# MICROCOMPUTER BUDGET MANAGEMENT SYSTEM

**James M. McGrann, Kent D. Olson, Timothy A. Powell, and Ted R. Nelson**


## Abstract

The enterprise budget, whole farm cash flow, and income statement are fundamental tools of farm and ranch management. The "Microcomputer Budget Management System" (MBMS) is a microcomputer software package that facilitates the storage and use of information for crop and livestock budgeting. It performs the calculations for several enterprise budgeting formats and for preparation of whole farm resource use reports and financial statements. The MBMS also includes internal machinery and irrigation cost calculation routines.

MBMS was developed for use by extension staff, researchers, lenders, consultants, and operators of diversified farms and ranches with many enterprises that use enterprise and whole farm budgeting for analysis and planning activities. The flexibility and detailed nature of the program requires the user to have knowledge of enterprise budgeting and operation of complex computer programs. This paper presents a discussion of the features and capabilities of the software and the computational procedures used in the cost calculations.


*Key words:* enterprise budget, whole farm, financial statements, resource use, budget generator.

Enterprise budget, whole farm cash flow, and financial statements are fundamental tools of farm and ranch management. They are used for economic analysis of resource allocation in production agriculture and for the evaluation of alternative technologies, production systems, and marketing strategies. Budgeting is widely used in economic research, policy evaluation, investment-project evaluation, and production management. Applications range form aiding very specific management decisions to government policy implications.

A continued cost-price squeeze, fluctuating input and output prices, and changes in technology increase the demand for timely enterprise budget and financial information. Computerized budget generator systems are one means of providing reliable, consistent, and up-to-date cost and return information. This paper describes microcomputer budget software, compares its capability to other programs, illustrates reports through partial examples, and describes cost calculation procedures used by the software.

## DESCRIPTION OF SOFTWARE

The Microcomputer Budget Management System (MBMS) is a microcomputer software package that facilitates storage of information for corp and livestock enterprise budgeting. It performs the necessary calculations for determining budgeting costs and returns including machinery, equipment, and irrigation cost calculations. MBMS supports several budget output formats which can be printed without the need to recalculate the budget. It also provides whole farm resource use reports for fuel, labor, machinery irrigation, and operating inputs. MBMS generates files that interface with SuperCalc and Lotus 1-2-

James M. McGrann is a Professor, Department of Agricultural Economics, Texas A & M University; Kent D. Olson is an Assistant Professor, Department of Agriculture and Applied Economics, University of Minnesota, Twin Cities; Timothy A. Powell is an Extension Associate, Department of Agricultural Economics, Texas A & M University; and Ted R. Nelson is a Professor, Department of Agricultural Economics, Oklahoma State University.

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3 electronic spreadsheets to provide whole farm cash flow and income statements.[1]

The cash flow can be set up for 12 months. The actual months are specified by the user. If the farm debt situation and interest cost are specified, the program will calculate monthly excess cash flows and operating capital borrowing requirements. The cash flow is attached to an income statement, so that with minor additional data farm income statement ratios can be calculated. Graphs of monthly cash flows and borrowing requirements facilitate statement analysis.

The MBMS software is menu driven, with substantial error checking capability in the screen data entry. This reduces the chance of undetected operator error. However, the high degree of flexibility built into the program requires the user to be knowledgeable of enterprise budgeting. A detailed data base must be developed to correctly use the program. The size and complexity of MBMS also makes it helpful if users are familiar with operating large programs in microcomputers.

If the data are available, input and calculation of an enterprise budget require approximately 4 hours. After the initial data files are prepared, specifying and obtaining other budgets require about 30 minutes. Generating the whole farm budget is just a matter of specifying the enterprises to be included and the number of units of each. The actual calculation time for the whole farm budget can be lengthly depending on the number and complexity of inputs at the enterprise level.

In recognition of the need for a high level of user knowledge and time, MBMS is supported by three manuals. First, a detailed software user's manual includes a description of the analytical and operational procedures used (McGrann et al.). Second, a supporting educational manual helps users increase their knowledge of enterprise budgeting and whole farm economic and financial analysis (Olson et al. 1984a). A third manual has example budgets prepared for a variety of crop and livestock enterprises and a whole farm budget (Olson et al. 1984b). Many features of MBMS are highlighted in these examples.

The flexibility in enterprise budgeting and the extensive whole farm summaries make MBMS a powerful planning and analysis tool. Extension staff, researchers, lenders, consultants, and managers of diversified farms and ranches are the clientele who will use the program to its fullest potential. It was designed for such a target audience.[2]

## COMPARISON TO OTHER SOFTWARE

MBMS is an enhancement of the mainframe computer based Oklahoma Budget Generator developed in the 1970's and used by many land-grant institutions and government agencies (Kletke). MBMS incorporates features to facilitate data entry and processing. Specific enhancements added to MBMS include: (1) the option of user defined values for machinery repair and maintenance cost calculations, (2) the option of user defined values for fuel use and implement capacities, (3) an internal irrigation cost calculation procedure, (4) whole farm budgeting, (5) whole farm resource use summaries, and (6) interface with spreadsheets for cash flow and income statement preparation.

A budget generator system is fundamentally a data base management system that includes equations for cost calculation of irrigation, machinery, equipment, and other fixed assets. MBMS differs from most currently used budgeting tools based on electronic spreadsheet software in that the data used in a budget are stored in their most elemental form in common data files and internal calculations are included for all resources used in production. Therefore, a change in, say, the price of fuel in the parameter file will be reflected in all of the stored budgets. In many electronic spreadsheets, each template (budget) would have to be updated individually and, in many cases, a number of resource costs must be calculated outside the spreadsheet (Bond; Edward).

A number of microcomputer accounting packages generate enterprise cost accounting information. Systems such as Terra and Redwing are examples (Datasphere Computer Systems, Inc.; Redwing Business Systems, Inc., 1985b). These systems do not generate the economic costs (e.g., opportunity cost for capital or land) required for evaluation of resource allocation questions. Information developed from accounting packages is use-

[1] SuperCalc is a trademark of the Sorcium Corporation. Lotus 1-2-3 is a trademark of the Lotus Development Corporation.

[2] MBMS is receiving national and international use by extension specialists in land-grant institutions, government agencies, private consultants, and agricultural managers.

ful in spreadsheet budgeting and as an input for MBMS, expecially for historical cash operating costs. For projection and economic analysis, MBMS recalculates costs as changes are made in resources within the budget or for the whole farm. Provisions are not made in accounting packages to calculate costs, but only to accumulate costs for historical transactions. MBMS does not have the capability of facilitating farm accounting. MBMS can complement farm accounting systems, but they are not substitutes for each another.

MBMS will access and maintain data bases for machinery, equipment, other resource inputs, products, parameters, and previously constructed budgets. Full-screen entry of information facilitates data entry, modification, and storage. An option allows the user to calculate operation and ownership costs of a resource immediately after entry but before the data are stored in the data base. This is an important data checking feature of MBMS.

## DATA ENTRY EXAMPLE

Figure 1 presents the data entry screen for a tractor resource. Data for a 100 horsepower tractor have been entered. Figure 2 shows the operation and ownership costs for the example tractor. The actual cost calculation procedure is described in a later section of this paper.

## RESOURCE AND OPERATION DEFINITION

MBMS allows the user to define several resources (e.g., tractor, labor, planter, and seed) as a "farming operation" (e.g., planting). This farming operation can then be called by name rather than repeatedly identifying each resource used.

User defined stages of production help ensure that a user can organize cost summaries to reflect decision points (e.g., land preparation, preplant, crop protection, preharvest, and harvest stages). Livestock budgets can be organized into stages such as feeding, marketing, etc.

Several alternative enterprise budget formats can be selected that provide different cost aggregation by stage, operation, resource name, and residual returns as well as a summary report and a report by expense type. These formats are available with costs calculated as either economic or cash/noncash costs. MBMS also generates reports on whole farm annual and monthly resource use and whole farm monthly cash flows.

## ENTERPRISE BUDGET EXAMPLE

Figure 3 shows an economic costs and returns budget by resource for a dryland wheat enterprise. Figure 4 shows the whole farm production cycle resource use for an example farm. Figure 5 shows the monthly usage of machinery for the same example farm.

## WHOLE FARM BUDGETING

Whole farm resource use and cash flow report generation from enterprise budgets are extremely important in ensuring resource use feasibility and consistency in analysis pro-

DESCRIBE TRACTOR RESOURCES

DTR

1. Full Name Tractor 100 HP

..... Engineering Data .....

3. Horsepower Rating (PTO HP) 100
4. Useful Life (Hr) 12000
5. Fuel Type (NG, LP, GA, DI) DI
6. Remaining Life (Hr) 12000
7. Fuel Consumption (Units per Hr)
8. Annual Use (Hr) 525

..... Economic Data .....

9. Current List Price ($) 37400
10. Salvage Value ($) 10
11. Current Market Value ($) 33660
12. Lease Payment (%)

..... Rmd (Opt. 1) .....

13. Hired Labor (Hr)
14. Off Farm Parts & Labor (4) 10
15. Owner Labor (Hr)
16. Use Base for R&M Cost (Hr)

..... RMD (Opt. 2) .....

17. Rep. Coeff. #1 .029
18. Dep. Fac. #1 .68
19. Years Owned (Yr) 7
20. Rep. Coeff. #2 1.50
21. Dep. Fac. #2 .92

..... Calc. Options .....

22. Fuel (D, C,) C
23. RMD Cost (1, 2) 2
24. Lease (H, A)

Quit, Help, First, Last, Examine, Change, $, Delete, Save, Update, Next, Back?

**Figure 1. Data Entry Screen for 100 Horsepower Tractor, Microcomputer Budget Management System.**

RESOURCE NAME "TRACTOR—100HP"

| | $/Hour | Totals $/Hour |
|---|---|---|
| Variable costs | | |
| Fuel | 8.27 | |
| Lube | 0.41 | |
| Repair and maintenance (Off-farm) | 0.79 | 9.47 |
| Fixed costs | | |
| Interest | 5.47 | |
| Depreciation | 5.30 | |
| Taxes, license, and insurance | 0.96 | 11.73 |
| Total cost | | 21.20 |

Quit, Continue, Print? ____

**Figure 2. Operation and Ownership Costs for Example Tractor, Microcomputer Budget Management System.**

cedures. Consistency in calculating the enterprise cash flow requirement and whole farm cash flows is achieved by recognition of the timing of cash flows and the "self-financing" of some enterprises in terms of operating capital (e.g., the dairy enterprise).

Annual use is the most critical variable in determining machinery hourly cost. A weakness in the widely used Oklahoma Budget Generator and other mainframe generators is that the annual hours of use for machinery and equipment are specified without a procedure to easily determine if the hours of use are correct for the whole farm description (Kletke). With MBMS, the ease in determining annual use through the whole farm resource use summary will help overcome this problem.

MBMS uses the electronic spreadsheet to facilitate preparation of the whole farm cash flow and income statement. Whole farm values are aggregated for the combination of enterprises (e.g., 200 acres of wheat and 300 head of cattle). This aggregated data can be used for reports within MBMS or can be transferred to templates for the development of cash flow and income statements. Templates are also included for the balance sheet and a worksheet to calculate debt repayment capacity.

ECONOMIC COSTS AND RETURNS
OWNER BUDGET BY RESOURCE
DRYLAND WHEAT TEXAS HIGH PLAINS REGION 1

| Gross income description | Quantity | Unit | $/unit | Total |
|---|---|---|---|---|
| Deficiency pmt. wheat | 15.00 | bu. | 1.15 | 17.25 |
| Wheat | 15.00 | bu. | 3.20 | 48.00 |
| Wheat grazing | 45.00 | days | 0.15 | 6.75 |
| Total gross income | | | | 72.00 |

| Variable cost description | Total |
|---|---|
| Chisel | 0.14 |
| Custom harvest wheat | 12.00 |
| Custom haul wheat | 1.50 |
| Grain drill | 0.34 |
| Interest earned | -0.01 |
| Interest OC borrowed | 0.95 |
| Pickup | 2.47 |
| Seed wheat | 2.50 |
| Sweep | 0.47 |
| Tractor-2, 150HP | 7.37 |
| Total VARIABLE COSTS | 27.74 |

Break-Even Price, Total Variable Costs, $0.24/bu. of WHEAT

| | | |
|---|---|---|
| GROSS INCOME minus VARIABLE COST | | 44.26 |

| FIXED COST description | Unit | Total |
|---|---|---|
| Machinery | acre | 7.04 |
| Land, Net Share Rent | acre | 25.00 |
| Total FIXED Cost | | 32.04 |

Break-Even Price, Total Cost, $2.38/bu of WHEAT

| | |
|---|---|
| Total of All Cost | 59.77 |
| NET PROJECTED RETURNS | 12.23 |

**Figure 3. Economic Costs and Returns Budget for Dryland Wheat, Microcomputer Budget Management System.**

WHOLE FARM PRODUCTION CYCLE RESOURCE USE
WHOLE FARM TEXAS HIGH PLAINS REGION 1

| Resource Name | Beg.Month | Units | Defined Use | Calculated Use | Percent Used |
|---|---|---|---|---|---|
| TRACTOR, 100HP | 01/01 | hour | 525.00 | 527.26 | 100.43 |
| TRACTOR, 150HP | 01/01 | hour | 700.00 | 703.93 | 100.56 |
| TRACTOR-2, 150HP | 01/01 | hour | 925.00 | 935.36 | 101.12 |
| BED PLANTER, 8R | 01/01 | hour | 100.00 | 109.14 | 109.14 |
| CHISEL | 01/01 | hour | 200.00 | 209.16 | 104.58 |
| CULTIVATOR, 8R | 01/01 | hour | 100.00 | 110.75 | 110.75 |
| GRAIN DRILL | 01/01 | hour | 170.00 | 173.23 | 101.90 |

**Figure 4. Partial Whole Farm Resource Use Report for Example Farm, Microcomputer Budget Management System.**

WHOLE FARM MONTHLY MACHINERY USE
WHOLE FARM TEXAS HIGH PLAINS REGION 1
1983

| MONTHLY USAGE OF MACHINERY | June | July | August | Sept. | Oct. | Nov. | Total |
|---|---|---|---|---|---|---|---|
| TRACTOR-2, 150HP | 86 | 222 | 390 | 221 | 0 | 0 | 919 |
| CHISEL | 0 | 120 | 75 | 0 | 0 | 0 | 194 |
| GRAIN DRILL | 0 | 0 | 51 | 122 | 0 | 0 | 173 |
| OFFSET DISC | 0 | 82 | 82 | 0 | 0 | 0 | 164 |
| RODWEEDER | 0 | 0 | 69 | 0 | 0 | 0 | 69 |
| SWEEP | 79 | 0 | 79 | 79 | 0 | 0 | 236 |

**Figure 5. Partial Monthly Machinery Use Report for Example Farm, Microcomputer Budget Management System.**

## MACHINERY, EQUIPMENT, AND IRRIGATION SYSTEMS COST CALCULATIONS[3]

Machinery, equipment, irrigation systems, and other capital asset cost calculations account for a majority of MBMS calculation procedures. The ownership costs for capital assets are based on current year market or replacement value. This allows cost to be expressed in current dollars and correctly expresses enterprise costs and returns. The whole farm income statement allows the user to input IRS depreciation for tax and financial management purposes.

MBMS does not have the capability of generating IRS depreciation. Maintenance and redistribution of a tax based program, which must be continually updated as tax laws change, would be prohibitive. Alternative templates or specialized programs (Redwing Business Systems, Inc., 1985a) can be acquired to calculate IRS depreciation. These values can be entered in the whole farm financial statements.

Two options are available to the user to calculate machinery operating and ownership costs. The user defined option allows the user to enter annual costs for repair and maintenance, fuel consumption, field capacity, etc. The repair and maintenance costs (on-farm labor and off-farm purchased parts and labor) are specified in terms of a base hours of asset use. Hourly costs are then calculated using the specified cost divided by the base hours. Repair and maintenance costs are held constant on an hourly basis as annual use exceeds or is less than the base. Current year depreciation is calculated on the basis of the specified annual use as a proportion of remaining life multiplied by the current market value adjusted for salvage value expressed as a percent of current market value.

The second machinery cost calculation option uses pre-specified formulas to duplicate the procedure described by the American Society of Agricultural Engineers in the *Agricultural Engineering Yearbook of Standards - 1983*. The second option for irrigation systems uses engineering estimates based on a percent of current list price for the different components. A chapter in the user's manual summarizes all the calculation procedures used in MBMS.

## LAND COSTS AND RETURNS

Considerable flexibility exists for the user to calculate land costs and returns to reflect alternative ownership arrangements. In the owner option, the user can specify alternative leasing arrangements, rates of return based on market value, as well as land appreciation (depreciation), if desired. Tenant options include crop share or cash lease options. When using crop share options, crop and input shares are defined when the enterprise budget is described. Flexibility exists to specify landlord and tenant arrangements. The software permits the user to describe a wide range of land cost calculation options to fit different decision environments and budgets uses. The user can determine the optimum tenure arrangement from this type of analysis.

## OPERATING CAPITAL

Operating capital is the short-term capital required to finance cash costs, both variable and fixed, during the enterprise production cycle. MBMS allows for the internally generated cash (i.e., from the sales of products) to offset the operating input expenses. Any cash surplus is carried forward and any deficit constitutes an operating capital requirement.

The annual capital requirement in the reports is the weighted average net capital requirement (weighted by the days outstanding); it is not the minimum or maximum of short-term financing required by the enterprise. Annual capital requirements may even be negative if accumulated monthly receipts are greater than expenses over the production cycle.

The economic cost of capital is determined by the net annualized requirement times a user specified interest rate. Surplus operating capital can earn a positive return at a user specified rate of interest. Normally, this rate would be different than the rate for borrowed capital.

The monthly cash flows from enterprises are combined to generate the monthly whole farm cash flow. It is at this stage of analysis that the user can reflect both the cash debt

[3] The next three sections summarize special calculation options used in MBMS. Section nine in the MBMS User Manual specifies all the calculation formulas and procedures used in MBMS.

payment requirements and cash flow requirements not related to specific enterprises (e.g., household living expenses). The whole farm cash flow generates the information for cash flow requirements and calculates cash interest obligations. This information is used to develop the income statement.

At the enterprise level, the program calculates the net economic interest cost on operating capital necessary to sustain the production cycle as well as providing an interest return for excess cash flow generated. At the whole farm level, the cash flow balances are calculated, enabling monthly input purchase and marketing plans to be closely monitored. Linking MBMS to spreadsheet analysis provides a bridge between enterprise economic analysis and the cash flow and income statement for the total farm.

## MICROCOMPUTER HARDWARE REQUIREMENTS

MBMS will operate on most microcomputers capable of using Microsoft MS-DOS version 2.0 or greater operating systems. A minimum of 256K CPU is required. A printer capable of printing 132 columns is necessary to print whole reports. The program requires a microcomputer with a hard disk to facilitate data storage and speed of operation.

## AVAILABILITY

The Texas Agricultural Extension Service is in charge of distribution of the program and support materials. MBMS supporting manuals and SuperCalc and Lotus 1-2-3 financial statement templates are distributed at a fee of $300 per licensed copy to cover distribution and program maintenance costs. MBMS has been made available free of charge to farm management specialists in 39 land-grant institutions. In addition, the program has been distributed to three divisions of the USDA, Agricultural Canada, and four farmers or private consultants. States may choose to distribute and support the program in their respective states or direct their clientele to the Texas Agricultural Extension Service to acquire the program.

## REFERENCES


American Society of Agricultural Engineers. "Agricultural Machinery Management.: *Agricultural Engineering Yearbook of Standards—1983*. American Society of Agricultural Engineers; St. Joseph, Michigan, 1983.

Bond, Larry K. "Electronic Spreadsheet Templates—Farm Management Series." Farmcomp, Logan, Utah, 1983, pp. 16-7.

Datasphere Computer Systems, Inc. "The Terra Cost Accounting System for Agriculture." Portland, Oregon, 1984.

Edward, William. "Figuring Crop Production Costs." Version 1, Microcomputer Worksheets for Agriculture, Cooperative Extension Service, Iowa State University; Ames, Iowa; January, 1984.

Kletke, Darrel D. "Operation of the Enterprise Budget Generator." Research Report P-790, Oklahoma State University, Agricultural Experiment Station; Stillwater, Oklahoma, 1979.

McGrann, James M., Kent D. Olson, Timothy A. Powell, and Ted R. Nelson. *Microcomputer Budget Management System User Manual*, System Design and Programming by Clay Laird. Texas Agricultural Extension Service, Department of Agricultural Economics, College Station, Texas; November, 1984.

Olson, Kent D., James M. McGrann, and Ted R. Nelson. *Using and Understanding Budgeting and the Microcomputer Budget Management System.* Texas Agricultural Extension Service, Department of Agricultural Economics, College Station, Texas; November, 1984a.

Olson, Kent D., James M. McGrann, Timothy A. Powell, and Ted R. Nelson. *Microcomputer Budget Management Systems Examples.* Texas Agricultural Extension Service, Department of Agricultural Economics; College Station, Texas; November, 1984b.

Redwing Business System, Inc. *Redwing Asset Management: Software for Managing Agriculture Assets.* Redwing, Minnesota, 1985a.

_____. *Redwing General Ledger*, Redwing, Minnesota, 1985b.