Using Extension Workshops as a Means for Collecting Farm Level Data

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The popular press in recognizing the data richness of today's society has labelled the 1980's as the "information age." With new generations of computers and computer software, our ability to assemble, store, retrieve and process information is reaching new dimensions. Unlike most agricultural innovations which have altered technical and cost relationships, microcomputer technologies have directly enhanced the coordination and control functions of management. The ability to maintain and process large quantities of information is reducing the basic unit of management control from the herd to the individual animal and from the farm to the field level. The relatively simple budgeting techniques of the 1960's have given way to cash flow, income tax and net worth analysis. Likewise, extension programs are evolving, becoming more complex, incorporating more data and requiring higher levels of farmer involvement. Extension clientelle are better educated and more business-minded. The thesis of this paper is that many extension programs can be used to collect farm level data for both research and extension purposes. This paper also reports on the evolution of the workshops and presents 1983 and preliminary 1984 Saskatchewan workshop results.

The Top Management Workshop program was developed in 1979 at the University of Wisconsin. Richard M. Kelmme is currently maintaining a farmer data base of approximately 40 farmers for cost analysis and extension planning guides. The program was initiated at the University of Saskatchewan in 1983 and is being further developed for use in farm management classes and as part of the provincial FARMLAB research program. The PC Top

Management FARMLAB project encompasses the following applied research and extension objectives:

1) to assist farmers in farm business analysis and forward planning,
2) to collect farm level data for development of provincial cost and financial benchmarks and to serve as a data base for research simulation models,
3) to study farmer behavior and attitudes towards risk,
4) to upgrade the skills of extension personnel and agricultural professionals and
5) to develop a teaching laboratory interface with the real world.

The PC Top Management Model

The PC Top Management Model employs the dual concepts of economic cost efficiency and financial feasibility in analyzing both short- and long-run decisions. Farm business analysis is initiated with the "Where Am I?" question emphasizing economic cost efficiency and cash flow requirements. Once the farm business is analyzed against group benchmarks, the analysis proceeds to the "Where do I want to go?" analysis of growth, investment and consolidation phases of business.

Economic Efficiency. The PC Top Management Model owes the orgins of its economic efficiency analysis to a budget generator constructed to develop extension planning guides. As such it incorporates the notion of enterprise "recipes" which are strictly deterministic patterns of production. The recipe approach has particular appeal in working with farmers and production specialists in that most crop production can best be expressed as fixed input/output coefficients. Likewise there are no "surprise" results as any given cost can be recreated with a simple calculator.

Farm and enterprise profitability and cost efficiency are both based on the opportunity cost approach. This familiar

approach values all products and all inputs at their highest and best use. Here it is assumed that all assets are priced at their fair market value and that family (unpaid) labor and management are paid their reservation price. While there is little debate among economists in specifying the costs of most variable inputs, there is considerable controversy over the valuation of fixed assets and the allocation of their costs among various products. While there are various methods of costing fixed assets, the method most consistent with the opportunity cost approach is the capital recovery method. The capital recovery charge(CRC) for any one year period is

(1) $$CRC=(V_o-V_1)+iV_1$$

where : V_o =beginning asset value,
V_1= ending asset value and
i = opportunity cost of capital.

Note that the change in asset values can be positive (appreciation) as in the case of land or negative (depreciation) as in the case of most field machines. Land charges present unique problems because of highly unstable land values. Net land charges are based on long-term relationships between interest rates on land and land appreciation rates that were traditionally close to cash lease rates. However, recently there seems to be more divergence between the two rates. Machine valuation is based on the results from Schoney and Finner, and Schoney and Brown which relate the current value of used machines to new replacement cost. Future "as is" machine values are based on projected new machine replacement cost and age.

Concern has also been raised as to the allocation procedure

of fixed machinery and land costs among the various crops. In general, there are three common procedures for allocating fixed costs: 1) direct use method, 2) shadow price method and 3) an indirect break-even approach. The direct use method is the method most commonly used by PC Top Management as well as most other budget generators. Total machine and building usage is estimated from user-supplied speed and field efficiency values. Harvesting performance rates are recorded in yield units per hour and are not a function of ground speed. One of the early flaws common to many budget generators was basing annual machine use on farmer estimates. First year farmers were asked to estimate total annual usage for each machine. Obviously, the sum of individual usage did not equal the whole. Participant estimates exceeded the calculated estimates by an average of 30 to 40 percent (Klemme, Schoney and Finner). This is not too surprising since computer estimates are traditonally based on traditional field performance equations which estimate direct field time and do not account for travel time or engine hour meter errors. Thus, in order to maintain internal consistency, all fixed costs are allocated based on a combination of direct field time and additional general farm overhead time.

Economic theory suggests that fixed costs should then be allocated in direct proportion to their marginal value product or shadow price. For example, an enterprise where timeliness is extremely crucial should receive higher machine use priority while a another which places few restrictions on timing receives a lower priority. Yet both may use the machine to the same

extent and both are charged the same proportion of fixed cost under the direct use method. A similar problem exists in valuing land in rotations. Thus higher-valued uses should support higher proportion of the total fixed costs (Johnson and Pasour). Several serious limitations are associated with the shadow price approach. First, the optimization of the entire cost structure is a difficult task requiring full knowledge not only of the entire firm cost structure but also of all alternative production possiblilities and opportunites. Secondly, allocation of fixed costs according to the value of the product means that cost allocation is not independent of product price fluctuations. Some types of operations involving management functions such as periodic field inspections and overhead machinery use (e.g. snow blowing or trips to town) are difficult to allocate in a direct fashion. Therefore, a variation of the shadow price procedure is used to allocate fixed costs which do not have direct use patterns. These fixed management and overhead machine charges are allocated on the basis of gross returns.

A third method, the break-even approach, assumes that all other secondary products just break even so that the total cost for a primary product or enterprise consists of all costs less the value of all other secondary products or enterprises. This formulation implicitly assumes optimal firm organization and long-run price equilibrium--not very appealing assumptions. This approach is reasonable where farms are characterized by one predominant enterprise such as dairy or wheat and all other enterprises are secondary. Secondary products may be inputs

to the primary enterprise, provide rotation benefits or reduce risk through diversification such as canola might provide in a wheat rotation. Fixed costs are allocated by direct use and by gross income as follows:

$$(2) \qquad ATC_k = [CX + VA + S_g(M+H) + S_d F - R]/Y_k$$

where:
- ATC_k = average total cost of production,
- CX = variable materials and custom services,
- VA = variable machine and building costs,
- M = management fee,
- S_g = gross return share of management and overhead,
- H = general overhead costs,
- F = capital asset fixed costs,
- S_d = direct share of fixed costs and,
- R = returns from other enterprise products.

Fixed costs in Equation (2) include the opportunity cost of operating capital commitments; capital recovery charges on machines, structures, equipment and land; and insurance.

Like most budget generators, FC Top Management incorporates a series of engineering relationships to estimate repairs and power usage. Diesel fuel use is estimated by power loading versus fuel efficiency functions and horsepower of the power unit. Repairs are estimated as a function of usage and new machine replacement costs. These equations and, in particular, the repair relationships tend to be unreliable for any given individual. Thus, a calibration procedure was added to scale our estimates of fuel and electricity usage and machine and building repairs to the actual participant values. This means in essence, that engineering equations are used to allocate repairs and power usage among the various activities.

Financial Feasibility. Budget generators work well in evaluating cost efficiency and short-run cash enterprise selection,

but they are ill equiped to evaluate major investment and growth alternatives because they ignore the financial structure of the firm. Further, many farmers are more concerned with cash flows than long-run economic cost efficiency. Accordingly, the basic budget generator model was augmented with a cash accounting system. Thus, there are dual accounts of variable/fixed or cash/non-cash categories for the various cost components. In addition, assets carry two values: remaining cost basis and fair market value. While in theory the investment decision can be stated as simultaneously maximizing terminal net worth subject to cash flow and financial constraints, in working with farmers, the investment problem is decomposed into a two step examination of economic profitibility and financial feasibility. Long-run economic profitability is measured by changes in net worth and financial feasibility is determined by examining cash flows and changes in debt structure over time.

PC TOP MANAGEMENT DATA REQUIREMENTS

The PC Top Management Model is divided into 6 sections: menus, calculations, data worksheets, screen tables, printed tables and graphic analysis. Data worksheets are divided into the following sections:

(1) general farm financial, tax, trends and labor;
(2) machine, equipment and building inventories;
(3) crop inventories;
(4) field characteristics and inventories;
(5) machine systems and performance;
(6) materials and custom services prices and inventories; and
(7) crop production recipes.

All sections follow the philosophy that "what you see is what

you have." In addition, user-supplied data are accessible from the worksheets which are programmed in text graphics. Section 1 has been divided into a series of pages which can be electronically "flipped" back and forth. Input data are accessed by positioning the cursor using the 4 cursor arrows. Finally, data are checked during entry: illegal characters are ignored and out of bounds data are signaled before the enter key or the cursor keys are pressed. Sections 2 through 6 are based on a spreadsheet style of data display. Row and column labels are predefined, automatic parameter checks are included and special windows are created which display previously defined information and codes. Section 7 resembles a recipe card with windows displaying predefined fields, machine systems and materials. The recipe metaphor is used to construct the production coefficients of each enterprise.

THE PC TOP MANAGEMENT WORKSHOPS

The PC Top Management Workshops are held throughout the province during the winter months. Last year only 11 farmers participated during an experimental workshop. This year in Saskatchewan over 40 farmers, 15 vocational agricultural students (short course students) and several long course students have signed up. Farm business data are collected from participating farmers and cooperating agricultural representatives throughout the province during the winter months. To date, participation has been largely at the invitation of regional farm management extension specialists. These farmers are an important data source, because while they are not average in sense of farm

numbers, they do account for much of farm production. Likewise, they are a group not generally or easily accessed by most extension programs. During informal discussions, they have been asked why they are participating in the program. While some farmers are looking for solutions to particular problems, many simply want to closely scrutinize their farm data, "fine tuning" their operations as much as possible. They also participate in the program because they find value in the program and they enjoy the chance to interact with other participants.

It takes at least 6 hours or more to complete the forms with some assistance from extension personnel. This should not be surprising, however, because they are determining the planning values for the next five years as well as potential business alternatives. The completed forms are returned to the University and the data entered on IBM PC microcomputers. After the data are entered, verified and validated, a two-day workshop is held, usually about two weeks after the initial data meeting. The first morning is devoted to the analysis of current performance. Later in the afternoon, 3 or 4 "what if" situations are delineated. The base farm data are then revised and the farm plan updated. The second day is devoted to analysis of farm growth potential or consolidation. Farm cash flows, taxes, net worth and machinery use patterns are projected for periods ranging from 5 to 15 years.

1983 and 1984 Cost of Production Results. The costs of production for wheat following fallow, wheat following wheat stubble and fallow in Table 1 are based on the spring workshops

of 1983 and 1984. The samples sizes are relatively small but they are expected to increase considerably by 1985. In 1984, the average cost of production for wheat on fallow was $4.19/bu and for wheat on stubble it was $4.54/bu, not including the costs of fallowing. Canadian prairie agriculture is characterized by extensive land operations and the cost data reflect this by exhibiting very high fixed costs and relatively low direct costs. Ignoring the fixed costs of fallowing, the fixed costs of management, machinery, buildings and land comprise from 60 to 70 percent of the total enterprise costs. Depending upon the rotation, including the fixed costs of fallowing increases the total proportion from 70 to 80 percent. This has several important economic implications. First, unless there are good product substitution possibilities, production will be relatively price insensitive. Secondly, land as a residual claimant means that land values should be very sensitive to price changes. As a corollary, it would be expected that it would be more difficult to pay for land out of earnings, creating potential financing problems and making these farms very sensitive to interest rates.

Machine Use Patterns. Our past experience indicates that the quickest way to diagnose machine cost inefficiencies is to review power unit and combine use patterns. Based on past experience and the 1983 Saskatchewan workshops, usage of 2-wheel drive tractors is relatively low--only about 183 hours of direct use and 223 hours of total use, considerably less than the corresponding 306 and 320 hours of use associated with 4-wheel drive tractors. This is not too surprising because these farms

are in a transition period to 4-wheel drive units as shown by the differences in age. In addition, several farms used 4-wheel drive units to power PTO rotary combines. The average SP combine usage is far below normal economic use thresholds. Note that diesel fuel usage in Imperial gallons is also relatively low--a little less than 5 gallons per acre of wheat. These are allocated estimates based on total farm gallons supplied by the farmers.

Table 1: PC Top Management Wheat and Fallow Enterprise Characteristics and Costs, Saskatchewan, 1983 and 1984

Item	Enterprise[a]					
	Wheat/Fallow		Wheat/Stubble		Fallow	
	1983	1984	1983	1984	1983	1984
Number of Farms	10	30	6	32	10	29
1. Acreage	538	420	324	435	563	464
2. Yield (bu/a)	37.4	32.8	25.3	28.9	--	--
Cost Component ($/a)						
3. Total Direct Cost[b]	45.90	47.80	49.80	56.43	4.90	8.84
4. Labor[c]	4.50	5.34	2.40	5.01	1.20	2.69
5. Management[d]	18.60	16.18	13.80	10.96	--	--
6. Operating Capital Charge[e]	2.80	2.80	3.20	3.39	.40	.53
7. Machine and Buildings[f]	3.40	33.83	29.90	34.86	8.90	12.96
8. Land Charge[g]	27.50	31.99	23.50	31.51	25.50	23.79
9. Average Total Cost ($/bu, acre)	3.99	4.19	4.54	4.91	40.98	48.81
10. Direct Hours (hr/a)	.74		.48		.24	
11. Fuel Consumption (gal/a)[h]	4.7		4.9		.8	
12. Machine Investment ($/a)[i]	131.90		127.50		51.8	

[a] The "/" denotes the previous crop.

[b] Total direct costs include: materials, power, repairs, custom services and hourly machine lease charges.

[c] Includes all labor.

[d] Based on allocation of a flat fee management charge.

[e] Based on one-half year use of (3).

[f] Sum of capital recovery charge, insurance and annual lease charges.

[g] Sum of capital recovery charges, property taxes and leases charges.

[h] Imperial gallons.

[i] Based on current fair market values.

The PC TOP MANAGEMENT PROGRAM AS A DATA COLLECTION DEVICE

The PC Top Management program can be used as a vehicle to gain access to farmer data which would be difficult to obtain in any other fashion. The PC Top Management program promises to provide a very rich source of farmer data because (1) data extend to the field and activity level and are not aggregated as in some accounting systems; (2) the data are maintained in a fashion consistent with decision models and are consistent with data base management techniques; and (3) both ex-ante and ex-post information can be collected. However, several serious limitations exist. First, the data is not representative and it may be very difficult to establish benchmark random sample data. Second, sample sizes have remained small when compared to the various state record keeping systems. Staff time commitments have been considerable and can not be justified unless combined with teaching and extension responsibilities. However, there are other uses which have yet to be explored. We expect the program to be useful in dealing with applied research needs of agricultural engineers, agronomists, horticulturists and soils scientists. PC Top Management can serve as a useful decision tool in evaluating alternative machines, production practices and crop rotations while minimizing staff time.

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