
Teaching Agricultural Economics with an Experiential Learning Tool: The "Packer-Feeder Game"

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Abstract

Teaching abstract concepts in agricultural economics is challenging for instructors and often a problem for students. An experiential learning tool used to teach economic and business principles through an experimental fed cattle market reduces this abstraction. Observations on student learning and instructor teaching experiences are discussed. Experiential learning tools offer a strong complement to agricultural marketing, price theory, and agribusiness management courses. They offer an inductive learning alternative to traditional deductive coursework. Experiential learning tools also teach interpersonal communication and conflict resolution skills. These are topics which are not found in most Colleges of Agriculture curricula.

Introduction

Teaching agricultural economics presents unique challenges. Many topics are abstract and intangible (Hudson *et al.*). Students who experience applications better understand principles and concepts (French and Turner). Similar observations have been made by economics and business teachers (Beckman; Powers; Walker; ABSEL). The *Fed Cattle Market Simulator*, also called the "Packer-Feeder Game," is a role-playing exercise designed to have students experience marketing, price theory, agribusiness, and other agricultural economics topics. The experience integrates classroom learning with each student's communication and analytical skills. The role playing experience leads to a deeper and more enduring understanding of accumulated discipline knowledge.

The *Fed Cattle Market Simulator* was developed as an *experimental economics* research tool. The developers are interested in the effects of market institutions on the economic performance of fed cattle markets. An experimental economics tool was assessed to be a good method for studying these data-poor issues. When a basic version of the market simulator was made operational, a common-time Independent Study course was offered to test the computer por-

tion of the simulator. The student reaction to the class was unexpected. The simulated market did not resemble an orderly experiment — controlled chaos is a more accurate description. Not only did the game generate a high level of enthusiasm and involvement, assignments and discussions with students suggested a large amount of learning about economic and business concepts took place. The developers plan to use the simulator to conduct economic experiments, but its use as a experiential learning tool may be the most important contribution.

The purpose of this paper is to describe the Packer-Feeder Game (so named by the students), summarize the students' educational experience and the instructors' teaching experience, and explain how experiential learning tools can play an important role in the agricultural economics curriculum. Courses with significant experiential learning components can complement existing courses and fill a current void in curricula.

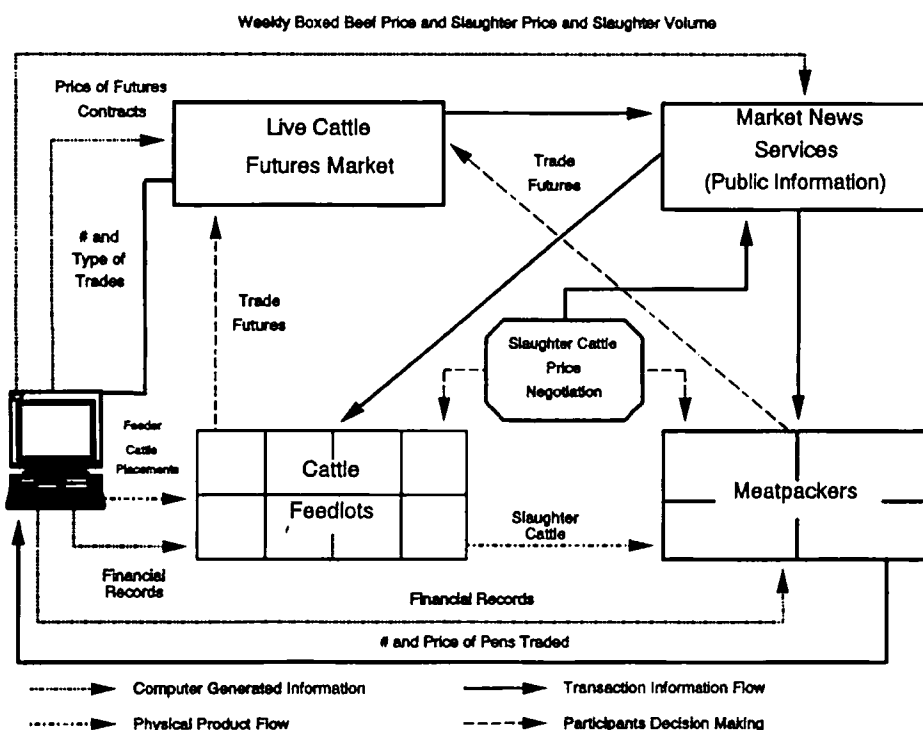
Description and Formal Course Topics

The Packer-Feeder Game was developed by members of the Department of Agricultural Economics at Oklahoma State University with support from the College of Agricultural Sciences and Natural Resources and the USDA/CSRS Higher Education Challenge Grant Program. Development began in 1990, and to date the market simulator has been used in five semester-long undergraduate courses (typical enrollment of 36 students), seven two-day seminars with personnel from a national meatpacker and feedlot operation, one two-day seminar with Masters students, and several half-day seminars with university and high school instructors, FFA and 4-H students, cattlemen, professional economists, and Polish agribusiness leaders. Most of the following discussion will refer to the semester-long courses, which met once per week for two hours. However, with the exception of the game length, the same comments apply to the seminars.

The Packer-Feeder Game creates a market for fed cattle in a classroom setting. Students and adult learners, hereafter referred to as participants, role play as feedlot marketing managers and meatpacker order buyers. The market simulates cash transactions between eight feedlots and four meatpacking plants, and futures transactions for these 12 teams and four speculators. A schematic of the game is provided in Figure 1. Feedlot marketing managers sell cattle from

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Figure 1 Schematic of the Fed Cattle Market Simulator.



their feedlots, and meatpacker order buyers purchase cattle for eventual sale as boxed beef. All teams have the ability to hedge or speculate by trading of live cattle futures contracts. The physical and financial portions of the simulator were developed with a high degree of industry realism. Thus, some basic details of the feedlot and meatpacking plant cost schedules and animal biology are taught to participants the first two class periods or the first seminar hour.

After an orientation, participants are divided into three-member teams and role playing begins. The teams move periodically from managing feedlots to managing meatpacking plants. Each participant experiences both sides of the market. Financial records are kept for each team as they change roles, and competition is developed for the best profit record. Participants experience different degrees of market complexity. Role playing begins with cash-only trading. Forward cash contracting is introduced after three class meetings, and live cattle futures trading after three additional meetings.

The time reference in the market is one week, which is simulated in a 12-minute real-time cycle. During the first eight minutes, cash cattle trading occurs between feedlots and packers. Participants role playing as order buyers usually approach feedlot managers. Each feedlot has a stack of paper cards representing cattle on a "show list" — those cattle available for sale. Prices are negotiated and sales take place within the range of available weights. When trades are completed, the transaction card is turned over to the instructors to be scanned into the computer portion of the game. A light board provides continuous cash market price and volume information. The 12 teams and four speculators also make

live cattle futures contract trades during the eight-minute session. Futures trades are handled in the same manner as cash trades — participants complete futures transaction forms and the forms are scanned into the computer. The futures market component of the computer program "makes the market" — will trade with any participant during the game week. However, futures transactions are "at-the-market" orders, so when participants sell (buy) contracts this pressures futures prices down (up). The light board also provides continuous futures contract price and volume information. After eight minutes, the trading week is halted. During the remaining four minutes of the cycle, the computer program prints summaries of market information which are posted on the blackboard and confidential firm financial reports which are provided to each team. During this information processing phase or "weekend," each team receives new cattle to be placed on its show list, updates its break-even calculations, forecasts supplies, and makes short-run marketing strategy adjustments.

Market transactions are incorporated into two economic models in the computer program. The computer feedback at the end of each 12-minute period reports the boxed beef price received by all packers for meat sold. The boxed beef price is determined from the total number and weight of cattle sold by feedlots to packers each week through a boxed beef demand schedule. Feedlots are informed of changes in the cost of feeding animals and cost of purchasing feeder cattle. Feeder cattle prices paid by feedlots change based on a margin between the participant-determined average fed cattle price and computer-controlled feed costs. The number of feeder cattle purchased by feedlots is controlled by the instructors so that a wide variety of market conditions occur during the semester. Supply conditions are initially stable, move to large numbers, then to small numbers, and finally return to normal numbers of cattle. Decisions by participant teams determine the direction of market prices. A key element of the participant experience is the realization that their collective action determines the market environment. They soon understand that to forecast the market environment they must understand the economic structure of the market and assess their competitors' behavior.

All transactions are conducted "face to face," emphasizing interpersonal communication and negotiation skills. Participants also learn to delegate and accept responsibilities within their team. They focus on collecting and analyzing informa-

tion and developing and implementing business strategies. Personality and communication skills significantly influence the success of a team, as does an understanding of economic concepts and business principles.

At selected points during the exercise (about every three-to-four months of game time), data summaries are presented to participants in the form of outlook speeches. Graphic displays of market relationships are presented and discussed. For example, scatter plots of cattle numbers related to boxed beef and fed cattle prices are presented. Cattle on feed inventory levels are analyzed relative to price levels (see Figure 2). Boxed beef and fed cattle price spread patterns are displayed. Aggregate profits earned by cattle feeders are compared with those of meatpackers. Finally, the current situation and its implications for future periods are discussed. Numerous relationships from economic theory can be drawn out in these presentations and used to analyze the market and its potential future path. Participants respond to presentations in two ways. First, the information presented gives them food for thought in modifying their strategies. Second, students have commented that the presentations give them a deeper understanding of theoretical principles they have learned in other classes because they have experienced the concept. For example, the data in Figure 2 were generated by the students. The scatter plot shows the different price and quantity combinations that occurred in the market. The interconnecting lines show the path of the market through time. The negative slope underlying the scatter plot illustrates the fundamental concept of demand — more product can only be marketed at lower prices. The student generated demand curve is summarized with a regression line which is plotted on Figure 2. The concept of a demand curve is used repeatedly in agricultural economics courses and can be taught successfully in a lecture environment. However, students respond with a vested interest if they are shown this figure as it develops during the semester. Knowing the shape of the demand curve underlying the market and future cattle supplies can help them forecast future prices. The fact that the price and quantity realizations are scattered around the underlying demand curve illustrates the effect of human behavior on markets, and illustrates how bargaining power can vary between the buying and selling sides of the market. Figure 2 illustrates, and students communicated, that they understood that meatpackers (feedlots) had more bargaining strength in a market where the supplies of cattle were increasing (decreasing). Market price were below (above) the demand curve during these times. These price dynamics concepts are exceptionally difficult to communicate in a lecture course.

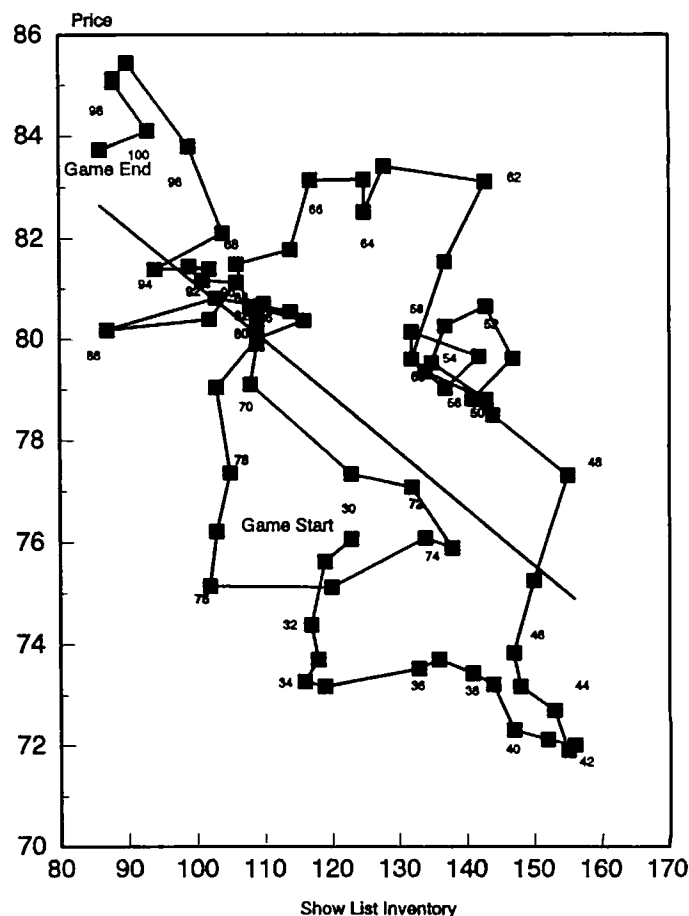
Student performance is evaluated based on a series of writing assignments. For example, students are asked to describe trading strategies, successes with strategies, and adjustments that have been made over time. Students are asked to describe their relationships with competitors and why certain business relationships have evolved. In addition, they describe why certain market events have occurred. For example, the class was asked to describe what caused a large increase in fed cattle prices between game weeks 44 and 48 and how the

feedlots were able to improve their profits relative to meatpackers when the opposite was true a few weeks before. The objective of these questions is to encourage students to reflect upon what they and the market environment are doing. Information from these assignments is used in outlook discussions.

Students are not graded on profit performance, but performance of top and bottom teams is publicized after each four weeks of game time. The best team is given a traveling silver loving cup, and a traveling “silver cow chip” trophy is awarded to the “best supporting” team. Given this publicity, the competitive spirit of students motivates serious participation. The “silver cow chip” trophy has obvious negative connotations and students work hard to move it off their table. Interestingly, the students also do not want to be recognized

Figure 2 Fed Cattle Price and Quantity Scatter Plot and the Underlying Fed Cattle Demand Curve Generated by Students during a Typical Game over a Semester.

The path of the market is indicated by the game week numbers and the starting and ending points. The straight line through the center of the data is the regression line which summarizes demand curve underlying the scatter plot data.



as the best team. The silver cup appears to identify a team as a undesirable trading partner. Teams strive to be profitable, but not conspicuously profitable in the short run, since this may damage long-term relationships and plans.

The equipment needed to operate the game is as follows: PC computer with at least a 80286 micro-processor, 640 kilobytes of RAM, and a 20 megabyte hard drive, laser printer (8 pages per minute), Optical Mark Reader (scanner), two 2 x 27 inch Programmable Message Displays (light boards), and print spool software. The game can be run without the scanner. Information from the transaction cards can be entered into the computer program by hand, although futures transactions must be limited. The game can also be conducted without the light board. A transaction summary is displayed on the computer screen during the eight-minute trading week. This summary can be written and updated on a chalkboard to provide a viable market news service. The game software is a compiled C program. The cash and futures markets are separate programs so that a cash-only game can be conducted. The package contains a program which will print scanner cards (i.e., the paper cattle and futures transactions) on standard 8½ x 11 inch paper. Print spool software is optional, but it makes game operation more efficient.

Teaching and Learning Experiences

Participating students have demonstrated increased understanding about how to make marketing and management decisions. Students better understand the need to develop sound but flexible strategies which are rooted in basic economic principles such as production efficiency, break-even analysis, economies of size, and risk management. They have a better understanding of how fundamental supply and demand affects market price determination, and they see how market psychology affects the dynamics of price discovery. Furthermore, participants respond that even the best formed strategies cannot be realized if they conflict with others in the market and when participants do not have effective communication skills to resolve such conflicts. These are skills which are important to agribusiness employers but which are infrequently included in the agricultural economics curriculum (Litzenberg and Schneider). Further, such realizations about interpersonal dynamics are difficult to achieve in the traditional classroom.

The simulator creates teachable moments. Participants have tried to form cartels, manipulate the futures market, and fail to honor contracts. These teachable moments are events that have been lived by the participants, but have arisen without prompting by instructors. As they occur, they offer case studies in which to discuss why they occurred and the results from their occurrence. Semi-controlled experiments are also conducted. These experiments provide especially good question and discussion material. Experiments include: reducing the number of packers from four to two, eliminating market information (due to government budget cuts), and closing packing plants due to labor strikes.

Participating in the simulated market creates a "need to know," encouraging self-motivation in the student's learning process. Students realize that to compete in the game they must understand break-even calculations, supply and demand structure, and be able to anticipate market changes. The teaching efforts are more effective when a need to know exists.

Another intangible product of the game is a realization of the need for sound business ethics. Participants learn competitor personalities and tactics. They do business with each other in a market setting for 15 class periods. Past experiences with other participants guide future activities and business relationships, even as participants switch roles from feedlot to meatpacker. However, switching roles changes attitudes as participants have the opportunity to see the marketing challenge from the other side of the bargaining table.

The game reinforces the individual/group conflicts that often arise in marketplaces. For example, during periods of large cattle numbers, feedlots, in the game and in the real world, typically face economic losses. As information becomes available that the large supplies scenario is ending, each feedlot has an incentive to hold cattle to heavier weights to capture profits from high prices expected later. However, if each feedlot holds cattle the period of large supplies and losses is prolonged — sometimes to the point of eliminating the potential profits of the small supplies scenario. This individual/group conflict is very effectively revealed and taught through the role playing game.

The following quote is taken from Ladd's discussion of the learning which takes place through the experience of conducting research (p.115). Discovery-learning or experiential learning has the same value regardless of the focus.

Torrance and Meyers mention two of the values of discovery-learning: 'Facts and ideas may be dismissed, forgotten, or discredited; but it is difficult to dismiss, forget, or discredit experience — a truly personal contact with a fact or idea' (p.6). Experiencing a solution provides a deeper more enduring understanding than reading a solution. 'You cannot dismiss [experience] as you can facts. They become part of you . . . because they engage the intellect, the emotions, the spirit, and generate feelings and attitudes' (p.16).

A significant portion of all Packer-Feeder Game participants have essentially this reaction to the experiential learning exercise. Torrance and Meyers found that university students indicated the most desirable teacher characteristic (out of 66) was "encourages me to think." Experiential learning provides students with something valuable: encouragement to think, and provides something of value to them when they are no longer students: enduring understanding (Ladd).

The biggest positive aspect of the course is that it facilitates inductive rather than deductive learning. Lecture courses encourage deductive learning. Instructors many times proceed through rules and examples. Then, students' apply the rules to different examples. This targets students' analytical abilities. Inductive learning involves the synthesis of

wholes from parts: putting together the big picture from an understanding of the pieces. Most frequently, synthesis skills are gained through real-world experiences which can have serious financial ramifications. This market simulator provides a medium for inductive learning and experimentation with different business strategies, without the real-world consequences. Several participants have suggested this is the case when integrating cash and futures trading strategies. At a university, synthesis skills are often targeted with term papers. Our perception is that experiential learning exercises are more successful inductive learning exercises for typical students and more successful for a broader range of students than term papers.

A further benefit of the game is that participants see the value of agricultural economics research. Research questions can be answered after role playing. The game lets students participate in a research-like process. They are subjects in an experiment, but they are also capable of analysis and comment. Conflicting reasonable arguments about market questions can be settled if experiences gained favor one position over another. In this environment, students see that answers to many relevant questions are not necessarily known. Rather, research and accumulated evidence are needed. For example, one question of interest to the beef industry is the effect of forward contracting between meatpackers and feedlots on cash market performance. Simulation participants have informed perspectives and can more intelligently discuss the issue. We have also asked participants if they were better off before or after the introduction of the live cattle futures market. Producer groups often target commodity futures markets as a source of market problems. Even after many participants experience bad outcomes in futures trading, the majority suggest they need the risk transfer and price discovery functions provided by the futures market.

The evolving and building process associated with the experiential learning exercise results in participants moving to higher levels of cognitive learning (Bloom *et al.*). Initially, participants work to *comprehend* the physical and financial mechanics of the trading processes. The format of the simulation (economic competition) requires immediate *application* of these skills. In this game, as in most economic markets, the market is anticipatory or forward looking; the future is uncertain and current actions influence future outcomes. Participants in successful teams *analyze* the market structure and behavior of other participants. As the game progresses and more complex scenarios emerge, the more knowledge about economics and business practices and about human behavior participants *synthesize* and bring to bear on their situation, the more likely their team is to be successful. Further, participants realize deeper learning through their experience. Participants can offer meaningful *evaluation* of market events and broader issues relevant to agricultural markets.

Because the game teaches at different levels it has proven to be effective with a broad variety of audiences. The game environment permits self-paced learning. Some students may be ready to analyze or synthesize knowledge while others are

still comprehending basic facts and applying fundamental skills. Team performance may depend on the team's cognitive level, but advanced teams and less advanced teams are both learning and can function in the game. The "learn at your own level" aspect of the game is illustrated by the fact that it has been used with similar success with high school student groups and groups of college trained industry managers with years of experience.

Summary and Conclusions

The Packer-Feeder Game, originally conceived to be a research tool, has been an effective teaching tool both in and outside the classroom. Repeatedly, students say that even though they have taken other economics, marketing, and management courses, it was through the experiential learning exercise that the concepts were integrated and made meaningful. Likewise, adult learners profess a broader understanding of the marketplace and, in many cases, an understanding of the other side of the market with which they trade in the real world. By reversing the focus of experimental economics from research to teaching, the same methods used in developing controlled experiments to learn about human economic behavior enable participants to learn and experience how markets operate.

The teaching potential of this market simulator is clear. Participants demonstrate increased understanding of many important economics and business concepts. Examples of concepts and principles taught are: production efficiency, break-even analysis, price forecasting using supply and demand information, economies of size, and risk management. Participants also develop interpersonal negotiation and conflict resolution skills, and an appreciation for business ethics. They are exposed to individual/group conflicts and work to develop, implement, and modify decision making strategies. The game creates teachable moments and a need-to-know atmosphere in the classroom. The game teaches inductive learning versus deductive learning. Participants synthesize and "live" economic concepts, suggesting that enduring learning takes place. Finally, participants see the value of applied agricultural economics research.

The market simulator developers are considering how to best use the Packer-Feeder Game in an agricultural economics curriculum. A real strength of the simulator is that it teaches to the deficiency of the student. Students push themselves up to and through higher levels of cognitive learning. Student participants learn the importance of elementary concepts. However, as they learn, the game continues to pose new challenges found in advanced concepts. The simulator could be a stand-alone course or a laboratory section of introductory, marketing, price theory, or agribusiness courses. It could be used to introduce participants to agricultural economics. In that role, it might be effectively used with freshmen or high school students to provide them with information about what agricultural economists do. It could be incorporated into a capstone course for seniors and used to re-

inforce economic principles taught in other courses, challenging them to solve problems in a real-world environment.

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