

Current Report

Cooperative Extension Service • Division of Agriculture • Oklahoma State University

Programmable Calculator
DECISION MAKER SERIES
FIELD CROPS COSTS AND RETURNS ANALYSIS
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Costs and returns budgeting is an essential part of farm management decision making. Farmers sometimes refer to budgeting as "plowing with a pencil." Most would admit that it is often easier to make money "plowing with a pencil" than to actually make that money on a farm. But, that illustrates a very important point. If a farmer cannot pencil out a profit using an enterprise budget, there is likely little chance of making a profit from that enterprise.

Effective enterprise decision making depends on a logical approach to the decision process. First it is important to determine overall objectives that are consistent with existing resources of the farming operation. In other words, the farmer should have realistic expectations regarding expected returns to land, labor, capital, and management resources. Next, comes the budgeting process. Budgeting ultimately affects the enterprise combination and levels of production that show the greatest promise of achieving overall objectives. Budgeting is a systematic method of evaluating potential outcomes of alternative decisions.

Each farmer faces a unique production situation. His or her land, labor, capital and management resources are different from that of neighbors. Base budgets, such as the OSU representative enterprise budgets, that represent typical enterprise costs and returns for an area are quite useful. But, the farmer must be able to "tailor" these budgets to a particular situation to enhance the probability of making wise choices among enterprise alternatives.

Each budgeted situation has a wide range of possible outcomes. Farmers should start with most likely yields, costs, prices, etc. based on the current situation and outlook. But, they must recognize that yields, and therefore, costs per unit of production, may vary widely with variable weather conditions. There may be risks associated with input prices not known at the time of the decision. And, uncertainty of market prices is always a major source of variability.

Most farmers would likely have little real difficulty in putting together a single set of estimated costs and returns. But, realization that no single set is adequate for purposes of

decision making has likely kept many farmers from doing so. The calculations in budgeting a sufficient number of alternatives has simply seemed too great a task to tackle. But now, programmable calculators have made multiple budget revisions quick and easy thus making enterprise budgets a more useful tool for farm decision making.

The following program is designed to be used for preparing quick modifications of existing OSU representative crop budgets. Quantities and prices of production inputs, interest rate, yield, and crop price can be modified. The program will calculate total operating cost, expected returns, breakeven price necessary to cover operating cost, returns above all indicated costs, and the breakeven price necessary to cover all indicated costs. The program is designed for use on a Texas Instruments TI-59 calculator with printer.

<u>Input required</u>	<u>Storage Register</u>
0. enter zero to initialize	00
1. seed quantity (units/ac)	01
2. seed price (\$/unit)	02
3. pesticide, herbicide (\$/ac)	03
4. labor (hours/ac)	04
5. wage rate (\$/hr)	05
6. machinery fuel, lub, repairs (\$/ac)	06
7. interest rate (%/100)	07
8. fertilizer 1 (units/ac)	08
9. price fertilizer 1 (\$/unit)	09
10. fertilizer 2 (units/ac)	10
11. price fertilizer 2 (\$/unit)	11
12. fertilizer 3 (units/ac)	12
13. price fertilizer 3 (\$/unit)	13
14. custom harvesting (\$/ac)	14
15. hauling charge (\$/unit)	15
16. miscellaneous operating costs (\$/ac)	16
17. fixed costs (\$/ac)	17
18. expected yield (units/ac)	18
19. expected price (\$/unit)	19
20. other benefits of the crop (\$/ac)	20

Output

The program will compute and print a summary of costs (COSTS) and a statistics (STATS) section. The COSTS and STATS items are labeled and defined as follows. (Quantities may be recalled from the noted storage registers.)

Labels	Definition	Storage Register
COSTS	COSTS per acre	
SEED	SEED	25
CHEM	CHEMicals (including herbi- cides & pesticides)	03
FERT	FERTilizer	26
LABR	LABoR	27
INTR	INTeRest	28
FLRP	Fuel, Lub, RePairs	29
HARV	HARVesting (custom) & hauling	30
MISC	MISCellaneous	31
TOPC	Total OperAting Costs	32
FC	Fixed Costs	33
STATS	STATistics	
YLD	YieLD (units/acre)	18
PRIC	PRICe (\$/unit)	19
OBEN	Other BENefits of the crop (\$/ac)	20

TRET	Total RETURNS (\$/ac)	34
RAOC	Returns Above Operating Costs (\$/ac)	35
BEOC	BreakEven to cover Operating Costs (\$/unit)	36
RAAC	Returns Above All stated Costs (\$/ac)	37
BEAC	BreakEven to cover All stated Costs (\$/unit)	38

Example

OSU representative enterprise budgets are available from OSU extension personnel. The following is a representative wheat budget. The circled quantities and prices should be entered in the noted storage register. For example, the price of wheat seed should be entered into register 02.

WHEAT FOR GRAIN OWN HARVEST EQUIP
SMALL GRAIN CLAY AND LOAM SOILS
USUALLY USE CLASSES I & II

76200301
08/01/81
NORTHCENTRAL

OPERATING INPUTS:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
WHEAT SEED	BU.	02 5.000	1.000	01 5.00	-----
18-46-0 FERT	CMT.	09 14.500	1.000	08 14.50	-----
NITROGEN (N)	LBS.	11 0.250	40.000	10 10.00	-----
INSECTICIDE	ACRE	4.500	1.000	03 4.50	-----
FERT. SPREADER	ACRE	2.250	2.000	16 4.50	-----
ANNUAL OPERATING CAPITAL	DOL.	07 0.170	33.792	5.74	-----
LABOR CHARGES	HR.	05 4.000	3.298	13.19	-----
MACHINERY FUEL, LUBE, REPAIRS	ACRE			06 22.10	-----
TOTAL OPERATING COST				79.54	-----
FIXED COSTS				VALUE	YOUR VALUE
MACHINERY					
INTEREST AT 17.0%	DOL.	23.596	-----		
DEPR., TAXES, INSUR.	DOL.	19.815	-----		
LAND					
INTEREST AT 0.0%	DOL.	0.0	-----		
TAXES	DOL.	0.0	-----		
TOTAL FIXED COSTS				17 43.41	-----
PRODUCTION:	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
WHEAT	BU.	19 4.450	32.000	18 142.40	-----
GRAZING	AUMS	0.0	0.750	20 0.0	-----
TOTAL RECEIPTS				142.40	-----
RETURNS ABOVE TOTAL OPERATING COSTS				62.86	-----
RETURNS ABOVE ALL COSTS EXCEPT OVERHEAD, RISK AND MANAGEMENT				19.45	-----

100# 15-46-0 FALL
40# NITROGEN SPRING
OWN COMBINE & TRUCK

SHARKEY
05/23/81 010000000

PROCESSED BY DEPT. OF AGRI. ECON. - OKLAHOMA STATE UNIVERSITY
PROGRAM DEVELOPED BY DEPT. OF AGRI. ECON. OKLAHOMA STATE UNIVERSITY

Input

0.	enter zero to initialize	0 STO 00
1.	seed quantity (units/ac)	1 STO 01
2.	seed price (\$/unit)	5 STO 02
3.	pesticide, herbicide (\$/ac)	4.5 STO 03
4.	labor (hours/ac)	3.298 STO 04
5.	wage rate (\$/hr)	4 STO 05
6.	machinery fuel, lub, repairs (\$/ac)	22.1 STO 06
7.	interest rate (%/100)	.17 STO 07
8.	fertilizer 1 (units/ac)	1 STO 08
9.	price fertilizer 1 (\$/unit)	14.5 STO 09
10.	fertilizer 2 (units/ac)	40 STO 10
11.	price fertilizer 2 (\$/unit)	.25 STO 11
12.	fertilizer 3 (units/ac)	0 STO 12
13.	price fertilizer 3 (\$/unit)	0 STO 13
14.	custom harvesting (\$/ac)	0 STO 14
15.	hauling charge (\$/unit)	0 STO 15
16.	miscellaneous operating costs (\$/ac)	4.5 STO 16
17.	fixed costs (\$/ac)	43.41 STO 17
18.	expected yield (units/ac)	32 STO 18
19.	expected price (\$/unit)	4.45 STO 19
20.	other benefits of the crop (\$/ac)	0 STO 20

Revised Budget

OSU CROP BUDGET COSTS	
5.	SEED
4.5	CHEM
24.50	FERT
13.19	LABR
5.23	INTR
22.10	FLRP
0.00	HARV
4.50	MISC
79.64	TOPC
43.41	FC
STATS	
32.	YLD
4.45	PRIC
0.	OBEN
142.40	TRET
62.76	RAOC
2.47	BEOC
19.97	RAAC
3.83	BEAC

Note that the total operating costs on the revision is within \$0.10 per acre of that on the original.

Output

Press A

OSU CROP BUDGET COSTS	
5.	SEED
4.5	CHEM
24.50	FERT
13.19	LABR
5.23	INTR
22.10	FLRP
0.00	HARV
4.50	MISC
79.02	TOPC
43.41	FC
STATS	
32.	YLD
4.45	PRIC
0.	OBEN
142.40	TRET
63.38	RAOC
2.47	BEOC
19.97	RAAC
3.83	BEAC

Note that the total operating costs on the TI-59 budget is \$0.52 less than that of the original budget. This difference results from the way in which the interest or annual operating capital charge is computed. It is possible to change the "crop factor" stored in register 0 to attempt to arrive at an interest charge which more closely approximates the charge on the budget. Alternatively, the following procedure will compute a "crop factor" which may result in a closer approximation.

Optional procedure for obtaining output which may result in a closer approximation.

- (a) Store total operating cost from budget in register 59.
79.54 STO 59
- (b) Enter annual operating capital value from budget and press A'.
- (c) Press A.

Equations

SEED, FERT, LABR = input quantity x input price
 CHEM, FLRP, MISC, FC, YLD, PRIC, OBEN = input value
 HARV = custom harvesting + (hauling charge x YLD)
 TOPC = SEED + CHEM + FERT + INTR + FLRP + HARV + MISC
 TRET = (YLD x PRIC) + OBEN
 RAOC = TRET - TOPC
 BEOC = (TOPC - OBEN) ÷ YLD
 RAAC = TRET - TOPC - FC
 BEAC = (TOPC + FC - OBEN) ÷ YLD
 INTR

Option 1. If zero is stored in register 00 the default crop factor of "5" will be used. The equation is:

$$INTR = 5 \times \text{interest rate} \div 12 \times (TOPC - HARV)$$

Option 2. Store the total operating costs from the OSU enterprise budget in register 59, enter the annual operating capital charge from the budget and press A'. The calculator will compute a crop factor and store it in register 00.

Crop factor computation:

- A. If custom harvesting (register 14) is greater than zero:

$$\text{Crop factor} = \frac{\text{annual operating capital} \div \text{interest rate} \div 12 \times (\text{budget operating costs} - ((\text{LABR} + \text{FLRP}) \times .2))}{}$$

- B. If custom harvesting (register 14) is equal to zero:

$$\text{Crop factor} = \frac{\text{annual operating capital} \div [\text{interest rate} \div 12 \times (\text{budget operating costs} - ((\text{LABR} + \text{FLRP}) \times .2))]}{}$$

Worksheet

Enter program and labels. Program may be stored in BANK 1, on card 1 and BANK 2, on card 1, side 2. Labels may be stored in BANK 3, on card 2, side 1. (Data may be stored in BANK 4, on card 2, side 2.) Two cards are required.

Item	Units	Keys Pressed	Display	Your Values		
INITIALIZE		0 STO 00	0.			
SEED QUANTITY	UNIT/AC	1 STO 01	1.			
SEED PRICE	\$/UNIT	5 STO 02	5.			
PESTICIDE, HERBICIDE	\$/AC	4.5 STO 03	4.5			
LABOR	HRS/AC	3.298 STO 04	3.298			
WAGE RATE	\$/HR	4 STO 05	4.			
MACHINERY FUEL, LUB, REPAIRS	\$/AC	22.1 STO 06	22.1			
INTEREST RATE	%/100	.17 STO 07	0.17			
FERTILIZER 1	UNITS/ AC	1 STO 08	1.			
PRICE, FERTILIZER 1	\$/UNIT	14.5 STO 09	14.5			
FERTILIZER 2	UNITS/ AC	40 STO 10	40.0			
PRICE, FERTILIZER 2	\$/UNIT	.25 STO 11	0.25			
FERTILIZER 3	UNITS/ AC	0 STO 12	0.			
PRICE, FERTILIZER	\$/UNIT	0 STO 13	0.			
CUSTOM HARVESTING	\$/AC	0 STO 14	0.			
HAULING CHARGE	\$/BU	0 STO 15	0.			
MISC. OPERATING COST	\$/AC	4.5 STO 16	4.5			
FIXED COSTS	\$/AC	43.41 STO 17	43.41			
EXPECTED YIELD	UNITS/ AC	32 STO 18	4.45			
EXPECTED PRICE	\$/UNIT	4.45 STO 19	4.45			
OTHER BENEFITS	\$/AC	0 STO 20	0			
OUTPUT (option 1)		A				

For general information on hand-held computers see OSU Fact Sheet 306 "Farm and Ranch Decisions Aided by Hand-Held Computers."

Option 3. If options 1 and 2 do not provide a satisfactory estimate of INTR, the user may try any crop factor in register 00. For example, if INTR is less than the annual operating charge on the budget, increase the size of the crop factor.

evaluate such decisions as alternative fertilization practices, pesticide and herbicide systems, as well as the impact of more or less favorable weather and market conditions. It is necessary to have reasonable estimates of yields, input quantities and costs, and other factors associated with each alternative. But, the calculator does all the "pencil pushing" once the appropriate numbers have been entered.

Summary

The worksheet illustrates one budget situation. Programmable calculators provide the decision maker with the analytical power to quickly analyze numerous alternatives. Thus, worksheet space is provided suggesting alternative prices, yields, input use levels, input costs, etc. This allows crop producers to quickly

There are no guarantees of profitable decisions. The best decision can result in losses if prices, yields and production costs are less favorable than expected. But, the odds of a profitable decision may be improved greatly by evaluation of all logical alternatives. Programmable calculators can remove some of the drudgery associated with crop enterprise budget analysis.

Program listing

Store on BANK 1, on card 1, side 1, and BANK 2 on card 1, side 2.

000	76	LBL	038	43	RCL	076	43	RCL	114	16	16	153	43	RCL
001	19	D*	039	00	00	077	10	10	115	42	STO	154	30	30
002	05	5	040	67	EQ	078	65	*	116	31	31	155	95	=
003	42	STO	041	19	D*	079	43	RCL	117	85	+	156	42	STO
004	00	00	042	10	E*	080	11	11	118	43	RCL	157	32	32
005	61	GTO	043	76	LBL	081	85	+	119	25	25	158	43	RCL
006	10	E*	044	10	E*	082	43	RCL	120	85	+	159	17	17
007	76	LBL	045	00	0	083	12	12	121	43	RCL	160	42	STO
008	11	A	046	42	STO	084	65	*	122	26	26	161	33	33
009	69	DP	047	23	23	085	43	RCL	123	85	+	162	43	RCL
010	00	00	048	43	RCL	086	13	13	124	43	RCL	163	18	18
011	43	RCL	049	44	44	087	95	=	125	27	27	164	65	*
012	41	41	050	69	DP	088	42	STO	126	85	+	165	43	RCL
013	69	DP	051	04	04	089	26	26	127	43	RCL	166	19	19
014	01	01	052	43	RCL	090	43	RCL	128	29	29	167	85	+
015	43	RCL	053	01	01	091	04	04	129	85	+	168	43	RCL
016	42	42	054	65	*	092	65	*	130	43	RCL	169	20	20
017	69	DP	055	43	RCL	093	43	RCL	131	03	03	170	95	=
018	02	02	056	02	02	094	05	05	132	95	=	171	42	STO
019	43	RCL	057	95	=	095	95	=	133	42	STO	172	34	34
020	43	43	058	69	DP	096	42	STO	134	22	22	173	75	-
021	69	DP	059	06	06	097	27	27	135	65	*	174	43	RCL
022	03	03	060	42	STO	098	43	RCL	136	43	RCL	175	32	32
023	98	ADV	061	25	25	099	06	06	137	07	07	176	95	=
024	69	DP	062	43	RCL	100	42	STO	138	65	*	177	42	STO
025	05	05	063	45	45	101	29	29	139	43	RCL	178	35	35
026	69	DP	064	69	DP	102	43	RCL	140	00	00	179	53	(
027	00	00	065	04	04	103	14	14	141	55	+	180	43	RCL
028	43	RCL	066	43	RCL	104	85	+	142	01	1	181	32	32
029	40	40	067	03	03	105	43	RCL	143	02	2	182	75	-
030	69	DP	068	69	DP	106	15	15	144	95	=	183	43	RCL
031	02	02	069	06	06	107	65	*	145	42	STO	184	20	20
032	69	DP	070	43	RCL	108	43	RCL	146	28	28	185	54)
033	05	05	071	08	08	109	18	18	147	43	RCL	186	55	+
034	69	DP	072	65	*	110	95	=	148	22	22	187	43	RCL
035	00	00	073	43	RCL	111	42	STO	149	85	+	188	18	18
036	00	0	074	09	09	112	30	30	150	43	RCL	189	95	=
037	32	X:T	075	85	+	113	43	RCL	151	28	28	190	42	STO
									152	85	+	191	36	36

192	43	RCL	348	23	304	04	360	43	RCL	386	43	RCL
193	35	-	349	77	GE	43	RCL	14	14	387	59	59
194	75	-	350	13	C	20	20	85	+	388	75	-
195	43	RCL	351	12	B	69	DP	43	RCL	389	53	-
196	17	17	352	76	LBL	06	06	15	15	390	53	-
197	95	=	353	13	C	76	LBL	65	x	391	43	RCL
198	42	STD	354	05	5	14	D	43	RCL	392	06	06
199	37	37	355	32	X+T	14	D	18	18	393	85	+
200	53	-	356	00	0	73	RCL Ind	54	)	394	43	RCL
201	43	RCL	357	42	STD	69	DP	95	=	395	04	04
202	33	33	358	23	23	04	04	35	1/X	396	65	x
203	85	+	359	69	DP	73	RCL Ind	65	x	397	43	RCL
204	43	RCL	360	00	00	21	21	32	X+T	398	05	05
205	32	32	361	43	RCL	58	FIX	95	=	399	54)
206	75	-	362	39	39	02	2	42	STD	400	65	x
207	43	RCL	363	69	DP	69	DP	00	00	401	93	.
208	20	20	364	02	02	06	06	91	R/S	402	02	2
209	54	)	365	69	DP	22	INV	76	LBL	403	54)
210	55	+	366	05	05	58	FIX	18	C	404	95	=
211	43	RCL	367	04	4	01	1	43	RCL	405	35	1/X
212	18	18	368	05	5	44	SUM	07	07	406	65	x
213	95	=	369	02	2	24	24	55	+	407	32	X+T
214	42	STD	370	07	7	44	SUM	01	1	408	95	=
215	38	38	371	01	1	21	21	02	2	409	42	STD
216	04	4	372	06	6	44	SUM	65	x	410	00	00
217	06	6	373	00	0	23	23	53	-	411	91	R/S
218	42	42	374	00	0	43	RCL	43	RCL			
219	24	24	375	69	DP	23	23	07	07			
220	02	2	376	04	04	77	GE	32	X+T			
221	06	6	377	43	RCL	15	E	65	x			
222	42	42	378	18	18	14	D	32	X+T			
223	21	21	379	69	DP	76	LBL	95	=			
224	08	8	380	06	06	15	E	35	1/X			
225	32	X+T	381	03	3	98	ADW	65	x			
226	76	LBL	382	03	3	91	R/S	32	X+T			
227	12	B	383	03	3	76	LBL	01	1			
228	73	RCL Ind	384	05	5	16	A	02	2			
229	24	24	385	02	2	32	X+T	42	STD			
230	69	DP	386	04	4	43	RCL	42	STD			
231	04	04	387	01	1	14	14	65	x			
232	73	RCL Ind	388	05	5	77	GE	00	00			
233	21	21	389	69	DP	17	B	35	1/X			
234	58	FIX	390	04	04	17	C	65	x			
235	02	02	391	43	RCL	18	C	32	X+T			
236	69	DP	392	19	19	76	LBL	47	47			
237	06	06	393	69	DP	17	B	44	44			
238	23	INV	394	06	06	43	RCL	45	45			
239	58	FIX	395	03	3	55	+	46	46			
240	01	1	396	02	2	01	1	47	47			
241	44	SUM	397	01	1	02	2	48	48			
242	24	24	398	04	4	65	x	49	49			
243	44	SUM	399	01	1	43	RCL	50	50			
244	21	21	400	07	7	55	+	51	51			
245	44	SUM	401	03	3	01	1	52	52			
246	23	23	402	01	1	02	2	53	53			
247	43	RCL	403	69	DP	54	65	54	54			

Label codes

Store in BANK 3, on card 2, side 1.

Storage Register

Code	Storage Register
3637133736.	39
1532363736.	40
3236410015.	41
3532330014.	42
4116221737.	43
36171716.	44
15231730.	45
21173537.	46
27131435.	47
24313735.	48
21273533.	49
23133542.	50
30243615.	51
37323315.	52
21150000.	53
37351737.	54
35133215.	55
14173215.	56
35131315.	57
14171315.	58
0.	59