AEE 328

Break-Even Analysis

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Break-Even Analysis -- Cost of Operating A 12-Foot Swather vs. Custom Hire

I. Assumptions:

a. Original cost $14,000

b. Two cuttings of hay per season

c. Operating speed, 2 acres per hour on the average

d. Gasoline consumption, 3.5 gallons per hour

e. Oil changed every 50 hours (5 quarts)

f. Labor rate, $3 per hour

II. Fixed Costs: Percent of original cost

Depreciation	10.0
Interest (1/2 x 9%)	4.5
Taxes, Shelter, Insurance	2.5
Total	17.0 percent

$14,000 x 17% = $2,380 annual fixed cost

III. Variable Costs:

	Cost Per Hour	Cost Per Acre
Fuel (gasoline 3.5 gal. x $.42)	$1.47	$ .74
Oil (5 qts. x $.60 = $3.00 ÷ 50 hrs.)	.06	.03
Grease (estimate)	.02	.01
Repairs and repair labor	3.00	1.50
	$4.55	$2.28

A.E.E. Series #328.

IV. Custom Rate: $8.00 per acre per cutting

V. Estimated Costs of Owning and Operating a 12-Foot Swather

Annual Fixed Costs of Owning Swather $800.00

Variable Costs Per Acre of Swathing

2 Cuttings:

Machine	$4.55
Labor	3.00
	$7.55

3 Cuttings:

Machine	$ 6.83
Labor	4.50
	$11.33

VI. Break-Even Analysis

A. Develop the break-even points for owning and operating the 12-foot swather under the following circumstances:

1. Using the algebraic solution:
   a. 2 cuttings annually
   b. 3 cuttings annually
2. Using the graphic method:
   a. 2 cuttings annually
   b. 3 cuttings annually

B. If you were considering the purchase of this machine:

1. To engage in custom operation, how many acres would you need to custom harvest annually at the custom rate given in order to break even?
2. To earn a 10 percent annual rate on your investment above all operating costs, how many acres would you need to custom harvest at the custom rate given?

Answers

Break-Even Analysis

A. Develop the break-even points for owning and operating a 12-foot swather under the following circumstances:

1. Using the algebraic solution:

   a. 2 cuttings annually

   b. 3 cuttings annually

   Let P = custon charge per acre, per cutting
   Q = acreage processed
   F = annual fixed costs of owning swather
   V = variable costs per acre of operating swather

   Then: $P.Q = F+V.Q$
   $P.Q-V.Q = F$
   $Q(P-V) = F$

   $Q = \frac{F}{P-V}$, Q at break-even acreage

   Solution 1a: 2 cuttings:

   $$Q = \frac{\$2380}{\$16 - \$7.55} = \frac{\$2380}{\$8.45} = 281.7 \text{ acres at break-even}$$

   Solution 1b: 3 cuttings:

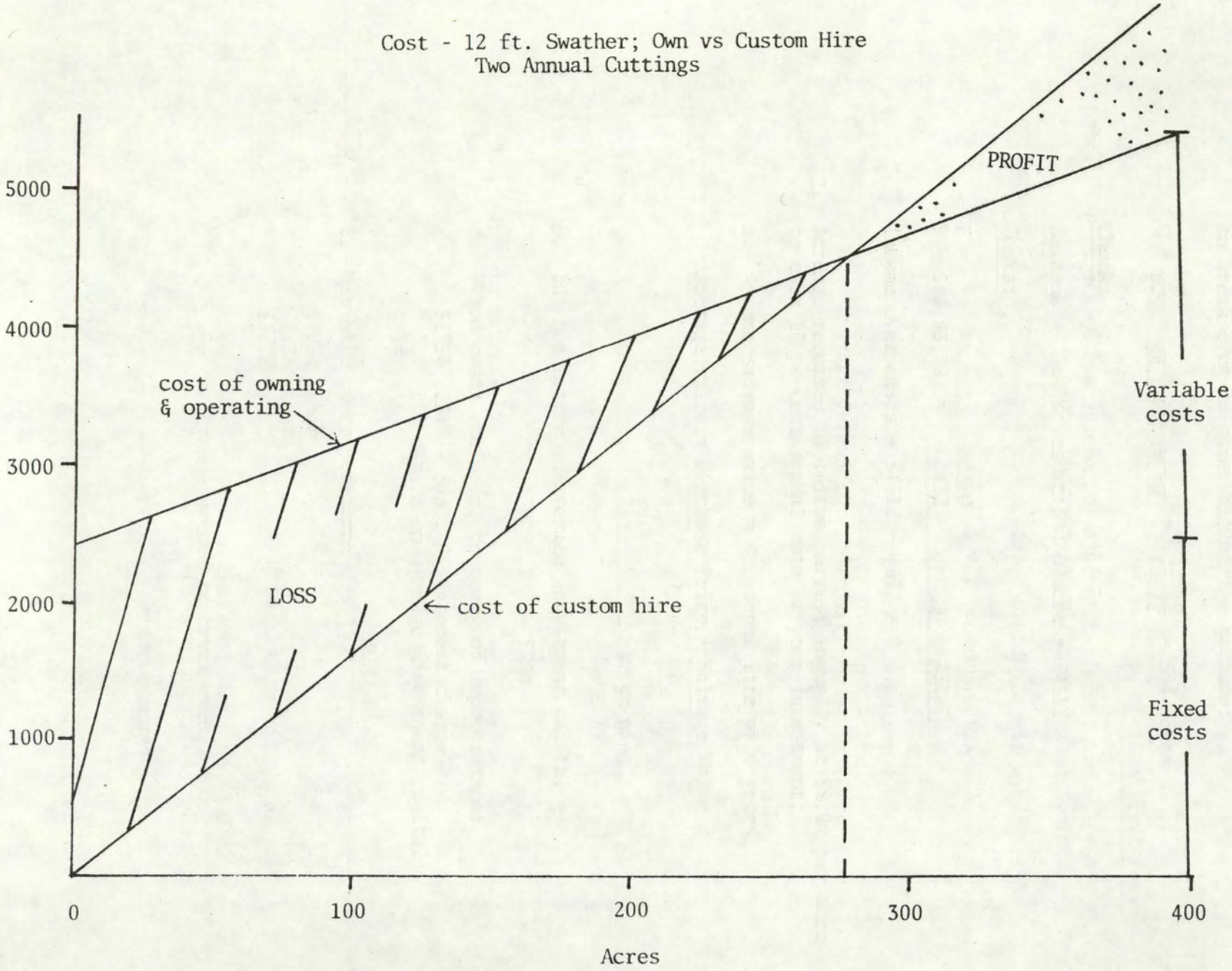
   $$Q = \frac{\$2380}{\$24 - \$11.33} = \frac{\$2380}{\$12.67} = 187.8 \text{ acres at break-even}$$

2. Using the graphic method

   a. 2 cuttings annually

   b. 3 cuttings annually

   SEE ATTACHED GRAPHS


Cost - 12 ft. Swather; Own vs Custom Hire
Two Annual Cuttings
5000
4000
3000
2000
1000
0
100
200
300
400
Acres
PROFIT
cost of owning
& operating
LOSS
← cost of custom hire
Variable
costs
Fixed
costs

f. Check:

Revenue -- 580.6 acres at $8.00/acre = $4644.80

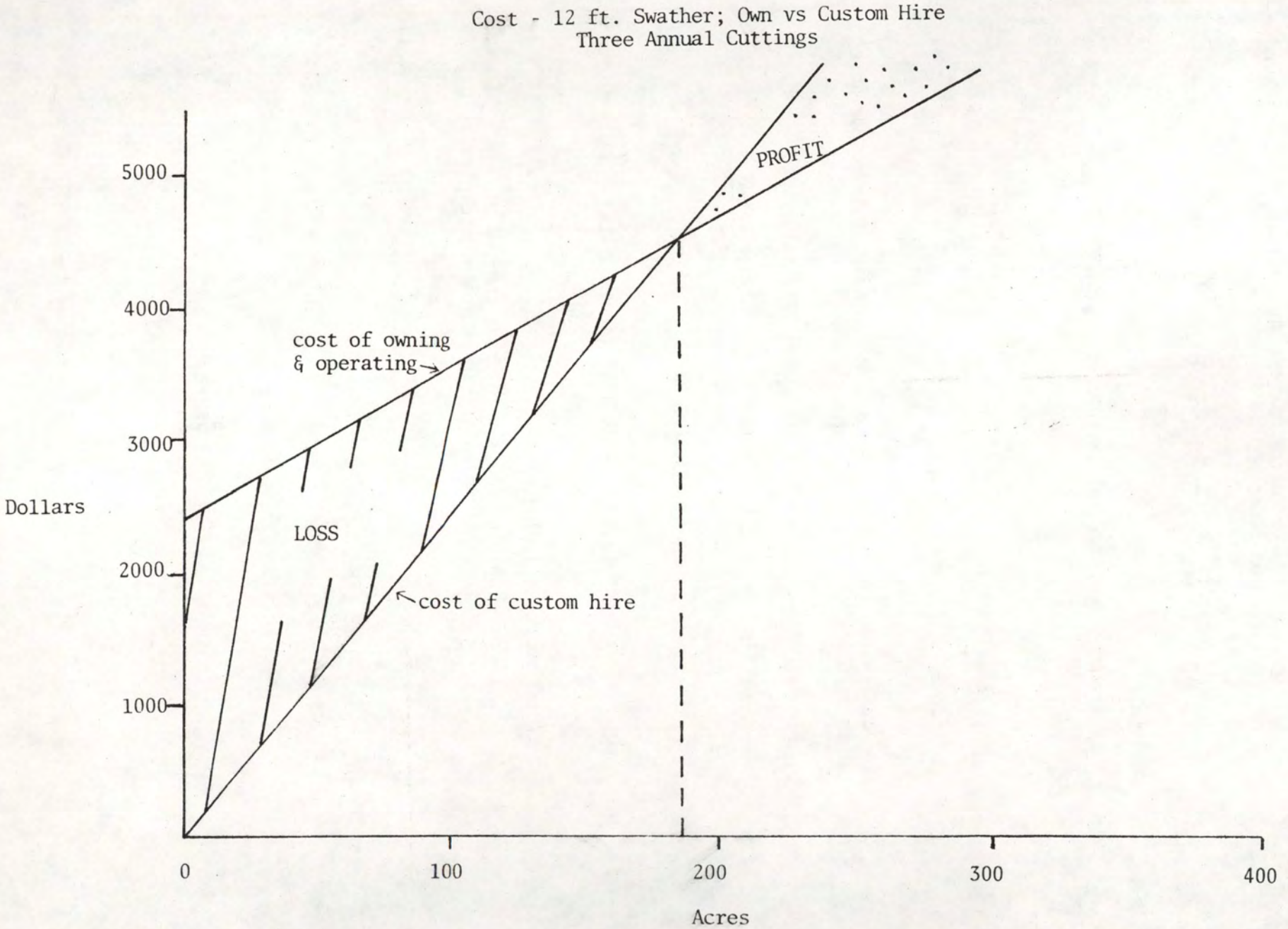
Costs:

F =	$1750	
V = 580.6 ($3.78) =	2194.67	3944.67

Income over costs = $4644.80 - 3944.67 = $700

Rate of return on average capital investment $\frac{\$\ 700}{\$7000}$ = 1096*

*Calculation of the rate of return by this method is only an approximation of the internal rate of return. Calculation of the internal rate of return using capital budgeting procedures is beyond the scope of this exercise.


Cost - 12 ft. Swather; Own vs Custom Hire
Three Annual Cuttings
PROFIT
5000
4000
3000
2000
1000
cost of owning
& operating
LOSS
cost of custom hire
Dollars
0
100
200
300
400
Acres

B. 1. Acreage required to custom harvest annually at $8.00 per acre to break even on ownership of the machine:

$$Q = \frac{F}{P-V} = \frac{\$2380}{\$8.00 - \$3.78} = \frac{\$2380}{\$4.22} = 564 \text{ acres}$$

Check:

Revenue -- 564 acres at $8.00/acre = $4512

Costs:

F =	$2380	
V = 564($3.78) =	2132	4512

Income over costs = $4512 - 4512 = 0

2. Acreage required to custom harvest annually at $8.00 per acre to earn 10 percent annual rate on your investment:

a. Assume salvage value = 0; useful life = 10 years.

$$\text{Average value} = \frac{\text{Purchase Price + Salvage Value}}{2}$$

$$\frac{\$14,000 + 0}{2} = \$7,000$$

b. 10% net return on average investment capital =

$$\$7000(.10) = \$700$$

c. Fixed costs including recovery of depreciation:

$1750 (2380 - $630, 9% interest charge)
700 (10% return on average investment capital)
$2450

d. Variable costs per acre:

$1.50 labor
2.28 other
$3.78

e. $Q = \frac{F}{P-V}$ = acreage needed to break even

$$= \frac{2450}{\$8.00 - \$3.78} = \frac{2450}{4.22} = 580.6 \text{ acres}$$