SOYBEAN TRADER: A MICROCOMPUTER SIMULATION OF INTERNATIONAL AGRICULTURAL TRADE

Richard A. Levins, Earl H. Brown, and C. Parr Rosson

Abstract

Soybean Trader is a microcomputer simulation of international grain trading. The program uses the format of a graphics-oriented game to teach basic economic principles and to stimulate interest in agricultural trade. Profits from trading serve as a score, and competition is encouraged by ranking top scores in Traders' Hall of Fame. Results of tests with adult and youth audiences indicated that the program is an interesting and effective teaching tool.

Key words: agricultural trade, international trade, microcomputer software, simulation.

The National Extension Task Force on Agricultural Trade has used many methods to increase public awareness and understanding of agricultural trade. One such effort was a national televideo conference entitled "Agricultural Trade Policy Under Scrutiny." Subsequently, a series of six fact sheets was prepared from material covered in the conference. Videotapes of the conference, the fact sheets, and a handbook for county agents were all made available for educational use in Extension programs.

The Task Force realized that these educational materials, no matter how well done, would not be used effectively unless the intended users were interested in learning about agricultural trade. Therefore, a separate project was funded to explore computer simulation as a means of creating interest in agricultural trade. The simulation was to be presented as a game suitable for use at fairs and exhibits, in Extension workshops, and as a supplement to courses in trade and marketing. A prototype of the simulation software, developed in BASIC, was used to formulate ideas on the simulation. A professional computer programmer familiar with Turbo Pascal was hired as part of a year-long project to program and test the final version.

Soybean Trader (ST), a microcomputer simulation of the activities of an international grain trader, was designed to take full advantage of color, sound, and graphics to immediately capture user interest. While the simulation requires no knowledge of grain trading, knowledge of grain trading will be rewarded through higher scores. Trading knowledge can be gained intuitively during many plays, or by direct reference to the educational materials mentioned above.

ST familiarizes the user with such basic economic concepts as supply and demand. More sophisticated concepts such as the effect of exchange rates, the management of price risk, and the use of various transportation modes are also integrated into the simulation.

REVIEW OF LITERATURE

Computer simulation has many uses in agricultural and general business settings. Some applications outside of agriculture which were of interest included many business and market games which have become popular microcomputer programs (see Caruso). Within agriculture, farm and market simulators of the type described by Babb have been used as teaching tools. Harsh, NCCI (1984), and NCCI (1985) provided other examples of computer simulations in teaching agriculture.

Richard A. Levins is an Associate Professor and Earl H. Brown is a Professor, Department of Agricultural and Resource Economics, University of Maryland; and C. Parr Rosson is an Associate Professor, Department of Agricultural Economics and Rural Sociology, Clemson University.

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An abundance of literature has been written concerning the economics of international agricultural trade. Much of the material used to develop Soybean Trader was taken from the "Agricultural Trade Policy Under Scrutiny" series of fact sheets (Rosson). An advanced simulation of agricultural trade developed by Richmond also provided valuable suggestions for designing ST.

PROGRAM OVERVIEW

In Soybean Trader, the player assumes the position of an international grain trader in New Orleans. In addition to making decisions on buying soybeans from selected soybean producing states and selling soybeans to importing countries, the player is asked to decide on methods of transportation, hedging, insurance, finance, and terms of sale.

The objective of the game is to maximize profit. Each player receives a rating at the end of each game based on the amount of profit earned. The types of decisions faced and the outcome of the decisions are selected from a data base according to assigned probabilities. This results in one being able to play the game many times (50 or more) without encountering much duplication and without being able to predict the outcome with any degree of certainty.

Soybean Trader was designed to be "user friendly" and very easy to use. A short User's Guide (Brown et al., 1986b) is provided, but most players are successful using only the on-screen instructions and help screens. All commands are executed by pressing <ESC>, the space bar, or one of the ten function keys. The function of each of these keys is displayed on the screen while the game is being played.

The decisions faced by the player are presented as multiple choice questions. Furthermore, there are no "right" and "wrong" answers of the type presented by a quiz. The score is related to the user's knowledge of agricultural trade, but is also influenced by random events that cause the score of even the most knowledgeable player to be unpredictable. The authors found this approach to be less intimidating for new users of the simulation.

Two versions of Soybean Trader, beginner's and advanced, were developed with each game consisting of five monthly marketing periods or plays. The beginner's game involves buying and selling only. The advanced game involves other decisions in addition to buying and selling. The advanced game also includes a possibility of bonus plays and a chance to be recognized in a Trader's Hall of Fame.

DETAILS OF PLAY

The player begins each ST game with a net worth of $2,100,000, which consists of 5,000 tons of soybeans and $1,000,000 in cash. The cost of soybeans in the beginning inventory is $220 per ton. A weighted average cost per ton is calculated after every purchase. The beginning Chicago price is $240 per ton. The first screen display is shown in Figure 1.

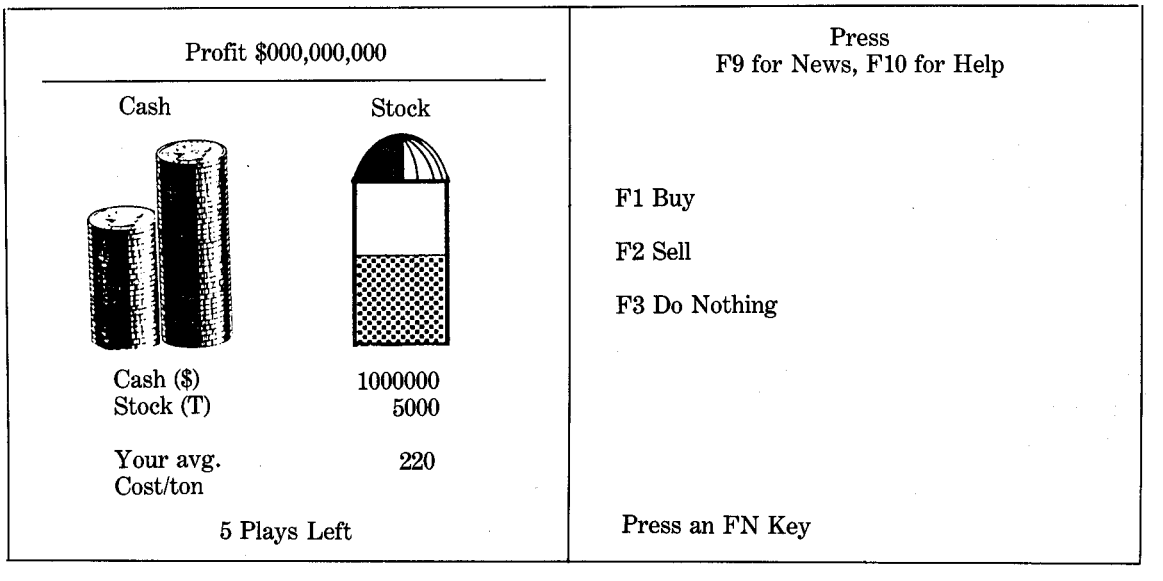

Figure 1. Example First Screen of Play from the ST Game.

At the beginning of each play, one of 22 news events that are likely to affect the Chicago price of soybeans is selected at random and displayed on the screen. Typical news events are "U.S. farmers experience drought conditions" and "New varieties of sunflower seed look promising." Half of the news events indicate that the Chicago price of soybeans is likely to be higher in the next play and half indicate that it is likely to be lower. The Chicago price will change from 0 to 30 percent in the direction indicated by the news event.

Each of the five rounds in a game involves a choice of buying or selling soybeans. If a player decides to buy, two buying opportunities and a choice of doing nothing are presented. The offering price of soybeans varies from 5 to 15 percent below the Chicago price. After a decision is made to purchase soybeans, the advanced game presents three possibilities which will occur with equal probability. The first of these possibilities is that the player will be asked to choose a method of shipment from the purchase site to New Orleans. The second possibility is that the player will be offered a chance to protect against a change in the price of soybeans to be delivered in 30 days. The third possibility is that the purchase does not require a second decision.

If a player decides to sell, two selling opportunities and a choice of doing nothing are offered. The selling price of soybeans varies from 10 to 30 percent above the Chicago price. After most sales, players of the advanced game are asked to make a second selling decision from a given set of options. The options are triggered either by a news event or a question.

As an example of a second decision, the player may be faced with "The SQI, a terrorist organization, has threatened to bomb all ships arriving in port of (country). How will you insure this shipment?" Without particular average, with particular average, and all risk are offered as choices. Regardless of the choice, 50 percent of the time the terrorists bomb the vessel and 75 percent of the shipment is lost unless all risk insurance was selected. The other 50 percent of the time, the shipment is made without interference. Appropriate charges are made for the insurance option selected.

The ST simulation also contains six random events that affect profit. These events are largely outside the control of the player, but in some cases the player can avoid the consequences by not selling to the country in question. Some of the events increase the player's profit, and others decrease it. These events appear as a second news flash when one of the decisions to be made could be affected by the event. An example of a random event is "Federal deficit likely to push value of dollar higher." If this event occurs, fifty percent of the time the value of the dollar increases 10 percent and the buyer decreases the order by 10 percent. Each random event, along with all second round buying and selling decisions, are presented in the program Technical Guide (Brown et al., 1986a).

A detailed profit and loss statement for the current period (month) of play, and for the year-to-date for all plays in the game, is made available after each play (Table 1). The profit and loss statement also lists interest earned based on 10 percent per annum of the amount of cash on hand. Expenses include a fixed expense of $10,000 each period, storage costs of $5.00 per ton of soybeans on hand, and charges for transportation, financing, and insurance.

The player receives a rating at the end of each game based on the amount of profit earned. The advanced game also has a Trader's Hall of Fame which features the seven highest scores or profits earned from playing the game on that disk. Players earning a place in the Trader's Hall of Fame type their names which are then displayed in the appropriate order.

TABLE 1. EXAMPLE PROFIT/LOSS STATEMENT FROM ST PROGRAM

Monthly Profit/Loss Statement
All Figures in 1000's

	Current	YTD
Sales	$ 360	$ 800
Product Cost	320	650
Margin	40	150
Interest Earned	2	4
Expenses		
Fixed Costs	10	20
Storage	2	5
Shipping	9	20
Insurance	3	3
Finance	2	3
Other	3	9
Profit(Loss)	13	97

REVIEW OF FIELD TESTING

ST was exhibited at the Maryland State Fair and the 1985 National Extension Public Policy Conference to test its appeal as an

attention-getter at public displays. In both cases, the program generated considerable interest and people often stood in line to play it. Various players commented that the graphics were appealing, that the game itself was "addicting," and that it provided a good way to learn more about trade. An interesting side-effect is that other states have now used ST in exhibits in which the primary focus was computers rather than teaching trade.

ST was also tested in two undergraduate marketing courses and at a summer workshop on teaching vocational agriculture. In one undergraduate course, the program was part of an in-class presentation. In the other, it was used as part of a homework exercise. Both the college-level and high school instructors felt that the program was an interesting and effective teaching tool.

The interest of younger students in the program was evaluated during two weekend retreats for 4-H teens. Results are presented in Table 2. One-half of those attending the workshops indicated that, to a great extent, ST helped them learn more about microcomputers and their uses. Another 27 percent believed ST assisted them to a fair extent. Almost one-quarter indicated that they were assisted only to a slight extent or not at all.

TABLE 2. SURVEY RESULTS OF SOYBEAN TRADER, 4-H TEEN RETREATS, MAY AND JUNE 1986

	Response					
Question[a]	Great Extent	Fair Extent	Slight Extent	Not At All	Don't Know	Total
	Percent[b]					
1	50.0 (11)	27.3 (6)	13.6 (3)	4.5 (1)	4.5 (1)	100 (22)
2	50.0 (11)	27.3 (6)	9.1 (2)	9.1 (2)	4.5 (1)	100 (22)
3	54.5 (12)	22.7 (5)	13.6 (3)	4.5 (1)	4.5 (1)	100 (22)

[a]1 = As a result of the workshop featuring Soybean Trader, to what extent did you learn more about microcomputers and their applications?

2 = As a result of the workshop featuring Soybean Trader, to what extent did you learn more about international trade of agricultural products?

3 = As a result of the workshop featuring Soybean Trader, to what extend did you learn more about world agriculture?

[b]Actual number in parentheses.

The primary purpose of ST was, of course, to familiarize people with international trade and world agriculture. One-half of those attending the 4-H retreats indicated that, to a great extent, ST taught them more about international trade of agricultural products. Another one-quarter indicated that to a fair extent, they learned more about trade. Only nine percent felt ST did not enhance their knowledge, while an additional nine percent believed it helped them to a slight extent. A related question revealed that almost 55 percent of the respondents thought ST enhanced their knowledge of world agriculture to a great extent. An additional 23 percent felt it helped them to a fair extent. Only 4.5 percent believed it did not help them at all.

CONCLUSION

The development and testing of ST showed that the program can enhance knowledge of international trade and key factors such as exchange rates, competitiveness, trade policies, and general supply/demand concepts. Further, for groups with a low level of knowledge concerning world agriculture, ST can improve and expand the overall knowledge base. The authors were sufficiently impressed with the results and effectiveness of teaching complex subjects as computer games that similar approaches are being explored for grain marketing and agricultural policy.

Soybean Trader was prepared for national distribution through state Extension offices. Extension specialists can obtain a free copy of the ST program, User's Guide, and Technical Guide package from Earl H. Brown, Dept. of Agricultural and Resource Economics, University of Maryland, College Park 20742. Soybean Trader requires an IBM-PC or compatible microcomputer with 256K RAM, one disk drive, and a color graphics adapter.

REFERENCES

Babb, M. "Agribusiness Simulators for Management Training." *So. J. Agr. Econ.*, 17,2 (1985): 193-97.

Brown, E., S. Peterson, D. Richmond, P. Rosson, and R. Levins. *Soybean Trader: Technical Guide.* University of Maryland Cooperative Extension Service, College Park, 1986a.

_____. *Soybean Trader: User's Guide.* University of Maryland Cooperative Extension Service, College Park, 1986b.

Caruso, D. "Breaking Away." *Personal Computing*, (July 1986): 90-97.

Harsh, S. "The Use of Management Gaming Models as Educational Tools." In *Computer Applications in Feeding and Management of Animals.* NCCI, Madison, WI, 1984.

North Central Computer Institute. *The Computer As a Classroom Tool, Proceedings.* Madison, WI, 1984.

North Central Computer Institute. *Computers in the Animal Sciences Classroom, Proceedings.* Madison, WI, 1985.

Richmond, D. *The Mechanics of Export Commodity Marketing: A Study of Produce, Processed Product, Hide, and Grain Exporters' Marketing Channels and Practices.* MS Thesis, Cornell University, Ithaca, NY, 1977.

Rosson, C. P., III. *Agricultural Trade Policy Under Scrutiny, An Overview.* (Ag Trade 1). Leaflet, Cooperative Extension Service, The University of Maryland, College Park, 1985.