Washington, D.C.: National Academies Press.

Okan, Z. (2003). Edutainment: Is learning at risk? *British Journal of Educational Technology, 34*(3). 255-264.

Oklahoma State University. (2010). University research compliance: Institutional review board. Stillwater, OK. Retrieved June 16, 2010, from http://compliance.vpr.okstate.edu/IRB/irb-index.aspx.

Oklahoma State University. (2009). Student profile. Stillwater, OK. Retrieved June 11, 2010 from http://vpaf.okstate.edu/IRIM/StudentProfileDownload.html.

Parker, W.C. (2005). *Social studies in elementary education* (12th ed.). Columbus, OH: Pearson Merrill, Prentice Hall.

Pauleen, D.J., Marshall, S., & Egort, I. (2004). ICT-supported team-based experiential learning: Classroom perspectives. *Education and Training, 46*(2), 90-99.

Poudel, D.D., Vincent, L.M., Anzalone, C., Huner, J., Huner, D., Wollard, Clement, T., DeRamus, A. & Blakewood, G. (2005). Hands-on activities and challenge tests in agricultural and environmental education. *The Journal of Environmental Education, 36*(4), 10-22.

Randel, J.M., Morris, B.A., Wetzel, C.D., & Whitehill, B.V. (1992). The effectiveness of games for educational purposes: A review of recent research. *Simulation and Gaming, 23*(3), 261-276.

Reiley, D.H., Urbancic, M.B., & Walker, M. (2008, Fall). Stripped-down poker: A classroom game with signaling and bluffing. *Journal of Economic Education, Fall,* 323-341.

Rhykerd, R.L., Tudor, K.W., Wiegand, B.R., Kingman, D.M., & Morrish, D.G. (2006). Enhancing experiential learning through a hands-on crop production and marketing contest. *NACTA Journal, December,* 25-30.

Roberts, T. G. (2006). A philosophical examination of experiential learning theory for agricultural education. *Journal of Agricultural Education, 47*(1), 17-29.

Robinson, J.S, Krysher, S, Haynes, J.C., & Edwards, M.C. (in press). How Oklahoma State University students spent their time student teaching in agricultural education: A fall versus spring semester comparison with implications for teacher education. *Journal of Agricultural Education.*

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6.

Sardone, N.B. & Devlin-Scherer, R. (2010). Teacher candidate responses to digital games: 21st –century skills development. *Journal of Research on Technology in Education, 42*(4), 409-425.

Schmidt, C. (2004). Are evolutionary fames another way of thinking about game theory? *Journal of Evolutionary Economics, 14,* 249-262.

Sims, R.R. (1983, July). Kolb's experiential learning theory: A framework for assessing person-job interaction. *Academy of Management: The Academy of Management Review, 8*(3), 501-508.

Smith, M.K. (2003). Introduction to informal education. *The Encyclopedia of Informal Education*. Retrieved July 12, 2010 from http://infed.org/i-intro.htm

Smith, L.W. & Van Doren, D.C. (2004, April). The reality-based learning method: A simple method for keeping teaching activities relevant and effective. *Journal of Marketing Education, 26*(1), 66-74.

Sorenson, T.L. (2002). Theory and practice in the classroom: A repeated game of multimarket oligopoly. *Contemporary Economic Policy, 20*(3), 316-329.

Stewart, V., Marsh, S., Kingwell, R., Pannell, D., Abadi, A., & Schilizzi, S. (2000). Computer games and fun in farming-systems education?: A case study. *Journal of Agricultural Education and Extension, 7*(2), 117-128.

Trochim, W.M. (2001). *The Research Methods Knowledge Base,* (2nd ed.). Cincinnati, OH: Atomic Dog Publishing.

Tuckman, B.W. (1999). *Conducting educational research* (5th ed.) New York: Thompson.

Vince, R. (1998, June). Behind and beyond Kolb's learning cycle. *Journal of Management Education, 2*(3), 304-319.

Warnick, B.K., Thompson, G.W., & Gummer, E. (2007). Investigating the needs of agricultural education graduates. *NACTA Journal, June,* 40-47.

Zagare, F.C. (1984). *Game theory: Concepts and applications*. Beverly Hills, CA: Sage Publications.

APPENDICES

APPENDIX A-Institutional Review Board Approval

Oklahoma State University Institutional Review Board

Date:	Monday, April 12, 2010
IRB Application No	AG1015
Proposal Title:	Assessing the Impact of an Agicultural Economics Game in Secondary Agricultural Education Curriculum: The Farm and Ranch Risk Management (FARRM) Game
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 4/11/2011

Principal Investigator(s):

Jill Rucker
446 Ag Hall
Stillwater, OK 74078

Dwayne Cartmell
448 Ag Hall
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

[X] The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

April 2010

Dear Parent:

Your child's Agricultural Education Class has been selected to participate in a research study on the effects of an agricultural economics curriculum on the student's overall knowledge.

The goal of this project is determine the knowledge gained by students about agricultural economics. The instructors for this curriculum will be agricultural economics specialists. The curriculum will be using applied situations in agricultural economic situations to demonstrate how agricultural economics is used in the real world. All students, *including your child*, will participate in the agricultural economics curriculum and will be given a series of pre-tests, post-tests, and one post-post-test to determine their understanding of agricultural economics concepts. Only the scores of the students whose parents have granted permission for participation in this study will be used for research purposes only. Participation in the study will not affect your student's grade in the course. Students will also be asked to complete a short survey. No information collected for this study will be released to the school or any other recipient. Information collected during the study will be coded to protect the identity of participants and all information collected will be confidential.

If you prefer your child does not participate in this study, please contact me as soon as possible. If we do not hear from you, we will ask your child if he/she would like to participate. After hearing and reading an explanation of the study and what is involved, and being given an opportunity to ask questions and voice concerns, your child will be asked to sign an assent form. Participation is voluntary and anyone may withdraw from the study, including withdrawing from data collected, at any time.

If you have any questions or concerns regarding the study, you can reach me by phone at (405) 744-6793 or by email at jill.rucker@okstate.edu. If you have questions about your rights as a research volunteer, you may contact the Oklahoma State University Institutional Review Board (IRB) Chair, Dr. Shelia Kennison at 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

Sincerely,

K. Jill Rucker

K. Jill Rucker
Agricultural Education, Communications,
and Leadership
Oklahoma State University

Okla. State Univ.
IRB
Approved 4/12/10
Expires 4/11/11
IRB# AG-10-15

Research Study of Agricultural Economics Curriculum in Agricultural Education Classes

Parent Permission Form

Return this form **only** if you **do not** want your student to participate in the agricultural economics curriculum study.

Print student's name:_____

I DO NOT CONSENT to allow my child to participate in the pre-, post-, and post-post-tests regarding the agricultural economics curriculum being conducted by researchers from Oklahoma State University.

_____	_____	_____
Printed Name	Signature	Date

If you agree to allow your student to participate in this study, please discard this form. If you have signed this form to indicate you do not consent to allow your student to participate in this study, please return the form to your student's agricultural education instructor.

April 2010

Dear Student:

Your class, agricultural education class with Mr. Dillingham has been selected to participate in a study about the knowledge and recognition of agricultural economics.

We are university researchers who work with high schools and students. The study will require you to take a series of agricultural economics pre-tests before the curriculum is presented as well as a series of agricultural economics post-tests after the curriculum has been presented. In addition, we would like you to fill out a short survey about your educational experiences.

These records, as well as your responses to the tests and survey, will remain completely anonymous and confidential, and will not be used for any other purpose than this research. You name will not be associated with any results.

Participation in the project is completely voluntary. Anyone can withdraw from the study at any time. **Please fill out the attached form and return it to the researchers indicating whether or not you would like to participate.**

If you have questions about this study, you may contact the researchers at 405-744-6793 or jill.rucker@okstate.edu. If you have questions about your rights as a research volunteer, you may make contact with Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

Sincerely,

K. Jill Rucker

Jill Rucker
Agricultural Education, Communications,
And Leadership
Oklahoma State University

Okla. State Univ.
IRB
Approved 4/12/10
Expires 4/11/11
IRB# AG1015

Research Study of Agricultural Economics Curriculum in Agricultural Education Classes

I, _____(Participant's Name), **CONSENT** to participate in the agricultural economics curriculum tests, surveys, and classroom observations for the study of agricultural economics curriculum in secondary agricultural education being conducted by researchers at Oklahoma State University.

I,_____(Participant's Name), **DO NOT CONSENT** to participate in the agricultural economics curriculum tests, survey, and classroom observations for the study of agricultural economics curriculum in secondary agricultural education being conducted by researchers at Oklahoma State University.

TEACHER, PLEASE RETURN THIS FORM TO:

Jill Rucker
Agricultural Education, Communications, and Leadership
Oklahoma State University
446 Agricultural Hall
Stillwater, OK 74078

Okla. State Univ.
IRB
Approved 4/12/10
Expires 4/11/11
IRB# AG-10-15

Research Study of Agricultural Economics Curriculum in Agricultural Education Classes

Control Group

April 2010

(Insert AG TEACHER'S NAME HERE) has agreed to participate in a joint research study between the Oklahoma Department of Career and Technology Education (ODCTE) and the Department of Agricultural Education, Communications and Leadership at Oklahoma State University. This instructor was selected from a pool of agricultural education instructors throughout the state of Oklahoma based on recommendations from the ODCTE program specialist staff. Please sign this letter of intent to indicate you have been informed about this study and support the teacher's participation in this research study.

Project Background Information:

The purpose of this curriculum is to teach students how to make basic farm management decisions. Each student will learn key agricultural economic concepts by listening to lectures and receiving in-class handouts. Specifically, agricultural economics specialists will teach the following:

- Agricultural marketing alternatives (two class periods)
- Land use decisions (one class period)
- Agricultural financial statements (one class period)
- Future limitations of land use decisions (on class period)

Procedures:

- Provide classroom instruction by agricultural economics specialists for the selected course using curriculum and resources developed by the Department of Agricultural Economics at Oklahoma State University.
- Administer a series of pre-tests to measure students' knowledge of agricultural economics prior to students being taught the agricultural economics curriculum in the teacher's selected course.
- Administer a series of post-tests immediately after the curriculum is taught to students to measure students' knowledge gain after being taught the agricultural economics curriculum in the teacher's selected course.
- Administer a post-post-test two weeks after curriculum is taught to students to measure the knowledge retained by students.

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Risks and Benefits:

There are no known risks associated with participation in this study. Perceived benefits of this study would include:

- An increase in student knowledge pertaining to agricultural economics
- Increased awareness of agricultural economics decisions made in the real world
- Enhanced agricultural economics curriculum for secondary agricultural education classes

Confidentiality:

The records of this study will be kept private and any information related to you or your students will be confidential. Additionally, any reports related to this study will remain confidential and will not indentify you or your students. A confidential report will be provided to the ODCTE because this is a joint research project between Oklahoma State University and Oklahoma Department of Career and Technology Education. Because this is a voluntary study, your decision to participate will have no bearing on you or your school's relationship with Oklahoma State University.

Contact Information:

If you have any questions about this study, please contact one of the following researchers:

Jill Rucker	Dr. Dwayne Cartmell
405-744-6793	405-744-0461
Jill.Rucker@okstate.edu	Dwayne.Cartmell@okstate.edu

If you have any questions about your rights as a research volunteer, you may contact the Oklahoma State University Institutional Review Board (IRB) Chair, Dr. Shelia Kennison at 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

Please retain a copy of this form for your records.

Statement of Consent:

I have read the above information, and I support the participation of the teacher in this study.

Printed Name	Signature	School	Date

Okla. State Univ.
IRB
Approved 4/12/10
Expires 4/11/11
IRB# AG-10-15

Research Study of Agricultural Economics Curriculum in Agricultural Education Classes

Treatment Group

April 2010

(Insert Ag Teacher's Name HERE)_____ has agreed to participate in a joint research study between the Oklahoma Department of Career and Technology Education (ODCTE) and the Department of Agricultural Education, Communications and Leadership at Oklahoma State University. This instructor was selected from a pool of agricultural education instructors throughout the state of Oklahoma based on recommendations from the ODCTE program specialist staff. Please sign this letter of intent to indicate you have been informed about this study and support the teacher's participation in this research study.

Project Background Information:

The purpose of this curriculum is to teach students how to make basic farm management decisions. Each student will learn key agricultural economic concepts by listening to lectures and receiving in-class handouts. Specifically, agricultural economics specialists will teach the following:

- Agricultural marketing alternatives (two class periods)
- Land use decisions (one class period)
- Agricultural financial statements (one class period)
- Future limitations of land use decisions (one class period)

Procedures:

- Provide classroom instruction by agricultural economics specialists for the selected course using curriculum and resources developed by the Department of Agricultural Economics at Oklahoma State University as well as the Farm and Ranch Risk Management (FARRM) computer program.
- Administer a series of pre-tests to measure students' knowledge of agricultural economics prior to students being taught the agricultural economics curriculum in the teacher's selected course.
- Administer a series of post-tests immediately after the curriculum is taught to students to measure students' knowledge gain after being taught the agricultural economics curriculum in the teacher's selected course.
- Administer a post-post-test two weeks after curriculum is taught to students to measure the knowledge retained by students.

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- An increase in student knowledge pertaining to agricultural economics
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Please retain a copy of this form for your records.

Statement of Consent:

I have read the above information, and I support the participation of the teacher in this study.

Printed Name	Signature	School	Date
_____	_____	_____	_____

Okla. State Univ.
IRB
Approved 4/12/10
Expires 4/4/11
IRB# AG-10-15

APPENDIX B-Checklists

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum Checklist—Introduction to Agricultural Economics

1. Was a pre-test administered during the beginning of class?

   ☐ Yes ☐ No

2. Check all the topics that were taught during the lesson:

   ☐ Definition of agricultural economics

   ☐ Activities associated with agricultural economics

   ☐ Industries agricultural economists play a key role in

   ☐ Definition of diminishing returns

   ☐ The concept of marginal returns and costs

   ☐ What agricultural economists do and study

   ☐ How economic decision aids help make more money

   ☐ Careers options for agricultural economists

   ☐ Concept of the margin

3. Check the following teaching materials and resources used:

   ☐ PowerPoint Presentation: General Agricultural Economics

   ☐ Handouts

4. Check the following application examples used during class:

   ☐ Examples of economic decision tools from farms

   ☐ Examples of economic decision tools from ranches

   ☐ Demonstrations of diminishing marginal returns

   ☐ Determining how much fertilizer is enough

5. Was a post-test conducted at the end of class?

   ☐ Yes ☐ No

6. Where there any interruptions (i.e., phone ringing, fire alarm, intercom, disciplinary actions, etc.) during the class period?

   ☐ Yes ☐ No

   If yes, please list:_____

7. Do you have any other comments about the lecture? Please list:

_____ _____

Instructor's Signature Date

FARRM Checklist—Resource Use Decisions Statements

1. Was a pre-test administered during the beginning of class?

   ☐ Yes ☐ No

2. Check all the topics that were taught during the lesson:

   ☐ Use of crop and livestock enterprise budgets to determine optimal resource uses

   ☐ Definition of fixed costs

   ☐ Definition of variable costs

   ☐ Difference between variable and fixed costs

   ☐ How to construct or modify an enterprise budget

   ☐ Why enterprise budgets are important management tools

   ☐ Enterprise budgets provide economic comparisons to help identify the most profitable uses of farm resources.

   ☐ Variable costs change depending on the level of production

   ☐ Fixed costs are incurred no matter how much is produced

   ☐ Budgets are only as good as the numbers used to construct them

   ☐ Budgets help farm managers make better decisions and provide information for other farm stakeholders

3. Check the following teaching materials and resources used:

   ☐ PowerPoint Presentation: Resource Use Decisions

   ☐ Handouts of example budgets

   ☐ Example spreadsheet budget template presentation

4. Check the following application examples used during class:

   ☐ Examples of Oklahoma common crop budgets including wheat, grain sorghum, and cotton

   ☐ Oklahoma common livestock budgets including cow/calf and wheat pasture stocker

   ☐ Example involving the examination of the profitability of owned land versus the profitability of rented land

5. Was a post-test conducted at the end of class?

   ☐ Yes ☐ No

6. Where there any interruptions (i.e., phone ringing, fire alarm, intercom, disciplinary actions, etc.) during the class period?

   ☐ Yes ☐ No

   If yes, please list:_____

7. Do you have any other comments about the lecture? Please list:

_____ _____

Instructor's Signature Date

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum Checklist—Marketing Risk Management Tools #1

1. Was a pre-test administered during the beginning of class?

   ☐ Yes ☐ No

2. Check all the topics that were taught during the lesson:

   ☐ Price Risk Management Tools

   ☐ How to determine the cash price received

   ☐ How the local cash price is determined

   ☐ How to identify which price risk management tool may be used to enhance prices

   ☐ All commodities are sold for a specified cash price

   ☐ Cash price cannot be predicted

   ☐ Risk management tools may be used to offset relatively low cash prices

   ☐ The purpose of risk management tools is not to enhance prices

   ☐ Market advisory firms may not be any better at marketing than farmers and ranchers

3. Check the following teaching materials and resources used:

   ☐ PowerPoint Presentation: Marketing Puzzle, Marketing Efficiency and Efficient Markets

   ☐ PowerPoint Presentation: Performance of Market Advisory Firms

   ☐ Fact Sheet: AGEC-548 *The Marketing Puzzle*

   ☐ Fact Sheet: AGEC-591 *Performance of Market Advisory Firms*

   ☐ Fact Sheet: AGEC 589 *Marketing Efficiency and Efficient Marketing*

4. Check the following application examples used during class:

   ☐ Current wheat and stocker cattle prices

   ☐ Current local elevator and Oklahoma City Stock Yards cash prices.

   ☐ Price information from the Kansas City Board of Trade

   ☐ Price information from the Chicago Mercantile Exchange

   ☐ Price information from the Chicago Board of Trade

   ☐ Applications that involve calculating net prices involving cash

   ☐ Applications that involve futures contracts

   ☐ Applications that involve futures option contract prices.

5. Was a post-test conducted at the end of class?

   ☐ Yes ☐ No

6. Where there any interruptions (i.e., phone ringing, fire alarm, intercom, disciplinary actions, etc.) during the class period?

   ☐ Yes ☐ No

   If yes, please list:_____

7. Do you have any other comments about the lecture? Please list:

_____ _____

Instructor's Signature Date

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum Checklist—Marketing Risk Management Tools #2

1. Was a pre-test administered during the beginning of class?

   ☐ Yes ☐ No

2. Check all the topics that were taught during the lesson:

   ☐ How to identify price risk management tools

   ☐ How to use basis to determine the expected price

   ☐ How to determine the cash price received

   ☐ How to determine the net price received

   ☐ Commodities are sold for a specified cash price

   ☐ Cash is the futures market contract price plus the basis

   ☐ The basis is used to adjust the futures market price to the local cash price

   ☐ The net price is the cash price plus any profit from futures or futures option contracts

3. Check the following teaching materials and resources used:

   ☐ PowerPoint Presentation: Marketing Puzzle, Marketing Efficiency and Efficient Markets

   ☐ Fact Sheet: AGEC-548 *The Marketing Puzzle*

   ☐ Fact Sheet: AGEC-549 *Marketing Puzzle: Futures Option Contracts*

4. Check the following application examples used during class:

   ☐ Current wheat and stocker cattle prices

   ☐ Current local elevator and Oklahoma City Stock Yards cash prices.

   ☐ Price information from the Kansas City Board of Trade

   ☐ Price information from the Chicago Mercantile Exchange

   ☐ Price information from the Chicago Board of Trade

   ☐ Applications that involve calculating net prices involving cash

   ☐ Applications that involve futures contracts

   ☐ Applications that involve futures option contract prices.

5. Was a post-test conducted at the end of class?

   ☐ Yes ☐ No

6. Where there any interruptions (i.e., phone ringing, fire alarm, intercom, disciplinary actions, etc.) during the class period?

   ☐ Yes ☐ No

   If yes, please list:_____

7. Do you have any other comments about the lecture? Please list:

_____ _____

Instructor's Signature Date

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Checklist—Financial Statements

1. Was a pre-test administered during the beginning of class?

   ☐ Yes ☐ No

2. Check all the topics that were taught during the lesson:

   ☐ Concept of a balance sheet

   ☐ Definition of assets

   ☐ Definition of liabilities

   ☐ Definition of net worth

   ☐ Relationship between assets, liabilities, and net worth

   ☐ Concept of a cash flow statement

   ☐ Potential uses of a cash flow statement

3. Check the following teaching materials and resources used:

   ☐ PowerPoint Presentation: Financial Statements

   ☐ Handouts of example statements

   ☐ Example spreadsheet based financial statement templates

4. Check the following application examples used during class:

   ☐ Oklahoma lenders frequently require a balance sheet to provide agricultural financing

   ☐ Oklahoma agricultural producers use cash flow tools to make wise equipment purchase decisions

5. Was a post-test conducted at the end of class?

   ☐ Yes ☐ No

6. Where there any interruptions (i.e., phone ringing, fire alarm, intercom, disciplinary actions, etc.) during the class period?

   ☐ Yes ☐ No

   If yes, please list:_____

7. Do you have any other comments about the lecture? Please list:

_____ _____

Instructor's Signature Date

APPENDIX C-Panel of Experts

Ms. Sheyenne Krysher
Graduate Teaching Associate
Agricultural Education, Communications, and Leadership
Oklahoma State University

Mr. J. Christopher Haynes
Graduate Teaching Associated
Agricultural Education, Communications, and Leadership
Oklahoma State University

Mr. J.C. Bunch
Graduate Teaching Associated
Agricultural Education, Communications, and Leadership
Oklahoma State University

APPENDIX D-Lesson Plans

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum Lesson Plan—Introduction to Agricultural Economics

Instructor: Eric Devuyst

Unit Topic: Agricultural Economics

Lesson Topic: Introduction to Agricultural Economics

Conduct Pre-Test at beginning of class: (5 minutes)

Objectives: Student should be able to:

1. Provide the definition for agricultural economics with 90 percent accuracy
2. Identify activities associated with agricultural economics
3. Identify at least five industries in which agricultural economists play a key role with 90 percent accuracy
4. Define and understand the concept of diminishing returns
5. Explain the concepts of marginal returns and cost, with little to no error

Teaching Materials and Resources:

PowerPoint Presentation: General Agricultural Economics

Handouts

Key Points will include:

1. What do agricultural economists do/study?
2. How can economic decision aids help make you more money? Will use examples from farms and ranches.
3. Where are agricultural economics employed? Includes a list of ten agricultural economists students might know.
4. Discover how everything happens on the margin.

Application Examples:

Economic decision tools: examples from farms and ranches

Demonstrations of diminishing marginal returns

How much fertilizer is enough?

Post-Test at end of class (5 minutes)

Instructors: Rodney Jones

Unit Topic: Agricultural Economics

Lesson Topic: Resource Use Decisions

Conduct Pre-Test at beginning of class: (5 minutes)

Objectives: Student should be able to:

1. Use crop and livestock enterprise budgets to determine optimal resource uses
2. Understand the difference between variable and fixed costs
3. Understand how to construct or modify an enterprise budget
4. Describe why enterprise budgets are important management tools

Teaching Materials and Resources:
PowerPoint Presentation: Resource Use Decisions

Handouts of example budgets

Example spreadsheet budget template presentation

Key Points will include:

1. Enterprise budgets provide economic comparisons to help identify the most profitable uses of farm resources.
2. Variable costs change depending on the level of production.
3. Fixed costs are incurred no matter how much is produced.
4. Budgets are only as good as the numbers used to construct them.
5. Budgets help farm managers make better decisions and provide information for other farm stakeholders.

Application Examples:
Examples of Oklahoma common crop budgets including wheat, grain sorghum, and cotton
Oklahoma common livestock budgets including cow/calf and wheat pasture stocker

Example involving the examination of the profitability of owned land versus the profitability of rented land

Post-Test at end of class (5 minutes)

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum Lesson Plan—Marketing Risk Management Tools #1

Instructor: Kim Anderson

Unit Topic: Agricultural Economics

Lesson Topic: Marketing Risk Management Tools

Conduct Pre-Test at beginning of class: (5 minutes)

Objectives: Student should be able to:

1. Identify price risk management tools
2. Determine the cash price received
3. Explain how the local cash price is determined
4. Identify which price risk management tool may be used to enhance prices

Teaching Materials and Resources:

PowerPoint Presentation: Marketing Puzzle, Marketing Efficiency and Efficient Markets, and Performance of Market Advisory Firms

Fact Sheets: AGEC-548 *The Marketing Puzzle*, AGEC-591 *Performance of Market Advisory Firms,* and AGEC 589 *Marketing Efficiency and Efficient Marketing*

Key Points will include:

1. All commodities are sold for a specified cash price
2. Cash price cannot be predicted
3. Risk management tools may be used to offset relatively low cash prices
4. The purpose of risk management tools is not to enhance prices
5. Market advisory firms may not be any better at marketing than farmers and ranchers

Application Examples:

Current wheat and stocker cattle prices

Current local elevator and Oklahoma City Stock Yards cash prices.

Price information from the Kansas City Board of Trade, the Chicago Mercantile Exchange, and the Chicago Board of Trade

Applications that involve calculating net prices involving cash, futures contracts, and futures option contract prices.

Post-Test at end of class (5 minutes)

Instructor: Kim Anderson

Unit Topic: Agricultural Economics

Lesson Topic: Using Marketing Risk Management Tools

Conduct Pre-Test at beginning of class: (5 minutes)

Objectives: Student should be able to:

1. Identify price risk management tools
2. Use basis to determine the expected price
3. Determine the cash price received
4. Determine the net price received

Teaching Materials and Resources:

PowerPoint Presentation: Marketing Puzzle, Marketing Efficiency and Efficient Markets

Fact Sheets: AGEC-548 *The Marketing Puzzle* and AGEC-549 *Marketing Puzzle: Futures Option Contracts*

Key Points will include:

1. All commodities are sold for a specified cash price
2. Cash is the futures market contract price plus the basis
3. The basis is used to adjust the futures market price to the local cash price
4. The net price is the cash price plus any profit from futures or futures option contracts

Application Examples:

Current wheat and stocker cattle prices

Current local elevator and Oklahoma City Stock Yards cash prices.

Price information from the Kansas City Board of Trade, the Chicago Mercantile Exchange, and the Chicago Board of Trade

Applications that involve calculating net prices involving cash, futures contracts, and futures option contract prices.

Post-Test at end of class (5 minutes)

Instructor: JC Hobbs

Unit Topic: Agricultural Economics

Lesson Topic: Financial Statements

Conduct Pre-Test at beginning of class: (5 minutes)

Objectives: Student should be able to:

1. Understand the concept of and be able to identify a balance sheet
2. Define and describe the relationship between assets, liabilities, and net worth
3. Understand the concept of and be able to identify a cash flow statement
4. Describe at least two potential uses of a cash flow statement

Teaching Materials and Resources:

PowerPoint Presentation: financial statements

Handouts of example statements

Example spreadsheet based financial statement templates

Key Points will include:

1. Assets are something owned or owed to the business
2. Liabilities are debts owed by the business
3. Assets minus liabilities equals the net worth
4. Cash flow tools summarize cash inflows and cash outflows over a given time period

Application Examples:

Oklahoma lenders frequently require a balance sheet to provide agricultural financing.

Oklahoma agricultural producers use cash flow tools to make wise equipment purchase decisions.

Post-Test at end of class (5 minutes)

APPENDIX E-Pre- and Post-Tests

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—PRE-TEST: Introduction to Agricultural Economics

Circle the letter containing the correct answer in each of the following questions:

1. A rancher decides to increase the number of cows on his or her 80 acre pasture (i.e., increase the stocking rate). When he or she doubles the number of cows, the total pounds of calves weaned increases by only 50 percent. This is an example of:
    a. Poor herd management
    b. The law of diminishing returns
    c. Inefficient replacement cows
    d. A lack of genetic diversity in the cow herd

2. Which of the following is an example of an agricultural economics career?
    a. Commodity trader/broker
    b. Banker/lender
    c. Credit analyst
    d. Farmer/rancher
    e. Policy analyst
    f. All of the above

3. If a farmer were to apply another 10 pounds of fertilizer at a cost of $5 and increase wheat revenue by $6, he or she should:
    a. Apply an additional 100 pounds of fertilizer
    b. Apply 10 pounds of fertilizer and consider how an additional 10 pounds would affect the profits
    c. Not apply the 10 pounds of fertilizer
    d. Quit farming because the mathematics involved with farming are too difficult

4. Which issue below would be example of a problem addressed by an agricultural economist?
    a. Determining the type of pest damaging a farmer's wheat crop
    b. Determining what vaccinations are needed to prevent disease in a cow herd
    c. Determining how many acres of a particular crop a farmer should plant
    d. Determining the type of feed to improve animal nutrition

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—POST-TEST: Introduction to Agricultural Economics

Circle the letter containing the correct answer in each of the following questions:

1. A rancher decides to increase the number of cows on his or her 80 acre pasture (i.e., increase the stocking rate). When he or she doubles the number of cows, the total pounds of calves weaned increases by only 50 percent. This is an example of:
    a. Poor herd management
    b. The law of diminishing returns
    c. Inefficient replacement cows
    d. A lack of genetic diversity in the cow herd

2. Which of the following is an example of an agricultural economics career?
    a. Commodity trader/broker
    b. Banker/lender
    c. Credit analyst
    d. Farmer/rancher
    e. Policy analyst
    f. All of the above

3. If a farmer were to apply another 10 pounds of fertilizer at a cost of $5 and increase wheat revenue by $6, he or she should:
    a. Apply an additional 100 pounds of fertilizer
    b. Apply 10 pounds of fertilizer and consider how an additional 10 pounds would affect the profits
    c. Not apply the 10 pounds of fertilizer
    d. Quit farming because the mathematics involved with farming are too difficult

4. Which issue below would be example of a problem addressed by an agricultural economist?
    a. Determining the type of pest damaging a farmer's wheat crop
    b. Determining what vaccinations are needed to prevent disease in a cow herd
    c. Determining how many acres of a particular crop a farmer should plant
    d. Determining the type of feed to improve animal nutrition

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—PRE-TEST: Resource Use Decisions

Circle the letter containing the correct answer in each of the following questions:

1. A variable cost of production will vary with a change in the level of production. Which of the following is **not** an example of a variable cost item?

   a. Fuel
   b. Fertilizer
   c. Feed
   d. Seed
   e. Interest on the purchase of land

2. Your farm produces a wheat yield of 40 bushels per acre, and you sell the wheat for $5.00 per bushel. What is the gross revenue from the sale of the wheat on a per acre basis?

   a. $100.00 per acre
   b. $150.00 per acre
   c. $200.00 per acre
   d. $400.00 per acre
   e. None of the above

3. You sell a calf for $600.00. It costs you $400.00 in variable costs and $50.00 in fixed costs to raise the calf. What is the net revenue above all costs?

   a. $200.00 per head
   b. $150.00 per head
   c. $550.00 per head
   d. $350.00 per head
   e. There is not enough information to answer the question.

4. Which of the following items is not a fixed cost of production?

   a. Depreciation on machinery and equipment
   b. Machinery fuel expenses
   c. Land rent
   d. Taxes
   e. Insurance

5. What is an important use of an enterprise budget?

   a. To compare profits among enterprises
   b. Determine weaknesses in potential profitability
   c. Provide information for lenders
   d. Evaluate projected net returns to land, labor, and management
   e. All of the above

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—POST-TEST: Resource Use Decisions

Circle the letter containing the correct answer in each of the following questions:

1. A variable cost of production will vary with a change in the level of production. Which of the following is **not** an example of a variable cost item?

   a. Fuel
   b. Fertilizer
   c. Feed
   d. Seed
   e. Interest on the purchase of land

2. Your farm produces a wheat yield of 40 bushels per acre, and you sell the wheat for $5.00 per bushel. What is the gross revenue from the sale of the wheat on a per acre basis?

   a. $100.00 per acre
   b. $150.00 per acre
   c. $200.00 per acre
   d. $400.00 per acre
   e. None of the above

3. You sell a calf for $600.00. It costs you $400.00 in variable costs and $50.00 in fixed costs to raise the calf. What is the net revenue above all costs?

   a. $200.00 per head
   b. $150.00 per head
   c. $550.00 per head
   d. $350.00 per head
   e. There is not enough information to answer the question.

4. Which of the following items is not a fixed cost of production?

   a. Depreciation on machinery and equipment
   b. Machinery fuel expenses
   c. Land rent
   d. Taxes
   e. Insurance

5. What is an important use of an enterprise budget?

   a. To compare profits among enterprises
   b. Determine weaknesses in potential profitability
   c. Provide information for lenders
   d. Evaluate projected net returns to land, labor, and management
   e. All of the above

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—PRE-TEST: Marketing Risk Management Tools #1

Circle the letter containing the correct answer in each of the following questions:

1. The local cash wheat price is established by:
    a. The local elevator manager
    b. Traders in Kansas City
    c. Traders in Chicago
    d. Adding the local basis to the Kansas City Board of Trade wheat contract price
2. The underlying futures contract price may be used:
    a. To establish the local cash price
    b. As insurance against lower prices
    c. Both a and b
    d. Neither a or b
3. Futures option contracts are directly related with:
    a. Cash prices
    b. Futures contract prices
    c. Neither cash nor futures prices
    d. Delivery of wheat or cattle for a cash payment
4. Put option contracts are used to:
    a. Put a product on the market for sale
    b. Establish a fixed cash price
    c. Establish an expected minimum price
    d. None of above
5. For producers who are selling wheat or cattle, call option contracts maybe used:
    a. With a forward contract to set a minimum price
    b. With a put option contract to set a minimum price
    c. By itself to set a minimum price
    d. Cannot be used to set a minimum price

6. What makes today's cash price different from yesterday's cash price?

    a. Old information
    b. The history of cash price movement
    c. New information
    d. Prices just change

7. Research shows if producers follow a market analyst's advice:

    a. The producer will always produce a higher price
    b. The producer will never receive a higher price
    c. The producer may or may not receive a higher price
    d. The producer will have to make a marketing decision

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—POST-TEST: Marketing Risk Management Tools #1

Circle the letter containing the correct answer in each of the following questions:

1. The local cash wheat price is established by:
    a. The local elevator manager
    b. Traders in Kansas City
    c. Traders in Chicago
    d. Adding the local basis to the Kansas City Board of Trade wheat contract price
2. The underlying futures contract price may be used:
    a. To establish the local cash price
    b. As insurance against lower prices
    c. Both a and b
    d. Neither a or b
3. Futures option contracts are directly related with:
    a. Cash prices
    b. Futures contract prices
    c. Neither cash nor futures prices
    d. Delivery of wheat or cattle for a cash payment
4. Put option contracts are used to:
    a. Put a product on the market for sale
    b. Establish a fixed cash price
    c. Establish an expected minimum price
    d. None of above
5. For producers who are selling wheat or cattle, call option contracts maybe used:
    a. With a forward contract to set a minimum price
    b. With a put option contract to set a minimum price
    c. By itself to set a minimum price
    d. Cannot be used to set a minimum price

6. What makes today's cash price different from yesterday's cash price?

    a. Old information
    b. The history of cash price movement
    c. New information
    d. Prices just change

7. Research shows if producers follow a market analyst's advice:

    a. The producer will always produce a higher price
    b. The producer will never receive a higher price
    c. The producer may or may not receive a higher price
    d. The producer will have to make a marketing decision

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—PRE-TEST: Marketing Risk Management Tools #2

Circle the letter containing the correct answer in each of the following questions:

1. The local cash wheat price is the:

    a. Price posted at the local elevator
    b. The Kansas City Board of Trade contract price plus the basis
    c. The local cash price plus profit from option contracts
    d. Both a and b

2. The expected hedge price is:

    a. The underlying futures contract price plus the basis
    b. The cash price plus futures contract price
    c. The cash price plus the basis
    d. None of above

Use the following information to answer questions 3 – 7:

June cash price	**$4.20**
KCBT contract price in April	**$4.50**
Expected local basis for harvest	**-$0.50**
Forward contract price	**$4.10**
Profit from put option contract	**$0.20**
$4.50 call option premium	**$0.20**
Profit from hedge	**$0.10**

3. If wheat is forward contracted for harvest delivery, what is the price received when the wheat is delivered at harvest?

    a. $4.20
    b. $4.50
    c. $4.00
    d. $4.00

4. The expected hedge price for harvest is:

    a. $4.20
    b. $4.50
    c. $4.00
    d. $4.00

5. If wheat was hedged and then sold at harvest, what was the net price received?

    a. $4.20
    b. $4.50
    c. $4.00
    d. $4.30

6. If a put option contract had been purchased, what was the net price received?

    a. $4.20
    b. $4.50
    c. $4.40
    d. $4.30

7. If wheat was forward contracted and a call option has been purchased, what was the net price received?

    a. $4.20
    b. $4.50
    c. $4.00
    d. $4.30

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FARRM Curriculum—PRE-TEST: Financial Statements

Circle the letter containing the correct answer in each of the following questions:

1. Which of the following items is **not** a current asset?

   a. Wheat in the elevator
   b. Interest and principal to be paid or due the next year
   c. Feed on hand
   d. Cash in the bank
   e. Value of a growing crop

2. Which of the following statements does **not** describe a use of the balance sheet?

   a. Determines the value of the business
   b. Contains a list of assets and liabilities of the business
   c. Provides financial information useful for your banker
   d. Determines the timing of cash inflows and outflows
   e. All of the above

3. Which of the following items would **not** be found on a cash flow statement?

   a. Fuel expense
   b. Debt payments
   c. Insurance payments
   d. Family living expenses
   e. Machinery depreciation expenses

4. What is the net worth of a business with total current assets of $250,000, non-current assets of $500,000 and total current liabilities of $200,000, and non-current liabilities of $400,000?

   a. $550,000
   b. $350,000
   c. $150,000
   d. $250,000
   e. None of the above

5. Which of the following items is **not** a use of a cash flow statement?

   a. Determines how much borrowing will be needed to cover cash shortages
   b. Determines if or when a major purchase can be made
   c. Determines the cash value of the business
   d. Provides information to your lender
   e. All of the above are important uses

Personal Code:_____

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FARRM Curriculum—POST-TEST: Financial Statements

Circle the letter containing the correct answer in each of the following questions:

1. Which of the following items is **not** a current asset?

   a. Wheat in the elevator
   b. Interest and principal to be paid or due the next year
   c. Feed on hand
   d. Cash in the bank
   e. Value of a growing crop

2. Which of the following statements does **not** describe a use of the balance sheet?

   a. Determines the value of the business
   b. Contains a list of assets and liabilities of the business
   c. Provides financial information useful for your banker
   d. Determines the timing of cash inflows and outflows
   e. All of the above

3. Which of the following items would **not** be found on a cash flow statement?

   a. Fuel expense
   b. Debt payments
   c. Insurance payments
   d. Family living expenses
   e. Machinery depreciation expenses

4. What is the net worth of a business with total current assets of $250,000, non-current assets of $500,000 and total current liabilities of $200,000, and non-current liabilities of $400,000?

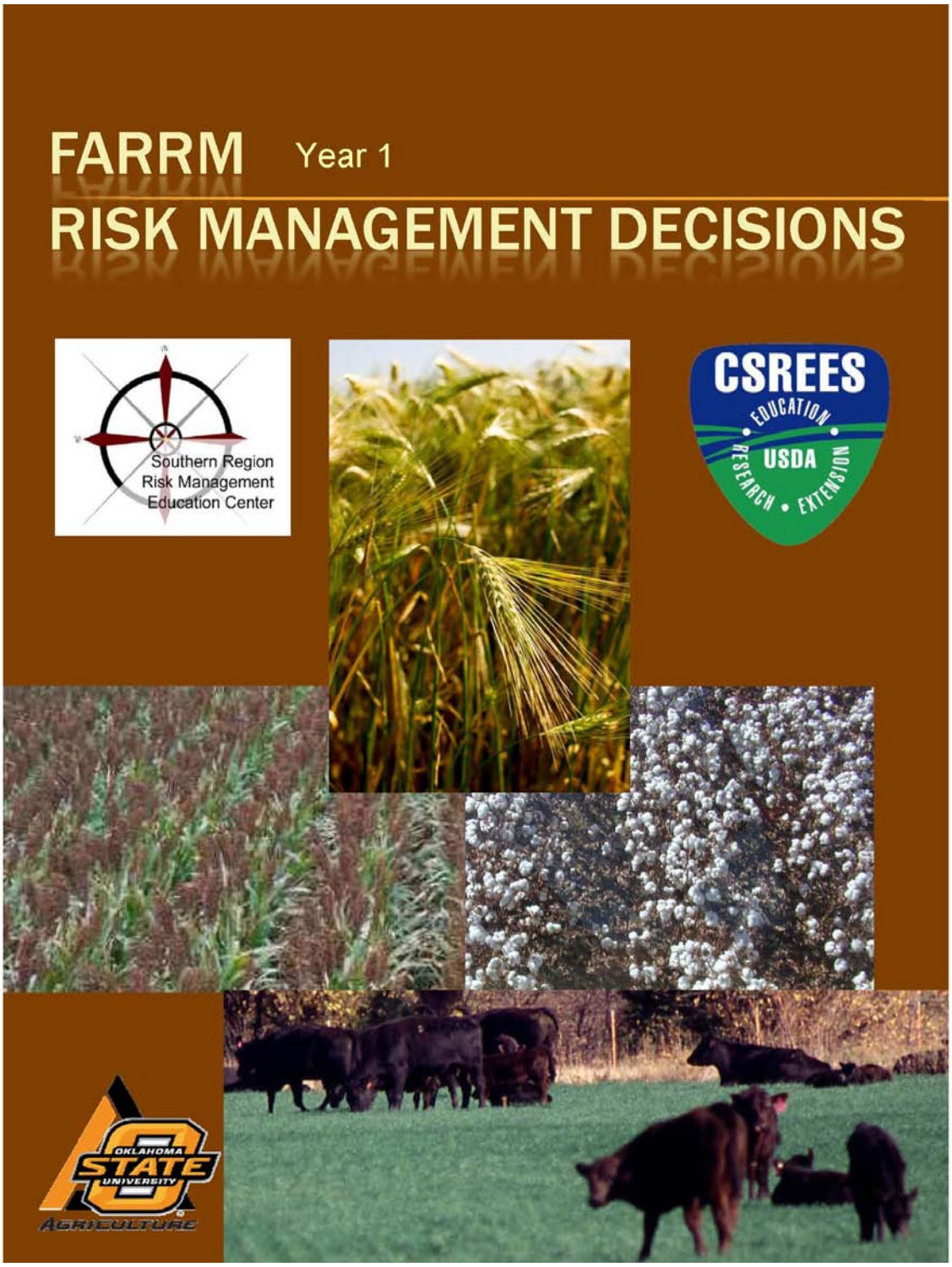
   a. $550,000
   b. $350,000
   c. $150,000
   d. $250,000
   e. None of the above

5. Which of the following items is **not** a use of a cash flow statement?

   a. Determines how much borrowing will be needed to cover cash shortages
   b. Determines if or when a major purchase can be made
   c. Determines the cash value of the business
   d. Provides information to your lender
   e. All of the above are important uses

APPENDIX F-FARRM Instruction Manual

FARRM Year 1



Developer: Kim Anderson PhD
Extension Specialist: J C Hobbs
Program Director: Gracie M Teague

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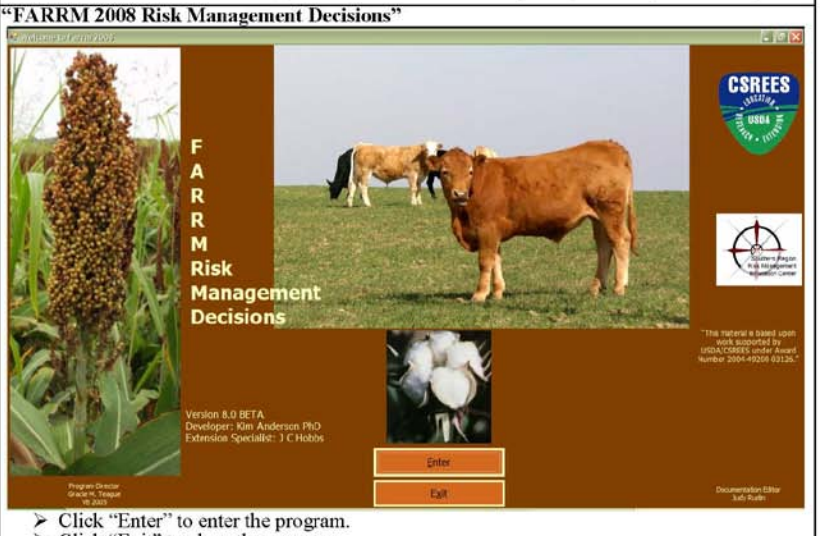
Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0707.

Running the FARRM Game – Year 1

Step	Screen	Screen Name and Instructions
1		Double click on the "FARRM (Farm and Ranch Risk Management) icon on your desktop.
2	1	**"FARRM 2008 Risk Management Decisions"**  ➢ Click "Enter" to enter the program. ➢ Click "Exit" to close the program. **NOTE: This screen remains open on your desktop throughout the game. If you want to exit the game at any time, click on the red X in the upper right-hand corner of the screen that you are working on. Then, click "Exit" on this screen to close the game and save your data.**
3	2	 "Select Current or New Player" ➢ First time players click  and go to Step 4 ➢ If you have played the game, but have not finished, click  go to Step 5. ➢ If you do not want to run the game, click "Exit". Main Form shows, click "Exit" to close the program.

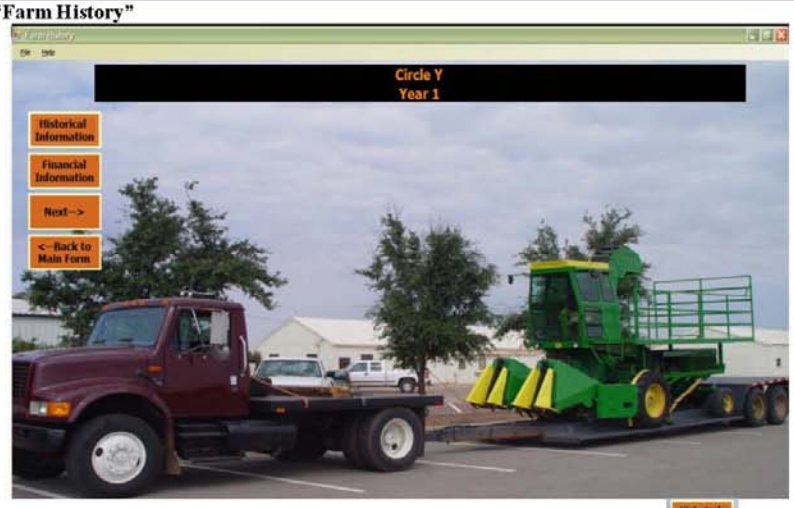
Step	Screen	Screen Name and Instructions
4	3	 "Enter a Session and Farm Name" ➢ Enter a session name in the field provided. ➢ Enter a farm name in the field provided. **NOTE: Session and farm names must be alpha characters only.** ➢ Click 
4	3A	 • An  icon replaces the  icon. • A new box appears with "Player Information". ➢ Click the button  If you want to stop playing, click  Main Form shows, click  to close the program.

Step	Screen	Screen Name and Instructions
5	4	**"Select a Session and Farm Name" (For Current Players)**

- When you click  this screen displays the names of available sessions and farm names.

- Click your session name. A box with farm names appears. Click your farm name. A "Player Information" box appears.
- Click the button  and Go to Step 6 – Screen 5 **"Farm History"** to continue playing the game. For year 2 and above, go to "Instructions for Year 2 and Subsequent Years".
- If you want to stop playing, click  . Main Form shows, click  again to close the program. **"FARRM 2008 Risk Management Decisions" screen**

Step	Screen	Screen Name and Instructions
6	5	**"Farm History"**



The farm name and the year appear at the top of the screen. You may select to review Historical Information or Financial Information, go to the Next -> screen, or go <-Back to Main Form.

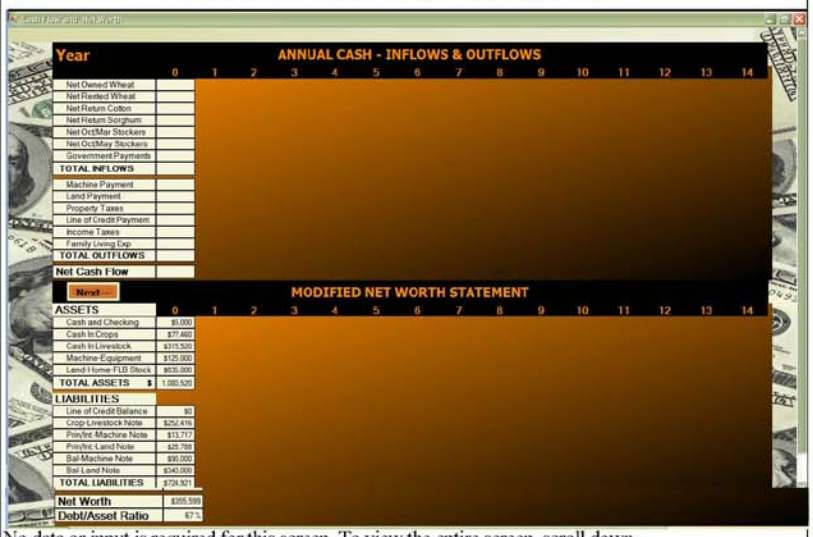
- To review the last 10 years of historical information (Yield, Average Daily Gain, and Price) of the potential production enterprises, click Historical Information Go to Step 7 – Screen 6 **"Historical Data"**
- To review "Cash Flow", or "Net Worth" statements, click Financial Information Go to Step 8 – Screen 7. **"Annual Cash – Inflows & Outflows/Modified Net Worth Statement"**
- Click Next -> to go to Step 9-Screen 8. **"Land Resources"**
- Click <-Back to Main Form to return to Step 2-Screen 1. **"FARRM 2008 Risk Management Decisions" screen**

Step	Screen	Screen Name and Instructions
7	6	**"Historical Data"**

This screen allows you to review ten years of farm historical crop yields, average daily gain, and financial information. No data or input is required for this screen.

- To review the historical production and prices, click the desired commodity (Wheat, Sorghum, Cotton, March Cattle, or May Cattle).
- Click <--Back to return to Step 6-Screen 5 **"Farm History"**.

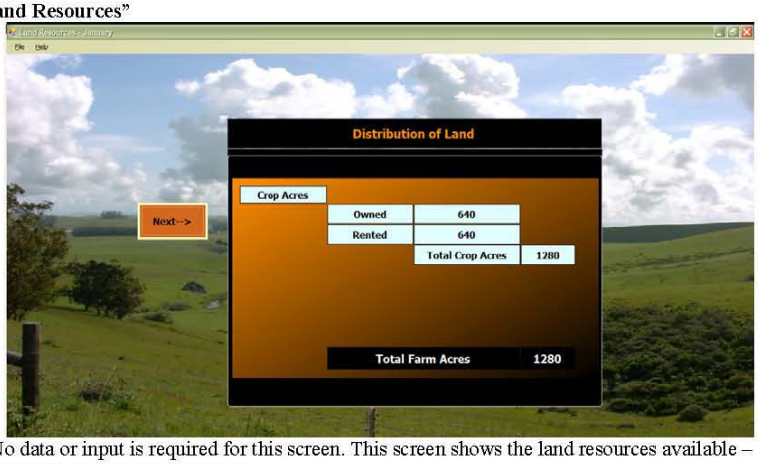
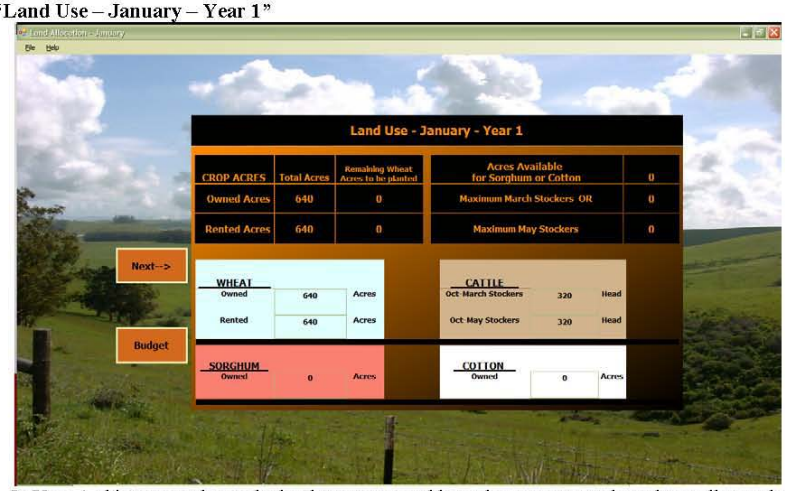
Step	Screen	Screen Name and Instructions
8	7	**"Annual Cash – Inflows & Outflows/Modified Net Worth Statement"**



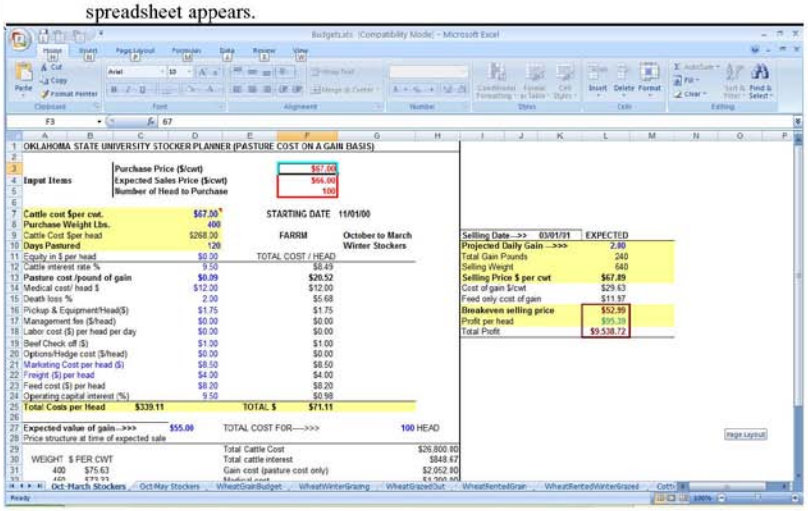
No data or input is required for this screen. To view the entire screen, scroll down.

- The cash-flow statement information, "Annual Cash-Inflows & Outflows," is simply the cash inflows or income and the cash outflows or expenses for the farm on an annual basis. The net cash-flow indicates the cash position at the end of the year.
- A positive cash-flow is a sign that the farm covered all cash operating and family living expenses, and the cash and checking balances increased.
- A negative cash-flow is a sign that the farm did not cover all cash operating and family living expenses, and the line of credit balance increased.
- Comparing the net cash-flow line over time provides information concerning the increase or decrease in the cash position of the farm at the end of each year.
- The "Modified Net Worth Statement" is a simple list of the farm assets and the farm liabilities at the end of each year. The assets include cash and checking account balances, cash invested in growing crops and livestock, plus the value of machinery, equipment, land, and buildings. The "TOTAL ASSETS" line indicates the current value of all farm assets.
- The farm started with debt to put in the wheat crop and to buy stocker cattle plus machinery debt and land debt. These debts have both interest and principal due each year. A line-of-credit exists to track short-term borrowing during those periods when expenses are greater than income. The "TOTAL LIABILITIES" line is the amount of all farm debts that the business owes.
- Tracking the net worth provides a measure of the annual growth for the farm business and how much of the business the farm operator owns. The last line is the debt-to-asset ratio, which is an indicator of the farms liquidity or borrowing capacity. Over the period of years that you are running the simulation, the desired result is for the debt-to-asset ratio to decline and the net worth to increase.
- Click 

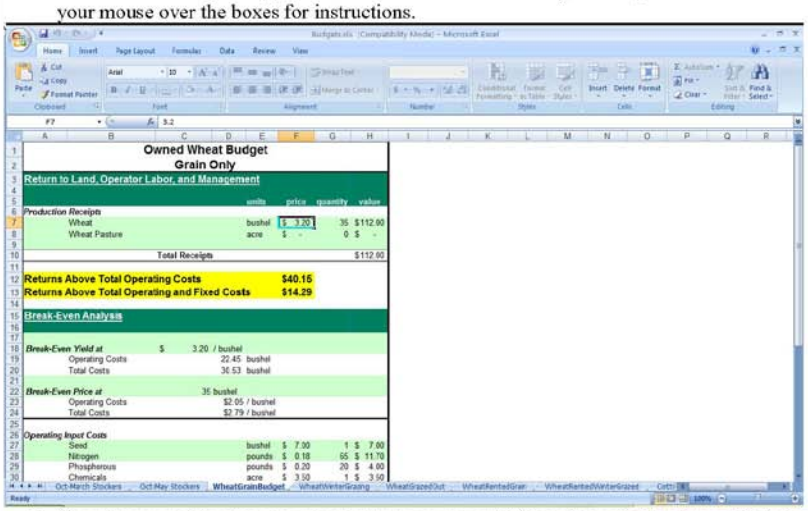
to return to Step 6-Screen 5, **"Farm History"**.

Step	Screen	Screen Name and Instructions
9	8	**"Land Resources"**  No data or input is required for this screen. This screen shows the land resources available – Crop Acres, owned and rented. ➢ Click Next--> to go to Step 10-Screen 9. **"Land Use – January – Year 1"**
10	9	**"Land Use – January – Year 1"**  In Year 1, this screen shows the land resources and how these resources have been allocated to production enterprises. No data can be entered in Year 1, except on the Excel "Budget" spreadsheets. In the following years (Year 2, Year 3 … Year 14), you decide how to allocate the land to the available production alternatives. See "Instructions for Year 2 and Subsequent Years".

Step	Screen	Screen Name and Instructions
		➢ To review the budget of each production enterprise, click Budget An Excel spreadsheet appears.



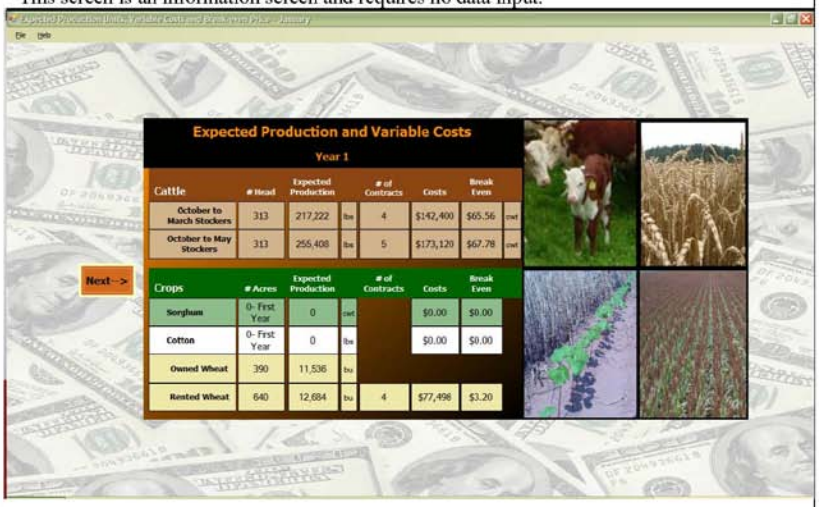
➢ Click the bottom tab on the Excel spreadsheet to select which enterprise budget you wish to review. You may change the values in the red boxes on any of the spreadsheets. Hold your mouse over the boxes for instructions.



➢ Close the spreadsheet to return to the land use screen (9) by either clicking the red X in the upper right-hand corner or closing the file with the Excel close icon.

➢ On screen 9, **"Land Use – January – Year 1"** click Next -> to go to Step 11-Screen 10. **"Expected Production and Variable Costs"**

Step	Screen	Screen Name and Instructions
11	10	**"Expected Production and Variable Costs Year 1"** This screen is an information screen and requires no data input.



"Cattle":

"# Head": the number of head purchased minus the death loss

"Expected Production": the number of head multiplied by the ten-year average stocker weight

"# of Contracts": "Expected Production" divided by 50,000 pound contracts and the maximum number of CME March or May contracts that may be sold to hedge the stockers

"Costs": the number of stockers purchased multiplied by the per-head costs

"Break-Even": "Costs" divided by "Expected Production" that shows the break-even sell price that must be received to cover all costs

"Crops":

"# Acres": the number of acres that will be harvested

Note that all "Sorghum", "Cotton", and "Rented Wheat" that were planted will be harvested; If you have "October to May Stockers" that will graze your wheat, "Owned Wheat" harvested acres (the number shown) will be less than the planted acres.

"Expected Production": the harvested acres ("# Acres") multiplied by the 10-year average yield per acre production. The amount of wheat that may be forward contracted is the "Expected Production" divided by 2.

"# of Contracts": "Expected Production" divided by 5,000 bushels. The maximum number of futures contracts or futures put or call options are the number of contracts divided by 2.

"Costs": "# (harvested) Acres" multiplied by the budgeted costs

"Break-Even": "Costs" divided by "Expected Production"

➢ Click the Next--> button to go Step 12-Screen 11. **"Wheat Insurance Options"**

Step	Screen	Screen Name and Instructions
12	11	**"Wheat Insurance Options YEAR 1"** This screen requires a decision (input). You must either select "CRC" or "RA" insurance coverage or the "No Insurance" option. Insurance guarantees you a minimum return per acre for each acre that is harvested. This screen is the same for all crops.

"CRC" (Crop Revenue Coverage)
"RA" (Revenue Assurance)

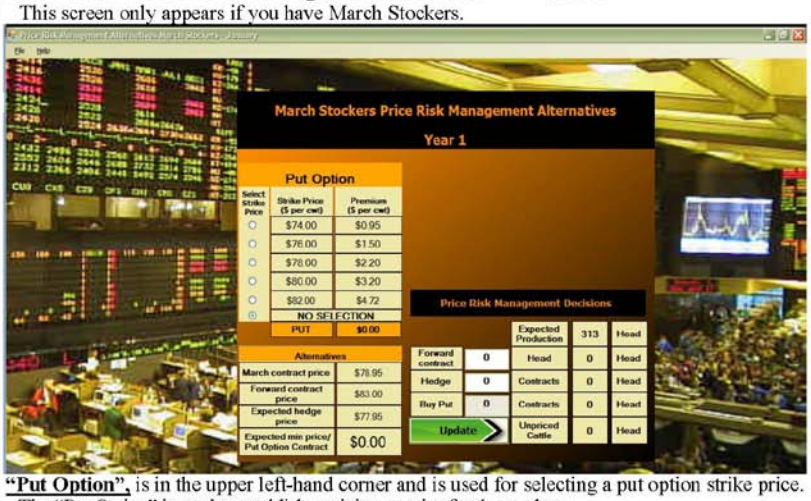
Both CRC and RA guarantee a minimum level of income that may be caused by low prices or low yields. The difference between CRC and RA is that the price used to calculate the CRC payoff is the Kansas City Board of Trade July contract average price during the month of June, while the RA price uses the KCBT July contract average price between July 1 and July 14.

"Premium": the cost (price) per acre of the underlying insurance policy
"Minimum Income per Acre": the expected minimum income per acre insured.
"Select Yield Coverage": with CRC, the percentage of expected yield per acre (5-year average); with RA, the percentage of the expected income (5-year average yield times a designated price based on a monthly average futures contract price)

- Click the desired coverage amount in the "Select Yield Coverage" column for either "CRC" or "RA" to select your insurance option.
- Click the "No Insurance" icon if you want no insurance.
- Click 

to go to Step 13-Screen 12. **"March Stockers Price Risk Management Alternatives"**

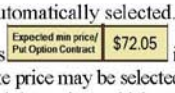
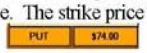
Step	Screen	Screen Name and Instructions
13	12	**"March Stockers Price Risk Management Alternatives Year 1"** This screen only appears if you have March Stockers.



"Put Option", is in the upper left-hand corner and is used for selecting a put option strike price. The "Put Option" is used to establish a minimum price for the stockers.

- Click the desired "Strike Price" button in the "Select Strike Price" column.

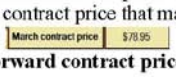
"Select Strike Price"

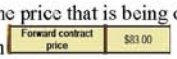
"NO SELECTION" is the default choice and is automatically selected. When you select a strike price, the expected minimum price appears  in the Alternatives section in the bottom left-hand corner. Each strike price may be selected to evaluate the expected minimum price. The last button selected determines which strike price is available to purchase. The strike price selected also appears in the box next to "PUT" in the Put Option section. 

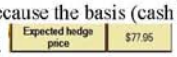
"Strike Price ($ per cwt)": guaranteed price that is selected by the buyer of the option contract. The strike price is the price that the option buyer takes if the option is executed. For example, if the put option contract strike is $74 for March Stockers, and the buyer exercises the option, the buyer receives a sold (short) futures contract position for the March feeder cattle futures contract. This method is the same as establishing a hedge at $74.

"Premium ($ per cwt)": price paid per unit of production for the option contract. Each option contract is 50,000 pounds. 

"Alternatives", is in the lower left-hand corner and shows prices that you can potentially use to "lock-in" a price. This is an information only section and requires no data input.

"March contract price": the Chicago Mercantile Exchange (CME) March Feeder Cattle contract price that may be used to hedge (lock-in) an expected price for the stockers 

"Forward contract price": the price that is being offered by cattle buyers for stockers that will be delivered in March 

"Expected hedge price": the "March contract price" plus the expected basis (minus if the expected basis is negative) Selling a March feeder cattle contract allows you to protect against lower prices. The exact price is unknown because the basis (cash price minus the futures contract price) is unknown and is estimated. 

Step	Screen	Screen Name and Instructions

"Expected min price/Put Option Contract": the expected price at which you may chose to sell the stockers if prices decline. If prices decline, the put option contract is used to establish a hedge at the selected strike price. Expected min price/ Put Option Contract $72.05

"Price Risk Management Decisions", is in the lower right-hand corner and is used to select risk management alternatives to "lock-in" prices. If you want to use one of the three alternatives ("Forward Contract", "Hedge", or "Buy Put"), you must enter the number of head or contracts in the appropriate box.

CAUTION: When you click Update, Next--> **appears. Do not click** Next--> **until you have made all decisions and completed all input.**

"Expected Production" shows the number of head that will be produced. Expected Production 313 Head

"Un-priced Cattle" shows the number of head that will be priced when the stockers are sold. Unpriced Cattle 119 Head

"Forward Contract" Enter the number of head that are to be forward contracted in the box next to "Forward contract" Forward contract 50 Head 50 Head

- Click Update and the number of head forward contracted appear in column four (next to "Head"). The forward contracted stockers will be sold for the Forward contract price $83.00 shown in the Alternatives section.

"Hedge" Enter the number of contracts (50,000 pounds per contract) that will be sold Hedge 1 Contracts 72 Head to establish an Expected hedge price $77.95 (Alternatives section) received when the stockers are sold.

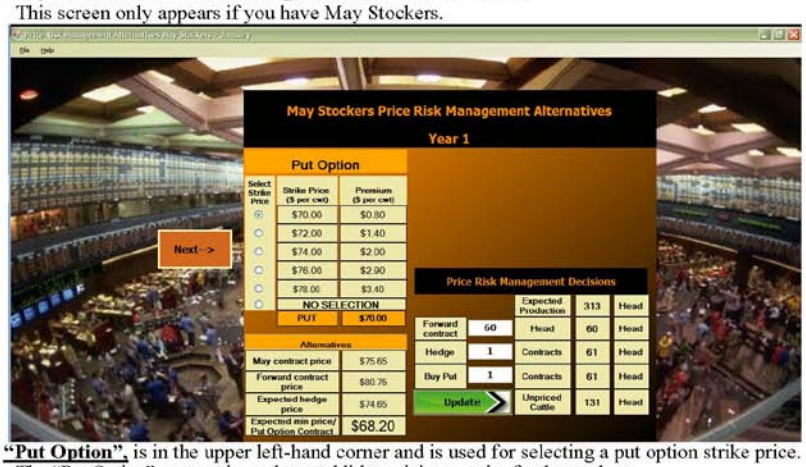
- Click Update and the number of stockers that are involved in the hedge appear in column four (next to "Hedge").

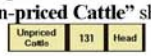
"Buy Put" Enter the number of contracts Buy Put 1 Contracts 72 Head (50,000 pounds per contract) that will be bought to establish an Expected min price/ Put Option Contract $72.05.

- Click "Update" and the number of stockers that are involved in the put appears in column four (next to "Buy Put")

Make any additional change(s) and then click Update. New changes are not entered into the model until Update is clicked.

NOTE: "Unpriced Cattle" must be zero (0) or greater. If the figure is below zero (0), you must change your input until the figure is zero (0) or above.

Step	Screen	Screen Name and Instructions
		➢ When the March Stocker decisions are complete, click the Next--> button to go to Step 14-Screen 13. **"May Stockers Price Risk Management Alternatives"**
14	13	**"May Stockers Price Risk Management Alternatives Year 1"** This screen only appears if you have May Stockers.  **"Put Option",** is in the upper left-hand corner and is used for selecting a put option strike price. The "Put Option" contract is used to establish a minimum price for the stockers, ➢ Click the desired "Strike Price" button in the "Select Strike Price" column. **"Select Strike Price"** "NO SELECTION" is the default choice and is automatically selected. When you select a strike price, the Expected min price/ Put Option Contract $68.20 appears in the Alternatives section in the bottom left-hand corner. Each strike price may be selected to evaluate the expected minimum prices. The last button selected determines the strike price. The strike price selected also appears in the box next to "PUT" in the Put Option section. PUT $70.00 **"Strike Price ($ per cwt)":** guaranteed price that is selected by the buyer of the option contract. The strike price is the price that the option buyer takes if the option is executed. For example, if the put option contract strike is $78 for May Stockers, and the buyer exercises the option, the buyer will receive a sold (short) futures contract position for the March feeder cattle futures contract. This method is the same as establishing a hedge at $78. **"Premium ($ per cwt)":** price paid per unit of production for the option contract. Each option contract is 50,000 pounds. Select Strike Price | Strike Price ($ per cwt) | Premium ($ per cwt) | $70.00 | $0.80 **"Alternatives",** is in the lower left-hand corner and shows prices that you can potentially use to "lock-in" a price. This is "information" only and requires no data input. **"May Contract Price":** the May Feeder Cattle contract price that may be used to hedge (lock-in an expected price) the stockers "Forward Contract Price": the price that is being offered by cattle buyers for stockers that will be delivered in May May contract price $75.65 **"Expected Hedge Price":** the "May Contract Price" plus the expected basis (minus if the expected basis is negative). Selling a May feeder cattle contract allows you to protect against lower prices. The exact price is unknown because the basis (cash price minus the futures contract price) is unknown and is estimated. Expected hedge price $74.65 **"Expected Min Price/Put Option Contract":** the expected price at which you may chose to sell the stockers if prices decline. If prices decline, the put option contract is used to establish a hedge at the selected Strike Price. Expected min price/ Put Option Contract $68.20

Step	Screen	Screen Name and Instructions
		"Price Risk Management Decisions", is in the lower right-hand corner and is used to select risk management alternatives that are used to "lock-in" prices. If you want to use one of the three alternatives ("Forward Contract", "Hedge", or "Buy Put"), you must enter the number of head or contracts in the appropriate box. **CAUTION: When you click "**  **",  appears. Do not click  until you have made all decisions and completed all input.** **"Expected Production"** shows the number of head that will be produced.  **"Un-priced Cattle"** shows the number of head that will be priced when the stockers are sold.  **"Forward Contract"** Enter the number of head that are to be forward contracted in the box next to "Forward contract".  ➢ Click  and the number of head forward contracted appears in column four (next to "Head"). The forward contracted stockers will be sold for the "Forward contract price". **"Hedge"** Enter the number of contracts (50,000 pounds per contract) that will be sold to establish an expected hedge price received when the stockers are sold.  ➢ Click  and the number of stockers that are involved in the hedge appears in column four (next to "Hedge"). **"Buy Put"** Enter the number of contracts (50,000 pounds per contract) that will be bought to establish an expected minimum price. ➢ Click  and the number of stockers that are involved in the put appear in column four (next to "Buy Put").  Make any additional change(s) and then click  . New changes are not entered into the model until  is clicked. **NOTE: "Unpriced Cattle" must be zero (0) or greater. If the figure is below zero (0), you must change your input until the figure is zero (0) or above.** ➢ When the May Stocker decisions are complete, click  to go to Step 15-Screen 14. **"March Stockers Net Return"**

Step	Screen	Screen Name and Instructions
15	14	**"March Stockers Net Return Year 1"** No data or input is required for this screen. This screen only appears if you selected March Stockers in the decision sheet on screen 12. Total production and the gross return generated by each selected marketing alternative, the variable costs, and the net return are shown.

"Production": the number of head sold, the weight in hundred-weight, the total hundred-weights sold

"Forward Contract": the number of head sold, the forward contract price, and the gross return from the forward contracted stockers (number of stockers multiplied by the price per cwt multiplied by the per head weight)

"Hedge" Only the gain or loss from the futures transaction is shown. The number of Chicago Mercantile March Feeder Cattle futures contracts that were sold, the gain or loss from each contract, and the total return from the futures transactions are shown. Note that the stockers for which the price was protected with a hedge are sold on the cash market The **"Net"** is the number of contracts multiplied by gain or loss per contract.

"Buy Put" Only the gain or loss from the put option transaction is shown. The number of March Feeder Cattle put option contracts that were sold, the gain or loss from each contract, and the total return from the put option transactions are shown The **"Net"** is the number of contracts multiplied by the gain or loss per contract.

"Sell Cash": the number of stockers sold on the cash market, the price received per cwt, and the total return from the cash sale are shown. The **"Net"** is the number of stockers multiplied by cwt/head multiplied by price.

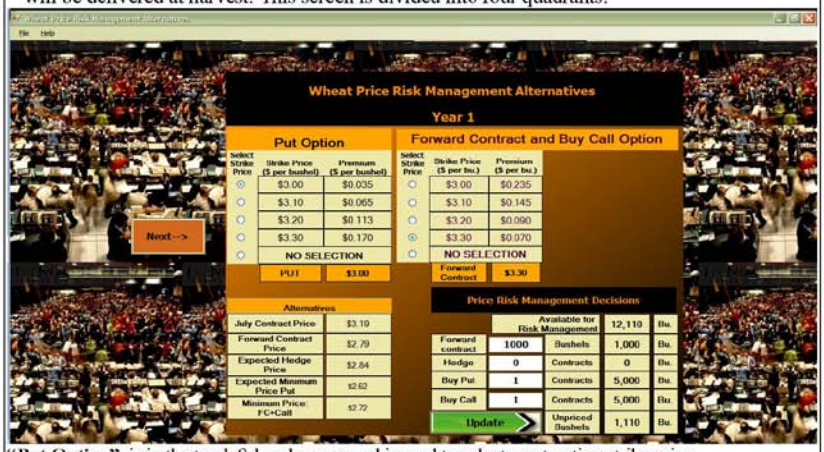
"Gross Return": the sum of the gain or loss from each marketing alternative.

"Variable Costs": the total cash costs required to produce the stocker cattle.

"Net Return": "Gross Return" minus "Variable Costs"

Click Next--> to go to Step 16-Screen 15. **"Wheat Price Risk Management Alternatives"**

Step	Screen	Screen Name and Instructions
16	15	**"Wheat Price Risk Management Alternatives Year 1"** These marketing (risk management) alternatives may be used to establish prices for wheat that will be delivered at harvest. This screen is divided into four quadrants:



"Put Option", is in the top left-hand corner and is used to select a put option strike price.

- Click the desired "Strike Price" and "Premium" button in the "Select Strike Price" column to select a strike price and premium. The resulting minimum price appears in the Alternatives section next to "Expected Minimum Price Put". Selecting a put strike price and premium has no impact on the model until the number of contracts in Price Risk Management Decisions section is completed.

Forward Contract and Buy Call Option", is in the top right-hand corner and is used to select a call option strike price. The strike price selected is used with the "Forward Contract Price" (shown in the Alternatives section) to establish a minimum price.

- Click the desired "Strike Price" and "Premium" button in the "Select Strike Price" column to select a call option strike price. The resulting calculated minimum price appears in the Alternatives section | Minimum Price: FC+Call | $2.72 | Selecting a call premium has no impact on the model until the number of contracts in the Price Risk Management Decisions section is completed.

"July Contract Price": July wheat contract price | July Contract Price | $3.19 |

"Forward Contract Price": the price for which wheat may be forward contracted for June delivery | Forward Contract Price | $2.79 |

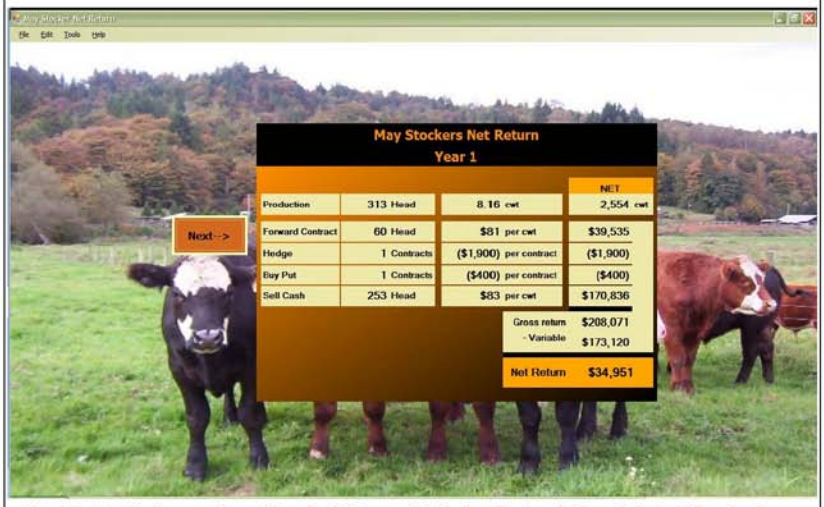
"Expected Hedge Price": the price that is expected if wheat is sold using a July wheat contract and the cash market The "Expected Hedge Price" is determined by the model by subtracting the basis (not shown) from the July wheat contract price. | Expected Hedge Price | $2.84 |

"Expected Minimum Price Put:" the lowest net price that is expected for the wheat. If the July wheat contract price is higher than the selected premium, the net price received will be higher than the expected minimum price. The net price is calculated by subtracting the premium from the June harvest wheat price and adding any put option value. The put will have value if the July wheat contract price is less than the strike price. | Expected Minimum Price Put | $2.62 |

"Minimum Price FC + Call:" the lowest possible net price at which the wheat will be sold. The net price is calculated by subtracting the selected call option premium from the forward contract price. If, at harvest, the KCBT July wheat contract price is above the selected call option strike price, the difference is added to the June (harvest) cash price to determine the net price. | Minimum Price: FC+Call | $2.72 |

Step	Screen	Screen Name and Instructions
		Wheat Price Risk Management Decisions" may be used to select alternatives that will set prices which will be received for the harvested wheat. **CAUTION: When you click "** Update **",** Unpriced Bushels 1,110 Bu **is calculated and** Next--> **appears. Do not click** Next--> **until you have made all decisions and completed all input.** **"Available for Risk Management"** The number of bushels shown in column 4 of Price Risk Management Decisions section is the average yield for the last 10 years multiplied by the number of harvested acres divided by 2. Available for Risk Management 12,110 Bu. **"Forward Contract"** Enter any number of bushels from 0 to all available bushels. Forward contract 1000 Bushels 1,000 Bu. ➢ Click " Update " and the number of bushels forward contracted appear in column four (next to "Bushels"). The forward contracted bushels will be sold for the "Forward Contract Price" shown in the Alternatives section. **"Hedge"** Enter the number of contracts to be sold. For each contract, 5000 bushels are subtracted from "Bushels Available for Risk Management". Hedge 0 Contracts 0 Bu. ➢ Click " Update " and the number of bushels that are involved in the hedge appears in column four (next to "Contracts") of the Price Risk Management Decisions section. **"Buy Put"** Enter the number of put option contracts that will be bought. For each contract, 5000 bushels will be subtracted from "Bushels Available for Risk Management". Buy Put 1 Contracts 5,000 Bu. ➢ Click " Update " and the number of bushels that are involved in the put appears in column four (next to "Contracts") of the Price Risk Management Decisions section. **"Buy Call"** Enter the number of call option contracts that will be bought. For each call option contract, 5000 bushels will be forward contracted and subtracted from "Bushels Available for Risk Management". Buy Call 1 Contracts 5,000 Bu. ➢ Click " Update " and the number of bushels that are involved in the call appear in column four (next to "Contracts") of the Price Risk Management Decisions section. **"Unpriced Bushels":** the number of bushels that have not been forward contracted, hedged, or covered with a put or a call option. Unpriced Bushels 1,110 Bu. The selections may be changed by changing the numbers that were entered in the Price Risk Management Decisions section and clicking " Update ". ➢ Click Next--> to go to Step 17 Screen 16. **"May Stockers Net Return"**

Step	Screen	Screen Name and Instructions
17	16	**"May Stockers Net Return Year 1"** No data or input is required for this screen. This screen appears if you selected May Stockers in the decision sheet on Screen 13. Total production and the gross return generated by each selected marketing alternative, the variable costs, and the net return are shown.



"Production": the number of head sold, the weight in hundred-weight, and the total hundred-weights sold

"Forward Contract": the number of head sold, the forward contract price and the gross return from the forward contracted stockers (number of stockers multiplied by the price per cwt multiplied by the per head weight)

"Hedge": the gain or loss from the futures transaction. The number of Chicago Mercantile May Feeder Cattle futures contracts that were sold, the gain or loss from each contract, and the total return from the futures transactions are shown. Note that the stockers for which the price was protected with a hedge are sold on the cash market (contracts multiplied by gain or loss).

"Buy Put": the gain or loss from the put option transaction. The number of May Feeder Cattle put option contracts that were sold, the gain or loss from each contract, and the total return from the put option transactions are shown (number of contracts multiplied by the gain or loss).

"Sell Cash": the number of stockers sold on the cash market, the price received per cwt, and the total return from the cash sale (number of stockers multiplied by cwt/head multiplied by price)

"Gross Return": the sum of the gain or loss from each marketing alternative

"Variable Costs": the total cash costs required to produce the stocker cattle

"Net Return": "Gross Return" minus "Variable Costs"

➢ Click Next--> to go to Step 18-Screen 17. **"Wheat Harvest Net Returns – June"**

Step	Screen	Screen Name and Instructions
18	17	**"Wheat Harvest Net Returns – June Year 1"** This screen shows how much wheat was produced, how much wheat is left to sell, the returns from the April marketing decisions, the variable costs, and the net return based on the amount of wheat sold.

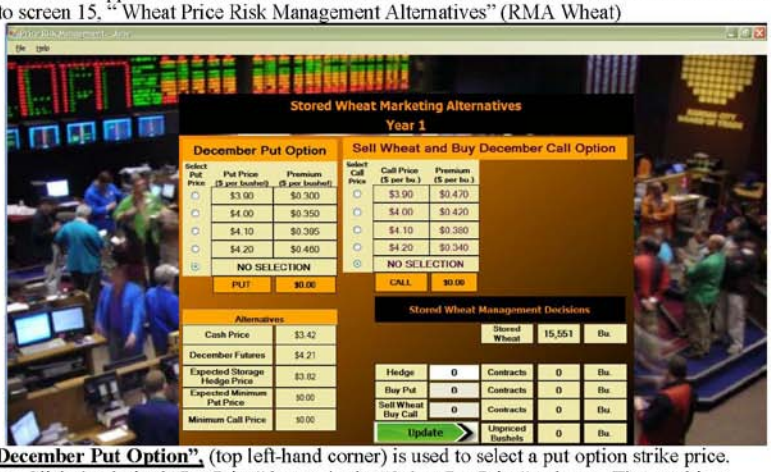
The maximum number of bushels that may be sold is shown in the top right-hand corner of this screen ("Stored Wheat"). The "Stored Wheat" number changes after "Update" is clicked.

- **"Forward Contract":** the number of bushels forward contracted in April, the per-bushel forward contract price, and the gross return The forward contracted bushels include both forward contracted bushels and the bushels that were forward contracted when call option contracts were purchased.
- **"Hedge":** the number of 5,000 bushel contracts, the gain or loss per contract, and the gross return from the contracts. Note that with a hedge, the wheat has not been sold. The return is the grain or loss from the futures contract sell in April and the purchase in June.
- **"Put Option":** the number of 5,000 bushel contracts, the gain or loss per contract, and the gross return from the contracts. Note that with a put option, the wheat has not been sold. The return is the grain or loss from the put option contract purchased in April and sold in June.
- **"Call Options":** the number of 5,000 bushel contracts, the gain or loss per contract, and the gross return from the call option contracts. The return is the grain or loss from the call option contract purchased in April and sold in June plus the forward contracted wheat.
- **"Sell Wheat":** The price at which participants may sell wheat by entering the number of bushels to be sold
- **"Gross Return":** the income generated from all of the alternatives before the crop insurance is added or subtracted and before the variable costs are subtracted
- **"Crop Insurance":** the insurance premium that was paid, any payoff from the insurance policy, and the net income (gain or loss) generated from the policy
- **"Variable Costs":** the "out-of-pocket" costs required to produce and harvest the wheat
- **"Net Return":** "Gross Return" plus or minus the insurance return minus the "Variable Costs"

➢ Enter the number of bushels you want to sell (Sell Wheat 5000 Bushels) and "Click "Update".

Step	Screen	Screen Name and Instructions
		 After "Update" is clicked, Next-> and Reset appear. If you want to change the number of bushels sold Sell Wheat 5000 Bushels, click Reset, make the change, and click "Update". ➢ If all of the wheat is sold, click Next-> to go to Step 19-Screen 18. **"Net Income Summary"** ➢ If some wheat is stored, click Next-> to go to Step 20-Screen 19. **"Stored Wheat Alternatives"**
19	18	**"Net Income Summary"** No input is required for this screen. If all the wheat is sold, this screen appears. Which shows all the available production enterprises and the number of units of each enterprise plus the net income for each. Also shown are the government payments and the net return for the year. **NOTE:** There are no Sorghum or Cotton Acres in Year 1.  ➢ Click Next-> to go to Step 20-Screen 19. **"Stored Wheat Alternatives"**

Step	Screen	Screen Name and Instructions
20	19	**"Stored Wheat Alternatives Year 1"** This screen appears if some or all of the wheat is not sold and is stored. This screen is similar to screen 15, " Wheat Price Risk Management Alternatives" (RMA Wheat)



"December Put Option", (top left-hand corner) is used to select a put option strike price.

- Click the desired "Put Price" button in the "Select Put Price" column. The resulting minimum price will appear in the Alternatives section 

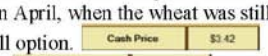
. Selecting a put premium has no impact on the model until the number of contracts in the Stored Wheat Marketing Decisions section is completed.

"Sell Wheat and Buy December Call Option" is in the top right-hand corner and is used to select a call option strike price. The strike price selected is used with the December Futures contract price (shown in the Alternatives section) to establish a minimum price.

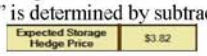
- Click the desired "Strike Price" button in the "Select Call Price" column to select a call option strike price. The resulting minimum price appears in the Alternatives section 

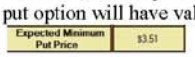
Selecting a call premium has no impact on the model until the number of contracts in Stored Wheat Marketing Decisions section is completed.

"Alternative Prices" is in the bottom left-hand corner and shows prices to use in the selection of the alternatives.

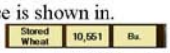
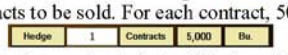
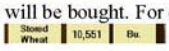
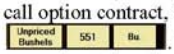
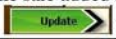
"Cash Price": the cash price for which the wheat may be sold. When call option contracts are purchased, the wheat is sold for cash. Remember that in April, when the wheat was still in the field, a forward contract price was used with the call option. 

"December Futures": the December wheat contract price 

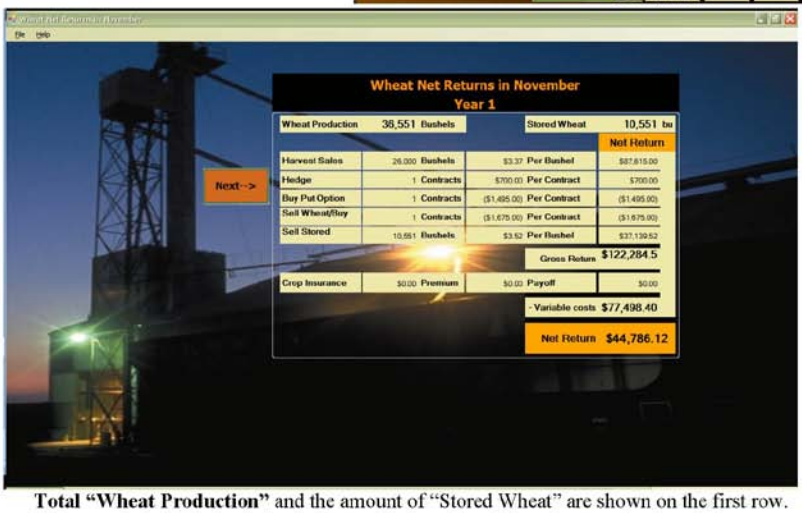
"Expected Storage Hedge Price": the price that is expected if wheat is sold using a December wheat contract and selling the wheat on the cash market in November. The "Expected Storage Hedge Price" is determined by subtracting the basis (not shown) from the December wheat contract price. 

"Expected Minimum Put Price": the lowest net price that is expected for the wheat. If the December wheat contract price is higher than the selected "Strike Price", the net price received will be higher than the expected minimum price. The put option will have value if the December wheat contract price is less than the strike price. 

"Minimum Call Price": the lowest possible net price that the wheat will be sold for. The net price is calculated by subtracting the selected call option premium from the forward contract price. If, in November, the KCBT December wheat contract price is above the selected call option strike price, the difference is added to the "Minimum Call Price" to determine the net price.

Step	Screen	Screen Name and Instructions
		"Stored Wheat Management Decisions" (lower right-hand corner) is used to select the alternatives for selling wheat. Each marketing alternative's price is shown in. **"Stored Wheat":** the number of bushels of wheat in storage.  **"Hedge"** Enter the number of contracts to be sold. For each contract, 5000 bushels are subtracted from "Stored Wheat".  **"Buy Put"** Enter the number of put option contracts that will be bought. For each contract, 5000 bushels are subtracted from "Stored Wheat".  **"Sell Wheat Buy Call"** Enter the number of call option contracts that will be bought. For each call option contract, 5000 bushels will be sold and subtracted from  and  . The sold wheat will be subtracted from "Stored Wheat" and the gross return from the sale added to "Harvest Sells" on Step 22-Screen 21 ➢ Click the  button to enter your selection in the model.  Your selections may be changed by changing the numbers that were entered in the Stored Wheat Management Decisions section and clicking  ,  appears after  is clicked. Click  to go to Step 21-Screen 20. **"Wheat Net Returns in November"**

Step	Screen	Screen Name and Instructions
21	20	**"Wheat Net Returns in November Year 1"** No data or input is required for this screen. All stored wheat is sold in November. This screen shows the returns for each stored wheat alternative.



Total "Wheat Production" and the amount of "Stored Wheat" are shown on the first row.

"Harvest Sales" The bushels of wheat sold, the price of the wheat received, and the gross return for wheat sold at harvest are shown.

"Hedge" The number of December futures contracts sold in June and the net return from the hedge transactions (sell futures contract in June and buy the futures back in November)

"Buy Put Option" The number of December futures contracts sold in June and the net return from the hedge transactions (Buy a December Put Option contract in June and sell it back in November)

"Sell Wheat/Buy" The number of call option contract(s) purchased and the net return from buying the call options in June and selling the call Option contract(s) in November

"Sell Stored" All stored wheat is sold at the November cash price.

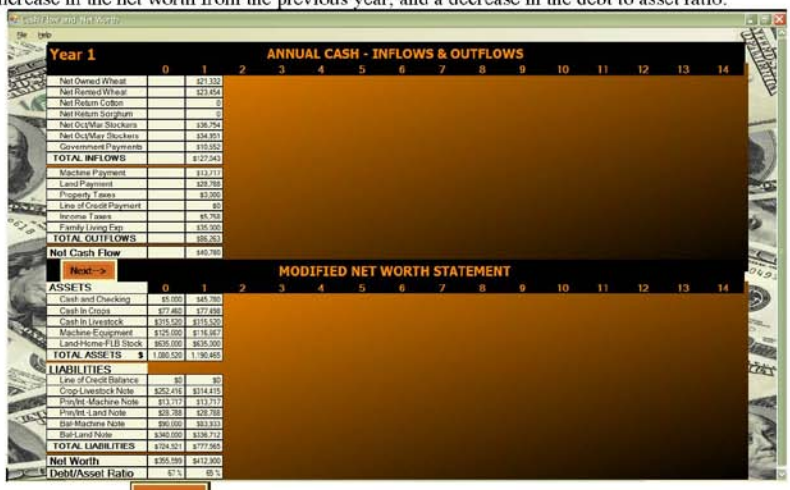
"Gross Return": the sum of the revenue generated from all wheat alternatives

"Crop Insurance": the insurance premium that was paid, any payoff from the insurance policy, and the net income (gain or loss) generated from the policy

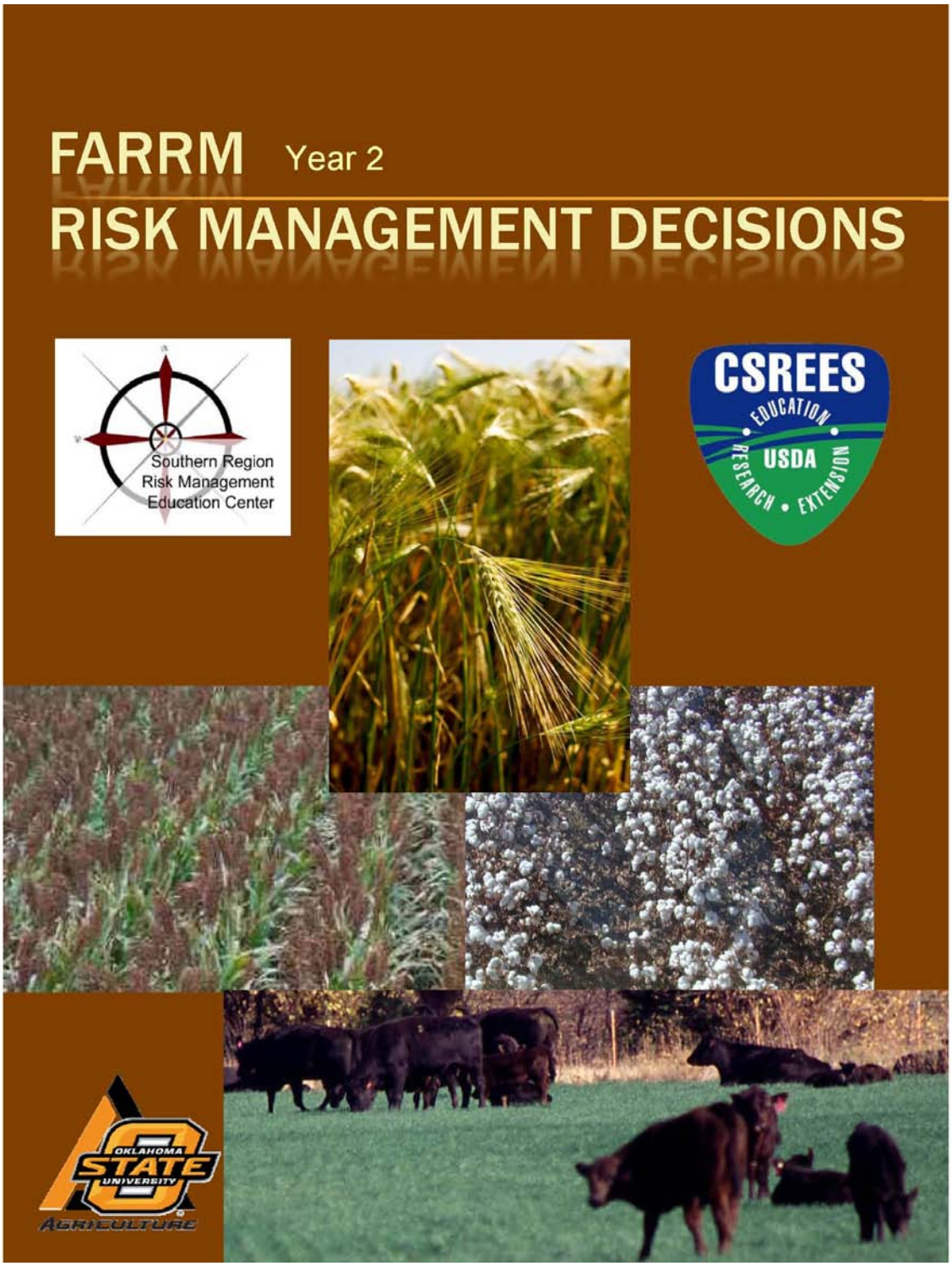
"Variable Costs": the cost of production as determined by multiplying the number of harvested acres by the costs shown in the wheat budget.

"Net Return": "Gross Return" minus "Variable" costs

➢ Click to go to Step 22-Screen 21. **"Net Income Summary"**

Step	Screen	Screen Name and Instructions
22	21	**"Net Income Summary Year 1"** No data or input is required for this screen.  If all the wheat is sold, and the cotton and sorghum acres are zero, this "Net Income Summary" screen appears. This screen shows all the available production enterprises, the number of units of each enterprise, and the net income for each. Also shown are the government payments and the "Net Return" for the year. ➢ Click Next--> to go to Step 23-Screen 22. **"Cash Flow and Net Worth"**
23	22	**"Cash Flow and Net Worth"** Once the calendar year is complete, this screen is updated allowing for the comparison of this year's cash-flow and net worth changes. The desired indicators are a positive net cash flow, an increase in the net worth from the previous year, and a decrease in the debt to asset ratio.  ➢ Click Next--> to go to Screen 2-5 to begin Year 2. Go to Instructions for Year 2 and Subsequent Years, Step 2-6.

FARRM Year 2


FARRM Year 2
RISK MANAGEMENT DECISIONS
Southern Region
Risk Management
Education Center
CSREES
EDUCATION
USDA
RESEARCH • EXTENSION
OKLAHOMA
STATE
UNIVERSITY
AGRICULTURE

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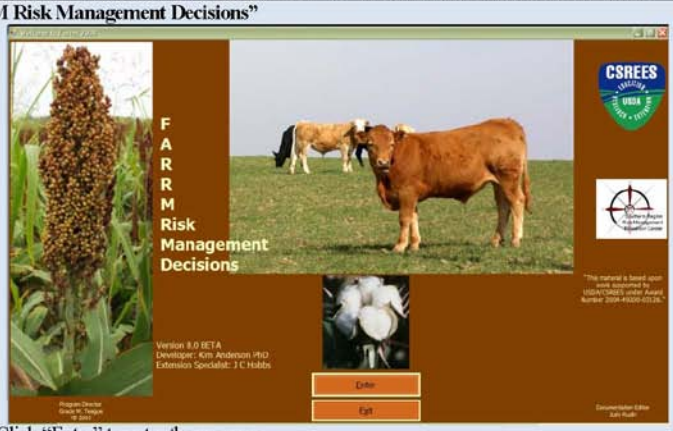
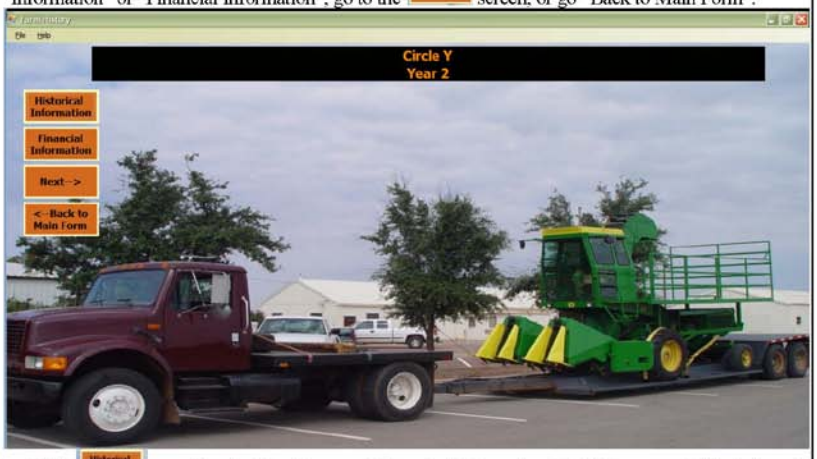
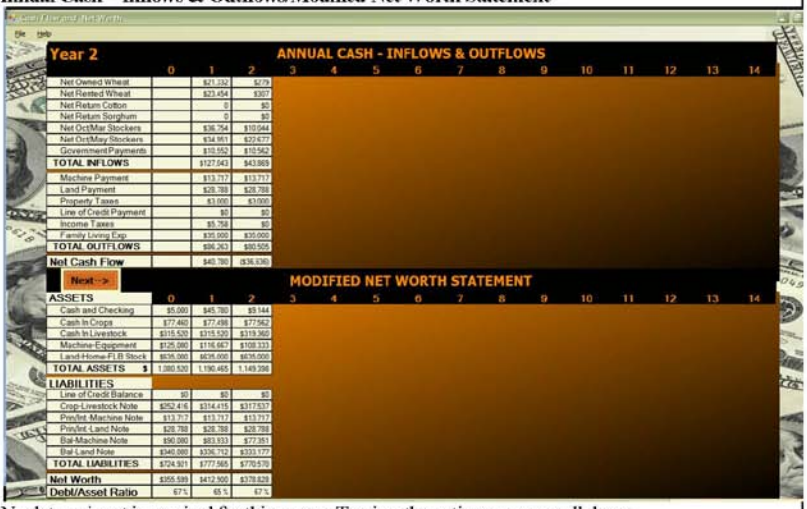
Running the FARRM Game – Year 2

Step	Screen	Screen Name and Instructions
2-1		If you completed Year 1 without closing the program, the program automatically goes to the "Farm History" screen for Year 2. Go to Step 2-6. – Screen 2-5
	FARRM	If you are entering the game again after completing Year 1 and closing the program, double click on the "FARRM (Farm and Ranch Risk Management) V8" icon on your desktop. Go to Step 2-2.
2-2	2-1	**"FARRM Risk Management Decisions"**  ➢ Click "Enter" to enter the program. ➢ Click "Exit" to close the program. **NOTE: This screen remains open on your desktop throughout the game. If you want to exit the game at any time, click on the red X in the upper right-hand corner of the screen that you are working on. Then, click "Exit" on this screen to close the game.**
2-3	2-2	**"Select Current Player"** When you have finished Year 1, the program will automatically start at the beginning of the year where you quit. ➢ Click Current Player and go to Step 2-4 – Screen 2-3.  If you do not want to run the game, click Exit. The main screen shows, click Exit again to close the program.

Step	Screen	Screen Name and Instructions
2-4	2-3	**"Select a Session and Farm Name"** ➢ When you click Current Player this screen displays the names of current sessions and farm names. ➢ Click your session name. A box with farm names appears. Click your farm name. A "Player Information" box appears. ➢ Click the Click to Play button and Go to Step 2-6 – Screen 2-5. **"Farm History".** ➢ If you want to stop playing, click "Exit". Screen 1 appears. On screen 1, click "Exit" again to close the program. **"FARRM Risk Management Decisions" screen.**
2-6	2-5	**"Farm History"** The farm name and the year appear at the top of the screen. You may select to review "Historical Information" or "Financial Information", go to the Next -> screen, or go "Back to Main Form".  ➢ Click Historical Information to review the last 10 years of historical information (Yield, Average Daily Gain, and Price) of the potential production enterprises. Your Year 1 information has been added to the tables and the previous Year 10 information has been dropped from the tables. The tables have been updated. Go to Step 2-7 – Screen 2-6. **"Historical Data"** ➢ Click Financial Information to review "Cash Flow" or "Net Worth" statements. Your Year 1 information has been added to the tables and the previous Year 10 information has been dropped from the tables. The tables have been updated. Go to Step 2-8 – Screen 2-7. **"Annual Cash – Inflows & Outflows/Modified Net Worth Statement"** ➢ Click Next -> to go to Step 2-9 - Screen 2-8. **"Land Use"** ➢ Click <- Back to Main Form to return to Screen 2-1. **"FARRM Risk Management Decisions" screen**

Step	Screen	Screen Name and Instructions
2-7	2-6	**"Historical Data"** This screen allows you to review farm historical crop yields, average daily gain, and financial information. No data or input is required for this screen.  ➢ To review the historical production and prices, click the desired commodity (Wheat, Sorghum, Cotton, March Cattle, or May Cattle).Go to Step 2-8 – Screen 2-7. **"Annual Cash – Inflows & Outflows/Modified Net Worth Statement"** ➢ Click <--Back to return to Step 2-6 - Screen 2-5. **"Farm History"**
		

Step	Screen	Screen Name and Instructions
2-8	2-7	**"Annual Cash – Inflows & Outflows/Modified Net Worth Statement"**



No data or input is required for this screen. To view the entire screen, scroll down.

The cash-flow statement information, "Annual Cash-Inflows & Outflows," is simply the cash inflows or income and the cash outflows or expenses for the farm on an annual basis. The net cash-flow indicates the cash position at the end of the year.

A positive cash-flow is a sign that the farm covered all cash operating and family living expenses, and the cash and checking balances increased.

A negative cash-flow is a sign that the farm did not cover all cash operating and family living expenses, and the line of credit balance increased.

Comparing the net cash-flow line over time provides information concerning the increase or decrease in the cash position of the farm at the end of each year.

The "Modified Net Worth Statement" is a simple list of the farm assets and the farm liabilities at the end of each year. The assets include cash and checking account balances, cash invested in growing crops and livestock, plus the value of machinery, equipment, land, and buildings. The "TOTAL ASSETS" line indicates the current value of all farm assets.

The farm started with debt to put in the wheat crop and to buy stocker cattle plus machinery debt and land debt. These debts have both interest and principal due each year. A line-of-credit exists to track short-term borrowing during those periods when expenses are greater than income. The "TOTAL LIABILITIES" line is the amount of all farm debts that the business owes.

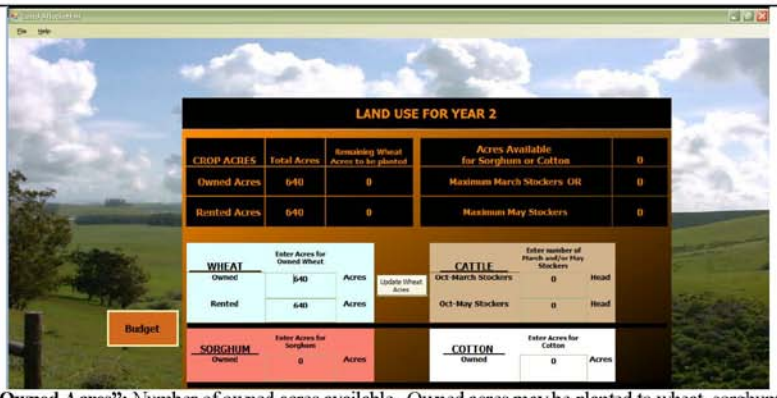
Tracking the net worth provides a measure of the annual growth for the farm business and how much of the business the farm operator owns. The last line is the debt-to-asset ratio, which is an indicator of the farms liquidity or borrowing capacity. Over the period of years that you are running the simulation, the desired result is for the debt-to-asset ratio to decline and the net worth to increase.

➢ Click 

to return to Step 2-6 - Screen 2-5, "Farm History".

2-9	2-8	**"Land Use - Year 2"** On this screen, you can decide how to allocate the land to the available production alternatives. The top half or the screen shows the amount of resources available. The amounts vary as the resources are allocated in the bottom half of the screen.

Step	Screen	Screen Name and Instructions



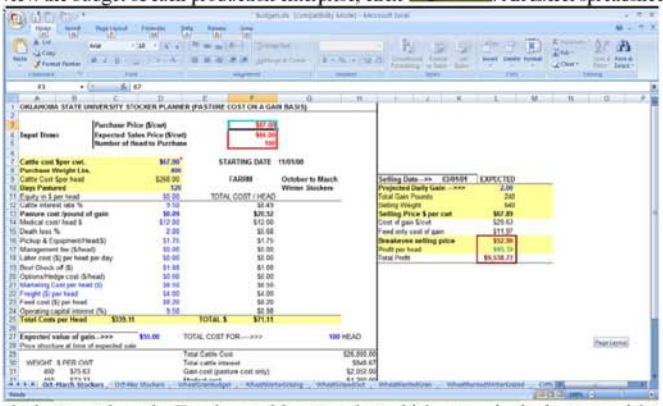
"Owned Acres": Number of owned acres available. Owned acres may be planted to wheat, sorghum, or cotton or may be double cropped by grazing-out the owned wheat acres with stockers and then planting the grazed-out acres to either and or cotton or sorghum. If sorghum or cotton is planted, the acres may be planted to wheat in the following year, but may not be grazed.

"Acres Available for Sorghum or Cotton": Number of acres of sorghum/cotton that may be planted. Sorghum/cotton acres are obtained by using May Stockers to graze out the wheat or by not planting wheat. The acres available for sorghum/cotton do not have to be allocated.

The bottom half of the screen is used to designate the number of acres of wheat, sorghum, or cotton and the number of March or May stockers. The crop and stock enterprise values are interrelated. Resource allocation must progress in the order of Owned Wheat, Oct-March Stockers, Oct-May Stockers, Sorghum, and Cotton.

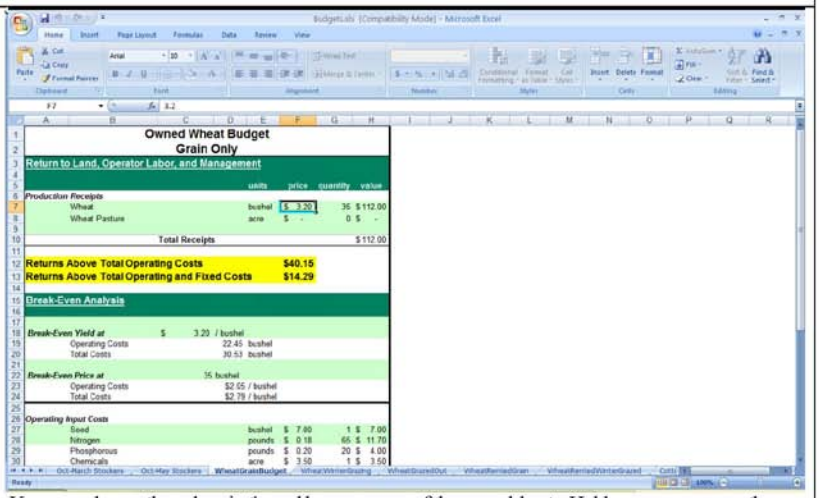
- To review the budget of each production enterprise, click 

. An Excel spreadsheet appears.



- Click the bottom tab on the Excel spreadsheet to select which enterprise budget you wish to review.

Step	Screen	Screen Name and Instructions



Owned Wheat Budget
Grain Only

Return to Land, Operator Labor, and Management

	units	price	quantity	value
Production Receipts				
Wheat	bushel	$ 3.20	35	$ 112.00
Wheat Pasture	acre	$ -	0	$ -
Total Receipts				$ 112.00

Returns Above Total Operating Costs	$40.15
Returns Above Total Operating and Fixed Costs	$14.29

Break-Even Analysis

Break-Even Yield at	$ 3.20	/ bushel
Operating Costs	22.45	bushel
Total Costs	30.53	bushel
Break-Even Price at	35	bushel
Operating Costs	$2.05	/ bushel
Total Costs	$2.79	/ bushel

Operating Input Costs				
Seed	bushel	$ 7.00	1	$ 7.00
Nitrogen	pounds	$ 0.18	65	$ 11.70
Phosphorous	pounds	$ 0.20	20	$ 4.00
Chemicals	acre	$ 3.50	1	$ 3.50

You may change the values in the red boxes on any of the spreadsheets. Hold your mouse over the boxes for instructions.

Close the spreadsheet to return to the land use screen by either clicking the red X in the upper right-hand corner or closing the file with the Excel close icon.

"WHEAT: Owned" Owned wheat acres may be allocated to Wheat, Sorghum, or Cotton. Another way to generate Sorghum or Cotton Acres is to graze the wheat out by selecting Oct-May Stockers. The grazed-out "Acres Available for Sorghum or Cotton" figure is shown in the top right-hand corner of the screen.

➢ Enter the number of acres for "Owned Wheat". 

"Wheat: Rented" Rented wheat acres are always 640 acres and are always allocated to wheat. All 640 acres must be harvested. Rented acres may be used to graze stockers at the rate of two acres per head.

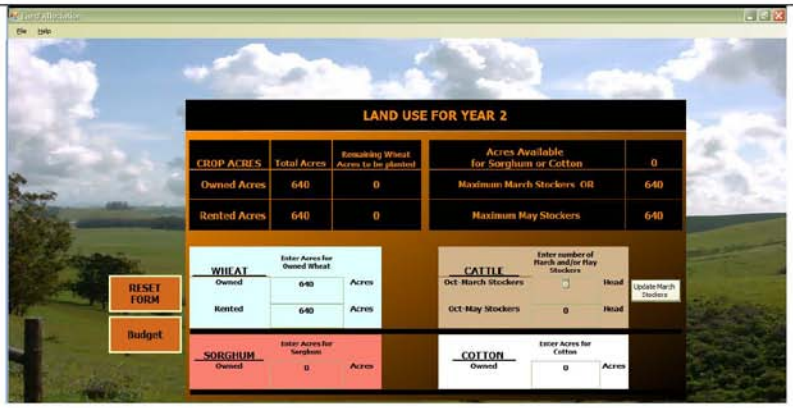
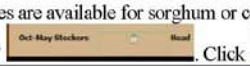
➢ Click 

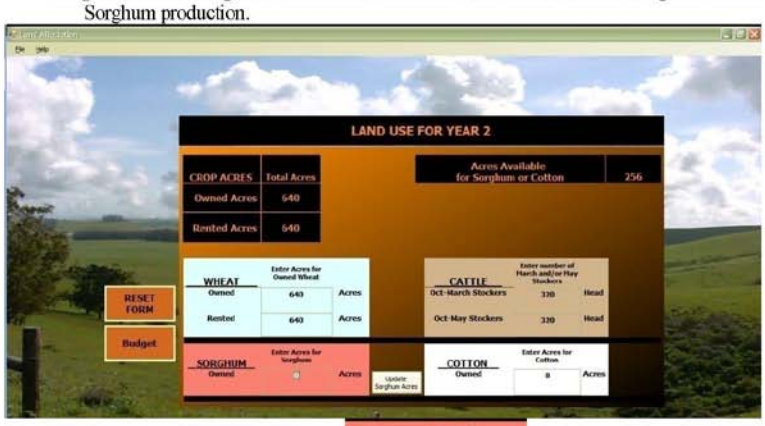
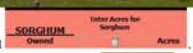
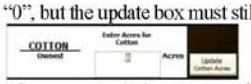
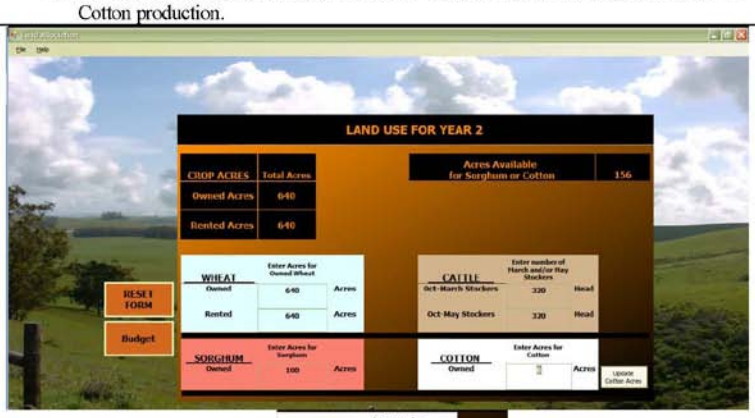
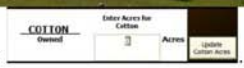
the 

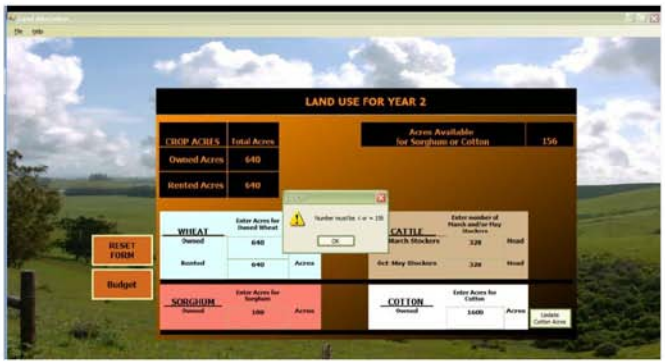
and 

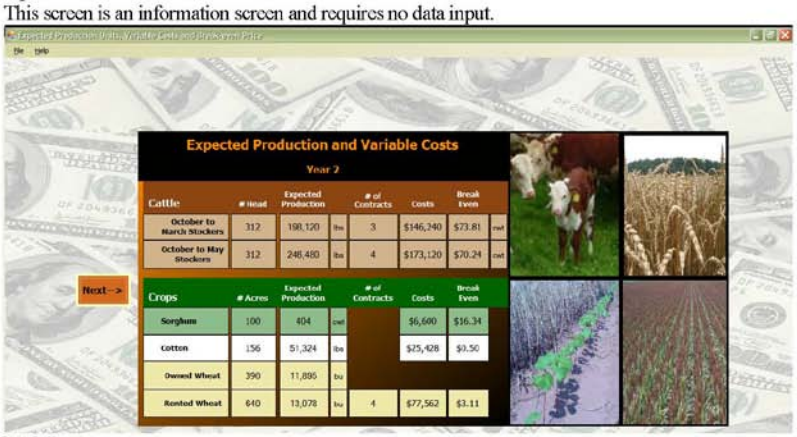
appears. Proceed to **"CATTLE" decisions.**

NOTE: If at any time you need to change the numbers you have entered, click "RESET FORM" to reset resource allocations. Change the numbers and click each update button in turn.

Step	Screen	Screen Name and Instructions
		 **"CATTLE: Oct-March Stockers"** This figure is used to allocate winter wheat acres to grazing stockers. The number of Oct-March and Oct-May stockers may not exceed the number of head shown in the "March Stockers Available" and "May Stockers Available" boxes. The stockers are sold in early March, and the wheat acres are harvested. ➢ Enter the number of "Oct-March Stockers".  Click  to proceed to Oct-May Stockers.   **"Oct-May Stockers"** This figure is used to allocate winter wheat acres to grazing stockers. The number of Oct-March and Oct-May stockers may not exceed the number of head shown in the "March Stockers Available" and "May Stockers Available" boxes. The stockers are sold in early May, and the grazed-out wheat acres are available for sorghum or cotton. ➢ Enter the number of "Oct-May Stockers"  . Click  to proceed

Step	Screen	Screen Name and Instructions
		to Sorghum Acres.  **"Sorghum Acres"** Sorghum Acres is used to allocate "Acres Available for Sorghum/Cotton" to Sorghum production.  ➢ Enter the number of acres for sorghum  . (Sorghum Acres may remain at "0", but the update box must still be clicked.)Click  to proceed to Cotton Acres.  **"Cotton Acres"** Cotton Acres is used to allocate "Acres Available for Sorghum/Cotton" to Cotton production.
		 ➢ Enter the number of cotton acres  . Click  to enter the number of acres allocated to Cotton. Cotton acres may remain at "0", but the update box must still be clicked.

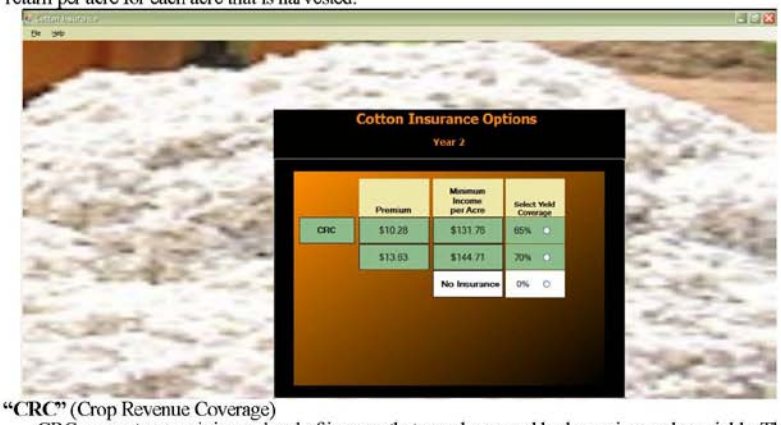
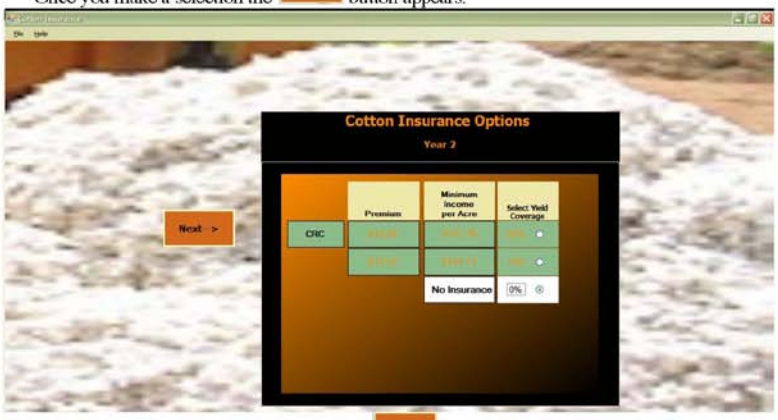
Step	Screen	Screen Name and Instructions
		 ➢ When all the resources have been allocated, Next-> appears. If the resource allocations need to be changed, click "RESET FORM" and Next-> disappears, and "Update Wheat Acres" appears. Follow the steps above to change any allocations. ➢ When you are satisfied with all of the allocations, click Next-> to go to Step 2-10 - Screen 2-9. **"Expected Production and Variable Costs"**  If you make an error click the OK button and reenter your data. (Example: To many cotton acres were entered.)

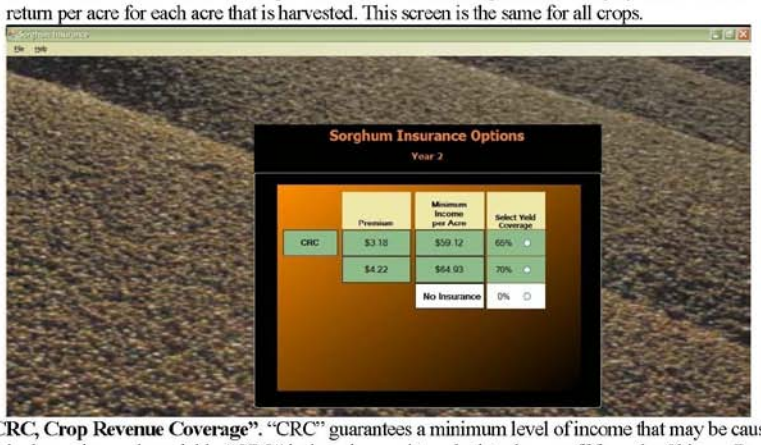
Step	Screen	Screen Name and Instructions
2-10	2-9	**"Expected Production and Variable Costs Year 2"** This screen is an information screen and requires no data input.  **"Cattle":** **"# Head":** the number of head purchased minus the death loss **"Expected Production":** the number of head multiplied by the ten-year average stocker weight. **"# of Contracts":** "Expected Production" divided by 50,000 pound contracts and the maximum number of March or May contracts that may be sold to hedge the stockers **"Costs":** the number of stockers purchased multiplied by the per-head costs **"Break-Even":** "Costs" divided by "Expected Production" that shows the break-even sell price that must be received to cover all costs **"Crops":** **"# Acres":** the number of acres that will be harvested **Note** that all "Sorghum", "Cotton", and "Rented Wheat" that was planted will be harvested; If there are "October to May Stockers" that will graze your wheat, "Owned Wheat" harvested acres (the number shown) will be less than the planted acres. **"Expected Production":** the harvested acres ("# Acres") multiplied by the 10-year average yield per acre production. The amount of wheat that may be forward contracted is the "Expected Production" divided by 2. **"# of Contracts":** "Expected Production" divided by 5,000 bushels. The maximum number of futures contracts or futures put or call options are the number of contracts divided by 2. **"Costs":** "# (harvested) Acres" multiplied by the budgeted costs Break-Even": "Costs" divided by "Expected Production". ➢ Click the Next--> button to go to Step 2-11 - Screen 2-10. **"Wheat Insurance Options"**

Step	Screen	Screen Name and Instructions
2-11	2-10	**"Wheat Insurance Options Year 2"** This screen requires a decision (input). You must either select "CRC" or "RA" insurance coverage or select the "No Insurance" option. Insurance guarantees you a minimum return per acre for each acre that is harvested.

"CRC" (Crop Revenue Coverage)
"RA" (Revenue Assurance)
Both CRC and RA guarantee a minimum level of income that may be caused by low prices or low yields. The difference between CRC and RA is that the price used to calculate the CRC payoff is the Kansas City Board of Trade July contract average price during the month of June, while the RA price uses the July contract average price between July 1 and July 14.
"Premium": the cost (price) per acre of the underlying insurance policy
"Minimum Income per Acre": the expected minimum income per acre insured.
"Select Yield Coverage": with CRC, the percentage of expected yield per acre (5-year average); with RA, the percentage of the expected income (5-year average yield times a designated price based on a monthly average futures contract price). Once you make a selection the Next -> button appears.

- Click the desired coverage amount in the "Select Yield Coverage" column for either "CRC" or "RA" to select your insurance option.
- Click the "No Insurance" icon if you want no insurance.
- If you planted only wheat, click Next -> to go to Step 2-14 - Screen 2-13. **"March Stockers Price Risk Management Alternatives"**
- If you planted cotton and sorghum, click Next -> to go to Step 2-12 - Screen 2-11. **"Cotton Insurance Options"**

Step	Screen	Screen Name and Instructions
2-12	2-11	**"Cotton Insurance Options Year 2"** This screen requires a decision (input). You must select "CRC" or select the "No Insurance" option. Insurance guarantees you a minimum return per acre for each acre that is harvested.  **"CRC"** (Crop Revenue Coverage) CRC guarantees a minimum level of income that may be caused by low prices or low yields. The CRC payoff is the Kansas City Board of Trade July contract average price during the month of June. **"Premium":** the cost (price) per acre of the underlying insurance policy **"Minimum Income per Acre":** the expected minimum income per acre insured. **"Select Yield Coverage":** with CRC, the percentage of expected yield per acre (5-year average) Once you make a selection the Next-> button appears.  ➢ If you planted only wheat and cotton, click Next-> to go to Step 2-14 - Screen 2-13. **"March Stockers Price Risk Management Alternatives"** ➢ If you planted cotton and sorghum, click Next-> to go to Step 2-13 - Screen 2-12. **"Sorghum Insurance Options"**

Step	Screen	Screen Name and Instructions
2-13	2-12	**"Sorghum Insurance Options Year 2"** This screen requires a decision (input). Select the "No Insurance" option, or select CRC insurance coverage by clicking on the appropriate button in the "Select Yield Coverage" column. The insurance guarantees the player a minimum return per acre for each acre that is harvested. This screen is the same for all crops.  **"CRC, Crop Revenue Coverage".** "CRC" guarantees a minimum level of income that may be caused by low prices or low yields. "CRC" is the price used to calculate the payoff from the Chicago Board of Trade July contract average price during the month of June. **"Premium".** The cost (price) per acre of the underlying insurance policy **"Minimum Income per Acre".** The expected minimum income per acre insured, the sum of the income from the crop sold at harvest, and the insurance payment **"Select Yield Coverage"** "CRC", the percentage of expected yield per acre (5-year average). Once you make a selection the Next--> button appears.  ➢ Click Next--> to go to Step 2-14 - Screen 2-13. **"March Stockers Price Risk Management Alternatives"**

Step	Screen	Screen Name and Instructions
2-14	2-13	**"March Stockers Price Risk Management Alternatives Year 2"** This screen only appears if you have March Stockers.

"Put Option", is in the upper left-hand corner and is used for selecting a put option strike price. The "Put Option" is used to establish a minimum price for the stockers.

- Click the desired "Strike Price" button in the "Select Strike Price" column.

"Select Strike Price"

"NO SELECTION" is the default choice and is automatically selected. When you select a strike price, the expected minimum price calculated appears Expected min price/ Put Option Contract $74.90 in the Alternatives section in the bottom left-hand corner. Each strike price may be selected to evaluate the expected minimum prices. The last button selected determines which strike price is available to purchase. The strike price selected also appears PUT $76.00 in the Put Option section.

"Strike Price ($ per cwt)": guaranteed price that is selected by the buyer of the option contract. The strike price is the price that the option buyer takes if the option is executed. For example, if the put option contract strike is $74 for March Stockers, and the buyer exercises the option, the buyer receives a sold (short) futures contract position for the March feeder cattle futures contract. This method is the same as establishing a hedge at $74.

"Premium ($ per cwt)": price paid per unit of production for the option contract. Each option contract is 50,000 pounds.

"Alternatives", is in the lower left-hand corner and shows prices that you can potentially use to "lock-in" a price. This is an information only quadrant and requires no data input.

"March contract price": the Chicago Mercantile Exchange (CME) March Feeder Cattle contract price that may be used to hedge (lock-in) an expected price for the stockers. March contract price $81.27

"Forward contract price": the price that is being offered by cattle buyers for stockers that will be delivered in March. Forward contract price $79.50

"Expected hedge price": the "March contract price" plus the expected basis (minus if the expected basis is negative). Selling a March feeder cattle contract allows you to protect against lower prices. The exact price is unknown because the basis (cash price minus the futures contract price) is unknown and is estimated. Expected hedge price $80.27

"Expected min price/Put Option Contract": the expected price at which you may chose to sell the stockers if prices decline. If prices decline, the put option contract is used to establish a hedge at the selected strike price. Expected min price/ Put Option Contract $74.90

Step	Screen	Screen Name and Instructions
		"Price Risk Management Decisions", in the lower right-hand corner and is used to select risk management alternatives to "lock-in" prices. If you want to use one of the three marketing alternatives (Forward Contract, Hedge, or Buy Put), enter the number of head or contracts in the appropriate box. **"Expected Production"** shows the number of head that may be produced. Expected Production 312 Head **"Un-priced Cattle"** shows the number of head that will be cash priced when the stockers are sold. Unpriced Cattle 84 Head **"Forward Contract"** ➢ Enter the number of head that are to be forward contracted in the box next to "Forward contract" Forward contract 70 Head 70 Head ➢ Click Update and the number of head forward contracted appears in column four (next to "Head"). The forward contracted stockers will be sold for the "Forward contract price" Forward contract price $79.50. **"Hedge"** ➢ Enter the number of contracts Hedge 1 Contracts 79 Head (50,000 pounds per contract) that will be sold to establish an expected hedge price received when the stockers are sold. Expected hedge price $80.27 ➢ Click Update and the number of stockers that are involved in the hedge appear in column four (next to "Hedge" in the Price Risk Management Decisions section). **"Buy Put'** ➢ Enter the number of contracts Buy Put 1 Contracts 79 Head (50,000 pounds per contract) that will be bought to establish an expected minimum price. Expected min price/ Put Option Contract $74.90 ➢ Click Update and the number of stockers that are involved in the put appear in column four (next to "Buy Put"). ➢ Make any additional change(s) and then click Update. New changes are not entered into the model until Update is clicked. **NOTE: "Unpriced Cattle" must be zero (0) or greater. If the figure is below zero (0), you must change your input until the figure is zero (0) or above.**  ➢ When the March Stocker decisions are complete, click the Next -> button to go to Step 2-15-Screen 2-14. **"May Stockers Price Risk Management Alternatives"**

Step	Screen	Screen Name and Instructions
2-15	2-14	**"May Stockers Price Risk Management Alternatives Year 2"** This screen only appears if you have May Stockers.

"Put Option", is in the upper left-hand corner and is used for selecting a put option strike price. The "Put Option" is used to establish a minimum price for the stockers.

- Click the desired "Strike Price" button in the "Select Strike Price" column.

"Select Strike Price"

"NO SELECTION" is the default choice and is automatically selected. To purchase "Put Option" contract(s) to establish a minimum price for the stockers,

- Click the desired "Strike Price" button in the "Select Strike Price" column. When you select a strike price, the calculated expected minimum price appears i Expected min price/ Put Option Contract $80.40 in the bottom left hand corner in the Alternatives section. Each strike price may be selected to evaluate the expected minimum prices. The last button selected determines which strike price is available to purchase. The strike price selected appears in the box next to "PUT". PUT $86.00

"Strike Price ($ per cwt)": guaranteed price that is selected by the buyer of the option contract The strike price is the price that the option buyer takes if the option is executed. For example, if the put option contract strike is $78 for May Stockers, and the buyer exercises the option, the buyer will receive a sold (short) futures contract position for the May feeder cattle futures contract. This method is the same as establishing a hedge at $78.

"Premium ($ per cwt)": price paid per unit of production for the option contract. Each option contract is 50,000 pounds.

"Alternatives", is in the lower left-hand corner and shows prices that you can potentially use to "lock-in" a price. This is "information" only and requires no data input.

"May Contract Price": the May Feeder Cattle contract price that may be used to hedge (lock-in an expected price) the stockers "Forward Contract Price": the price that is being offered by cattle buyers for stockers that will be delivered in May. May contract price $83.15

"Expected Hedge Price": the "May Contract Price" plus the expected basis (minus if the expected basis is negative) Selling a May feeder cattle contract allows you to protect against lower prices. The exact price is unknown because the basis (cash price minus the futures contract price) is unknown and is estimated. Expected hedge price $82.15

"Expected Min Price/Put Option Contract": the expected price at which you may chose to sell the stockers if prices decline. If prices decline, the put option contract is used to establish a hedge at the selected Strike Price. Expected min price/ Put Option Contract $80.40

Step	Screen	Screen Name and Instructions
		"Price Risk Management Decisions", is in the lower right-hand corner and is used to select risk management alternatives that are used to "lock-in" prices. If you want to use one of the three marketing alternatives ("Forward Contract", "Hedge", or "Buy Put"), you must enter the number of head or contracts in the appropriate box.

CAUTION: When you click Update, Next--> **appears. Do not click** Next--> **until you have made all decisions and completed all input.**

"Expected Production" shows the number of head that will be produced.

"Un-priced Cattle" shows the number of head that will be priced when the stockers are sold.

"Forward Contract"

- Enter the number of head that are to be forward contracted in the box next to "Forward contract". Forward contract | 50 | Head | 50 | Head
- Click Update and the number of head forward contracted appear in column four. The forward contracted stockers will be sold for the "Forward contract price". Forward contract price | $75.50

"Hedge"

- Enter the number of contracts Hedge | 1 | Contracts | 63 | Head (50,000 pounds per contract) that will be sold to establish an expected hedge price received when the stockers are sold. Expected hedge price | $82.15 (shown in the "Alternatives section")
- Click Update and the number of stockers that are involved in the hedge appear in column four Hedge | 1 | Contracts | 63 | Head

"Buy Put'

- Enter the number of contracts Buy Put | 1 | Contracts | 63 | Head (50,000 pounds per contract) that will be bought to establish an expected minimum price Expected min price/ Put Option Contract | $80.40 (shown in the "Alternatives section").
- Click Update and the number of stockers that are involved in the put appear in column four. Buy Put | 1 | Contracts | 63 | Head
- Make any additional change(s) and then click Update. New changes are not entered into the model until Update is clicked.
- When the May Stocker decisions are complete, click Next--> to go to Step 2-16 - Screen 2-15. **"March Stockers Net Return"**

Step	Screen	Screen Name and Instructions
2-16	2-15	**"March Stockers Net Return Year 2"** No data or input is required for this screen. This screen only appears if you selected March Stockers in the decision sheet on screen 10. Total production and the gross return generated by each selected marketing alternative, the variable costs, and the net return are shown.

"Production": the number of head sold, the weight in hundred-weight, the total hundred-weights sold

"Forward Contract": the number of head sold, the forward contract price, and the gross return from the forward contracted stockers (number of stockers multiplied by the price per cwt multiplied by the per head weight)

"Hedge" Only the gain or loss from the futures transaction is shown. The number of March Feeder Cattle futures contracts that were sold, the gain or loss from each contract, and the total return from the futures transactions are shown. Note that the stockers for which the price was protected with a hedge are sold on the cash market. The **"Net"** is the number of contracts multiplied by gain or loss per contract).

"Buy Put" Only the gain or loss from the put option transaction is shown. The number of March Feeder Cattle put option contracts that were sold, the gain or loss from each contract, and the total return from the put option transactions are shown. The **"Net"** is the number of contracts multiplied by the gain or loss per contract.

"Sell Cash": the number of stockers sold on the cash market, the price received per cwt, and the total return from the cash sale are shown. The **"Net"** is the number of stockers multiplied by cwt/head multiplied by price.

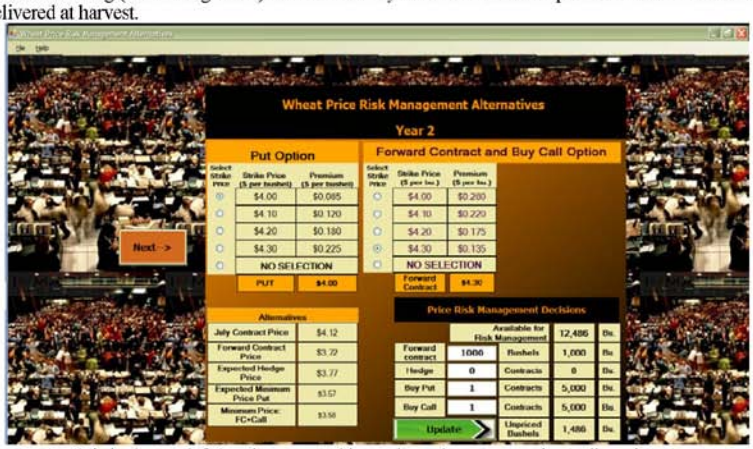
"Gross Return": the sum of the gain or loss from each marketing alternative

"Variable Costs": the total cash costs required to produce the stocker cattle

"Net Return": "Gross Return" minus "Variable Costs"

- Click Next--> to go to Step 2-17 - Screen 2-16. **"Wheat Price Risk Management Alternatives"**

Step	Screen	Screen Name and Instructions
2-17	2-16	**"Wheat Price Risk Management Alternatives Year 2"** These marketing (risk management) alternatives may be used to establish prices for wheat that will be delivered at harvest.



"Put Option", is in the top left-hand corner and is used to select a put option strike price.

- Click the desired "Strike Price" button in the "Select Strike Price" column to select a strike price and premium. The resulting minimum price appears in the Alternatives section Expected Minimum Price Put | $3.57. Selecting a put strike price and premium has no impact on the model until the number of contracts is completed in the "Price Risk Management Decisions section".

"Forward Contract and Buy Call Option", is in the top right-hand corner and is used to select a call option strike price. The strike price selected is used with the "Forward Contract Price" to establish a minimum price. Forward Contract Price | $3.72

- Click the desired "Strike Price" button in the "Select Strike Price" column to select a call option strike price. The resulting minimum price appears in the "Alternatives" section Minimum Price: FC+Call | $3.58. Selecting a call premium has no impact on the model until the number of contracts in "Price Risk Management Decisions section" is completed.

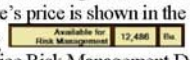
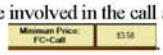
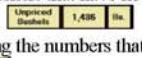
"Alternatives" is in the bottom left-hand corner and shows prices to use in the selection of the marketing alternatives. The information shown here is used when selecting the Price Risk Management Decisions.

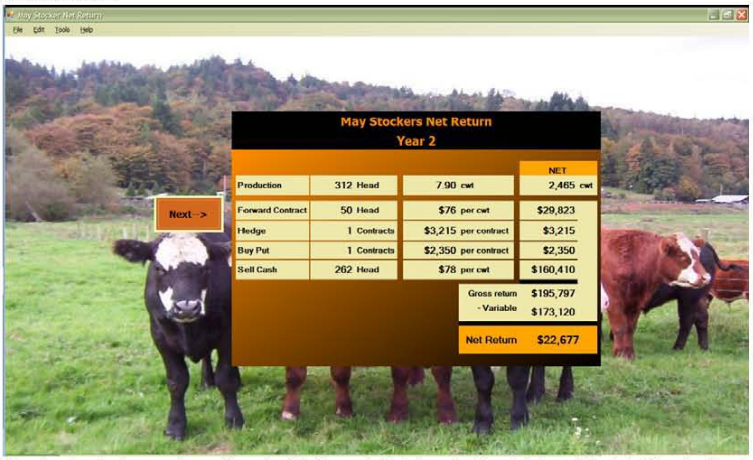
"July Contract Price": the Kansas City Board of Trade July wheat contract price. July Contract Price | $4.12

"Forward Contract Price": the price for which wheat may be forward contracted for June delivery Forward Contract Price | $3.72

"Expected Hedge Price": the price that is expected if wheat is sold using a July wheat contract and the cash market The "Expected Hedge Price" is determined by the model by subtracting the basis Expected Hedge Price | $3.77 from the July wheat contract price.

"Expected Minimum Price Put:" the lowest net price that is expected for the wheat. If the July wheat contract price is higher than the selected premium, the net price received will be higher than the expected minimum price. The net price is calculated by subtracting the premium Select Strike Price | Strike Price ($ per bushel) | Premium ($ per bushel) | $4.00 | $0.085 from the June harvest wheat price and adding any put option value. The put will have value if the July wheat contract price is less than the strike price. Expected Minimum Price Put | $3.57

Step	Screen	Screen Name and Instructions
		"Minimum Price FC + Call:"  the lowest possible net price at which the wheat will be sold. The net price is calculated by subtracting the selected call option premium from the forward contract price. If, at harvest, the July wheat contract price is above the selected call option strike price, the difference is added to the June (harvest) cash price to determine the net price.  **"Price Risk Management Decisions"** may be used to select marketing alternatives that will set prices that will be received for the harvested wheat. Each alternative's price is shown in the Alternatives section. **Bushels "Available for Risk Management Decisions"**  The number of bushels shown in column 4 of the Price Risk Management Decisions section. The bushels "Available for Risk Management" is the average yield for the last 10 years multiplied by the number of harvested acres divided by 2 because only ½ of the Expected Production can be priced before harvest. **"Forward Contract"** ➢ From the available bushels enter number of bushels you want to  ➢ Click  and the number of bushels forward contracted appears in the column four. The forward contracted bushels will be sold for the  shown in the Alternatives section. **"Hedge"** ➢ Enter the number of contracts to be sold.  For each contract, 5000 bushels are subtracted from bushels "Available for Risk Management". You are guaranteed this price  . ➢ Click  and the number of bushels that are involved in the hedge appear in column four in the Price Risk Management Decisions section. **"Buy Put"** ➢ Enter the number of put option contracts that will be bought.  For each contract, 5000 bushels will be subtracted from bushels "Available for Risk Management". ➢ Click  and the number of bushels that are involved in the put appear in column four.  **"Buy Call"** ➢ Enter the number of call option contracts that will be bought.  For each call option contract, 5000 bushels will be forward contracted and subtracted from ""Available for Risk Management". ➢ Click  and the number of bushels that are involved in the call appears in column four in the Price Risk Management Decisions section.  **"Unpriced Bushels":** the number of bushels that have not been forward contracted, hedged, or covered with a put or a call option.  The selections may be changed by changing the numbers that were entered in Price Risk Management Decisions section and clicking  . ➢ Click  to go to Step 2-18 - Screen 2-17. **"May Stockers Net Return"**

Step	Screen	Screen Name and Instructions
2-18	2-17	**"May Stockers Net Return Year 2"** No data or input is required for this screen. This screen appears if you selected May Stockers in the decision sheet on Screen 14. Total production and the gross return generated by each selected management alternative, the variable costs, and the net return are shown.  **"Production":** the number of head sold, the weight in hundred-weight, and the total hundred-weights sold **"Forward Contract":** the number of head sold, the forward contract price and the gross return from the forward contracted stockers (number of stockers multiplied by the price per cwt multiplied by the per head weight) **"Hedge":** the gain or loss from the futures transaction The number of May Feeder Cattle futures contracts that were sold, the gain or loss from each contract, and the total return from the futures transactions are shown. Note that the stockers for which the price was protected with a hedge are sold on the cash market (contracts multiplied by gain or loss). **"Buy Put":** the gain or loss from the put option traction The number of May Feeder Cattle put option contracts that were sold, the gain or loss from each contract, and the total return from the put option transactions are shown (number of contracts multiplied by the gain or loss). **"Sell Cash":** the number of stockers sold on the cash market, the price received per cwt, and the total return from the cash sale (number of stockers multiplied by cwt/head multiplied by price) **"Gross Return":** the sum of the gain or loss from each marketing alternative **"Variable Costs":** the total cash costs required to produce the stocker cattle **"Net Return":** "Gross Return" minus "Variable Costs" ➢ Click Next-> to go to Step 2-19 - Screen 2-18. **"Wheat Harvest Net Returns – June"**

Step	Screen	Screen Name and Instructions
2-19	2-18	**"Wheat Harvest Net Returns – June Year 2"** This screen shows how much wheat was produced, how much wheat is left to sell, the returns from the April marketing decisions, the variable costs, and the net return based on the amount of wheat sold.

"Forward Contract": the number of bushels forward contracted in April, the per-bushel forward contract price, and the gross return. The forward contracted bushels include both forward contracted bushels and the bushels that were forward contracted when call option contracts were purchased.

"Hedge": the number of 5,000 bushel contracts, the gain or loss per contract, and the gross return from the contracts. **Note** that with a hedge, the wheat has not been sold. The return is the grain or loss from the futures contract sell in April and the purchase in June.

"Put Option": the number of 5,000 bushel contracts, the gain or loss per contract, and the gross return from the contracts. **Note** that with a put option, the wheat has not been sold. The return is the grain or loss from the put option contract purchased in April and sold in June. "Call Options": the number of 5,000 bushel contracts, the gain or loss per contract, and the gross return from the call option contracts. The return is the grain or loss from the call option contract purchased in April and sold in June plus the forward contracted wheat.

"Sell Wheat": The price at which participants may sell wheat by entering the number of bushels to be sold. Sell Wheat 5000 Bushels. The maximum number of bushels that may be sold is shown in the top right-hand corner of this screen ("Stored Wheat"). The "Stored Wheat" number changes after Update is clicked.

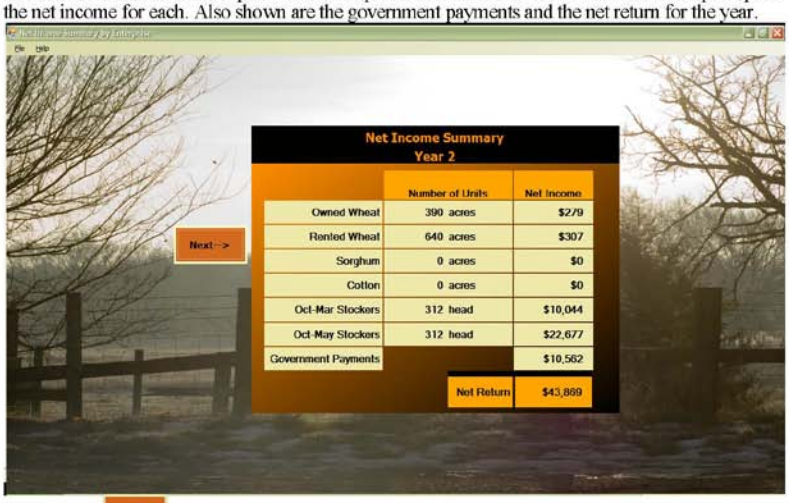
"Gross Return": the income generated from all of the marketing alternatives before the crop insurance is added or subtracted and before the variable costs are subtracted

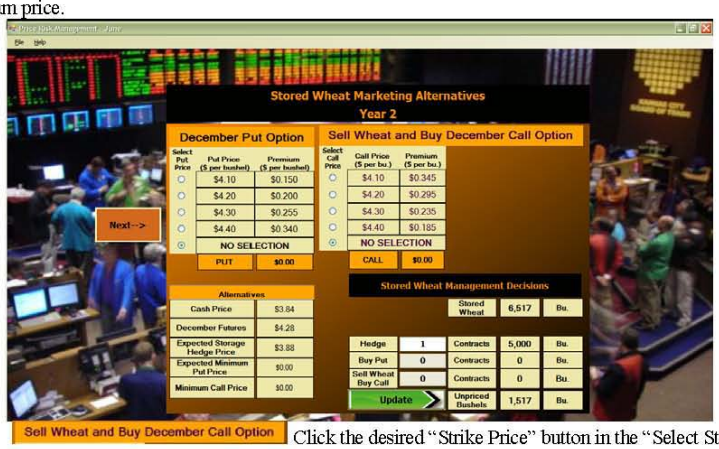
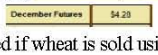
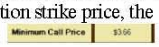
"Crop Insurance": the insurance premium that was paid, any payoff from the insurance policy, and the net income (gain or loss) generated from the policy

"Variable Costs": the "out-of-pocket" costs required to produce and harvest the wheat

"Net Return": "Gross Return" plus or minus the insurance return minus the "Variable Costs"

- Enter the number of bushels you want to sell Sell Wheat 5000 Bushels and click Update.
- After Update is clicked, Next-> and Reset appear. To change the number of bushels sold in the box that appears next to "Sell Wheat", click Reset, make the change, and click Update.

Step	Screen	Screen Name and Instructions
2-20	2-19	**"Net Income Summary"** No data or input is required for this screen. If all the wheat is sold at harvest and there are no Sorghum or Cotton Acres, this screen appears. This screen shows all the available production enterprises and the number of units of each enterprise plus the net income for each. Also shown are the government payments and the net return for the year.  **Net Income Summary Year 2** Next-> Number of Units / Net Income Owned Wheat 390 acres $279 Rented Wheat 640 acres $307 Sorghum 0 acres $0 Cotton 0 acres $0 Oct-Mar Stockers 312 head $10,044 Oct-May Stockers 312 head $22,677 Government Payments $10,562 Net Return $43,869 ➢ Click Next-> to go to Step 2-26 – Screen 2-25 **"Cash Flow and Net Worth"** ELSE If there is stored wheat, sorghum acres, and cotton acres. ➢ Click Next-> to go to Step 2 - 21 – Screen 2 – 20 **"Stored Wheat Marketing Alternatives"** ELSE If all wheat is sold at harvest and there is sorghum acres, and cotton acres. ➢ Click Next-> to go to Step 2 - 24 – Screen 2 - 23. **"Grain Sorghum Net Return"**
2-21	2-20	**"Stored Wheat Marketing Alternatives Year 2"** This screen appears if some or all of the wheat is not sold and is stored. This screen is similar to Screen 16, " Wheat Price Risk Management Alternatives" (RMA Wheat)  **Stored Wheat Marketing Alternatives Year 2** December Put Option Sell Wheat and Buy December Call Option Select Put Price / Put Price ($ per bushel) / Premium ($ per bushel) $4.10 $0.150 $4.20 $0.200 $4.30 $0.255 $4.40 $0.340 NO SELECTION PUT $0.00 Select Call Price / Call Price ($ per bu.) / Premium ($ per bu.) $4.10 $0.345 $4.20 $0.295 $4.30 $0.235 $4.40 $0.185 NO SELECTION CALL $0.00 Alternatives Cash Price $3.84 December Futures $4.28 Expected Storage Hedge Price $3.88 Expected Minimum Put Price $0.00 Minimum Call Price $0.00 Stored Wheat Management Decisions Stored Wheat 6,517 Bu. Hedge 0 Contracts 0 Bu. Buy Put 0 Contracts 0 Bu. Sell Wheat Buy Call 0 Contracts 0 Bu. Update Unpriced Bushels 0 Bu.

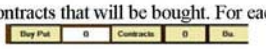
Step	Screen	Screen Name and Instructions
		"December Put Option", (top left-hand corner) is used to select a put option strike price. ➢ Click the desired "Strike Price" button in the "Select Strike Price" column to select a strike price and premium. The resulting calculated minimum price will appear  in the Alternatives section. Selecting a put premium has no impact on the model until the number of contracts in in the Price Risk Management Decisions section is completed. **"Sell Wheat and Buy December Call Option"** is in the top right-hand corner and is used to select a call option strike price. The strike price selected is used with the forward contract price to establish a minimum price.  ➢  Click the desired "Strike Price" button in the "Select Strike Price" column to select a call option strike price. The resulting calculated minimum price appears  . Selecting a call premium has no impact on the model until the number of contracts is completed. **"Alternatives"** is in the bottom left-hand corner and shows prices to use in the selection of the marketing alternatives. The information shown in this quadrant is used when making Stored Wheat Management Decisions. **"Cash Price":** the cash price for which the wheat may be sold. When call option contracts are purchased, the wheat is sold for cash. Remember that in April, when the wheat was still in the field, a forward contract price was used with the call option.  **"December Futures":** the December wheat contract price.  **"Expected Storage Hedge Price":** the price that is expected if wheat is sold using a December wheat contract and selling the wheat on the cash market in November. The "Expected Storage Hedge Price" is determined by the model by subtracting the basis (not shown) from the December wheat contract price.  **"Expected Minimum Put Price":** the lowest net price that is expected for the wheat. If the December wheat contract price is higher than the selected "Strike Price", the net price received will be higher than the expected minimum price. The put option will have value if the December wheat contract price is less than the strike price.  **"Minimum Call Price":** the lowest possible net price that the wheat will be sold The net price is calculated by subtracting the selected call option premium from the forward contract price. If, in November, the December wheat contract price is above the selected call option strike price, the difference is added to the "Minimum Call Price" to determine the net price.  **"Stored Wheat Management Decisions"** (lower right-hand corner) is used to select the alternatives for selling wheat. Each alternative's price is shown in the "Alternatives" section.

Step	Screen	Screen Name and Instructions
		"Stored Wheat": the number of bushels of wheat in storage. 

"Hedge"

- Enter the number of contracts to be sold. For each contract, 5000 bushels are subtracted from "Stored Wheat". 

"Buy Put"

- Enter the number of put option contracts that will be bought. For each contract, 5000 bushels are subtracted from "Stored Wheat". 

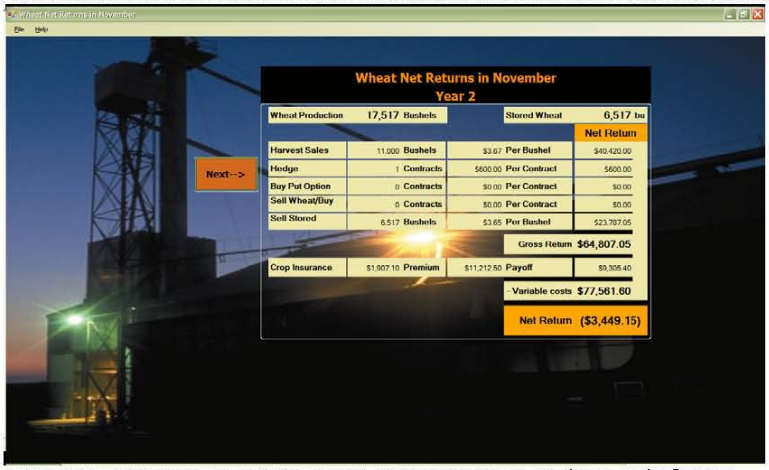
"Sell Wheat Buy Call"

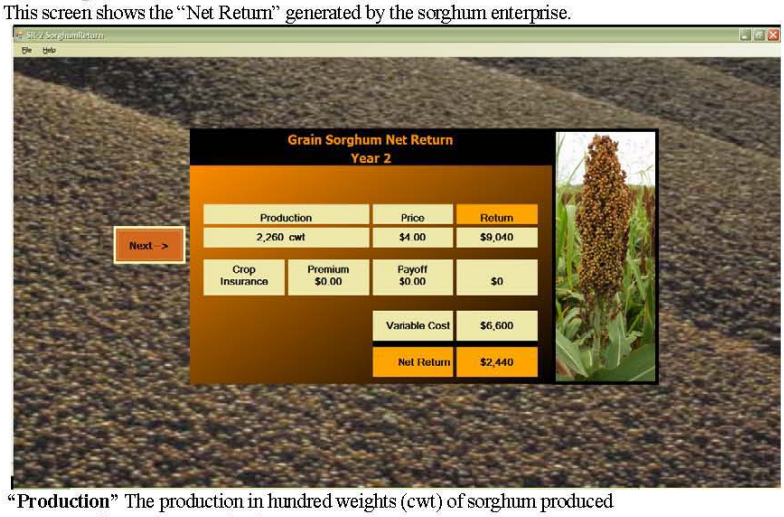
- Enter the number of call option contracts that will be bought. For each call option contract, 5000 bushels will be sold and subtracted from "Stored Wheat" and "Unpriced Bushels". The sold wheat will be subtracted from "Stored Wheat" and the gross return from the sale added to "Harvest Sells" on Screen 21 (Step 22). 
- Click the  button to enter your selection in the model.

Your selections may be changed by changing the numbers that were entered in Stored Wheat Management Decisions section and clicking  .

 appears after  is clicked.

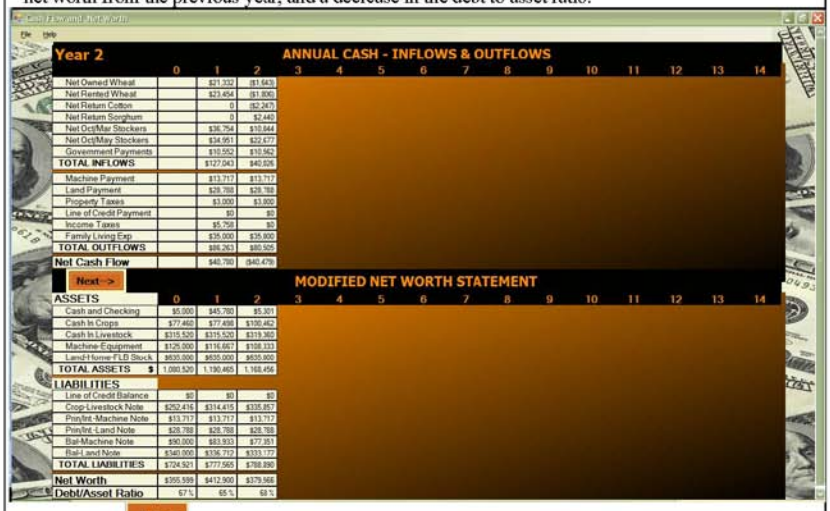
Click  to go to Step 2-22 - Screen 2-21. **"Wheat Net Returns in November"**

Step	Screen	Screen Name and Instructions
2-22	2-21	**"Wheat Net Returns in November" For Year 2** No data or input is required for this screen. All stored wheat is sold in November. This screen shows the returns for each stored wheat alternative.  **Total "Wheat Production" and the amount of "Stored Wheat"** are shown on the first row. **"Harvest Sales"** The bushels of wheat sold, the price of the wheat received, and the gross return for wheat sold at harvest are shown. **"Hedge"** The number of December futures contracts sold in June and the net return from the hedge transactions (sell futures contract in June and buy the futures back in November) **"Buy Put Option"** The number of December futures contracts sold in June and the net return from the hedge transactions (Buy a December Put Option contract in June and sell it back in November) **"Sell Wheat/Buy"** The number of call option contract(s) purchased and the net return from buying the call options in June and selling the call Option contract(s) in November **"Sell Stored"** All stored wheat is sold at the November cash price. **"Gross Return":** the sum of the revenue generated from all wheat marketing alternatives **"Crop Insurance":** the insurance premium that was paid, any payoff from the insurance policy, and the net income (gain or loss) generated from the policy ➢ Click Next--> to go to Step 2-23 - Screen 2-22. **"Grain Sorghum Net Return"**

Step	Screen	Screen Name and Instructions
2-23	2-22	**"Grain Sorghum Net Return Year 2"** This screen shows the "Net Return" generated by the sorghum enterprise.  **"Production"** The production in hundred weights (cwt) of sorghum produced **"Price"** Dollars per cwt received **"Return"** Production multiplied by the price produces the Gross Return from raising sorghum **"Crop Insurance"** The return from purchasing insurance **"Premium"** The dollars paid to insure the sorghum **"Payoff"** The amount paid to the producers for loss of sorghum income due to low yields and/or price **"Return"** The payoff minus the premium and is the net return from the insurance purchase. **"Variable Cost"** The "out-of-pocket" costs (seed, fertilizer, fuel, etc.) or the dollar amount required to plant and harvest the Sorghum. Variable costs do not include land or equipment costs. **"Net Return"** Gross Return plus any gain or loss from the Crop Insurance minus the Variable Cost Click Next--> to go to Screen Step 2-24-Screen 2-23. **"Cotton Net Return"**

Step	Screen	Screen Name and Instructions
2-24	2-23	**"Cotton Net Return For Year 2"** This screen shows the "Net Return" generated by the cotton enterprise.  **"Production"** The production in hundred weights (cwt) of cotton produced **"Price"** Dollars per cwt received **"Return"** Production multiplied by the price produces the Gross Return from raising cotton **"Crop Insurance"** The return from purchasing insurance **"Premium"** The dollars paid to insure the cotton **"Payoff"** The amount paid to the producers for loss of cotton income due to low yields and/or price **"Return"** The payoff minus the premium and is the net return from the insurance purchase. **"Variable Cost"** The "out-of-pocket" costs (seed, fertilizer, fuel, etc.) or the dollar amount required to plant and harvest the cotton Variable costs do not include land or equipment costs. **"Net Return"** Gross Return plus any gain or loss from the Crop Insurance minus the Variable Costs ➢ Click Next--> to go to Step 2-25 - Screen 2-24.

Step	Screen	Screen Name and Instructions
2-25	2-24	**"Net Income Summary Year 2"** No data or input is required for this screen. If all the wheat is not sold, and there are cotton and sorghum acres, this "Net Income Summary" screen appears. This screen shows all the available production enterprises, the number of units of each enterprise, and the net income for each. Also shown are the government payments and the "Net Return" for the year.  ➢ Click Next-> to go to Step 2-26 - Screen 2-25.

Step	Screen	Screen Name and Instructions
2-26	2-25	**"Cash Flow and Net Worth"** Once the calendar year is complete, this screen is updated allowing for the comparison of this year's cash-flow and net worth changes. The desired indicators are a positive net cash flow, an increase in the net worth from the previous year, and a decrease in the debt to asset ratio.  ➢ Click Next--> to go to Screen 2-5 to begin Year 3.
		

APPENDIX G-Student Questionnaire

Personal Code:_____

College of Agricultural Science & Natural Resources
Oklahoma State University

FARRM Curriculum—Questionnaire General Agricultural Economics Information

Please select the response which best suits you:

1. Gender of Student:
   - ☐ Male
   - ☐ Female

2. Grade Classification:
   - ☐ Eighth Grade
   - ☐ Ninth Grade—Freshmen
   - ☐ Tenth Grade—Sophomore
   - ☐ Eleventh Grade—Junior
   - ☐ Twelfth Grade— Senior

3. How many years have taken agricultural education classes?
   List:_____

4. Have you been involved with the FFA chapter?
   - ☐ Yes
   - ☐ No

   If yes, list the number of years involved in FFA:_____

   If yes, are you still involved with the FFA chapter?
   - ☐ Yes
   - ☐ No

5. Have you been involved in 4-H?

   ☐ Yes

   ☐ No

   List the number of years involved in 4-H:_____

   If yes, are you still involved with 4-H?

   ☐ Yes

   ☐ No

6. Where do you live?

   ☐ In town residence - no garden or livestock animals

   ☐ In town residence - with garden and/or livestock animals

   ☐ Rural residence - no crops or livestock animals

   ☐ Rural residence - with garden and/or livestock animals, but not for farming

   ☐ Rural residence - on a working farm

7. Have you had any lessons on agricultural economics?

   ☐Yes

   ☐No

8. Have you visited the Oklahoma State University (OSU) Web site?

   ☐Yes

   ☐No

9. Have you ever visited the OSU College of Agricultural Sciences and Natural Resources Web site?

   ☐Yes

   ☐No

10. Have you ever visited the OSU Department of Agricultural Economics Web site?

☐Yes

☐No

11. Have you ever participated in the Agricultural Economics Career Development Event (CDE)?

☐Yes

☐No

12. Have you ever used Fact Sheets produced by the OSU Agricultural Economics department?

☐Yes

☐No

13. Have you ever sought information from any of the following publications (Check all that apply)?

☐High Plains Journal

☐Feedstuff

☐Southwest Farm Press

☐Farm Journal

☐None of the above

14. Have you ever watched the agricultural economics segments on *SunUp* with Dr. Anderson or Dr. Peel?

☐Yes

☐No

If yes, how often?

Never	Rarely	Sometimes	Often	Weekly
☐	☐	☐	☐	☐

15. Have you ever watched any agricultural economics segments on *Oklahoma Horizons*?

☐Yes

☐No

If yes, how often?

Never	Rarely	Sometimes	Often	Weekly
☐	☐	☐	☐	☐

Please indicate which response BEST describes your opinion regarding each statement below:

16. If asked by my instructor, I could correctly define agricultural economics.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
☐	☐	☐	☐	☐

17. I have knowledge about industries associated with agricultural economics.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
☐	☐	☐	☐	☐

18. I can identify careers associated with agricultural economics.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
☐	☐	☐	☐	☐

19. I make agricultural economics related decisions on a monthly basis.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
☐	☐	☐	☐	☐

20. I am interested in pursuing a career associated with agricultural economics.

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
☐	☐	☐	☐	☐

VITA

Kathryn Jill Anderson

Candidate for the Degree of

Doctor of Philosophy

Dissertation: ASSESSING THE IMPACT OF AN AGRICULTURAL ECONOMICS GAME IN SECONDARY AGRICULTURAL EDUCATION CURRICULUM: THE FARM AND RANCH RISK MANAGEMENT (FARRM) GAME

Major Field: Agricultural Education

Biographical:

Personal Data: Born in Stillwater, Oklahoma on October 3, 1977, daughter of Kim and Kathryn Anderson, married July 26, 2003, wife of Dan Rucker, mother of Michael Grace "Gracie" Rucker.

Education: Graduated from Stillwater High School, Stillwater, Oklahoma in May 1996; received Bachelor of Science in Business Administration in Marketing from Oklahoma State University, Stillwater, Oklahoma in December 2000; received a Master of Business Administration from Oklahoma State University from Oklahoma State University, Stillwater, Oklahoma in December 2003. Completed the requirements for the Doctor of Philosophy Degree in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in (July 2010).

Experience: Instructor, Department of Agricultural Education, Communications, and Leadership, Oklahoma State University; Graduate Teaching Associate, Department of Agricultural Education, Communications, and Leadership, Oklahoma State University; Assistant to the Vice President for Student Affairs, Office of the Vice President for Student Affairs, Oklahoma State University; Financial Services Adviser, Stillwater National Bank, Stillwater, Oklahoma.

Professional Memberships: American Association for Agricultural Education; Association for Communication Excellence in Agricultural Sciences and Natural Resources; North American Colleges and Teachers of Agriculture.

Name: Kathryn Jill Anderson Date of Degree: July, 2010

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: ASSESSING THE IMPACT OF AN AGRICULTURAL ECONOMICS GAME IN SECONDARY AGRICULTURAL EDUCATION CURRICULUM: THE FARM AND RANCH RISK MANAGEMENT (FARRM) GAME

Pages in Study: 211 Candidate for the Degree of Doctor of Philosophy

Major Field: Agricultural Education

Scope and Method of Study: This study sought to determine if the use of the Farm and Ranch Risk Management (FARRM) game and associated curriculum improved student awareness about the field of agricultural economics and increased the understanding about agricultural economics concepts among selected Oklahoma secondary agricultural education students. A quasi-experimental, non-equivalent control group design was used in this study. The data was analyzed using one-way ANOVA, correlations, frequencies, percentages, means, standard deviations, and eta squared.

Findings and Conclusions: Characteristics of the selected student participants indicated participants were male (58.9%) and the majority (65.1%) reported living in rural residences. All participants were enrolled in a high school agricultural education class and were classified as freshmen (28.8%), sophomores (20.0%), juniors (25.0%), and seniors (22.5%). Participants had been enrolled in agricultural education classes for an average of 2.74 years and were involved with FFA (77.5%). Participants reported limited exposure to agricultural economics with less than half (42.5%) having prior lessons in agricultural economics. Moreover, participants reported an inability to correctly define agricultural economics (M = 3.12), identify careers associated with agricultural economics (M = 2.95), make monthly agricultural economic decisions (M = 2.78), and identify industries associated with agricultural economics (M = 2.86). One-way ANOVA analyses were conducted on each of the lesson areas: introduction to agricultural economics (p = .000*), resource use (p = .101), marketing tools one (p = .118), marketing tools two (p = .308), and financial statements (p = .001*). Significance was detected at an *a priori* determined alpha of .05 for the lessons on the introduction to agricultural economics and financial statements. All effect sizes were classified as small, excepted for the effect size for the introduction to agricultural economics ($\acute{\eta}^2$ = .165), which is classified as a large effect size.

ADVISOR'S APPROVAL Dr. D. Dwayne Cartmell