TRAINING FOR FARM MANAGEMENT DECISIONMAKING

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The objective of this paper is to discuss a farm management training course designed to develop allocative ability. The paper consists of three sections. The first section briefly emphasizes the importance of allocative ability in relation to farm management decision-making. The second section describes in some detail certain aspects of the training program in farm management at the University of Queensland. Finally, we discuss the course in relation to educational principles.

ALLOCATIVE ABILITY

Conventional economic theory makes the assumption of perfect information. In this context the productive value of education is attributed to a "worker effect" (i.e., more physical output from a given set of resources). Welch (20) highlights the importance of another productive effect of education, namely the "allocative effect." The allocative effect refers to the individual's ability to "acquire, decode and sort market and technical information efficiently" (7, p. 85). It will be especially important when the individual is faced with a constantly changing situation. Allocative ability, therefore, is essential if the modern business manager is to perform effectively his basic task of decisionmaking.

Due to the diverse nature of agricultural production activities and the dynamic nature of the factors influencing farm management decisions, the allocative effect of education may be relatively more important in the rural sector than in other industries (20). As the modernization of agriculture proceeds, the intensity of decision-making by farmers increases and allocative ability becomes an increasingly important component of managerial skill (17). Modernization of agriculture, therefore is not simply a physical process; the development of greater allocative capacity among the farm managers is also required.

While research such as that reported by Welch (20) and Huffman (7) has demonstrated that "education" improves the allocative ability of farmers, little attention has been given to devising

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training programs specifically for this purpose. As stated earlier, the objective of the present paper is to outline a training program designed to develop the allocative capacity of the students. The course emphasises the acquisition, processing and interpretation of information and the making of decisions in an uncertain, dynamic context.

THE DECISION-MAKING TRAINING PROGRAM

The training program at the University of Queensland employs both traditional teaching/learning methods and a complex, computerized management simulation.[1] A key element in the course is the self-discovery self-motivated learning situations created by allowing the students to manage their own simulated farm.[2] The discussion of the course will be presented under the following headings: budgeting, programming, production functions, accounting and finance, decision theory, time related and other aspects.

Budgeting

The course is commenced by presenting each student with a farm management game manual (15). The manual provides all of the necessary information about the farm which each student is to manage. The first task of the student/manager is to familiarize himself with the farm and the constraints within which he (the manager) must operate. Secondly, the student must begin to narrow down the total number of possible activities before looking at potential whole-farm plans. To facilitate these objectives, a questionnaire has been constructed to guide students through the manual and to highlight important features of the farm. Attention is drawn to facts which are important in the selection of activities (e.g., historical price trends in certain enterprises, low rainfall periods of the year, seasonal pasture growth trends, and expensive capital items).

By the time the questionnaire is completed, some partial budgeting and common sense lead to the selection of one or more alternative ways (activities) of carrying out each enterprise. Each student is then responsible for calculating gross margins (including a monthly flow of all resources) for each activity. At this early stage the usefulness and limitations of the gross margin concept are discussed in relation to each manager's own farm.

The next step towards simulated management involves selection

by the manager of a feasible whole-farm plan based upon the activity budgets. This is a time consuming task with the necessity for checking labour, feed and cash-flows on a monthly basis. At this point, we do not emphasize the overall profitability of the plan but simply its feasibility. Once a feasible plan is selected, further modification using partial and parametric budgets takes place. Many management decisions are made at this and later stages using partial budgets. It is important that students learn to use these simple tools with speed, skill and confidence.

Programming

Students appreciate the tediousness of manual whole-farm planning during the above exercises. Further, the student/managers learn that an infinite number of possible plans exist for their farm. Since the whole-farm budget is constructed manually using a matrix formulation, only a small degree of re-organization is required to obtain a conventional linear programming matrix. Each student is asked to make the required modifications and they are generally able to do so easily. Students develop a strong intuitive feeling for linear programming without formal lectures on the subject.

Each student is subsequently presented with the results of a detailed linear programming matrix for the farm. The advantages over manual budgeting are obvious. In addition, students observe the close relationship between hand-budgeting and linear programming, and become aware of the limitations inherent in the single-period LP model. In this atmosphere it is easy to extend the programming concept to more advanced models. For example, a multi-period LP model for the CTFMG is used to demonstrate how fairly simple modifications can be made to the static LP matrix to investigate the optimal firm growth path. Work is currently underway to develop a Monte-Carlo matrix for the CTFMG and, in time, a full range of programming models will be available.

Production functions

Once a farm plan has been decided upon, simulated management begins. Decisions are made on a monthly basis. A further limitation of the simple gross margin approach to planning is introduced at this stage. This limitation refers to the use of one point only on the production function in gross margin calculations.

The fertilizer production function for the highly profitable potato enterprise is extracted from the simulation model. This forms the basis of an auxiliary exercise to determine the best nitrogen and phosphorus fertilizer rates to be used on the potato crop. A real-world evaluation of the use of production functions for decision-making involves consideration of several factors. These include the opportunity cost of the inputs, the possibility of a mis-specified production function and the effects of uncertain price and weather influences. Each of these points becomes obvious to the students operating in the simulated farm environment.

Accounting and finance

Summary financial accounts and supporting documents from the CTFMG appear in the standard format recommended for Australian primary producers (9). Students recognize the importance of uniformity in constructing these accounts by reference to the operation of their own farm. The arguments used in (9) are of great value in assisting an understanding of the logic of the accounts which are then analysed as a basis for future decisions. This is done by comparative analysis of gross margins and/or various ratios of efficiency (5). We encourage an active diagnostic comparison with other farms (since each farm encounters the same environment), with other years on the same farm, or with standards suggested by the game manual. Such a diagnosis of past records must then be translated into improved decisions for the following year. Usually this will involve budgeting plans suggested by the analysis.

Month-by-month tactical changes of plan are required as management proceeds because levels of livestock feed, labour, cash availability and other key parameters invariably differ from the manager's expectations. Although the monthly reports prepared by the computer contain all *essential* records, a number of *supplementary* records are desirable and students quickly learn the importance of systematically recording feedback from the dynamic farming system. Students are given the additional opportunity to compare actual and budgeted financial results on a monthly (or quarterly) basis by participation in a commercial computerized accounting service. This service is available to Australian farmers (4) and uses the standardized ACCRA code (2). At the beginning of the planning year, budgeted expenditures and receipts are coded by students for each farm and forwarded to the accounting service bureau. When simulated management begins, actual receipts

and expenditures are similarly coded and processed. Students receive from the accounting service monthly (or quarterly) comparisons of actual and budgeted cash-flows for their farms. As well as emphasizing the control function, this procedure saves a tremendous amount of arithmetic and familiarizes students with the benefits and mechanics of a computerized accounting service.

Decision theory

The practical application of decision theory is considered to be an essential component of the course. In other sections of the course, *ad hoc* approaches to handling uncertainty are discussed, but these provide no general conceptual frame-work to guide the manager in making decisions.

Many of the technical production relationships used in the game are not specified in the manual. Students are encouraged to discover these relationships for themselves in order to improve their decisions. Additional information is sometimes supplied via supplementary exercises. Information may also be obtained by a comparison of results between farms. However, an extremely effective way of generating information quickly is via experiments conducted on the simulation farm. Even on one farm, small scale experimentation can be effective, and where a co-operative research program is conducted by several farms the benefits increase accordingly.

The conceptual frame-work of decision-making is stressed *in lieu* of the mechanical solution to "canned exercises". Past experience has shown that students are prepared to accept solutions to problems based on the minimax and other criteria even when such a solution is clearly in conflict with their own preferences. Careful attention is paid to the elucidation of personal preferences in relation to the managerial exercise. A clear *understanding* (versus manipulation) of probability is an essential pre-requisite for obtaining a good conceptual grasp of the frame-work of decision theory. It is the *layout* of the decision problem which requires the conceptual understanding and we ask each student to isolate, consider and solve farm decision problems of personal concern in relation to *his* farm.

Time related decisions

The time dimension of the simulation is important in two

respects. It is via the time lag that uncertainty is introduced. Furthermore, the pay-offs for some decisions are distant enough so that the opportunity costs involved in the decision have to be explicitly recognized. For example, many alternative investments are possible on the simulated farm and these may be financed from with-in the business or by borrowing. Large scale borrowings must be justified by presenting a multi-year budget to the administrator. The various investment decision criteria (21) are *critically* evaluated in relation to farm investments.

Other aspects of the course

The CTFMG is realistic. However, we take advantage of every opportunity to add further realism. Reference has already been made both to the fact that the output from the CTFMG conforms to the national (Australian) standard format for rural accounting data, and that a commercial accounting service is used by the class-room managers. Access to the commercial accounting bureau raises questions about the relationship between farm managers and their advisors (private and public). Students are also confronted with decisions about how best to utilise these off-farm management resources.

Another important real-world aspect of the course is concerned with income tax. The management simulation makes provision for the payment of an exogenously determined amount of income tax. Each student/manager, therefore, must file a real income tax return form at the end of each simulated business year. To do this he must convert the managerial accounts, presented as output from the management simulation, to taxation accounts. Students are asked to report both on the major differences between the managerial and the taxation approach to farm accounting and on how the consideration of income tax legislation may influence farm decisions (e.g., investment decisions).

Although the management simulation and associated exercises as outlined above provide the major focus for the course, all students also under-take a case study of an actual farm. The students visit these farms in small groups, each group accompanied by an advisor. Students are asked to consider: (a) the influence of goals and attitudes of the manager in determining strategies, including considerations of household/business interrelationships; (b) problems of data collection in the real world (as compared with the CTFMG exercise); (c) the physical implementation segment of the

management cycle (12); and (d) the additional constraints within which the real world manager must operate (social, technological, institutional, etc.). The farm-case study brings an extra dimension of realism to the course and provides the students with an opportunity to test some of their newly acquired skills outside the class-room.

TRAINING FOR FARM MANAGEMENT DECISION-MAKING IN RELATION TO EDUCATIONAL PRINCIPLES

In this final section the approach to training for farm management decision-making outlined above, is discussed in relation to principles presented in the well known and important UNESCO publication by Faure *et al.* (6).

Relationship between theory and professional practice

"Since knowledge will have to be revised and completed all through life, we may accordingly suppose that studies may be shortened while the relationship between introductory theory and professional practice in higher education - which is sometimes inordinately protracted - may be revised. It would seem an extraordinary anomaly that in an age when theory is, in essentials, combined with practice and human beings, biologically speaking, reach maturity earlier, students are left marking time until the age of 25 and more in a kind of waiting room, where they are held at a remove from real life, productive activity, independent decision-making and responsibility." (6, p. xxx)

At the University of Queensland we place the students in a simulated management situation to create the need for "theoretical" procedures of the type outlined in the main section of the paper. Theory and practice are learned *simultaneously*. In an earlier article (12) the senior author has portrayed management as a cyclical process containing both "academic" and "practical" segments and suggested that simulation exercises are the only means available for effectively demonstrating the full management cycle in the class-room. Almost a decade of subsequent teaching experience using the CTFMG has strengthened this belief.

New knowledge

"One implication of the scientific and technological era is

that knowledge is being continually modified and innovations renewed. It is therefore widely agreed that education should devote less effort to distributing and storing knowledge ..... and more to mastering methods of acquiring it." (6, p. xxx)

How does one master methods of acquiring knowledge about farm management ? "Knowledge" in this context refers not to physical input-output data but to knowledge about analytical decision-making procedures. How can the allocative ability of farm managers be enhanced with reference to decision-making procedures as farming conditions change ? Decision analysis can, in this sense, be thought of as new technology (3, p. 5). There are "optimum amounts of observation and analysis to perform" (8, p. 367) and "any manager who stopped to make a formal analysis of more than some very small fraction of his decision problems would clearly have no time left for managing" (18, p. 69). By emphasizing the practical application and *ex-post* critical evaluation of currently used procedures, we hope to enable students to form a balanced judgement about their usefulness. By emphasizing the *limitations* of these procedures, we try to *anticipate* future developments including the practical application of existing theory.

Motivation

"The study of motivation is the key to every modern educational policy ... curiosity ... remains one of the deepest drives in human nature ... This would ordinarily be the strongest kind of motivation, if it were encouraged, which precisely, it is not ." (6, p. xxviii)

Both the survey reported by Tanner (19) and our own experience with the CTFMG substantiates claims that management simulations are useful in stimulating student interest. To successfully capitalize on this interest, decision-making procedures must be carefully integrated into a course at the time of major impact. This will usually be at a time when students perceive that a "better" decision can be made by making use of the procedure.

Self learning

"Self-learning, especially assisted self-learning has irreplaceable value in any educational system." (6, p. 209)

In our training course, some structure and uniformity is

considered essential for both organizational and educational reasons. However, whenever possible, students are allowed to proceed at their own pace and on their own initiative. Formal lectures and practical classes are kept to a minimum and most class time is kept free for informal lectures, discussion and individual student work on assignments relating specifically to the farm which he is managing.

Teacher-pupil relationship

"The teacher's duty is less and less to inculcate knowledge and more and more to encourage thinking ..... he (the teacher) will have to become more and more an adviser, a partner you talk to; someone who helps seek out conflicting arguments rather than handing out ready made truths. He will have to devote more time and energy to productive and creative activities, interaction, discussion, stimulation, understanding, encouragement." (6, p. 78)

To adopt this approach, class size must be kept reasonably small. Even with 20 or 30 students, it is highly desirable to have at least two staff members present during class time to allow this informal personal approach to succeed. Clearly "teaching can proceed in the absence of learning." (10, p. 757). We are seeking a teaching program which proceeds in the presence of learning.

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FOOTNOTES

[1]The management simulation employed is the Central Tablelands Farm Management Game (C.T.F.M.G.). For a brief outline of this exercise see Longworth (14). Full details are available in Longworth (13,15). The CTFMG and other farm management games currently used in Australia have been compared by Lindner (11). Tanner (19) contains a survey of students' attitudes to various methods of teaching farm management (including the use of the CTFMG) at three different institutions.

[2]As stressed by Ashby *et al.*, two important conditions need to be satisfied before one can consider utilizing a new educational technology (1, p. 11). First, the new pedagogic tool must emphasise or illustrate significant aspects of the course. Second, the new educational technology must highlight these features of the course in a uniquely advantageous manner.