that an English auction resulted in buyers capturing a significantly lower percentage of surplus than a private negotiation market with or without price reporting. Further investigation is needed into the effectiveness of laboratory market experiments in enhancing the learning of marketing concepts. This paper is an introduction to this teaching method.

References

Bergstrom, J.C. and J.R. Stoll. "Structure, Conduct, and Performance in Contingent Markets." Selected paper presented at Amer. Ag. Econ. Assoc. annual meeting, Reno, Nevada, 1986.

Buccola, S.T. "Pricing Efficiency in Centralized and Noncentralized Markets." *Amer. J. Agr. Econ.* 67(1985):583-590.

Drinka, Thomas P., Jon M. King, and Darrel R. Weishuar. 1987. "Microcomputer-Assisted Futures Trading Game." *NACTA Journal.* XXXI(2):42-45.

Forster, D.L. and C.A. Roberts. "Oral and Electronic Double Auction Markets: An Experimental Comparison." *N. Cent. J. Agr. Econ.* 9(1987):99-106.

Hudson, M.A., R.M. Leuthold, C.A. Roberts, B.D. Adam, and S.T. Sonka. "Microcomputer-Based Networks for Teaching Agricultural Marketing." *Proceedings of the Amer. Ag. Econ. Assn. Teaching Workshop,* Reno, Nevada, 1986.

Plott, C.R. "Industrial Organization Theory and Experimental Economics." *Journal of Economic Literature* 20(1982):1485-1527.

Rhodus, W. Timothy, and Dennis R. Henderson. "Measuring Allocative Efficiency in Experimental Markets: An Alternative Approach." *North Central Journal of Agricultural Economics,* 10(2)275-280.

Smith, V.L. "Microeconomic Systems as an Experimental Science." *American Economic Review* 72(1982):923-955.

Teaching Farm Management Using a Computer-Simulated Farm

John R. Winter

Abstract

AGR 313 (Advanced Farm Management) is an undergraduate course taught at Illinois State University utilizing a computerized farm simulation. The simulation has proven to be an effective tool in teaching the decision making skills and economic concepts required to be a successful farm manager. The simulation allows the instructor to focus on different aspects of farm management including proper input usage, machinery replacement decisions, land purchase-rental analysis, decision-making in a risky environment, and decision-making over time. Students can be exposed to a wide variety of decision making environments in a relatively short time period by using the computer simulation. Just as important, students receive rapid feedback relating farm management decisions to outcomes. This greatly reinforces the lessons being learned.

Introduction

Farm management is the application of the decision making process to solving problems in the planning, operation, and control of the farm business. Farm managers must decide what to grow, how much to grow, and how to grow it. These decisions are made in a dynamic environment characterized by uncertainties in production and constraints on resources. Successful farm management requires the development of skills in all phases of decision making (Kay, 1986). Agriculture 313 (AGR 313) at Illinois State University utilizes a computer-simulated farm to teach applied decision-making in a farm mangement setting. The course title is "Advanced Farm Management."

AGR 313 consists primarily of junior and senior undergraduates majoring in the various disciplines related to agricultural production management: agribusiness, agronomy, agricultural education, animal science, and agricultural mechanization. The prerequisites for AGR 313 are AGR 213: Farm Management and AGR 216: Farm Accounting. Most of the students have taken introductory courses in agricultural economics, agricultural mechanics, animal science, and plant science in addition to more advanced course work in their respective areas of concentration.

The class is divided into management teams of 3-5 students. An attempt is made to distribute abilities (computer knowledge, mathematical skills, farm business management acumen, etc.) equally among the management groups.

Throughout the course, management groups perform in a competitive framework with a prescribed goal of maximizing the net income of the farm. The team with the highest net income for any particular decision is awarded 100 points. Other team scores are determined by the percent of the highest net income achieved. This grading procedure provides great incentive to identify management strategies which maximize proft.

Farm Setting

The computer-simulated farm is modeled after a cash grain operation. All teams begin with identical financial positions. Assets are valued at $1,425,937 with debt of $574,790 for a beginning net worth of $851,147. There are eight, eighty (80) acre fields owned, distributed over two soil types (5 Grade I and 3 Grade II fields). The managers also have the opportunity to buy or cash rent up to four additional fields each of Grade I and Grade II soils. The managers must select from among seven crops — potatoes, cantaloupe, alfalfa hay, wheat, barley, bush beans, and sweet corn. Students sometime bemoan the fact that the traditional Central Illinois crops of field corn and soybeans are not included in the simulation. However, the primary objective of the course is to teach students to make management decisions based on careful analyses and budgeting of the alternatives. Traditional crops are not included to eliminate any preconceived ideas of what the "right" crop mix is. Crop decisions must be made on the basis of analyses rather than history. Crop prices and yields can be fixed by the instructor or permitted to vary according to prescribed distributions. The initial machinery set includes both old and new equipment and large and small equipment. Managers must

Winter is an associate professor of Agricultural Economics at Illinois State University, Normal, IL 61761-6901.

evaluate when to replace old machinery with new and small machines with large. Each student has complete description of the simulated farm in the *Farm Management Simulation Student Manual* which is made available to them.

Course Objectives

The primary ojbective of AGR 313 is to help students develop their decision-making ability in the agricultural production context. Castle, Becker, and Nelson (1987, p. 4) assert that "rarely is a person skilled in all aspects of the decision-making process. But it is the development of these skills in all phases of decision making that makes the farm manager successful."

The primary objective is supported by several secondary objectives including the following:

1. To review economic theory as it relates to issues in farm planning and organization.
2. To emphasize the proper role of various decision making aids (partial budgets, enterprise budgets, cash flow budgets, etc.) for evaluating farm management decisions.
3. To provide experience in making a wide variety of farm management decisions and evaluating their relative importance in the business.
4. To improve students' oral and written communication skills.

Course Structure and Activities

Management teams are the basic organizational unit in the class. Each team of 3-5 students is charged with making the management decisions of the simulated farm. The course is normally structured to include five "decisions" encompassing nine "years."

Each of the decisions is designed to teach one or two important principles in farm management decision makin. The decisions increase in complexity throughout the semester as students build on the lessons of prior decisions. The particular structure and decisions that comprise the course have been developed and refined over the six year history of the course.

Based on the experience of teaching the course, the instructor can predict with a great deal of certainty the decision making errors that will be made. The decisions have been designed and modified over time to focus on these common errors. In this way, these decision errors can be made in the classroom with a relatively low cost to the student rather than in the field where economic impacts would be much more severe.

Description of Decisions

Decision 1 is designed primarily to familiarize students with the simulated farm. Students are given unlimited operating capital to produce crops on the eight owned fields with a single period operating horizon. No additional land can be bought or rented. No machinery decisions are made by the students. Most profitable fertilizer levels must be determined and the optimum crop mix must be identified. Most students are generally familiar with the economic principles involved in these decisions and relatively few errors are made.

Decision 2 focuses on the different roles of enterprise budgets as compared to cash flow budgets. A severe operating capital limitation is imposed to emphasize the differing roles of these two budget types. The severe capital constraint precludes growing the most profitable crop and forces students to evaluate cash flow constraints in making production decisions. Experience in teaching the course suggests that students are proficient at reciting the differences in enterprise and cash flow budgets and "describing" the proper role of each in farm management decision making. However, students do not fully appreciate and **learn** these differences until they are faced with making the decision that emphasizes these differing roles. The instructor feels that this is perhaps the most important lesson taught in the course and one that cannot be completely learned without the aid of experience which is easily rendered by the simulated farm. This lesson is continually reinforced in all subsequent decisions.

Decision 3 permits buying or renting land and buying new machinery. The principal economic lesson emphasized in this decision is the difference between investment and cost. Again, experience reveals that students can recite the difference in these items but do not fully appreciate their importance until forced to make important decisions that depend on correct accounting of these differences. Appreciation of the economic impact of the difference between cost and investment on management decisions is perceived to be another extremely important lesson that can be taught more effectively with the use of the computer simulated farm.

Decisions 1, 2 and 3 are all made in the realm of perfect certainty—crop yields and prices are known in advance. Decision 4 relaxes this assumption and deals with the effect of production uncertainty on farm management decisions. Within this scenario, prices and yields are randomly selected from pre-specified normal distributions. Students are exposed to the impact that production uncertainty can have on net income, the trade-off that traditionally exists between expected income and risk, and the benefits of diversification in the face of production uncertainty.

The stated objective of the first four decisions is to maximize the net income of the farm for a single production period. Decision 5 is a multi-year decision where outcomes of previous years are carried forward affecting cash carry-over and available operating funds. Students learn the importance of good cash management and how to evaluate capital purchases (land and machinery) in a multi-year framework.

By the fifth decision, students are thoroughly familiar with the operation of the farm. The classical assumptions of full knowledge and static production decisions are relaxed. Students must make decisions in an uncertain environment and the future viability of the

farm depends on successful operation through time. These conditions provide a fair approximation of the "real world" decision making environment facing farm managers. The computerized farm simulation allows this approximation without excessive expenditures of capital or time.

Summary and Conclusion

A computerized farm simulation has proven to be an effective means of teaching decision making skills required to be a successful farm manager. The instructor can direct the decisions to emphasize various economic principles. Students receive rapid feedback to relate outcomes to decisions made.

Specific advantages of the farm simulation include:

1. repeated use of the decision making process in farm management scenarios;
2. exposure to a wide variety of farm management decisions in a fairly realistic framework;
3. experience in making farm management decisions in a risky environment;
4. experience in making farm management decisions in a multi-period framework;
5. rapid feedback relating outcomes to decisions to reinforce learning;
6. development of oral persuasive skills and written communication skills; and
7. experience in small group (committee) mechanics and politics.

The author has found the farm simulation to be a valuable addition to the traditional lecture format commonly found in farm management courses. In conclusion, the farm simulation provides many of the same benefits that could be derived from the management of an operating farm as described by Honeyman (1985 p. 12) with the additional benefits of rapid feedback on decision results and limited capital investment and financial risk.

References

Kay, Ronald D. *Farm Management: Planning, Control, and Implementation*. 2nd ed. McGraw-Hill Book Co., 1986.

Castle, E.C., M.H. Becker, and O.G. Nelson. *Farm Business Management: The Decision-Making Process*, 3rd ed. Macmillan Publishing Co., 1987.

Farm Management Simulation Student Manual. Course notes to accompany AGR 313: Advanced Farm Management, Illinois State University, 1988.

Honeyman, Mark S. "Teaching Farm Management and Decision-Making Skills Using a Student-Managed Farm." *NACTA Journal*, 29: 3 (June, 1985), 9-13.

A QUANTITATIVE COUNSELLING APPROACH

Course Prerequisites and Undergraduate Student Performance

Marshall A. Martin

Introduction

Upper division undergraduate agricultural courses normally build on skills and knowledge acquired in previous courses. These advanced courses in the various agricultural disciplines often require the development of quantitative skills in mathematics and statistics. Also these advanced courses frequently draw on a student's analytical skills in the core area of the discipline e.g., economic theory for agricultural economics majors or biology and chemistry for majors in agronomy, animal science, biochemistry, forestry, or botany and plant pathology.

Counsellors often are uncertain as to a student's potential for success in an advanced course. Grade point averages are the most widely used indicator of a student's academic ability. For example, Krockover, Mortlock, and Johnson found that SAT scores, high school rank, and freshman grade point averages were highly correlated with the final grade point average of graduating college seniors.

In most disciplines one or more prerequisite courses are required before a student is allowed to enroll in an advanced course. Sometimes diagnostic tests are available to determine if a student has the appropriate background to master successfully a subject area. Royer, Abranovic, and Sinatra found that while a grade point index was a good predictor of course performance, they also found that a student's reading comprehension and subject matter knowledge were useful predictors of course performance. They used a minitest at the beginning of the semester to determine students' potential performance in courses in business statistics and educational psychology. They also found that scores on the minitests and grade point averages were highly correlated.

This article illustrates a quantitative approach used in the Department of Agriculture Economics at Purdue University to determine those factors which might be the most appropriate indicators of a student's successful completion of a senior-level, elective course in agricultural price analysis. While the empirical results are specific to an agricultural economics course taught at Purdue University, the conceptual framework and methodology are appropriate for any academic discipline.

Course and Student Description

As taught at Purdue University, about one-fourth of the agricultural price analysis course is devoted to a review of the appropriate microeconomic economic theory for agricultural pric analysis, one-half covers the statistical theory and application of regression analysis to applied price analysis problems using microcomputers, and the remainder of the course treats several

Martin is an associate professor of agricultural economics at Purdue University, West Lafayette, IN 47907.