Notes

[1]Copyright 1978 and 1982 by Century Communications, Inc., Skokie, Illinois.

[2]*CFS Software* includes demonstration data that uses the "Jim Profit" case farm example that is contained in the *Coordinated Financial Statements for Agriculture* manual. The case farm data are used to illustrate the preparation of the financial statements.

[3]In reality, only about 20 percent of the students in ABE 351 have never used a microcomputer. About 20 percent of the students have manually completed some or all of the financial statements before enrolling in ABE 351, while less than 10 percent have worked with the computerized version of CFS.

[4]Through trial and error 25 boots have proven to be an adequate number of access opportunities for students to complete the term project. In fact, most students use no more than 10 boots. If students do use up their boots, they are provided with another 25 boot version at no cost.

[5]The "Fred H. America" case farm data can be found in the instructor's material for "Your Financial Condition" workshops sponsored by the Cooperative Extension Service, Department of Agricultural Economics, College of Agriculture, University of Illinois, Urbana, November 1985.

[6]The College of Agriculture has a microcomputer lab consisting of 15 IMB PC microcomputers and eight Epson printers. The lab is open to students approximately 35 hours per week with a lab assistant available for consultation during this time.

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LINEAR AND QUADRATIC MODELS

Feed Formulation Software For Instruction

Gene M. Pesti and Bill R. Miller

Introduction

A number of commercial feed formulation programs are available to the feed mixing industry. Commercial programs are often used in instruction even though their design and degree of sophistication makes their use somewhat difficult to learn. Classroom time must be spent teaching the use of the program that could be spent teaching the principles of economics, feed formulation and nutrition.

We designed and directed coding of two feed formulation programs specifically for use in instruction that could be used in our microcomputer laboratories. The code is designed around a simplex algorithm by Lee (1975). The laboratories have IBM Personal Computers and Texas Instruments Professional Computers with 256K of random access memory, the MS-DOS operating system, and IBM or Epson dot matrix printers capable of printing 132 characters per line.

Theoretical Bases

The two programs appear to be very similar. Indeed, they use the same editor for entering and altering data. However, the actual feed formulation is based on two entirely different concepts.

The linear program is called "User-Friendly Feed Formulation" or "UFFF" (pronounced oof). It solves a cost minimization problem and answers the question: "What combination of available feedstuffs meets a set of nutritional requirements for the least cost of a unit of feed?" This program is similar to commercial feed formulation software (Dent and Casey, 1967). Specifications for minimum and maximum levels of all nutrients and ingredients have to be entered into the program. The solution is least cost with respect to the particular specifications entered. It does not follow that the least cost pound of feed will result in the most efficient growth or least cost of a pound of broiler. The latter question is answered using quadratic programming.

The quadratic program is called "User-Friendly Broiler Quadratic Programming" or "BQP." It solves a growth maximization problem and answers the question: "If there are limited funds that can be spent on feed for each bird, what combination of feedstuffs gives the heaviest bird?" The principles of this program and its application to the commercial broiler industry have been detailed by Miller *et al* (1986) and Pesti *et al.* (1986). Essentially, it considers that as the energy level of the diet increases, body weight at any time is increased and carcass fat is increased; as the protein level of the diet increases, body weight is increased and carcass fat is decreased.

Specifications for the minimum and maximum levels of all ingredients and nutrients except protein and energy are entered into the program; in addition, a quadratic equation relating the broiler's total weight response to protein and energy intakes, and a linear relationship between time and protein and energy intakes must be entered. Restrictions on carcass fat can be entered.

BQP maximizes cost per pound of broiler produced assuming that the firm has limited resources to spend on feed. The solution is likely not the one that maximizes technical feed efficiency (g gained/g feed), but that the desired weight should minimize cost per unit of gain ($/g gained). The BQP solution is a list of the amount of each feed ingredient to be mixed

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(identical to the UFFF output), the weight of the bird to be produced, the amount of feed intake, and the economically efficient protein and energy levels per unit of feed.

Program Descriptions

Both programs use an interactive editor. The student is first presented with a menu that allows reading a stored problem or the creation of a new one. A second menu allows the student to edit ingredient names and limits, nutrient names and limits, the ingredient/nutrient matrix, the ingredient costs, proportions between nutrients, or the quadratic equation (BQP only). Brief instructions and function key definitions are included at the top of each screen throughout the programs. An additional choice from the second menu causes the problem to be solved.

Two input/output (I/O) screens from the program give the ingredient usages (with marginal price changes for use) and nutrient levels (with shadow prices). Ingredient costs and nutrition restrictions are listed on these screens and can be edited from them. The problem can be re-solved immediately by pressing a function key. BQP has an additional I/O screen that contains the feed cost per bird (which may be edited) and resulting weights, feed consumption, and economically efficient energy and protein levels.

On an IBM PC, UFFF can solve a problem with 17 ingredients and 19 nutrients in approximately 25 seconds; but requires only a few seconds on an IBM PC/AT with a math co-processor. BQP takes approximately 108 seconds to solve a problem with 15 ingredients and nine nutrients on a standard IBM PC.

Instructional Use

Our teaching experience with the UFFF program has been that it can be learned by undergraduates with little problem. Graduate students, on the other hand, may be reluctant if they have experience with another feed formulation program. The problem is not with a lack of features. Instead, they appear to have difficulty in learning a second syntax. For instance, they may want to enter an ingredient number to edit an ingredient name (former program syntax) when all they need to do is move the cursor to the appropriate place on the screen and type over the previous name (UFFF syntax).

Program Availability

The UFFF and BQP programs are available from the University of Georgia College of Agriculture Electronic Bulletin Board for use in undergraduate or graduate instruction. Programs may be downloaded to a microcomputer by connecting to (404) 542-0836 at 1200 baud, 08 bits, 01 stop bits and NO parity. Material downloaded will include the program, example problem files, a license agreement and an invoice for $10.00 to cover distribution. Copies of the programs on 5¼" floppy diskette and documentation for the editor (Pesti and Miller, 1987) may be obtained by writing to Agricultural Communications, University of Georgia, College of Agriculture, Athens, Georgia 30602.

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Teaching Communication Skills in the Agriculture Classroom

Julia Gamon

The well on my grandparents' farm was shallow and often went dry in a summer drought. Water was, consequently, a precious commodity which my grandmother used very carefully. I remember visiting as a child with my baby brother and watching her get the very last drop of good out of a pail of water. First she gave the baby a bath, then she reused the water to wash her hair, a batch of diapers had the next turn, and finally she poured the water on the rose bushes by the back door.

College classroom time is also a precious commodity; there is so much to teach in so little time. Choosing what will be of most value to students is a constant challenge for agriculture teachers because of a continually changing agricultural knowledge base. It takes skill to choose what is important to teach and to teach it in a manner that will enhance maximum learning.

Communication Skills - A Priority

At a teaching retreat for agriculture professors at Iowa State University in the summer of 1986, one of the main concerns identified was the need to teach communication skills within agriculture courses. This concern is echoed by potential employers of agriculture college graduates. Magill (1982) and Broader and Houston (1986) found that communication skills were at the top of employers' wanted lists. Students won't get a chance to use their agricultural knowledge unless they know how to communicate with potential employers. In a recent *NACTA Journal*, Cobia (1986) stated, "We owe it to our students as well as our profession to enhance student communication skills."

As added incentive for teaching communication skills is that as students communicate to others, they learn more themselves. When students merely listen to

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