



chapter four

WHAT IS YOUR COST OF PRODUCTION?

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Instructor Guidelines

This chapter provides a guide that will assist a producer in identifying the cost of production of a particular crop, or for all the crops grown on a farm. The differences between economic, financial, and cash costs are developed and interpreted. Assigning whole farm expenses and the costs associated with multiple use equipment are the most difficult aspects of developing the cost of production for a particular crop. In this chapter, several different methods for developing and assigning farm expenses to multiple crops are discussed. Three different methods for calculating and assigning equipment costs including depreciation are developed.

The chapter then discusses how a producer might develop their marketing objectives based on their production costs. A very practical and useful stair step approach for establishing pricing goals is presented clearly showing which costs and returns are covered at different pricing levels.

As an alternative to costing out each crop, the cash flow budget is developed and information is presented on how to identify the breakeven price that is necessary to cover the cash requirements of the farm. Finally, an exercise is presented on how to compare grain storage alternatives.

A Power Point presentation is provided on the CD-ROM that covers the material in this chapter. Without discussion, the Power Point presentation can be covered in about an hour. This chapter also lends itself to one or more in depth presentations. One example would be to have producers modify the information in the examples with information from their own farms or to have the audience provide suggestions of how a different set of information might better fit farm they know about in their vicinity. It is also very instructive to have producers discuss the differences between the cash and economic approach to costs and to think about why it might be useful to consider the economic costs even if they make short term decisions on their cash cost needs.

Introduction

Determining your cost of production is a difficult but rewarding task.

Difficulty

- Allocating costs to individual enterprises.
- Additional time and expense.

Rewards

- Determine which enterprises are making or losing money.
- Identify candidates for cost reduction (don't measure, can't control).
- Cost information serves as a basis for more informed marketing.

Objectives of Discussion

- Understand cost of production concepts
- Learn how to determine your cost of production
- Allocating whole-farm costs to an enterprise
- Cost allocation criteria
- Computing depreciation on machinery
- Developing a schedule of field operations and associated costs
- Using MACHCOST computer program to estimate the cost of field operations
- Learn how to base your marketing objectives on production costs
- Whole-farm cash flow budgeting and your marketing plan
- Review grain storage enterprise economics
- Use Case Farm to illustrate concepts

Meet Profit Farms

(see *Chapter 8: Case Farm* for a complete description)

- 1,500-acre dryland grain operation.
- Operated by Max and Marlene Profit.
- Sole proprietorship, calendar year, cash tax reporting.
- 1,200 acres owned and 300 acres leased on a 1/3- landowner, 2/3-operator agreement. The Profits get 2/3's of crop and pay 2/3's of fertilizer, crop insurance and all remaining expenses (except land taxes).
- Rotation is summer fallow—winter wheat—spring barley.
- Winter wheat yields have ranged between 37 and 82 bushels per acre over past 10 years and averaged 62 bushels.
- Barley yields have varied between 2.1 and .75 tons per acre and averaged 1.25 tons over past 10 years.
- Market value of assets is \$1.33 million, \$408 thousand of debt—a debt/asset position of 32%.

Understanding Production Costs

Alternative definitions of production costs

Economic costs

Cost attributed to all resources, including purchased inputs, equity capital, and operator/family labor and management.

Financial costs

Cost attributed to all resources, except equity capital and operator/family labor and management.

Cash expenditures

Only cash expenditures are considered, including principal and interest on term debt and personal withdrawals. Depreciation and interest on equity are excluded.

Table 1. Costs of producing winter wheat on owned land, selected cost concepts, Profit Farms^a

Item	Economic (\$/ac.)	Financial (\$/ac.)	Cash (\$/ac.)
<i>Variable costs:</i>			
Fertilizer and chemicals	45.28	45.28	45.28
Seed	8.34	8.34	8.34
Custom	0.00	0.00	0.00
Crop insurance (MPCI, 65%, \$3.65)	3.46	3.46	3.46
Machinery repairs, fuel, and lubrication	26.66	26.66	26.66
Hired labor	5.20	5.20	5.20
Miscellaneous (legal, accounting, dues, utilities etc.)	5.36	5.36	5.36
Interest on operating capital	6.02	5.18	5.18
Total variable costs	100.32	99.48	99.48
<i>Fixed costs:</i>			
Personal property taxes and insurance	5.47	5.47	5.47
Land tax (2 acres)	6.48	6.48	6.48
Interest on term debt (land and machinery)	30.20	30.20	30.20
Depreciation	34.99	34.99	—
Total fixed costs	77.14	77.14	42.15
<i>Opportunity costs:</i>			
Interest on equity in land (2 ac. @ 4%) & machinery buildings (10%)	52.27	—	—
Operator/family labor	26.00	—	—
Operator management (65 bu. x \$3.25 x 0.07)	14.79	—	—
<i>Other:</i>			
Principal on term debt (land, machinery, buildings)	—	—	30.08
Personal withdrawals	—	—	46.80
TOTAL: per ac.	270.52	176.62	218.51
per bu. @ 65 bu. (most likely)	4.16	2.72	3.36
per bu. @ 75 bu. (optimistic)	3.61	2.35	2.91
per bu. @ 55 bu. (pessimistic)	4.92	3.21	3.97

^aIncludes one acre of summer fallow

Interpretation

Economic costs

- 🔗 \$4.16 is breakeven price—the price needed to cover all resource costs, including operator/family labor, management, and equity capital.
- 🔗 Price above \$4.16 implies a return to risk taking.
- 🔗 Price below \$4.16 implies a return to operator/family labor, management, and equity that is below alternative, similar risk uses of those resources.
- 🔗 Longer run concept than financial and cash breakeven prices.

Financial costs

- 🔗 \$2.72 is breakeven price—the price needed to cover all costs as defined according to financial accounting (tax and financial statement reporting) standards. Implies zero return to operator/family labor, management, and equity capital.
- 🔗 Price above \$2.72 implies a return to operator/family labor, management, and equity capital (defined as net income, according to accounting standards).
 - Net worth = Retained earnings + Contributed capital + Personal net worth + Valuation equity.
 - Change in retained earnings = Net income (before taxes) minus Taxes minus Personal withdrawals.
 - If market price minus financial breakeven price is greater than taxes plus personal withdrawals, then retained earnings are positive.
- 🔗 Price below financial breakeven implies reduction in retained earnings.
- 🔗 Longer run concept than cash breakeven price.

Cash expenditures

- 🔗 \$3.36 is breakeven price—the price needed to cover all cash expenditures.
- 🔗 If price exceeds \$3.36, cash position is strengthened.
- 🔗 If price is below \$3.36, cash position is weakened (reduced cash on hand, reduced savings, liquidation of inventories, reduced living standard, liquidation of capital assets, etc.).
- 🔗 Short-run (this year) concept; business continuity is dependent on meeting cash obligations in a timely manner.

Exercise 1. Cost of production

Assume you have the following data from your dryland grain operation. The data reflects items allocated to the farm's winter wheat enterprise (including summer fallow) and are reported on a per-acre basis for the YrX1 crop year. You own the land.

Item	\$/ac.	Economic cost	Cash expenditure
1. Seed, fertilizer, and chemicals	50	_____	_____
2. Hired labor	5	_____	_____
3. Crop insurance	4	_____	_____
4. Value of your/family labor and management	23	_____	_____
5. Machinery and vehicle fuel, lubrication, and repairs	24	_____	_____
6. Machinery and vehicle depreciation	16	_____	_____
7. Principal payments on machinery and land debt	20	_____	_____
8. Down payment on new drill	10	_____	_____
9. Property taxes (real estate and personal property)	8	_____	_____
10. Interest on operating capital (all debt)	6	_____	_____
11. Interest on equity in machinery and land	44	_____	_____
12. Interest on machinery and land debt	15	_____	_____
13. Personal withdrawals (family living and personal investments)	33	_____	_____
14. Miscellaneous (accounting, dues, legal, insurance, etc.)	5	_____	_____
15. Repayment of operating capital loan	62	_____	_____
TOTAL	325		

Question: Assuming a yield of 50 bushels per acre, what is the economic cost and cash expenditure per bushel for the YrX1 winter wheat crop?

\$ _____ /bu. Economic cost

\$ _____ /bu. Cash expenditures

Two Approaches for Determining your Cost of Production

Approach 1. Allocate whole-farm costs to an enterprise (see Tables 2-5)

Cost allocation criteria (Figs. 1 and 2.)

- If full cost of production is desired, it is necessary to allocate costs associated with inputs used in more than one enterprise.
- Allocation criteria must be consistent with the effort management wants to devote to enterprise budgeting/accounting.

Figure 1. Suggested allocation criteria

Cost item	Criteria
Seed, fertilizer, chemicals, crop insurance	Direct
Management	Percent of gross revenue
Land:	
Rented	Direct (cash rent or share of crop)
Owned: Property taxes	Direct, based on agricultural land value
Interest on equity	Direct, based on agricultural land value
Interest on debt	Spread evenly over indebted acres (or all owned acres if you don't want to separate owned land with debt from owned land without debt)
Net rent	Direct
Labor (hired and unpaid)	Percent of time, or percent of field operations (see following example)
Machinery (operating and ownership)	Hourly use (tractors), or percent field operations (see following example)

Figure 2. Profit Farm's percent field operations, a good cost allocation criteria. Labor and machinery costs (depreciation, interest, property taxes, insurance, fuel, oil, and repairs) are allocated to individual enterprises according to the percent of total field operations (last column above.)

Crop	No. of field operations	x	Acres	=	Total	Percent of total
Winter Wheat	7		500		3,500	30.43
Summer Fallow	5		500		2,500	21.74
Spring Barley	11		500		5,500	47.83
TOTAL	23		1,500		11,500	100.00

Table 2. Summary of projected economic costs per acre for winter wheat and summer fallow, owned and leased land, Profit Farms

Item	Cost per acre	
	Owned	Leased
<i>Variable costs</i>		
Seed (60 lbs. @ 13.9¢)	\$8.34	\$8.34
Fertilizers: Nitrogen, Aqua (70 lbs. @ 31.1¢)	21.77	14.59
Nitrogen, Sol. 32 (10 lbs. @ 47.2¢)	4.72	3.16
Phosphorous, 10-34-0 (10 lbs. @ 46.6¢)	4.66	3.12
Sulfur, 12-0-0-26 (10 lbs. @ 24.6¢)	2.46	1.65
Herbicides: Roundup (s.f.) (12 oz. @ 42¢)	5.04	5.04
Harmony Extra (1/3 oz. @ \$16.05)	5.35	5.35
MCPA (½ pt. @ \$2.55)	1.28	1.28
Crop insurance	3.46	2.32
Fuel & lubrication (\$10,205 whole farm x .52 allocation ÷ 500 acres)	10.61	10.61
Repairs (\$15,430 whole farm x .52 allocation ÷ 500 acres)	16.05	16.05
Hired labor (\$5,000 whole farm x .52 allocation ÷ 500 acres)	5.20	5.20
Operator labor (2,500 hrs. x \$10 x .52 allocation ÷ 500 acres)	26.00	26.00
Miscellaneous (\$5,150 whole farm x .52 allocation ÷ 500 acres)	5.36	5.36
Interest on operating capital (total variable costs ÷ 2 x 10%)	6.02	5.41
Total variable costs	\$126.32	\$113.48
<i>Fixed costs</i>		
Depreciation (\$33,643 whole farm x .52 allocation ÷ 500 acres)	\$34.99	\$34.99
Personal property taxes & insurance on machinery (\$5,255 whole farm x .52 allocation ÷ 500 acres)	5.47	5.47
Real estate taxes (\$3.24 per acre x 2 acres)	6.48	0.00
Interest on debt		
Machinery (\$7,367 total interest x .52 allocation ÷ 500 acres)	7.66	7.66
Land (\$13,525 total interest ÷ 1,200 acres x 2 acres)	22.54	0.00
Interest on equity		
Machinery (\$213,500 mkt. – \$116,651 debt x 10% interest x .52 allocation ÷ 500 acres)	10.07	10.07
Land (\$937,500 mkt. real estate – \$150,000 bldgs. – \$154,575 debt x 4% interest ÷ 1,200 acres x 2 acres)	42.20	0.00
Management (65 bu. x \$3.25 mkt. x 7%)	14.79	14.79
Total fixed costs	\$144.20	\$72.98
TOTAL ECONOMIC COSTS PER ACRE	\$270.52	\$186.46
TOTAL ECONOMIC COSTS PER BUSHEL @ 65 bu. owned / 43.3 bu. leased	\$4.16	\$4.31

Table 3. Summary of projected cash expenditures per acre for winter wheat and summer fallow, owned and leased land, Profit Farms

Item	Cost per acre	
	Owned	Leased
<i>Variable costs</i>		
Seed	\$8.34	\$8.34
Fertilizer	33.61	22.52
Herbicides	11.67	11.67
Crop insurance	3.46	2.32
Fuel & lubrication (\$10,205 whole farm x .52 allocation ÷ 500 acres)	10.61	10.61
Repairs (\$15,430 whole farm x .52 allocation ÷ 500 acres)	16.05	16.05
Hired labor (\$5,000 whole farm x .52 allocation ÷ 500 acres)	5.20	5.20
Miscellaneous (\$5,150 whole farm x .52 allocation ÷ 500 acres)	5.36	5.36
Interest on operating capital loan	5.18	4.71
Total variable costs	\$99.48	\$86.78
<i>Fixed costs</i>		
Personal property taxes & insurance on machinery (\$5,255 whole farm x .52 allocation ÷ 500 acres)	\$5.47	\$5.47
Real estate taxes	6.48	0
Interest on machinery & land debt	30.20	7.66
Total fixed costs	\$42.15	\$13.13
<i>Other expenditures</i>		
Principal on term debt		
Machinery (\$24,858 whole farm x .52 alloc. ÷ 500 acres)	\$25.85	\$25.85
Land (\$2,537 ÷ 1,200 acres x 2 acres)	4.23	0
Personal withdrawals (\$45,000 whole farm x .52 allocation ÷ 500 acres) ^a	46.80	46.80
Total other expenditures	\$76.88	\$72.65
TOTAL CASH EXPENDITURES PER ACRE	\$218.51	\$172.56
TOTAL CASH EXPENDITURES PER BUSHEL		
@ 65 bu. owned / 43.3 bu. leased	\$3.36	\$3.99

^a Does not include income and social security taxes.

Table 4. Summary of projected economic costs per acre for spring barley, owned and leased land, Profit Farms

Item	Cost per acre	
	Owned	Leased
<i>Variable costs</i>		
Seed (70 lbs. @ 17¢)	\$11.90	\$11.90
Fertilizer:Nitrogen,Aqua (70 lbs. @ 31.1¢)	21.77	14.59
Nitrogen, Sol. 32 (8 lbs. @ 47.2¢)	3.78	2.52
Phosphorous, 10-34-0 (8 lbs. @ 46.6¢)	3.73	2.49
Sulfur, 12-0-0-26 (17 lbs. @ 24.6¢)	4.18	2.79
Herbicides: Buctril (1/3 pt. @ \$8.52)	2.84	2.84
MCPA (_ pt. @ \$2.55)	1.28	1.28
Fargo (1 1/4 qt. x \$10.81 + \$1.75 application x 3 acres)	4.58	4.58
Crop insurance	1.52	1.01
Fuel & lubrication (\$10,205 whole farm x .48 allocation ÷ 500 acres)	9.80	9.80
Repairs (\$15,430 whole farm x .48 allocation ÷ 500 acres)	14.81	14.81
Hired labor (\$5,000 whole farm x .48 allocation ÷ 500 acres)	4.80	4.80
Operator labor (2,500 hrs. x \$10 x .48 allocation ÷ 500 acres)	24.00	24.00
Miscellaneous (\$5,150 whole farm x .48 allocation ÷ 500 acres)	4.91	4.94
Interest on operating capital (total variable costs ÷ 2 x 10%)	5.70	5.12
Total variable costs	<u>\$119.63</u>	<u>\$107.47</u>
<i>Fixed costs</i>		
Depreciation (\$33,643 whole farm x .48 allocation ÷ 500 acres)	\$32.30	\$32.30
Personal property, taxes & insurance on machinery (\$5,255 whole farm x .48 allocation ÷ 500 acres)	5.04	5.04
Real estate taxes	3.24	0.00
Interest on debt		
Machinery (\$7,367 total interest x .48 allocation ÷ 500 acres)	7.07	7.07
Land (\$13,525 total interest ÷ 1,200 acres)	11.27	0.00
Interest on equity		
Machinery (\$213,500 mkt. – \$116,651 debt x 10% interest x .48 allocation ÷ 500 acres)	9.30	9.30
Land (\$937,500 mkt. real estate – \$150,000 bldgs. ÷ \$154,575 debt x 4% interest ÷ 1,200 acres)	21.10	0.00
Management (1.5 tons x \$75 mkt. x 7%)	<u>\$7.88</u>	<u>\$7.88</u>
Total fixed costs	<u>\$97.20</u>	<u>\$61.59</u>
TOTAL ECONOMIC COSTS PER ACRE	\$216.83	\$169.06
TOTAL ECONOMIC COSTS PER TON @ 1.5 tons Owned/1 ton. Leased	\$144.55	\$169.00
TOTAL ECONOMIC COSTS PER CTW. @30 cwt. owned / 20 cwt. leased	\$7.23	\$8.45

Table 5. Summary of projected cash expenditures per acre for spring barley, owned and leased land, Profit Farms

Item	Cost per acre	
	Owned	Leased
<i>Variable costs</i>		
Seed	\$11.90	\$11.90
Fertilizer	33.46	22.39
Herbicides	8.70	8.70
Crop insurance	1.52	1.01
Fuel & lubrication (\$10,205 whole farm x .48 allocation ÷ 500 acres)	9.80	9.80
Repairs (\$15,430 whole farm x .48 allocation ÷ 500 acres)	14.81	14.81
Hired labor (\$5,000 whole farm x .48 allocation ÷ 500 acres)	4.80	4.80
Miscellaneous (\$5,150 whole farm x .48 allocation ÷ 500 acres)	4.94	4.94
Interest on operating capital loan	4.79	4.35
Total variable costs	\$94.72	\$82.70
<i>Fixed costs</i>		
Personal property taxes & insurance on machinery (\$5,255 whole farm x .48 allocation ÷ 500 acres)	\$5.04	\$5.04
Real estate taxes	3.24	0
Interest on machinery & land debt	18.34	7.07
Total fixed costs	\$26.62	\$12.11
<i>Other Expenditures</i>		
Principal on term debt		
Machinery (\$24,858 whole farm x .48 alloc. ÷ 500 acres)	\$23.86	\$23.86
Land (\$2,537 ÷ 1,200 acres)	2.11	0
Personal withdrawals (\$45,000 whole farm x .48 allocation ÷ 500 acres) ^a	43.20	43.20
Total other expenditures	\$69.17	\$67.06
TOTAL CASH EXPENDITURES PER ACRE	\$190.51	\$161.87
TOTAL CASH EXPENDITURES PER TON @ 1.5 owned / 1 leased	\$127.01	\$161.87
TOTAL CASH EXPENDITURES PER CWT.		
@ 30 cwt. owned / 20 cwt leased	\$6.35	\$8.09

^aDoes not include income and social security taxes.

Estimating machinery depreciation

Definition:

- Expense that reflects the amount of capital “used up” during the year.
- Depreciation is conceptually difficult to estimate.

Two concepts:

- Income tax depreciation
 - May use either accelerated (150% DB/SL - 7 yrs.) or straight line (10 years) depreciation, plus expensing option for IRS-defined depreciation.
 - Generally, accelerated depreciation exceeds actual depreciation in early years.
 - IRS recovery periods (7-10 years) used to compute tax depreciation are generally shorter than producer use periods.
 - Tax-defined depreciation is a good choice for financial statement preparation, since it needs a consistent, verifiable approach.
 - Generally, tax defined depreciation does not accurately reflect economic (true) depreciation.
- Economic depreciation—several alternatives for computing.

Based on original cost (boot & trade-in)

$$\text{Annual depreciation} = \frac{\text{Original cost} - \text{Salvage value}}{\text{Years in business}}$$

Wheel tractor example:

$$\text{Annual depreciation} = \frac{\$100,000 - \$30,000}{10} = \$7,000$$

Given inflation and improved productivity of machinery, understates true depreciation.

Based on current market price of machinery

$$\text{Annual depreciation} = \frac{\text{Current market price} - \text{Salvage value}}{\text{Remaining years in business}}$$

Wheel tractor example:

$$\text{Annual depreciation} = \frac{\$45,000 - \$30,000}{5} = \$3,000$$

– Shortcut approach is to place market price on entire machinery complement (from balance sheet), assume no salvage value, and convert remaining years to an annual percent

Annual depreciation for entire complement = Current market \times 10% (= 10 years)

Example:

Annual depreciation = \$250,000 \times .10 = \$25,000

- Easy to calculate.
- Understates annual funds needed to replace machinery, assuming current market is less than eventual replacement cost.
- Often necessary to know depreciation for individual machines or fraction of complement, which requires additional analysis.

Based on current replacement cost

(Current purchase price of machine that would be purchased to replace old machine; may be new or used machine, depending on purchase policy).

Annual depreciation = $\frac{\text{Current market price} - \text{Salvage value}}{\text{Years in business}}$

Wheel tractor example:

Annual Depreciation = $\frac{\$125,000 - \$37,500}{10} = \$8,750$

- Accurate estimate of annual funds needed to replace machine when it wears out.
- Must be recalculated when machinery prices change.

Approach 2. Develop a schedule of field operations and associated costs

Estimate the per acre cost of each field operation used to produce an individual crop. (see Profit Farms, wheat on owned land, table 6)

- 🔧 Requires detailed information, especially machinery costs.
- 🔧 Sources of machinery cost information

PNW Farm Machinery Costs: 1997 (PNW 346)

Order from:

Bulletins Office, WSU

PO Box 645912

Pullman, WA 99164-5912

1-800-723-1763

\$6.25

See also: <http://farm.mngt.wsu.edu>

MACHCOST-Software that calculates and displays the fixed and variable costs of farm machinery.

Hardware requirements:

IBM or IBM compatible

PC Dos 2.1 or higher

Available from:

Department of Agricultural Economics and Rural Sociology

University of Idaho

Moscow, ID 83843

\$20.00

Basing Marketing Objectives on Production Costs

Knowing your production costs improves marketing by:

- Providing a pricing objective through the discovery of breakeven prices.
- Determining the portion of the crop that must be sold at a particular price to insure meeting earnings goal and cash commitments.
- Determining the portion of the crop that can be left unpriced ("gambled on") once minimum earnings and cash flow commitments have been realized.
- Understanding the earnings and cash flow implications of selling the crop at a particular price (see following stairstep approach).
- Reducing hope and emotion while adding focus and discipline to the marketing decision.

Figure 3. Basing your marketing objectives on production costs with a stair-step approach using economic costs from Table 2 for the Profit Farms' wheat/summer fallow on owned land (65 bu.)

Accumulated \$/Bu.	Item	\$/Bu.
	<u> ?</u> Profit (return to risk)	?
	<u> 4.16</u> Return on equity (4% land, 10% machinery, and buildings)	0.81
	<u> 3.35</u> Depreciation	0.54
	<u> 2.81</u> Operator/family labor and management	0.63
	<u> 2.18</u> Interest on term debt (land, machinery, and buildings)	0.46
	<u> 1.72</u> Personal and real property taxes, insurance	0.18
<u> 1.54</u>	Variable costs.(except operator and family labor)	1.54



Figure 4. Basing your marketing objectives on production costs with a stair-step approach using cash expenditures from Table 3 for the Profit Farms' wheat/summer fallow on owned land (65 bu.)

Accumulated \$/Bu.	Item	\$/Bu.
	<u>?</u> Increase in Cash Position	?
<u>3.36</u>	Personal Withdrawals	0.73
<u>2.63</u>	Principal on term debt (land, mach., & bldgs.)	0.46
<u>2.17</u>	Interest on term debt (land, mach., & bldgs.)	0.46
<u>1.71</u>	Personal and Real Property Taxes, Insurance	0.18
<u>1.53</u>	Variable costs	1.53

Exercise 2. Summary of your marketing objectives and production costs

Marketing objectives	Price based on enterprise budget Profit Farms wheat (\$/bu.)	Your enterprise (\$/bu.)
Realize a profit (return to risk)	4.16	_____
Realize target return on equity and cover all other costs	4.16	_____
Cover all cash obligations, including variable and cash fixed costs, principal on term debt, and personal withdrawals	3.36	_____
Cover variable and fixed costs, operation/family labor and management, and earn zero return on equity and risk	3.35	_____
Cover variable and cash fixed costs, operation/family labor and management, and earn zero return to depreciation, equity, and risk	2.81	_____
Cover variable expenses only (don't produce if less than)	1.54	_____

Using your whole farm cash flow budget as the basis for a marketing plan

- Useful to know what the various prices for a particular commodity imply relative to recovery of costs and expenditures for that commodity (as per previous discussion).
- Also useful to know what commodity production and prices imply relative to projected whole farm cash flow.
- See Profit Farms projected whole farm cash budget for year ending 12/31/X3 and its basis for a marketing plan (pages 17, 18, 20, 21).

Whole farm cash flow budgeting

- Shows cash inflows and outflows, usually on a monthly basis, during the year.
- Two types:
 1. Projected–cash flow budget
 2. Actual–cash flow statement (not same as SCF)
- Focus on projected monthly cash flow.

Uses of cash flow budget

1. Focus on plans for the future. Must plan for:
 - Production
 - Marketing
 - Capital asset purchases and sales
 - Financing
2. Project timing and magnitude of cash inflows and outflows.
3. Project operating capital needs.
4. Manage cash deficit and surplus.
5. Control.
 - Projected vs. actual cash flow comparisons as year unfolds.

Figure 5. Cash flow budget format

	Total	Jan.	Dec.
<i>Cash inflows (receipts)</i>				
1. Operating income				
2. Capital sales				
3. Other receipts				
<i>Cash outflows (expenditures)</i>				
1. Operating expenses				
2. Capital purchases				
3. Other expenditures				
<i>Financial summary</i>				
1. Money to borrow				
2. Loan payments				
3. Loan balances				

Figure 6. Cash Flow Budget for Profit Farms Year Ending 12/31/X3

Item	Actual 'X2	Projected 'X3	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Beginning cash balance	\$9,610	\$21,664	\$21,664	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Operating receipts:														
2. Crops	190,812	147,769	25,315					61,227		61,227	61,227	19,000		
3. Government payments	21,135	19,000												
4. Other														3,500
5. Capital receipts: Machinery, real estate	3,500	3,500												1,753
6. Non-farm Income: Off-farm wages	15,780	15,777	1,753	1,753	1,753	1,753	1,753		100		1,753	1,753	1,753	1,753
Interest & dividends	770	1,317	152	165	100	100	100	100	100	100	100	100	100	100
7. TOTAL CASH AVAILABLE (add lines 1-7)	241,607	209,027	48,884	6,918	6,853	6,853	6,853	5,100	5,100	66,327	68,080	25,853	6,853	10,353
Operating expenses:														
9. Chemicals	10,185	10,185				8,125		2,060						
10. Custom									10,721					
11. Fertilizer	31,329	31,329				15,623					4,985			
12. Gas, fuel, oil	10,205	10,205	250	250	250	1,800	250	250	1,105	3,100	2,000	250	250	450
13. Insurance	4,337	4,337			709						1,616			2,012
14. Labor hired	5,000	5,000							1,500	3,500				
15. Marketing & transportation	2,106	2,106	720							693	693			
16. Rents & leases														
17. Repairs	15,430	15,430	2,500	2,500	500	1,000	500	250	250	1,500	3,200	250	480	2,500
18. Seed	10,120	10,120			5,950						4,170			
19. Storage														
20. Supplies	850	850	150	50	50	50	50	50	100	100	100	50	50	50
21. Taxes: real estate & personal property	3,888	3,888				1,944						1,944		
22. Misc.	2,194	2,194	183	183	183	183	183	183	183	183	183	183	183	181
23. Total cash operating expenditures (add lines 9-22)	95,644	95,644	3,803	2,983	7,642	28,725	983	2,793	13,859	9,076	16,947	2,677	963	5,193

Exercise 3. Cash flow budget for Profit Farms

1. How much cash is projected to be generated by the farm and off-farm activities in X3?
2. How much cash will be needed to get through X3?
3. How do the Profits plan to finance the projected cash flow shortfall?
4. How much operating capital must be borrowed in X3?
5. Will the Profit's be able to pay off X3 operating loan by the end of X3?
6. What is the peak operating loan outstanding during X3?
7. Will total debt increase or decrease during X3?
8. When are capital purchases made and how are they financed?
9. What does the cash flow projection indicate about the Profits 12/31/X3 cash flow strength relative to 12/31/X2?

Figure 7. Whole farm cash flow analysis of marketing plan

	Crop 1: <u>W</u> :Wheat	Crop 2: <u>S</u> :Barley	Crop 3:	FARM TOTAL
1. Quantity of crop in beginning inventory	5,020 bu. (A)	50 tons (B)	(C)	
2. Expected crop production	30,355 bu. (A)	584 tons (B)	(C)	
3. Crop not available for sale ^a	0 (A)	0 (B)	(C)	
4. Crop available for sale ^b (line 1 + line 2 – line 3)	35,375 bu. (A)	634 tons (B)	(C)	
5. Total annual cash requirement (from cash flow budget, line 31 + line 38 – line 24)				\$213,989
6. Crop sales price (\$ per unit)	\$ 3.25 (A)	\$ 75 (B)	(C)	
7. Total annual cash receipts (line 4 x line 6)	\$ 114,969 (A)	+ \$ 47,550 (B)	+ \$ (C)	= \$ 162,519
8. Other cash sources ^c				\$ 60,000
9. Total annual cash available from all sources (line 7 + line 8)				\$ 229,519
10. CASH SURPLUS/DEFICIT (line 9 – line 5)				\$ 8,530
11. Crop 1: <u>W</u>:Wheat. Analysis:				
A. Cash receipts from other crops (line 7B + line 7C + line 8)	\$ 107,550			
B. Net annual cash requirement (line 5 – line 11A)	\$ 106,439			
C. Quantity of crop 1 sales to breakeven (line 11B ÷ line 6A)	32,750 bu.			
D. Quantity of crop 1 available for sale above breakeven sales (line 4A – line 11C)	2,625 bu.			
E. Breakeven price on total available crop 1 (line 11B ÷ line 4A)	\$ 3.01			
12. Crop 2: <u>S</u>:Barley. Analysis:				
A. Cash receipts from other crops (line 7A + line 7C + line 8)	\$ 174,969			
B. Net annual cash requirement (line 5 – line 12A)	\$ 39,020			
C. Quantity of crop 2 sales to breakeven (line 12B ÷ line 6B)	520 tons			
D. Quantity of crop 2 available for sale above breakeven sales (line 4B – line 12C)	114 tons			
E. Breakeven price on total available crop 2 (line 12B ÷ line 4B)	\$ 61.55			
13. Crop 3: _____ Analysis:				
A. Cash receipts from other crops (line 7A + line 7B + line 8)				
B. Net annual cash requirement (line 5 – line 13A)				
C. Quantity of crop 3 sales to breakeven (line 13B ÷ line 6C)				
D. Quantity of crop 3 available for sale above breakeven sales (line 4C – line 13C)				
E. Breakeven price on total available crop 3 (line 13B ÷ line 4C)				

^a Fed to livestock &/or ending inventory.
^b Add the amounts on lines 1 and 2, and subtract the amount on line 3.
^c Accounts received, government payments, capital sales, nonfarm income, cash on hand, savings, etc.



Major Conclusions from worksheet analysis

Assuming:

Total annual cash requirement of \$213,989 (line 5).
 35,375 bushels of wheat available for sale (line 4A) at \$3.25 (line 6A).
 634 tons of barley available for sale (line 4B) at \$75 (line 6B).
 \$60,000 from other sources:

\$9,000	accounts receivable (barley)
19,000	government payments
3,500	capital sales
15,777	non-farm income (wages)
1,317	non-farm interest and dividends
<u>11,406</u>	decrease in cash and savings
\$60,000	

Conclude:

Expect cash surplus of \$8,530 (line 10).
 Will have 2,625 bushels of wheat available for sale at price different from \$3.25 (line 11D).
 Breakeven cash flow price for sale of all wheat is \$3.01 (line 11E), assuming all 634 tons of barley sold at \$75 per ton.
 Will have 114 tons of barley available for sale at price different from \$75 (line 12D).
 Breakeven cash flow price for sale of all barley is \$61.55 (line 12E), assuming all 35,325 bushels of wheat are sold at \$3.25.

Grain Storage Enterprise Economics

Table 6. Enterprise economics commercial storage

Revenue		
Sale of 10,000 bu. @ \$3.85 net market on 11/15/X1		\$38,500
Expenses		
Transfer of 10,000 bu. @ \$3.50 net market on 8/15/X1	35,000	
Holding expenses:		
Storage (1¢/bu./mo. x 10,000 bu. x 3 mo.)	450	
Handling (2¢/bu. loaded in and out)	400	
Interest (10,000 bu. x \$3.68 average net market x .10 interest x 1/4 yr.)	920	
TOTAL EXPENSES		36,770
Profit (loss) from storage		1,730

Storage breakeven analysis—wheat example

Breakeven (3 months)

= \$36,770 Total expenses ÷ 10,000 bu.

= \$3.68

Breakeven price increase per month before in storage

= (\$0.04 handling + \$0.015 storage + (\$3.50 price × 0.10 interest
× 1/12))

= 8.4¢

Breakeven price increase per month after in storage

= (\$0.015 + (\$3.50 Price × 0.10 Interest × 1/12))

= 4.4¢

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AAEA Task Force on Commodity Costs and Returns. "Commodity Costs and Returns Estimation Handbook." AAEA Business Office, Ames, IA. 1998.

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Stodick, L., and R. Smathers. "MACHCOST—A Machinery Cost Analysis Program." Microcomputer Users Guide No. 42. Department of Agricultural Economics and Rural Sociology. University of Idaho, Moscow, ID., 1989.

WWW Sites for PNW Crop Enterprise Budgets

University of Idaho: <http://www.uidaho.edu/ag/agecon/budgetavea.html>

Oregon State University: <http://eesc.orst.edu/tango/pubsearch/0132.qry?function=search>

Washington State University: <http://farm.mngt.wsu.edu/pub.htm>

Other Western States: <http://agecon.uwyo.edu/wfmec/bulletins.html>

Appendix—Exercise answers

Exercise 1. Cost of production

Assume you have the following data from your dryland grain operation. The data reflects items allocated to the farm's winter wheat enterprise (including summer fallow) and are reported on a per-acre basis for the YrX1 crop year. You own the land.

Item	\$/ac.	Economic cost	Cash expenditure
1. Seed, fertilizer, and chemicals	50	_____	_____
2. Hired labor	5	_____	_____
3. Crop insurance	4	_____	_____
4. Value of your/family labor and management	23	_____	_____
5. Machinery and vehicle fuel, lubrication, and repairs	24	_____	_____
6. Machinery and vehicle depreciation	16	_____	_____
7. Principal payments on machinery and land debt	20	_____	_____
8. Down payment on new drill	10	_____	_____
9. Property taxes (real estate and personal property)	8	_____	_____
10. Interest on operating capital (all debt)	6	_____	_____
11. Interest on equity in machinery and land	44	_____	_____
12. Interest on machinery and land debt	15	_____	_____
13. Personal withdrawals (family living and personal investments)	33	_____	_____
14. Miscellaneous (accounting, dues, legal, insurance, etc.)	5	_____	_____
15. Repayment of operating capital loan	62	_____	_____
TOTAL	325	196	182

Question: Assuming a yield of 50 bushels per acre, what is the economic cost and cash expenditure per bushel for the YrX1 winter wheat crop?

\$ 3.92/bu. Economic cost

\$3.64/bu. Cash expenditures

Exercise 3. Cash Flow Budget Exercise—Profit Farms

1. How much cash is projected to be generated by the farm and off-farm activities in X3?

Total cash available (line 8)	= \$209,027
– Beginning cash balance (line 1)	– 21,664
= Cash generated (farm and off-farm)	= \$187,363

2. How much cash will be needed to get through X3?

Total cash required (line 31)	= \$224,094
+ Operating loan interest (line 38)	+ 4,895
= Total cash needed	= \$228,989

3. How do the Profits plan to finance the projected cash flow shortfall?

$$\begin{aligned} \text{Shortfall} &= \text{Cash generated} - \text{Cash needs} \\ &= \$187,363 - \$228,989 \\ &= -\$41,626 \end{aligned}$$

Financed by:

\$11,327	Net inflows from savings (= \$15,482 inflows from savings, Ln33 – \$4,155 outflows to savings, line 39)
10,000	New term debt (R. Weeder, line 36, December)
16,664	Decrease in cash balance (\$21,664 line 1, January – \$5,000 line 1, December)
3,635	Increase in operating loan carryover (\$35,705 line 41 – \$32,070 line 42)
<hr/>	
\$41,6264	

4. How much operating capital must be borrowed in X3?

\$122,783 line 35
Non-revolving line of credit

5. Will the Profits be able to pay off the X3 operating loan by the end of X3?

No, see \$35,705 balance line 41, December

6. What is the peak operating loan outstanding during X3?

\$87,078 line 41, July

7. Will total debt increase or decrease during X3?

$$\begin{aligned} &\$281,628 \quad \text{end X2, line 44} \\ &- 267,868 \quad \text{end X3, line 44, December} \\ &\hline &= \$13,760 \quad \text{decrease in debt} \end{aligned}$$

8. When are capital purchases made and how are they financed?

\$15,000 Rodweeder, line 24, December
Financed by:
\$10,000 New term debt, line 36, December
5,000 Operating capital loan, line 35, December

\$15,000 Rodweeder Expenditure

9. What does the cash flow projection indicate about the Profits' 12/31/X3 cash flow strength relative to 12/31/X2?

Deteriorating

- ↓ Cash balance = \$16,664 (Line 1 – Line 40), 77%
- ↓ Savings = \$11,327 (Line 33 – Line 39), 28%
- ↑ Operating loan carryover = \$3,635 (Line 41 – Line 42), 11%
- ↓ Accounts receivable = \$9,000
- ↑ Barley inventory (50T.) between 12/31/X2 and 12/31/X3
- Wheat inventory (5,000 Bu.) between 12/31/X2 and 12/31/X3

