

The Utilization of Spreadsheet Software for Simulating Monetary Returns of a Layer Enterprise in an Egg Production Course

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Abstract

A class problem for an egg production course was devised utilizing a Macintosh® computer and spreadsheet software to evaluate the profit potential of a 1,000,000 bird layer enterprise. Spreadsheet templates for each student were made with differing values for each aspect of the enterprise. A 10 year period was covered and students were provided with all the necessary values for production schedules and prices. Students were then given additional "what-if" scenarios that showed comparisons with the initial assumptions and how minor changes in one aspect of the enterprise could change profit outlook. This problem provided a valuable experience in utilization of computer skills and in the use of a spreadsheet in a management situation.

Introduction

Utilization of the personal computer (pc) has increased dramatically in recent years. As more powerful applications become available the uses for the pc have broadened. A knowledge of pc uses and applications is necessary to graduates in all majors, but can be especially useful for those in science and business fields.

Introduction of the Apple Macintosh® computer in 1984 redefined the concept of the user interface. With the increased sales and use of the mouse driven interface in computer products manufactured by other vendors, the understanding of this interface is of great importance to students who are expected to be computer literate.

One of the primary uses for the computer in business is for modeling and forecasting business expenses. This is usually accomplished through use of the spreadsheet. A spreadsheet can be loosely defined as a computer program used for automating numerical tasks. In many cases the spreadsheet will also have a number of other features based on the spreadsheet such as a database or charting capabilities. Utilization of spreadsheets for manipulation of numbers is the second most widely used software application after word processing¹

The objective of this paper is to describe a spreadsheet problem used in an egg production class at the junior to graduate level. Students were expected to learn basic computer skills, use of spreadsheet software for projections and "what-if" questions as well as to determine the costs and effects of changing prices on profit potentials of a layer enterprise.

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Materials and Methods

Students were provided with a spreadsheet template on disk which included production parameters and pricing for a variety of income and expense categories. A printout of a spreadsheet template and a set of production figures and sample input parameters is provided below (Figure 1). Each student was given a slightly different set of input parameters to insure that individual work was a necessity. Additionally, students were provided with access to a Macintosh Plus® computer and Microsoft Works® software. This software program has a simple spreadsheet as well as word processing, database, charting and communications in an integrated package

	January 1988	February 1988	... December 1997
Expenses:			
Loan payment w/interest			
Depreciation			
Feed costs			
Pullet costs			
Utilities			
Labor			
Miscellaneous			
Total expenses			
Inflation			
Inflation adjusted total			
Depreciated value			
Credits:			
Spent hens			
Jumbo egg sales			
X large egg sales			
Large egg sales			
Medium egg sales			
Small egg sales			
Total credits			
Net profit/loss			
Inputs			
Number of hens		1000000	
Monthly / month (%)		0.0058	
Hen body weight		3.75	
Spent hen value/lb		0.16	
Price/pullet		2.35	
Jumbo egg price		0.83	
X-large egg price		0.81	
Large egg price		0.78	
Medium egg price		0.72	
Small egg price		0.61	
Principal		10000000	
Interest rate		0.1	
Interest rate per month		0.0083	
Price per ton of feed		195	
Number of employees		32	
Average hourly wage		6	
Average hours per week		40	
Electricity \$/kwhr		0.066	
Kwhr used/month		40000	
Inflation rate		0.06	
Simple depreciation/yr		0.1	

Production figures							
Month of Production	Feed (g/bird-month)	Hen day%	% jumbo	% xlg	% large	% medium	% small
1	2550	30	0	0	0	20	80
2	2790	78	0	0	2	46	52
3	2850	91	2	5	5	78	10
4	2920	92	3	10	16	71	0
5	2980	88	8	10	20	64	0
6	3000	84	6	10	45	39	0
7	3000	81	8	20	60	12	0
8	3000	78	10	20	61	9	0
9	3000	77	10	21	66	3	0
10	3000	73	10	22	68	2	0
11	3000	70	10	23	67	0	0
12	3000	68	11	23	66	0	0
13	3000	66	11.5	25	63.5	0	0
14	2800	62	12.5	25	62.5	0	0

Figure 1. Sample spreadsheet template, input parameters and production figures for the egg production simulation problem. Please note that inputs were placed onto the spreadsheet template to save space and are normally located on a different area of the spreadsheet.

which, with system operating software, still leaves space on an 800 Kilobyte diskette for storage of some data. The manual² was available to students, but was not really necessary for the project due to the ease of use of the program. Students were also provided with a set of ten problems from which they could choose five to complete. The first problem was devised as the basic 10 year projection of credits versus debits. Several assumptions were used on the problem to simplify execution. These assumptions included a single laying cycle followed by a one month down time, monthly hen-day production figures (versus weekly) and a constant depreciation rate. It was felt that these assumptions would not significantly alter the principles of the problem, but would provide a needed reduction of complexity. Prices used were estimated as closely as possible based on current values derived from a variety of sources. Given the templates (Figure 1), students were then expected to use the price structures and performance parameters given to devise formulas which would calculate accurate values for each month for that particular expense. Example formulas were given in the instructions such as the formula for loan payments: $[= - \text{pmt} (.00834, 120, 10000000)]$. This formula tells the computer to subtract the payment calculated from a monthly interest rate of .834% for 120 payments with a total loan of \$10,000,000. With the instructions and a template students were then expected to devise other formulas from input values to determine income and expenses on the various portions of the spreadsheets for a period of 10 years.

Results and Discussion

Students were placed in the situation of a manager for an agricultural firm and asked to determine the profit potential of an investment in housing and equipment for a layer operation over a 10 year period. Profits varied widely between students as well as their approaches to the problem solving. It is estimated that students spent a minimum of 40 hours on the computer although several students have indicated a far greater amount of time. The students learned a great deal about both the computer and spreadsheet as well as how the different aspects of the expenses contribute to the cost of egg production. Questions that were used to induce "what if" responses included items on varying interest rates, feed costs, effects of a disease outbreak, energy costs, egg prices and manure disposal. Another interesting, but difficult question involved researching economic trends to predict such items as labor costs, inflation rates, future egg price structure, etc. to come up with a projection based on their best estimates of future economic trends.

Several difficulties were encountered throughout the course of this problem. Although efforts were made to simplify as many aspects of the problem (almost to the exclusion of reality) as possible, it was still a major undertaking which resulted in a large commitment of time and stacks of computer paper for each student. Completion of the first problem was necessary before

the other problems could be addressed and this proved to be the most difficult aspect. By the time students had gotten through the initial problem, subsequent problems were of far less difficulty due to the ability to change only a small number of the components as well as the added skill obtained during performance of the initial problem. Additionally it must be noted that as expected, students selected the easier problems from the choices given.

Overall it would appear that the spreadsheet problem was a worthwhile undertaking for the students. Basic computer skills were learned by students for the first time or were developed more fully. This type of simulation or a similar exercise done on paper may be the only way for students to truly get a handle on the economics of a production enterprise. Due to the large number of questions concerning various aspects of the problem, a large commitment of time is necessary for assisting students. Student evaluations of the problem varied from too difficult, to the best experience they have encountered in their college education. It appeared that differences in evaluation had to do primarily with previous computer experience with experienced students finding the problem beneficial. Although the information presented here may not fit all situations, it does provide a method for utilization of the pc in a challenging and useful situation for students in a production course.

References

- ¹ Seiter, C., 1988. The numbers racket: An insider's guide to selecting a spreadsheet. *Macworld* 5(2):177-183.
- ² *Using Microsoft Works*, 1986. Microsoft Corporation, Productivity Software, Inc.

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