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**New Technologies
and
Innovations
in
Agricultural Economics
Instruction**

edited by

David L. Debertain
Mary A. Marchant
Stephan J. Goetz

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Experimental Economics Simulator of the Fed Cattle Market

Stephen R. Koontz, Derrell S. Peel, James N. Trapp, and Clement E. Ward*

Teaching agricultural marketing and the associated management decision-making process presents a unique challenge. The uniqueness of this challenge is perhaps best reflected by the ongoing debate regarding whether marketing and management are sciences or arts, or some combination of each. Irrespective of one's position on this subject, the debate illustrates that topics of marketing and management decision-making are characteristically abstract and intangible. To truly understand the principles, procedures, and concepts of marketing and management decision-making, students must experience their application. This experience involves integrating classroom learning with each student's own communication skills, analytical styles and learning capacities. Until this is done, contents of marketing and management classes remain a body of knowledge that has no "spirit," and that knowledge is not fully assimilated.

A survey of agribusiness chief executive officers found training in economic theory, computer skills, and science and technology adequate. However, some of the most desired characteristics, interpersonal skills such as negotiation and public speaking, were among the most lacking in college graduates (Litzenberg and Schneider). An additional issue is that, while demand for marketing and management courses is relatively high, students do not really know if they will appreciate or will be successful in a marketing and management career prior to being employed. One of several teaching objectives includes giving students the opportunity to develop precisely the skills desired by agribusiness employers. Well trained students need an opportunity to experience management

and marketing decision-making in an interpersonal environment.

The objective of this paper is to explain the development and use of the Fed Cattle Market Simulator in the Department of Agricultural Economics at Oklahoma State University.

Experimental Economics, Teaching, and Simulator Origin

Over the past few years, experimental economics has been utilized with increasing success to address research issues (Plott 1982 and 1989). Its purpose is to provide economists with a realistic laboratory to learn about human economic behavior. Traditionally, such an experimental laboratory has been absent in economics, unlike the physical or biological sciences, because of the inability to design and conduct controlled scientific economic experiments in a dynamic and complex business environment. However, progress is being made with the aid of computers to develop experimental laboratories in which to duplicate real-world conditions and to design and conduct controlled experiments (Walker; Powers; Bartlett and King; Beckman). The realism of experimental economics also provides an ideal teaching tool for abstract and intangible topics in agricultural marketing and management (French and Turner; Hudson et al.). 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 can enable students to learn about market systems and how to apply their innate and acquired skills in the marketplace. The Fed Cattle Market Simulator was developed

*The authors are Assistant Professors and Professors in the Department of Agricultural Economics at Oklahoma State University. Senior authorship is not assigned.

as a unique approach to enhance teaching of agricultural marketing and management decision-making skills. Problem-solving skills of students are enhanced by making timely, decisive marketing and management decisions in a complex interactive market-simulated environment.

Over the past 18 months, an effort was undertaken by the authors to develop a market simulator representing the fed cattle and meatpacking industries for use in a special problems class. The effort initially had a research orientation. Rapid structural and behavioral changes in cattle feeding and meatpacking have raised numerous questions relative to the impacts on buyer competition for fed cattle, level and variability of fed cattle prices, and accuracy of reported market prices (Ward 1988). However, researching the impacts is especially difficult, partly because of data unavailability. Data limitations arise from a combination of two factors primarily: (1) relatively few firms, most of which are privately held corporations or subsidiaries of conglomerate corporations which do not publicly release certain data and information, or which only release certain data and information in consolidated reports; and (2) increasing non-cash-price coordination, which results in no market-discovered, publicly-available transaction prices.

Consequently, to conduct research on structural and behavioral changes and their impacts, approaches had to be considered which relied less on publicly-available data. One approach which has been employed successfully in other industries is experimental economics. Experimental economics is a means of capturing the essential behavioral characteristics of market participants in a controlled laboratory environment. Thus, the primary purpose for developing an experimental fed cattle market simulator was to conduct research. However, in developing the simulator, it was quickly discovered that it was an effective classroom teaching tool.

The Fed Cattle Market Simulator was designed incorporating research results describing the current structure of the cattle

feeding and meatpacking sector of the economy; the simulator also incorporates the combined knowledge of the authors of the cattle feeding and meatpacking industries. Further, the market simulator uses the developing country simulator Green Revolution/Exaction (Chapman and Dowler; Chapman and Tsakok) as a guide. Green Revolution/Exaction, developed at the University of Cambridge in conjunction with the World Bank, has been used successfully at Oklahoma State University for several years in classes and with adult learners to teach developing country and agricultural policy issues.

Course and Simulator Description

The Fed Cattle Market Simulator course is taught as a one-hour special problems class and is designed to supplement traditional courses in agricultural marketing and management. The class meets formally for one and a half hours each week during the semester. The first three periods of the course are spent orienting the students with the structure of the cattle feeding and meatpacking sectors as well as with the simulator. The simulator focuses on the marketing transactions between eight feedlots and four meatpacking plants. Thus, some specific details of the feedlot and meatpacking plant cost schedules and animal biological attributes must be taught to the students. However, the main focus of the course is independent of its cattle and beef market setting. The main objective of the course is to teach students to develop and implement sound marketing and management plans. To be effective in this effort, students must independently assimilate information being generated by the simulator and peer competitors that influence their firm's situation, and the aggregate market environment within which they are operating.

After three orientation periods, the remaining class periods are spent experiencing different market scenarios with the simulator. Each scenario becomes increasingly more complex, beginning with cash trading only and progressing to permit forward contracting and then commodity futures contract trading. Throughout all scenarios, students are divided into three-member teams and are moved between

managing feedlots and managing meatpacking plants. Financial records are kept for each team, and competition is developed among teams for the best profit record in the combined management of all firms operated and futures market transactions made.

Each class period simulates eight to ten weeks of real-time activity. One week of real-time is simulated in an eight minute cycle. Trading of cattle between feedlots and packers occurs for five minutes. During the other three minutes, instructors complete the processing of all trades made with a computerized spreadsheet program and provide feedback data to update market information and firm financial reports. During this three-minute information processing period or "weekend," each team updates its own current break-even conditions, supply forecasts, other information sources, and makes adjustments to their marketing strategies. Continuous market information is given by market reporters who observe individual trades and post the price range of cash trades made during the trading period as well as the volume of cattle traded. Prices for forward contracted trades are not reported by these market reporters but are included in the computer-generated average price summary produced and given to each team at the end of each eight-minute cycle. The computer feedback at the end of each eight-minute period also reports the boxed beef price received by packers for their product. The boxed beef price is determined from the total number of cattle sold by feedlots to packers each week through a boxed beef demand schedule. Feedlots are also informed of changes in the cost of feeding animals and cost of purchasing feeder cattle. The number of feeder cattle purchased by each feedlot is controlled by the instructors and not the team so that a wide variety of market conditions will occur during the semester. After four weeks of transactions, an end-of-the-month financial statement is given to each feedlot and packing plant indicating its preceding four week profit performance.

Trading continuity between class periods is ensured by having trading begin in subsequent class periods where the previous class ended. Cash trading, forward contracting, and futures market trading are incorporated sequentially into

the simulation as students' skills and familiarity with the simulation improve. All transactions are conducted "face to face," emphasizing interpersonal communication and negotiation skills. Students also learn to delegate responsibilities within their team. They focus on collecting and analyzing information and developing and implementing business plans and strategies. Personality and communication-negotiating skills significantly influence the success of a team as well as knowledge and understanding of economic concepts, business principles, and good economic common sense.

Computerized record-keeping templates are used to record cash and futures transactions and to develop the firm financial records used by students. Appropriately aggregated transactions data are incorporated into a beef market supply and demand model, and the output used to provide realistic interactive market feedback. For example, the meat price responds to the quantity of animals sold by the teams, and input prices for feedlots change based on an equilibrium margin relationship between fed cattle price, feeder animal cost, feed costs and the number of animals in the feeding system. The decisions by the student teams largely determine the direction of the market. A key element of the experience gained by the students is the realization that their collective action determines the market environment generated by the simulator. They soon comprehend that to forecast the market environment in the future they must understand the physical features of the market and assess what their competitors are planning. The challenge is then to effectively form strategies for this future environment. Thus, a primary benefit of the simulator is in providing students with structured realistic learning experiences through which they can apply economic and business principles learned in other courses.

At selected points during the simulation (about every three to four months of simulated time) summaries of the data generated by the computerized record keeping system are presented to the students. The summaries are presented in the form of market outlook speeches. Graphical displays of key market relationships are developed, presented, and

discussed. For example, scatter diagrams of slaughter levels related to boxed beef and slaughter cattle price are presented. Cattle on feed inventory levels are analyzed relative to price levels. Delays between placements and marketings are observed. Boxed beef and slaughter cattle price spread patterns are displayed. The relationship of profits made by feeders versus packers across the weeks of the simulation are also compared. Finally, discussion of the current situation and its implications for future periods are discussed. Numerous theoretical relationships can be drawn out in these presentations and used to analyze the market and its potential future path. Students respond with vested interest to such presentations in two ways. First, the information presented gives them food for thought in developing future strategies in the simulation. Secondly, students comment that the presentations give them a deeper understanding of theoretical principles they have learned in other classes by providing examples of the theories that they have actually experienced.

Course Testing and Evaluation

Testing and evaluation of students are primarily based on a series of questionnaire-like assignments given to students throughout the semester. For example, students are asked to describe the strategies they are using, the success they are having with their strategy, what adjustments they have made to their strategy over time, and what is working and what is not. Students are also asked to describe their relationship with competitors and why they feel certain business relations have evolved. In addition, they are asked to describe why they believe certain market events have occurred. The objective of these questions is to encourage students to reflect upon what they are doing relative to the simulated environment rather than having them blindly follow a strategy or, even worse, follow no strategy at all. All assignments are graded on three levels: merit, satisfactory, and below expectations. The information gleaned from these assignments is then used for short discussions at the beginning of classes when the assignments are returned.

As time permits during the semester, special experiments are run. These experiments provide especially good question and discussion materials. Experiments conducted have included: reducing the number of packers from four to two, removing all reporting of market information (due to Gramm-Rudman-Hollings like legislation), and labor strikes at packing plants. Figure 1 includes a schematic summary of the market simulator taken from a 1991 Southern Agricultural Economics Association meetings poster developed by the authors. The figure also indicates some experiment findings as well as some general observations on market reactions.

Students are not graded on their profit performance. However, the performance of teams is publicized to the class. Special recognition is given at the beginning of each class in the form of a traveling trophy to the best team and a traveling "cow chip" trophy to the "best supporting" team, i.e. the team that lost the most money on the other side of the market from the best team. Given this small amount of publicity, the natural competitive spirit and pride of students appears to be quite sufficient to motivate a serious learning effort on the part of students.

Concluding Remarks

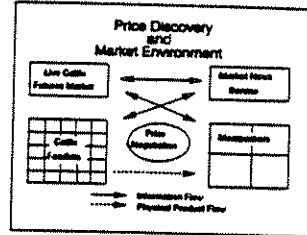
The Special Problems course taught using the Fed Cattle Market Simulator has been an effective teaching tool in the Department of Agricultural Economics at Oklahoma State University. Repeatedly, reactions by students are that, even though they have had many other economics, marketing, and management courses, it was through this game that they integrated and brought the concepts to life.

The potential of the simulator for teaching is clear, despite the fact its development is ongoing. Participating students have demonstrated increased understanding of making marketing and management decisions in a simulated marketplace. Students better understand the need to develop sound but flexible strategies which are rooted in basic technical and economic principles such as production efficiency, break-even analysis,

The Fed Cattle Market Simulator

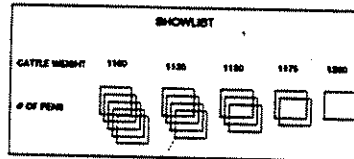
Department of Agricultural Economics,
Oklahoma State University

ABSTRACT
Economists have limited opportunities to: (1) conduct controlled experiments; and (2) provide in-the-experience in classroom/extension courses. Experimental economics fills both needs. A game simulating the fed cattle market was developed to teach how markets operate, including price discovery and market structure, and to conduct controlled experiments. Participants play the roles of cattle feeders, packers, and market news reporters. Results indicate participants have a deeper understanding of such economic principles as supply and demand, price discovery, market structure, and value of information after playing the game, compared with any learning in traditional agricultural economics courses.



FEEDLOT INFORMATION:

- CURRENT COST OF FEEDING
- FEEDER CATTLE PRICE
- BREAK-EVEN PRICE FOR FED CATTLE



PACKER INFORMATION

- BOXED BEEF DEMAND SCHEDULE
- PROCESSING COST BY VOLUME
- GIVEN A BOXED BEEF PRICE FORECAST A BREAK-EVEN FED CATTLE PURCHASE PRICE CAN BE ESTIMATED

NEGOTIATED PRICE AND PACKER ID IS ENTERED ON TRANSACTION CARD

MARKET NEWS ROLE:

- GATHERS TRANSACTION CARDS FOR ALL TRADES
- REPORTS VOLUME AND PRICE RANGE FOR EACH TRADING PERIOD

TRANSACTION CARD

FEEDLOT ID: 5

WEEK CONTRACTED:

WEEK OF SALE/DELIVERY: 26

1ST WEEK ON SHOWLIST: 25

PACKER ID: 7 ✓ HERE IF CONTRACTED

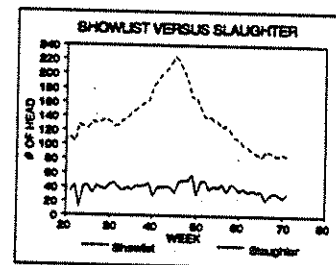
PRICE: 78.20

PUBLIC INFORMATION

LAST WEEK: 25	CURRENT WEEK: 26
BOXED BEEF PRICE: 123.50	VOLUME CONTRACTED: 5
FED CATTLE PRICE: 77.90	VOLUME TRADED: 32
VOLUME TRADED: 40	PRICE RANGE: 77.25 TO 78.90

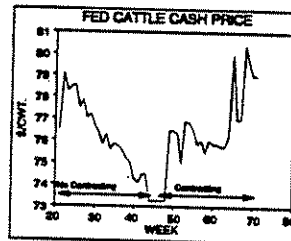
OBSERVATION

- SEASONAL INCREASE THEN DECREASE IN FEEDER CATTLE SUPPLIES AND NUMBER OF CATTLE ON FEED
- RELATIVELY STABLE MARKETINGS AND SLAUGHTER
- ORDERLY MARKETING OF CATTLE RESPONDING TO PRICE INCENTIVES



EXPERIMENTS

- INTRODUCTION OF FORWARD CONTRACTING
- DISRUPTION OF PACKING PLANT SERVICES (LABOR STRIKE)
- COMBINE FOUR PACKERS INTO TWO FIRMS
- ELIMINATE MARKET NEWS SERVICES



OBSERVATION

- INCREASE THEN DECREASE IN CATTLE MARKETINGS DUE TO SEASONAL SUPPLY VARIABILITY
- PRICE LEVELS RESPOND TO SUPPLY VARIATIONS BY DECLINING THEN INCREASING OVER TIME
- VOLATILITY OF PRICES FOR NON-CONTRACTED CATTLE INCREASES AFTER FORWARD CONTRACTING IS INTRODUCED

market supply and demand conditions, economies of size, and risk management. The simulator also integrates microeconomic principles with aggregate market effects stemming from industry structure and behavior. Furthermore, students respond after learning from the experimental environment that even the best formed strategies cannot always be realized if they conflict with others in the system and when they do not have effective communication and negotiation skills to resolve such conflicts. Such realizations are difficult to achieve in the traditional classroom learning environment.

The simulator creates and capitalizes on "teachable moments," and has generated several replicas of unique real-world situations. Students have attempted to form cartels, manipulate the futures market, and fail to honor contracts. These "teachable moments" are events that have been "lived" by the players, but have arisen through the game structure without prompting. As they occur, they offer realistic case studies in which to discuss why they occurred and the results from their occurrence.

Another intangible product of the game is a realization of the need for sound business ethics. Students learn competitor personalities and tactics. They must continue doing business with each other in a market oriented setting on a weekly basis over more than a dozen class periods. Past experiences with other participants rapidly begin to guide future activities. This remains true even as students switch roles from feedlot manager to meatpacking plant manager. However, switching roles sometimes changes attitudes as players have the opportunity to see the marketing challenge from the other side of the bargaining table. Indeed a point stressed to the students is that knowing your break-even price permits "defensive marketing," but estimating your opponents' break-even price permits "offensive marketing."

As a final point while the Fed Cattle Market Simulator is currently applied to the cattle feeding and beefpacking industries, the application could be modified to simulate production and processing of other commodities and the interaction of other agribusiness firms. The critical elements of the simulation are that

the commodity in question must be continuously produced and the processing sector faces declining average costs with fewer numbers of processing firms than production firms. This describes a majority of the agribusiness sectors in American agriculture. Thus, the simulator could be adapted to simulate pork, lamb, poultry, and seafood industries.

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