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BUDGET PLANNER: USER-ORIENTED WHOLE-FARM BUDGETING SOFTWARE

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Abstract

Budget Planner is a whole-farm or enterprise budgeting software program that is simple to use for farmers, extension agents, and other budgeters who are sometimes inexperienced, but that also provides the detail necessary to be accurate. Program defaults eliminate repetitive questions that change little from budget to budget. Defaults can be temporarily overridden, or they can be permanently changed with a detailed modify program. The program leads a user through a sequence similar to that a producer might utilize. Input forms were created to enlarge the user clientele and eventually increase computer use by farmers and extension agents.

Key words: budget, enterprise, whole-farm, user-friendly, microcomputer.

A Kellogg Foundation study in 1984 estimated that 75 percent of farmers would own computers by 1991 (*Ag Computing*). This seems doubtful since estimates of farmers and ranchers that owned microcomputers by 1986 ranged from only 5 to 18 percent (Widmer-Vikla; *Ag Computing*). Currently, there are more than 750 private software programs (Faulkner and Brown) and more than 1750 public programs (Strain and Simmons) vying for the limited software market for farmers and ranchers. Although limited PC use is the result of a variety of influences, too little attention may have been given to user experience in software design. Perhaps software itself and support programs for it could be better designed to help contribute to growth in computer ownership and use.

Budget Planner is a software program for partial, enterprise, or whole-farm budgeting (Hoag et al.). No claims are made that Budget Planner will, on its own, stimulate increased computer use, but the program is designed with attention to user needs and may ultimately contribute to greater computer use. Budget Planner was specifically designed to stimulate a desire to learn more about economics through computer examples that are useful and easy to understand. In the design phase, a balance was sought between detail and ease of use. Sacrifices in each goal were made on a subjective basis to achieve that balance.

The criteria used to develop Budget Planner were based on popular farm press articles, an article in the *Doane's 1986 Agricultural Computing Directory* entitled "11 Rules for Ag Software Development," and a software rating system used in *Ag Computing*. These criteria were:

INTENDED USE

The program should be needed by the users for well-defined end uses. It should be designed to meet their skill level in computer use and in the subject matter of the program, hardware and computer availability constraints, and the user's coding and data entry constraints.

QUALITY CONTROL

Programs should be reliable, both from a programming perspective and from a subject matter perspective. A peer review and extensive pre-testing with potential users will improve quality.

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The author would like to thank the co-authors of Budget Planner, Edmond Estes, Lenny Rogers, and Vernon Cox, as well as Karen Klonsky and Jim DuBrulle at the University of California, Davis, for their help in developing Budget Planner Plus.

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USABILITY The screen design and processing capabilities should be clear enough to make the program as easy to use as possible. The appropriate amount of educational support should be available and access should be reasonably easy.

EDITING It should be easy to edit data and to recompute results. It should be possible to escape the program when desired and to resume using the program at a later time.

OUTPUT The output should reflect the needs of the users and should not have an overwhelming volume. Users should be able to view results on screen or on a hard copy and should be able to print subsets of the output when applicable.

These criteria are somewhat arbitrary, but they have a logical basis. They are not universal for all programs however. For example, spreadsheets have made it very easy for extension workers to respond quickly with economic decision aids to rapidly changing policies or conditions. But spreadsheets have a limited format and usually require that someone owns a particular spreadsheet program and knows how to use it. A custom-designed program can always be more user-friendly and more mistake-proof than a spreadsheet, but it takes more time and thought to develop. The urgency of program development and the duration of its applicability determine whether a spreadsheet is more appropriate than a detailed program.

BUDGET PLANNER: PROGRAM DESCRIPTION

Budget Planner consists of two disks, one called the Program disk and the other called the Modify disk. The Modify disk is used to set up the Program disk with default values. It has considerably more detail about calculations, such as repairs or depreciation on equipment. The Program disk has less detail and relies heavily on defaults created by the Modify program. This speeds data entry on the program disk, since informational detail is minimized. It also makes the program considerably more user friendly without inhibiting the ability to increase in usefulness as a grower becomes more proficient at using it.

The Budget Planner program begins with an initial set-up screen, "General Farm Information," where producers enter their name and address. They are also asked for the labor rate to operate machinery and the interest rate on annual operating costs. The labor cost is labor time multiplied by labor usage. Labor time required to operate equipment is adjusted upward from the time required to complete each operation to account for start-up and wind-down time. The interest charge is compounded monthly from the month the operation is completed until the crop is harvested.

After collecting the general farm information, users enter their base data on one of four input screens (Figure 1). "Crop information" is entered first with the program branching down to the "Enterprise Operations" to produce each crop, the "Equipment and Vehicle Use" needed to complete each operation, and the "Material and Non-Machine Labor Used" for each operation. To keep the program small enough to use on 256k machines, only five crops can be entered on one budget, but an infinite number of budgets can be linked together to create any size whole-farm budget.

There are default values for farm data provided in windows on three of the four screens. Materials or crop operations can be entered directly or by using the default aids provided in the windows, but the windows are always needed for entering equipment. The information in the windows can be permanently changed via the separate program called "Budget Planner: Modify." Program defaults provided in the windows are often accepted initially by beginning users, making it easier for them to learn the program. Users can fine tune their budgets by substituting actual data for the defaults later when they are more proficient with the program.

In the example shown in Figure 1, three crops are produced on a total of 265 acres. Yields, prices, and other data are shown in the "Crop Information" screen. The operations required to produce corn begin with HER-FER-DI (herbicide application with fertilizer and a discing) and end with LIME. The equipment used in HER-FER-DI is 11, 35, 59, and 1 (a tractor, tandem disc, tractor-mounted sprayer, and pickup truck) with a total estimated operating time of 8 minutes per acre (7.3 acres/hour). The program estimates the operating time as that for the slowest implement used unless the user overrides the

default in the box shown in the lower left-hand side of the screen. The model year is entered because the program multiplies annual ownership costs by an appropriate price index which is set through the Modify Program. Finally, for HER-FER-DI in corn, 1.0 units of a herbicide costing \$16.36 and 7.04 units of a 30 percent liquid nitrogen at \$4.45 are applied per acre.

The estimate of the time per acre to complete an operation typifies the program's compromise between detail and simplicity. Rather than asking a user about speed and field efficiency, the program assumes the operation has median values for the chosen equipment (which are entered with Modify before using the program). A 16-foot combine for example operates at 3 mph with field efficiency of 73 percent. Rather than asking this information, the users are simply asked to adjust the pre-determined estimate in acres per hour or minutes per acre.

The program will repeat queries for the equipment and material use for each operation entered in the crop and then repeat the process for the next crop. When all crops are completed, the program will total the equipment

use for all entered crops. Producers are shown the total hours of use and given an opportunity to indicate any additional use of the equipment for other crops and enterprises not budgeted. The fixed costs of the equipment are pro-rated proportionally to their use for the budgeted crops as compared to nonbudgeted crops.

Finally, the program will show the user the assumed annual (depreciation, interest, taxes, and insurance) and hourly (fuel, lubrication, and repairs) costs for all equipment used. The costs for each piece of equipment were originally entered through the Modify Program. A user may accept defaults or change them. Changes to defaults are stored as a permanent record for the budget only where they are altered, and defaults in the program itself are unaltered for future users. The defaults can be permanently changed for the program by using the companion program, Modify.

BUDGET PLANNER: INTENDED USE

Budget Planner was designed to be used by producers to compute the costs of various management alternatives. Therefore, it had to be easy to enter, then easy to change. More recently, an update of the program includes

CROP INFORMATION sample

Crop Name	Acres ^a in Crop	Yield Unit/Acre	Enter For Each Crop		Acres Rented	Rental \$/Acre
			Price \$/Unit	Harvest Month		
Tobacco	25.00	2200.00	1.55	9		
COM	120.00	100.00	2.65	9		
Soybean	120.00	30.00	5.00	10		

^a Acres must be the same for each crop in a double or triple crop

Press (F1) to edit selected crop or (ESC) when done

ENTERPRISE OPERATIONS FOR Corn sample

Enter any operation name or, if listed, number of example operation

No.	Name or No.	Month
1.	HER-FER-DI	3
2.	DIS	3
3.	PLT-INS-FE	4
4.	CULTIVATE	5
5.	HARVEST	9
6.	BUSH MCG	10
7.	LINE	10
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

No.	Example Operations
1.	Bale
2.	Bd/Frt/Trp
3.	Shave Bed
4.	Combine
5.	Cultivate
6.	Cult/spray
7.	Curing
8.	Cust harv
9.	Digging
10.	Discing
11.	Disc/harrow
12.	Ferc. Appl
13.	Fert/plan

PgUp/PgDn - Scroll Examples

Press (F1) to edit a single selected operation or (F2) to resume entering from a selected operation or (ESC) to quit

EQUIPMENT AND VEHICLE USE FOR Corn - HER-FER-DI sample

Select Equipment Used	No.	Description
Number		
Model Year		
BT	1.	Pickup truck 0.5 T
25	2.	Truck 2 Ton
1983	3.	Tractor d1 16 Ap
55	4.	Tractor d1 25 Ap
1	5.	Tractor d1 35 Ap
19	6.	Tractor d1 40 Ap
19	7.	Tractor d1 45 Ap
19	8.	Tractor d1 55 Ap
19	9.	Tractor d1 70 Ap
19	10.	Tractor d1 80 Ap
	11.	Tractor d1 90 Ap
	12.	Tractor d1 100 Ap
	13.	Tractor d1 110 Ap

This operation takes 8 minutes/acre or 7.3 acres/acre. Change to minutes/acre.

PgUp/PgDn - Scroll Equipment Choices

Press (F1) to continue or (ESC) to quit

MATERIAL AND NON-MACHINE LABOR USED FOR Corn - HER-FER-DI sample

Enter any material name or, if listed, number of example material:

Materials	Units/Acre	Price/Unit
HERBICIDE	1.00	16.36
30/210 NIT	7.04	4.45

No.	Example Materials
1.	INSECTICID
2.	Countersic
3.	Diazinon4E
4.	Dyfonot18C
5.	Furadan15G
6.	Lannal18C
7.	Lorsban15C
8.	Lorsban 4E
9.	Orthen75SP
10.	Sevin 10D
11.	Sevin 05S
12.	HERBICIDE
13.	2,4D amine

Non-Mach Lab: HOURS/ACRE Usage/Hour

PgUp/PgDn - Scroll Examples

Press (F1) to continue or (ESC) to quit

Figure 1: Primary Budget Data Entry Screens.

features for those individuals, such as extension specialists, who do several budgets at a time. To make Budget Planner useful for farm management, output includes breakeven prices and yields, cash flow, crop returns, and marginal costs for every operation. It has quick editing features so that information can be changed and the resulting costs and returns quickly computed. For example, the profitability of conservation tillage can be found by entering a budget with conventional tillage and comparing costs and returns to a second budget with conservation tillage. The conservation tillage budget can be created by simple editing to the conventional tillage budget.

This program is useful for sensitivity or "what if" analysis on crop alternatives or crop management systems, but it gives no guidance about optimizing over various management alternatives. An optimization program called Crop Planner (Estes et al.) utilizes Budget Planner as a core program to provide input into a linear programming model that does give guidance about management choices. Other researchers and Extension specialists are also using Budget Planner in more comprehensive programs. Finally, Extension specialists in other disciplines are using the program to determine the costs of their recommendations.

BUDGET PLANNER: QUALITY CONTROL

Budget Planner is written in Turbo Pascal and can be used on any IBM compatible with 256k or greater in random access memory. The program has been thoroughly tested by graduate students, extension agents, extension specialists, and farmers, and the budgeting procedures have passed a peer review. After a year and a half of testing, the program was released through Extension Computer Services at North Carolina State University in Raleigh for \$50. The program is guaranteed against defects and has user support for problems should they arise.

BUDGET PLANNER: USABILITY

Budget Planner is menu driven and uses input fields and key protection to reduce the possibility of entry error. All screens were tested for user friendliness and redesigned as necessary. It is also designed so that producers do not need computer experience or budgeting experience to use the program. People can even gain access to the program without owning or having access to a com-

puter. Input forms enable extension agents or other specialists with computers to work with farmers who are unwilling or unable to use a computer themselves (Figure 2). The input forms were developed to increase the use of the program. Producers who are apprehensive about computers can try the forms and be encouraged to use computers later if they find that the output is useful.

Most producers can develop budgets whether they have farm records or not by relying heavily on supplied defaults. The program's default system keeps it simple but maintains the program's ability to provide more accurate information by overriding predetermined defaults.

BUDGET PLANNER: EDITING

Budget Planner is structured for farm planning. The capability for easy editing is therefore important so that alternative management practices can be easily compared. Users could develop separate budgets for each alternative management system, but editing existing budgets saves time when many operations are unchanged in the new budget. The program can be exited at almost any point and can be re-entered with relative ease. An edit menu guides users to where changes are desired as quickly as possible.

Farm decisions that could be examined using Budget Planner's edit feature include the hiring of a pest scout, crop rotation, conservation tillage, government program participation, chemical/mechanical tradeoffs, and cost effectiveness of harvesting a severely damaged crop. For example, the "sample" budget stored on the Modify disc of the Budget Planner program contains a farm with 25 acres of tobacco, 120 acres of corn, and 120 acres of soybeans. A producer that needs to sell tobacco quota to raise capital can retrieve the saved budget, "sample," delete tobacco, increase corn or soybean acreage by 25, and compare whole-farm net returns with and without tobacco.

BUDGET PLANNER: OUTPUT

The output for Budget Planner can be displayed on screen and/or on a hard copy. Assorted output can be viewed repeatedly with almost instantaneous speed since it is stored in random access memory and not recomputed until the output mode is exited.

The output is divided into eight parts. There is an enterprise budget, crop returns report, breakeven analysis, monthly cash flow,

price/yield sensitivity table, equipment cost and use summary, explicit summary of farm budgeting data including equipment and materials used for each operation, and annual and hourly costs for equipment used.

Costs for each crop are displayed in the enterprise budget with the same name and in the same order as the operations were entered. If trucks were entered in the budget, they are listed as operations at the bottom of the budget since their costs are not allocated by operation. Costs are divided between operating and ownership costs. The operating costs for each operation are machine,

material, non-machine labor, and operating interest.

The operating costs are summed to obtain total operating costs and then added to equipment ownership costs to compute total costs. The variable cost of an operation is directly usable for marginal decision analysis since it relates one-to-one with the operation performed. Most budgeting outputs do not provide the cost of an operation in a simple format. This format was chosen so that it would show the producers their costs for each operation or action undertaken.

The returns per acre and for the whole-farm

FARM INFORMATION									
1. Name	I.M. SAMPLE				2. County				
3. Address									
4. Crop for this budget	CORN				5. Machinery wage/hr.	5.00			
6. Acres in this crop	120				7. Yield (unit/acre)	100 bu			
8. Price/unit of yield	2.65				9. Month of harvest	9			
10. Loan interest rate	11%								

ENTERPRISE OPERATIONS									
OPERATION					OPERATION				
NAME	MONTH COMPLETED (01 - 12)				NAME	MONTH COMPLETED (01 - 12)			
1. HERB-HER-IDT	0	1	2	3	26.	0	1	2	3
2. PLT-SC	0	1	2	3	27.	0	1	2	3
3. PLT-ING-FIE	0	1	2	3	28.	0	1	2	3
4. CULT-IVANT	0	1	2	3	29.	0	1	2	3
5. HARVEST	0	1	2	3	30.	0	1	2	3

EQUIPMENT AND VEHICLE USE										
TRACTORS, EQUIPMENT AND TRUCKS USED BY OPERATION										
OPERATION	NO.	YR.	NO.	YR.	NO.	YR.	NO.	YR.	NO.	YR.
1.	11	83	35	83	59	83	1	83		
2.	11	83	25	83						
3.	10	83	38	83	1	83				
4.	10	83	55	83						
5.	NONE									

MATERIALS AND NON-MACHINE LABOR USE									
OPERATION	MATERIAL	UNIT/ACRE	PRICE/UNIT	MATERIAL	UNIT/ACRE	PRICE/UNIT	NON-MACHINE LABOR		
							HOURS/ACRE	WAGE/HOUR	
1.	HERBICIDE	1.00	16.30						
	5-15-30 BK	2.00	7.30						
2.									
3.	CORN (seed)	16.00	1.18	COUNTER	6.00	1.50			
	30% LIQ N	3.33	4.45						
4.									
5.	CSTM HAR	100.00	0.30				0.30	6.00	

Figure 2: Sample Sections of an Input Form.

are given for each crop. Net returns are calculated for four cost levels: 1) returns over operating costs, 2) returns over operating and equipment ownership costs, 3) returns over operating, equipment ownership, and land rent, and 4) average returns over operating, equipment ownership, and land rent. The average returns in (4) will equal the returns in (3) if all land is rented. The average returns distribute land rent equally over all land farmed.

In the breakeven analysis, users are given the breakeven price and yield to cover various costs. A table is also generated that shows the returns over operating costs given various yields and prices. Ten, 20, and 30 percent are added and subtracted to the entered yield and price to construct the table—these ranges can be set to anything in Budget Planner Plus, which is described later. Producers have liked this table far more than the breakeven yield and prices.

A cash flow table is generated that gives the total "cash" requirement on an accrual basis by month and use to produce each crop. Producers may not actually spend their money on the inputs in the month they use them, but the table is useful for planning. Some producers have used the cash flow to secure bank loans.

The final output type is a summary of equipment cost and use and a summary of all data entered. Equipment and materials are listed by operation along with the time to complete each operation and the month of each operation. Two tables are also generated: a table with the annual and hourly costs of equipment used and a table with the total hours of use for each piece of equipment.

ILLUSTRATIONS OF BUDGET PLANNER USES

Budget Planner has been used for a variety of Extension applications and for classroom teaching. In an advanced farm management class, students developed budgets for various fertilizer input levels with diminishing marginal returns to crop yields. The students were divided into four groups with varying farm sizes from 50 to 400 acres. Using Budget Planner, they edited a budget by changing yield, fertilizer level, and crop acreage. The students graphed the average total cost curves and then combined their data into a longrun envelope.

Farmers have been invited to special Extension meetings where one to four at a time would use the program on a portable com-

puter to follow preset examples. They developed budgets, then edited them for a variety of farm management questions. They determined the impact on profits for alternative farm size, tillage systems, crop combinations, input modifications, farm commodity program participation scenarios, reactions to pest or weather destruction, and certain other questions in which they had an interest.

A pilot project is currently underway to teach producers how to use Budget Planner and a microcomputer through a mobile computer laboratory that contains several microcomputers and appropriate software.

UPDATE AND IMPROVEMENTS: BUDGET PLANNER PLUS

A new version of Budget Planner designed for mass budget production by experienced users, called Budget Planner Plus, is currently being developed. The new program will explicitly account for multiple products from a single crop, such as lint and seed in cotton. It can include irrigation more easily and has added features to include capital costs and overhead more readily. The new program will also have a coding system to distinguish the types of operations or materials used. Traditional budgets typically breakout pre-harvest from post-harvest and various types of inputs from others. Users will be able to set their own codes with the Modify program. The program should not be appreciably harder for end users.

Also planned is the addition of a quick entry routine to bypass the menus. This will be useful for experienced users entering many budgets. The ability to customize output formats will also be added. There is some dispute about how output should look, which is usually a function of the intended use. Standard outputs will be offered, but there will also be an option to dump the results into a spreadsheet. In addition, a partial source code will be provided so that purchasers can modify the output reports to fit their own needs. Finally, the program can analyze more crops. Budget Planner Plus will be out in spring or early summer 1989.

OTHER BUDGETING PROGRAMS

There are several other microcomputer budgeting programs available from private and public sources. The Microcomputer Budget Management System developed by McGrann et al. is probably the most comprehensive of these programs and is used in

several states. However, it was not designed to be easy or quick to use.

A program that is similar to Budget Planner in the sense that it is generally usable by anyone is the Mississippi State Budget Generator (MSBG) (Spurlock et al.). This program has gained acceptance in many states and pre-dates Budget Planner by several years. MSBG does not offer windows that show defaults and requires users to look up in-

formation on written handouts. In addition, the program does not lead the user through building a budget as Budget Planner does. MSBG is not as convenient for whole-farm budgeting as Budget Planner, but it does have the ability to create livestock budgets. Finally, MSBG has a broader range of output formats than Budget Planner, a weakness which will be corrected in Budget Planner Plus.

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