Adventures in *Forest Operations Accounting*

Look Closely!

Count fast!

S. Bick – Northeast Forests, LLC

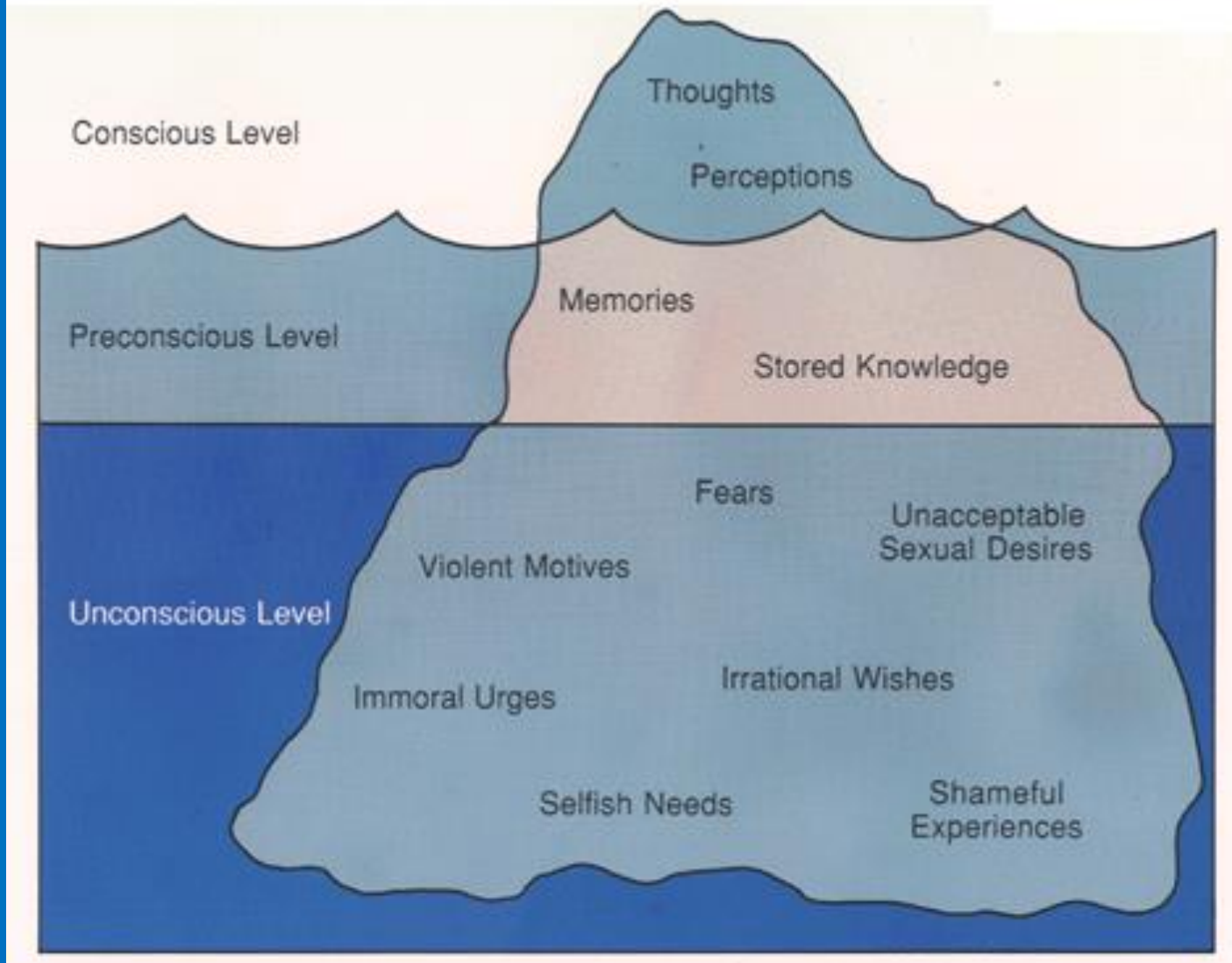
NERCOFE 2015

Traditional Logging Costs Approach

Foresters think of logging costs in terms of unit prices ($/MBF; $/cord)

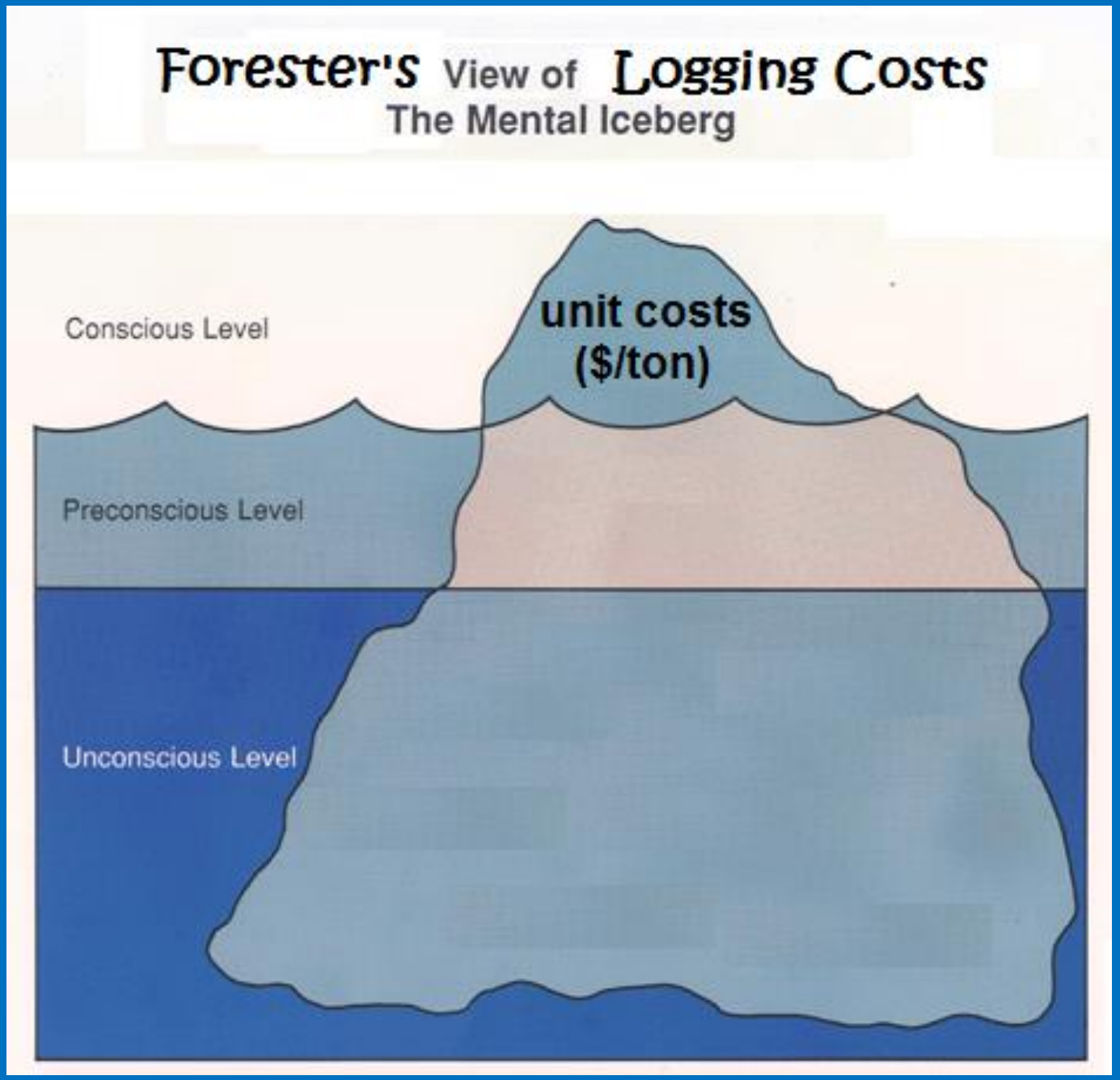
- This is just the tip of the iceberg

Freud's View of the Human Mind: The Mental Iceberg



Forester's View of Logging Costs

The Mental Iceberg



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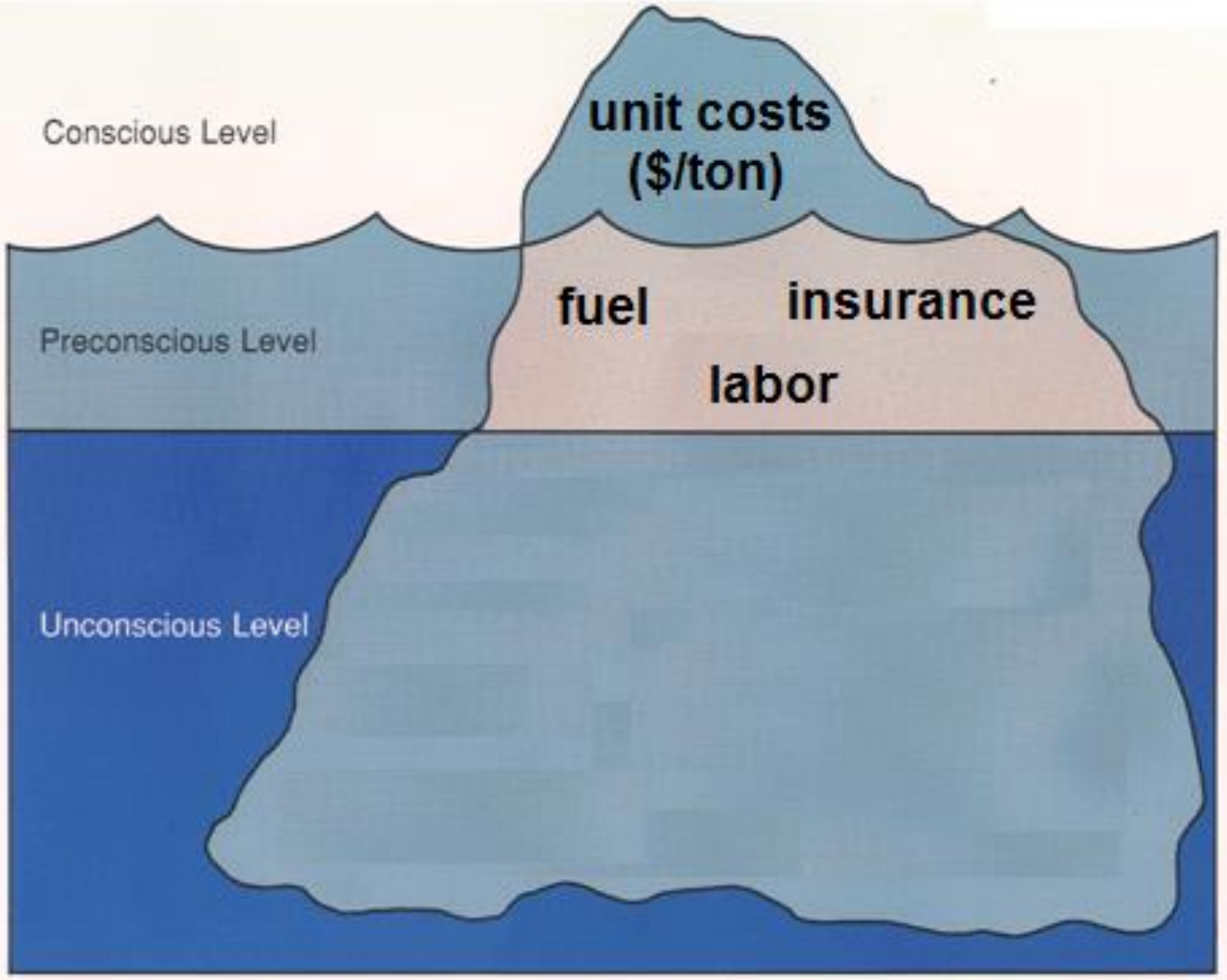
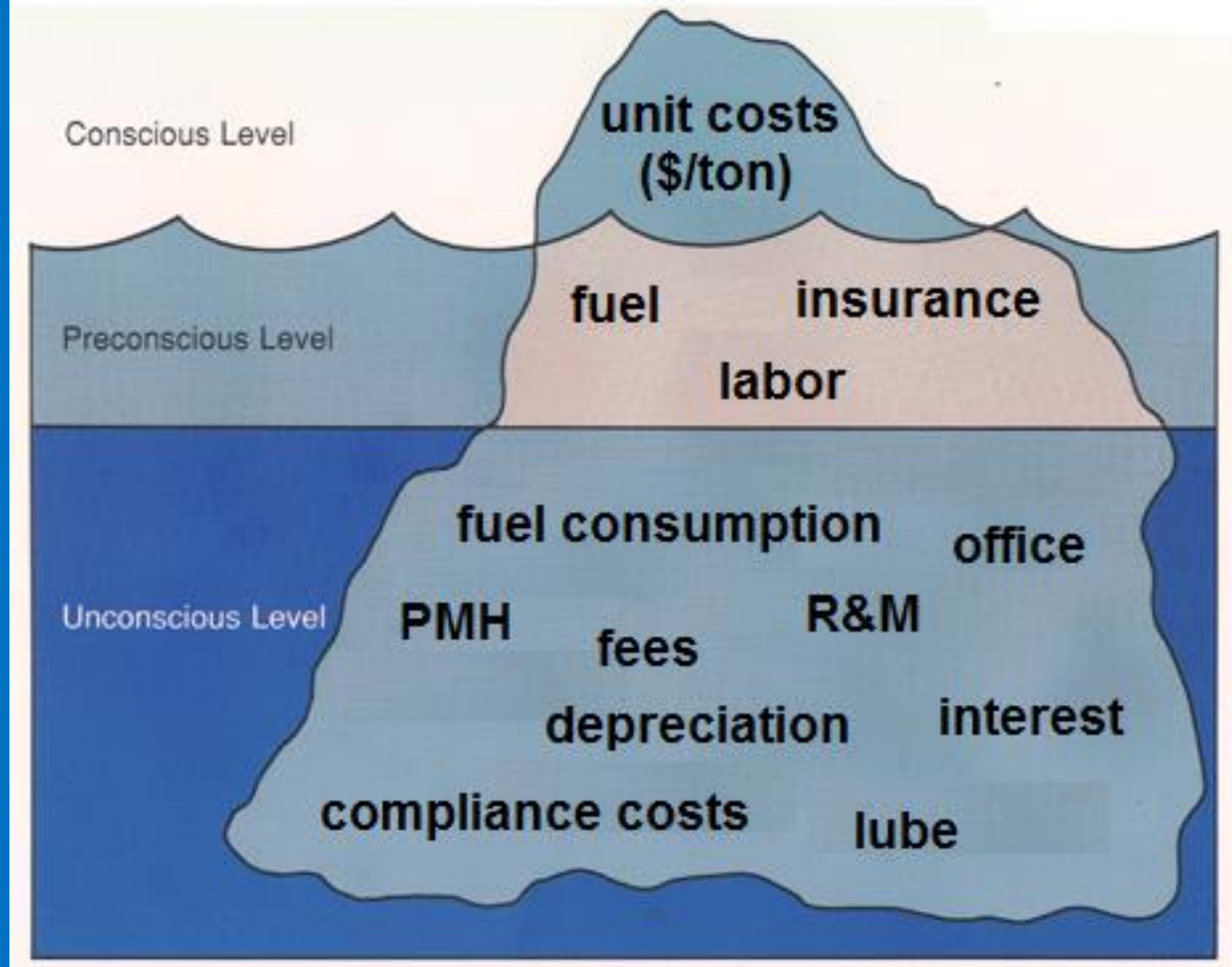
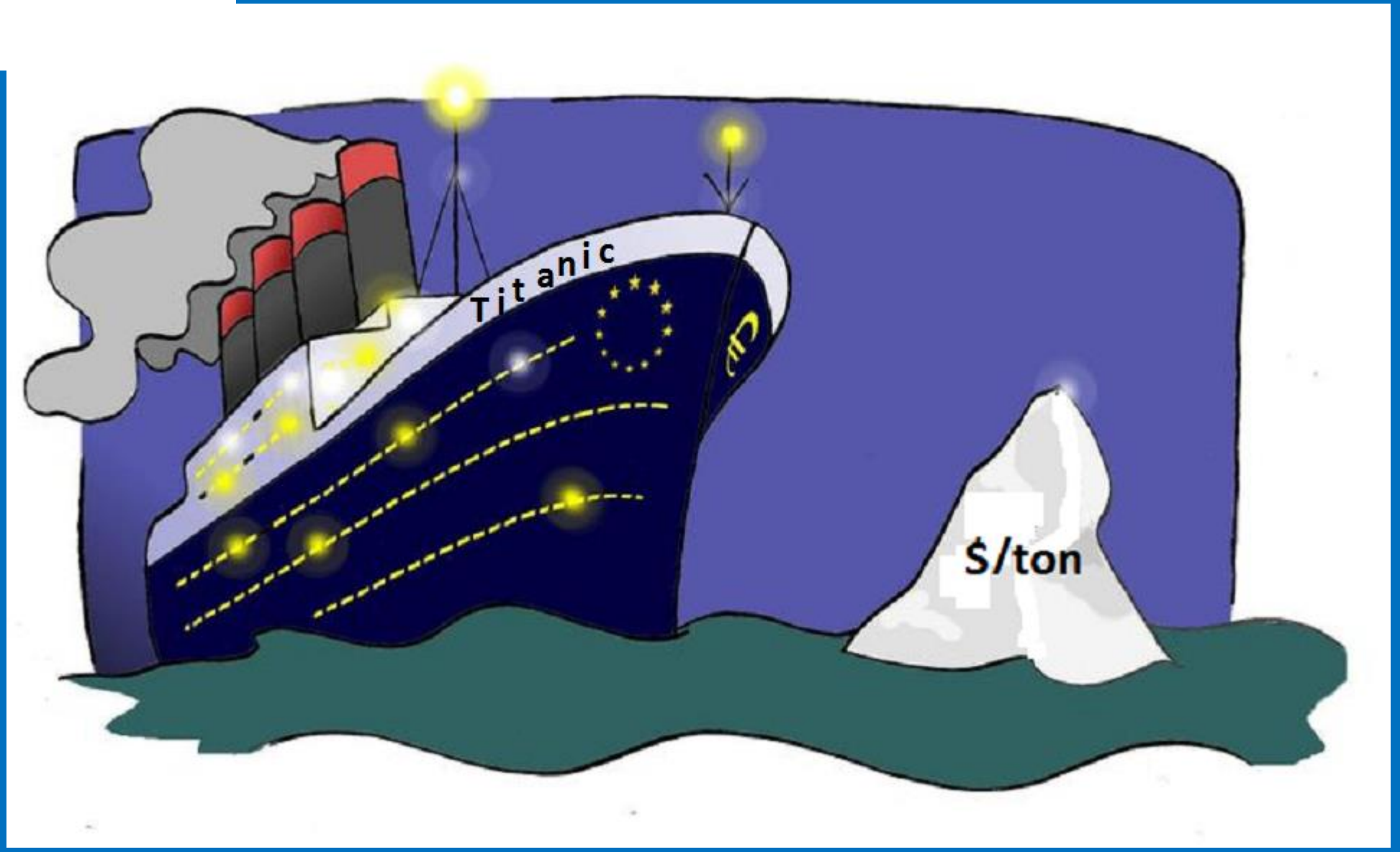


Forester's View of Logging Costs

The Mental Iceberg



Titanic Forestry



Benjamin

Forest Engineer

NSRC

Northeastern States Research Cooperative

Northeastern States Research Cooperative

Knowledge to guide the future of Northern Forest communities

Germain

Forest Operations

Farrand

Human Resources

“In logging, I realize there is nothing to hide. I will show anyone who wants to know, what the wood was worth. Ninety out of a hundred times, it’s not a very pretty picture.”

Sausage Making Details

- Investments in Logging
- Equipment Depreciation
- Throughput, Operational Expense & Investment
- Profit & Return on Investment in Logging
- Timber harvesting variability
- WTH Examples
- Logging Business Equity

Investments in Logging

- Loggers invest in equipment
- Equipment does not increase in value
- Any return on the investment comes from production

Investments in Logging - continued

- Production brings in revenue, but requires cost inputs
- All costs must be covered before a return can be realized on the investment
- Using equipment depreciates it’s value

Depreciation of Equipment

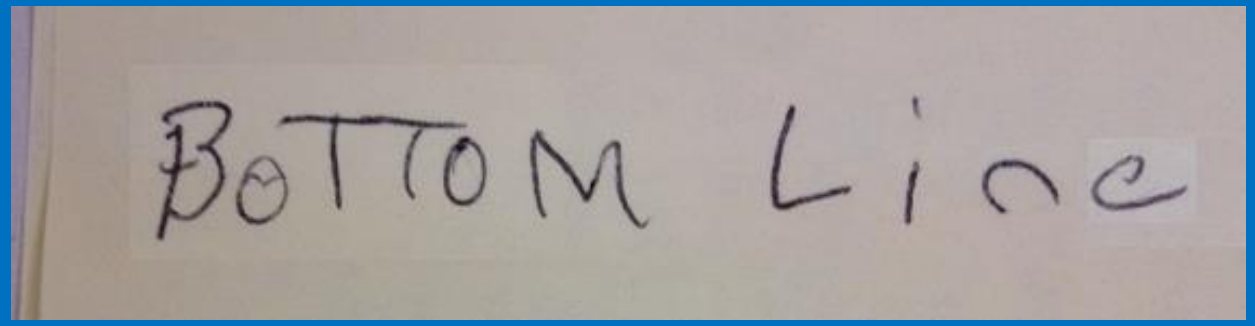
- Depreciation is recovered after other fixed and variables costs are paid for
- ROI comes from revenue exceeding operating costs (including depreciation)
- Depreciation is the true measure of the logger's investment!

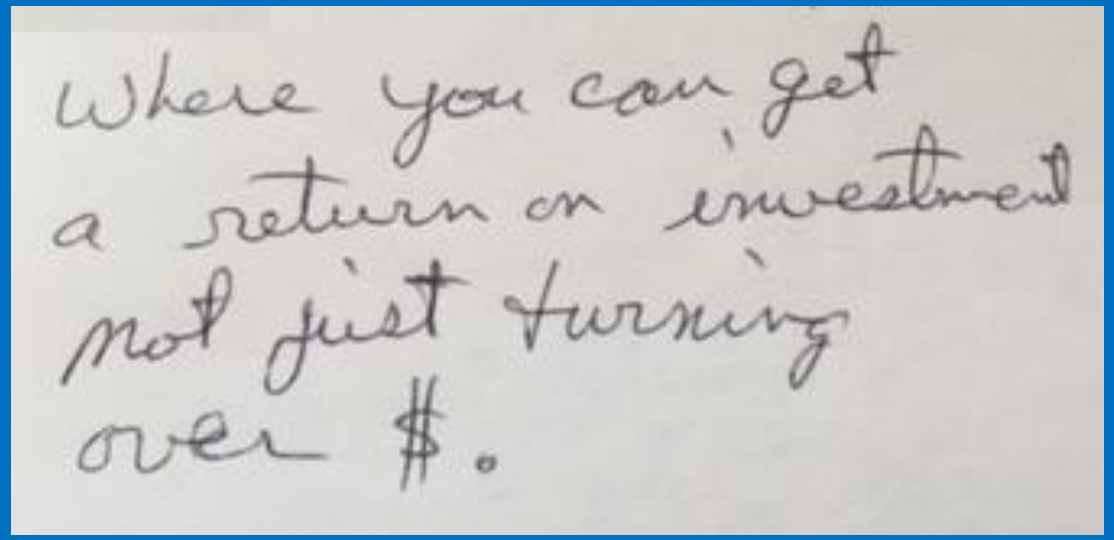
deprecation = consumption of equipment value

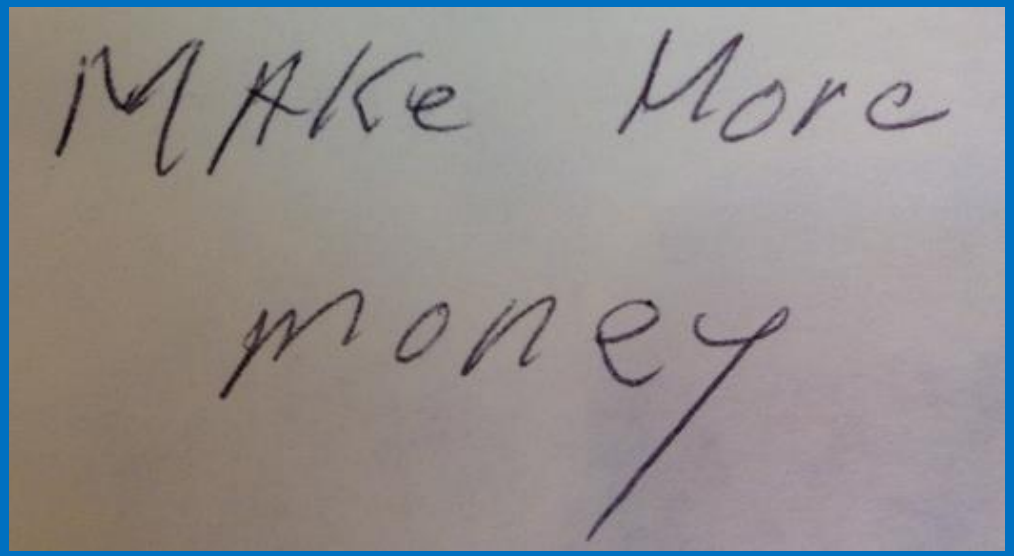
Depreciation = Investment???

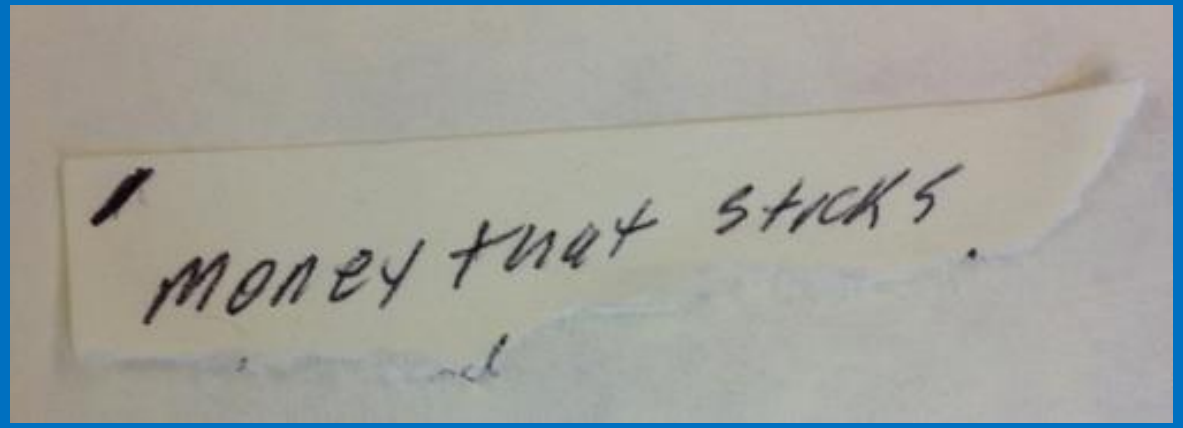
- Accountants minimizes tax burden (and rightly so)
- Functional depreciation is different
- Any operable machine can produce a return on investment
- Hourly depreciation is used for operations accounting

Why <u>invest</u> in logging?









Profit & Wages

The owner is paid last

Opportunity cost – a living wage

Profit – a return expected for the risk involved

Would you?

Forest Operations Accounting

What is a logger's investment in an individual logging job?

What is Return on Investment? How is it measured?

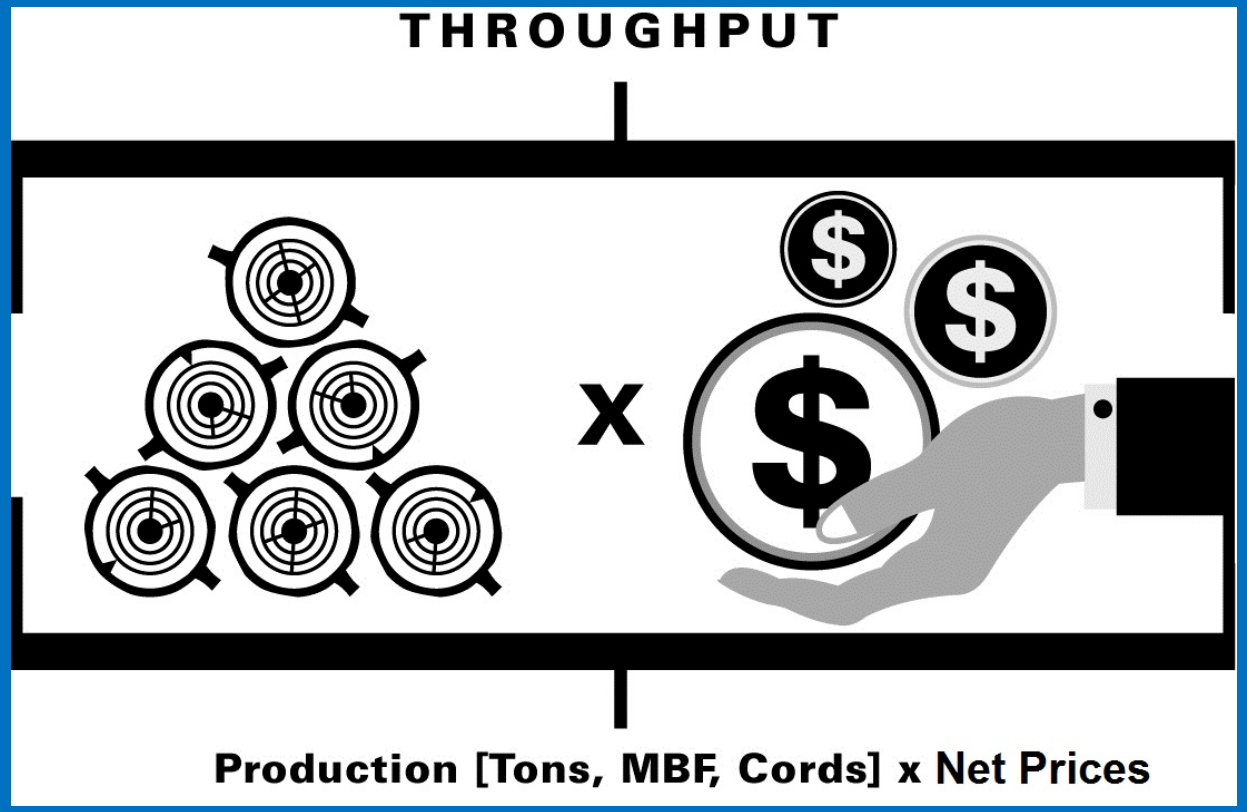
What is the ROI from any single logging job?

Throughput Accounting

- **Accountant** - *"someone who solves a problem you didn't know you had in a way you don't understand"*

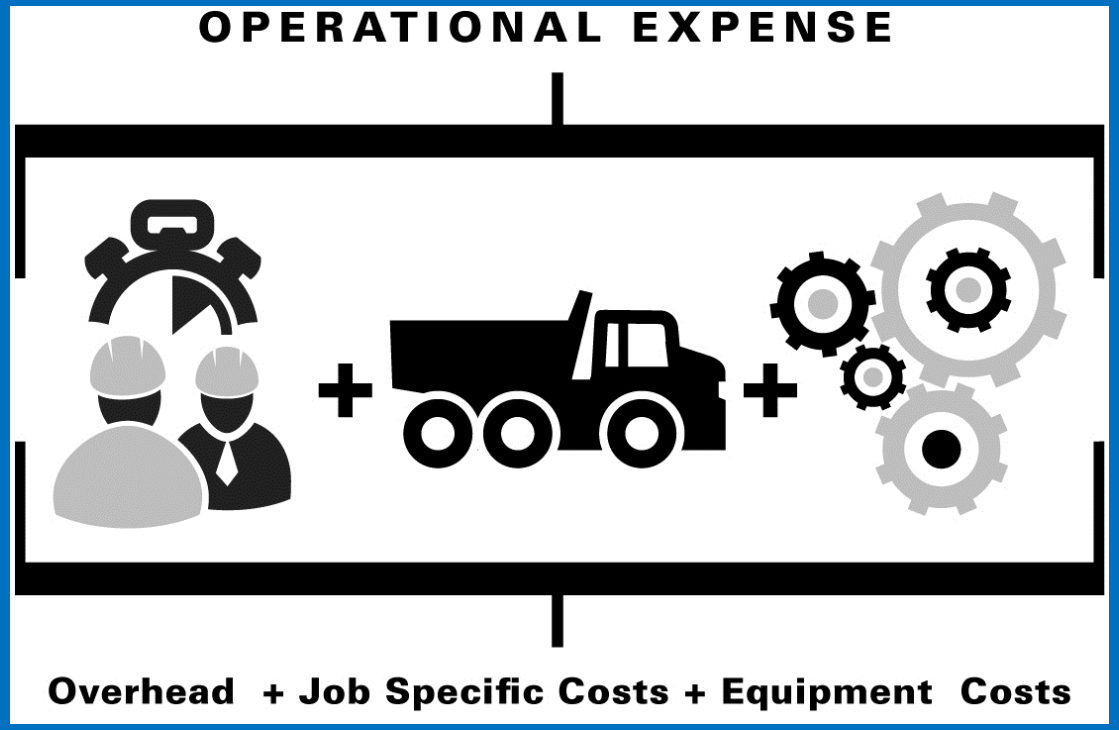
- **Throughput Accounting** – *"a simple method of making financial measurements a business can use in making decisions"*

Throughput



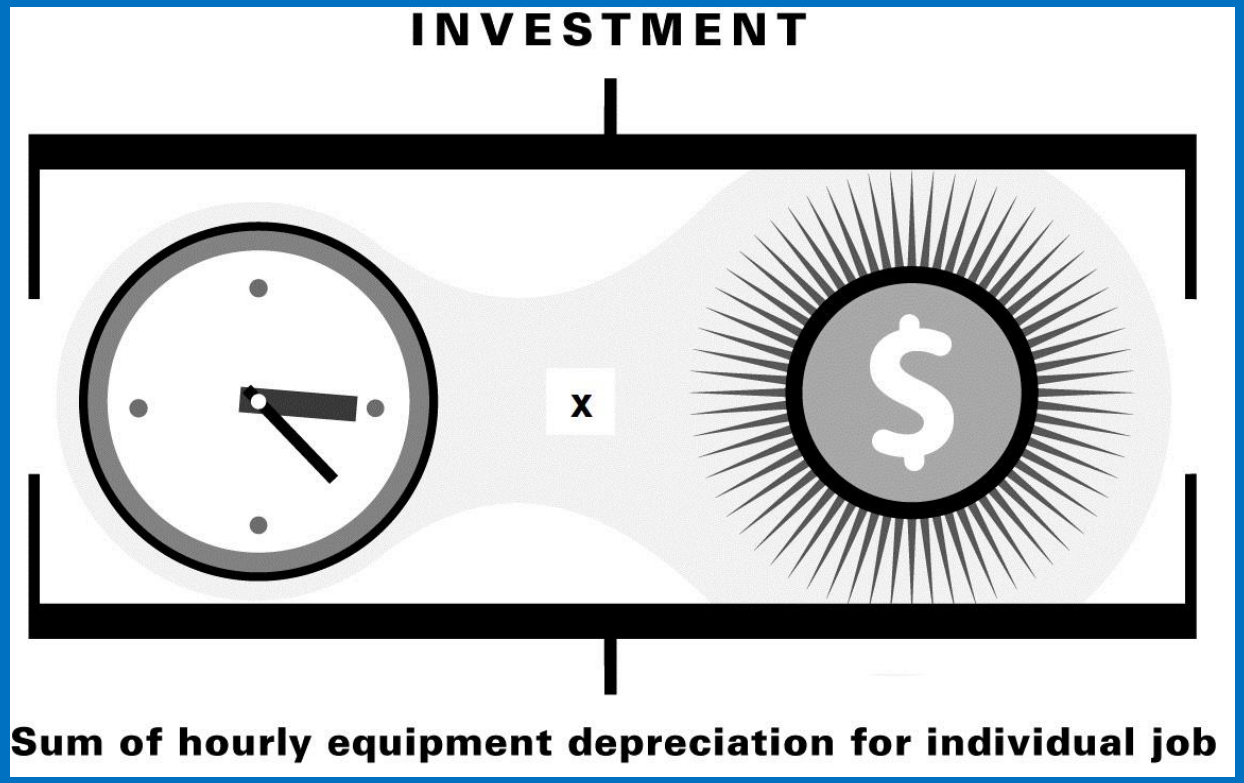
- The rate at which the business generates income.
- Sum of production volume of each product x net price
- Net price = price – truly variable costs (e.g. stumpage, contract trucking)

Operational Expense



- The costs associated with operating a business
- Includes a wage for the owner/operator
- Important, but not the primary way to improve a business

Investment



- How do we measure this investment for an individual harvesting job?

Financial Measurements

- Net Profit = Throughput – Operational Expenses

- Return on Investment = Net Profit ÷ Investment

<u>Operations Question:</u>

Will this increase profits and ROI?

When to make Financial Measurements

Traditional Approach:

Monthly

Quarterly

Annually

Throughput Approach:

Individual harvesting jobs

Why?

Ways to Increase Profits

Lower operational expense

"A penny saved is a penny earned."

- Benjamin Franklin

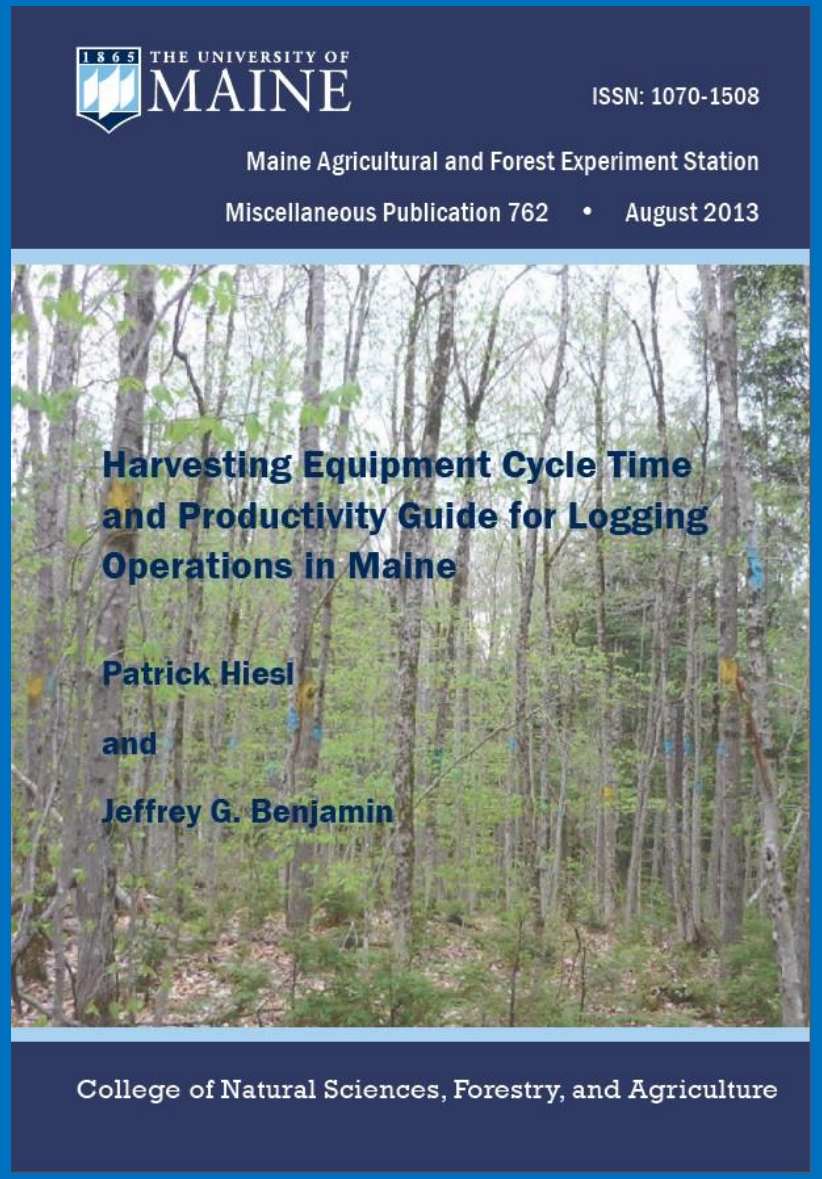
Increase Throughput

"If I can find a leverage point I can move the earth."

- Archimedes

Productivity is the Key to Contract Logging

- Hiesl & Benjamin Pub
- Provides cycle time and productivity equations for various pieces of logging equipment
- An excellent resource to use in building a productivity index!



General WTH Logging Productivity Index

- A value of 1 represents average conditions
- Other values are multiples or fractions of the average conditions,
- A value of 0.5 is half as hard as average; a value of 2.0 is twice as hard as average

General Logging Productivity Index for Whole Tree Harvesting in the Northeast

	lighter stocking (4" DBH) ← bunch size (tons) → heavier stocking (10" DBH)									
Skidding distance(ft.)	2.0	2.0	3.0	3.0	4.0	4.0	5.0	5.0	6.0	6.0
100	1.4	1.4	1.2	1.1	0.9	0.8	0.7	0.7	0.5	0.4
200	1.4	1.4	1.2	1.1	1.0	0.8	0.7	0.7	0.5	0.5
300	1.5	1.4	1.2	1.1	1.0	0.8	0.7	0.7	0.5	0.5
400	1.5	1.4	1.3	1.1	1.0	0.8	0.7	0.7	0.5	0.5
500	1.5	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.5	0.5
600	1.6	1.5	1.3	1.2	1.0	0.9	0.8	0.7	0.5	0.5
700	1.6	1.6	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5
800	1.6	1.6	1.4	1.2	1.1	0.9	0.8	0.7	0.6	0.5
900	1.7	1.6	1.4	1.2	1.1	0.9	0.8	0.8	0.6	0.5
1000	1.7	1.7	1.4	1.3	1.1	1.0	0.8	0.8	0.6	0.5
1100	1.8	1.7	1.5	1.3	1.1	1.0	0.8	0.8	0.6	0.5
1200	1.8	1.8	1.5	1.3	1.2	1.0	0.9	0.8	0.6	0.6
1300	1.9	1.8	1.5	1.4	1.2	1.0	0.9	0.8	0.6	0.6
1400	1.9	1.9	1.6	1.4	1.2	1.1	0.9	0.8	0.6	0.6
1500	2.0	1.9	1.6	1.5	1.2	1.1	0.9	0.9	0.7	0.6
1600	2.0	2.0	1.6	1.5	1.3	1.1	0.9	0.9	0.7	0.6
1700	2.1	2.0	1.7	1.5	1.3	1.1	1.0	0.9	0.7	0.6
1800	2.2	2.1	1.7	1.6	1.3	1.2	1.0	0.9	0.7	0.7
1900	2.2	2.2	1.8	1.6	1.4	1.2	1.0	1.0	0.7	0.7
2000	2.3	2.2	1.8	1.7	1.4	1.2	1.0	1.0	0.7	0.7
2100	2.4	2.3	1.9	1.7	1.4	1.3	1.1	1.0	0.8	0.7
2200	2.4	2.4	1.9	1.8	1.5	1.3	1.1	1.0	0.8	0.7
2300	2.5	2.5	2.0	1.8	1.5	1.4	1.1	1.1	0.8	0.8
2400	2.6	2.6	2.1	1.9	1.6	1.4	1.2	1.1	0.8	0.8

Productivity Impacts Financial Returns

3 WTH Examples – using the same volumes & prices for each (1,000 tons; $20/ton)

- First job – average conditions: ROI = 4%
- Second job – closer, bigger timber: ROI = 255%
- Third job – smaller, farther timber: ROI = -145%

Job 1 = 10” DBH, 1,000’ skid; Job 2 = 12” DBH, 500’ skid;

Job 3 = 8” DBH, 2,200’ skid

PATH 2.0

Planning & Analysis in Timber Harvesting

- Microsoft Excel based software utility
- Funded by USDA Forest Service's Wood Education Resource Center (WERC) competitive grants program & NSRC
- PATH is free

PATH is an Excel File in a PDF

What does PATH 2.0 do?

Striving, thriving or just surviving?

- Project Profit & ROI for an upcoming job
- Calculate Profit & ROI after the job is done
- Compare equipment investment alternatives

Important Concepts in PATH

- PATH will calculate many things, but all are based on information you supply
- Productive working days – an important number that often fluctuates and can be difficult to estimate
- Daily production rates – realism is more important than optimism;

Using PATH 2.0

1. Input equipment to develop hourly machine rates
2. Input general business information to develop overhead rates
3. Enter utilization rates for each piece of equipment
4. Enter production rates and prices by product
5. Analyze financial results

Hourly Machine Rates

Main Index

(input data in white cells only)

Enter up to twelve machines below; Evaluate Costs and Returns for Individual Jobs in the FM and PC Worksheets

			$/PMH
1	Machine Name		#NUM!
	Acquisition Cost		opportunity cost
	Financed Amount		
	Loan Interest Rate		
	Loan Term (years)		
	Machine Ownership Life		
	Machine Hours until Significant Repairs		
	% of cost to depreciate		
	Expected Annual Use (hours)		
	Monthly Payment (calculated from above)	#NUM!	
	Repairs & Maintenance Cost per PMH		
##	Fuel Cost Per Gallon ($)	$ 2.80	
	Fuel Consumption Rate (gallons/hour)		
	Lube Costs per 1,000 hours of service		
	Hourly Operator Costs ($)		
	Ratio of Machine Hours to Operator Time		
	Annual Insurance Costs ($)		

What percent of the machine's value will depreciate between original acquisition and the first significant overhaul? Think in terms of the machine's usefulness in your operation, rather than resale value.

PATH 2.0 WTH Example

- Mechanized harvesting crew
- 1 tracked feller buncher, 2 grapple skidders, stroke delimber, loader with slasher, bulldozer
- pulpwood & sawlog production
- financial measurements for various harvesting situations over one year

			$/PMH
1	Machine Name	feller buncher	$ 127.20
	Acquisition Cost	$ 475,000	opportunity cost
	Financed Amount	$ 400,000	1%
	Loan Interest Rate	4.00%	
	Loan Term (years)	4.0	
	Machine Ownership Life	15,000	
	Machine Hours until Significant Repairs	5,000	
	% of cost to depreciate	40%	
	Expected Annual Use (hours)	1,000	
	Monthly Payment (calculated from above)	$ 9,032	
	Repairs & Maintenance Cost per PMH	$ 9.00	
			use slidebar for fuel
##	Fuel Cost Per Gallon ($)	$ 2.80	
	Fuel Consumption Rate (gallons/hour)	8.5	
	Lube Costs per 1,000 hours of service	$ 2,000	
	Hourly Operator Costs ($)	$ 35.00	
	Ratio of Machine Hours to Operator Time	75%	
	Annual Insurance Costs ($)	$ 4,750	

			$/PMH
2	Machine Name	loader-slasher	$ 72.38
	Acquisition Cost	$ 150,000	opportunity cost
	Financed Amount	$ 100,000	1%
	Loan Interest Rate	4.00%	
	Loan Term (years)	4.0	
	Machine Ownership Life	15,000	
	Machine Hours until Significant Repairs	5,000	
	% of cost to depreciate	40%	
	Expected Annual Use (hours)	1,500	
	Monthly Payment (calculated from above)	$ 2,258	
	Repairs & Maintenance Cost per PMH	$ 6.00	
##	Fuel Cost Per Gallon ($)	$ 2.80	
	Fuel Consumption Rate (gallons/hour)	4.5	
	Lube Costs per 1,000 hours of service	$ 1,000	
	Hourly Operator Costs ($)	$ 35.00	
	Ratio of Machine Hours to Operator Time	90%	
	Annual Insurance Costs ($)	$ 1,500	

		$/PMH
3 Machine Name	skidder 1	$ 86.82

Acquisition Cost	$ 300,000	opportunity cost
Financed Amount	$ 250,000	1%
Loan Interest Rate	4.00%	
Loan Term (years)	4	
Machine Ownership Life	15,000	
Machine Hours until Significant Repairs	6,000	
% of cost to depreciate	50%	
Expected Annual Use (hours)	1,600	
Monthly Payment (calculated from above)	$ 5,645	
Repairs & Maintenance Cost per PMH	$ 8.00	
Fuel Cost Per Gallon ($)	$ 2.80	
Fuel Consumption Rate (gallons/hour)	5.5	
Lube Costs per 1,000 hours of service	$ 1,500	
Hourly Operator Costs ($)	$ 30.00	
Ratio of Machine Hours to Operator Time	90%	
Annual Insurance Costs ($)	$ 3,000	

			$/PMH
4	Machine Name	older skidder	$ 97.28
	Acquisition Cost	$ 100,000	opportunity cost
	Financed Amount	$ 1	1%
	Loan Interest Rate	1.00%	
	Loan Term (years)	1.0	
	Machine Ownership Life	5,000	
	Machine Hours until Significant Repairs	3,000	
	% of cost to depreciate	80%	
	Expected Annual Use (hours)	700	
	Monthly Payment (calculated from above)	$ 0	
	Repairs & Maintenance Cost per PMH	$ 8.00	
	Fuel Cost Per Gallon ($)	$ 2.80	
	Fuel Consumption Rate (gallons/hour)	5.5	
	Lube Costs per 1,000 hours of service	$ 1,500	
	Hourly Operator Costs ($)	$ 30.00	
	Ratio of Machine Hours to Operator Time	75%	
	Annual Insurance Costs ($)	$ 3,000	

			$/PMH
5	Machine Name	st. delimber	$ 75.84
	Acquisition Cost	$ 250,000	opportunity cost
	Financed Amount	$ 200,000	1%
	Loan Interest Rate	5.00%	
	Loan Term (years)	4.0	
	Machine Ownership Life	20,000	
	Machine Hours until Significant Repairs	7,000	
	% of cost to depreciate	40%	
	Expected Annual Use (hours)	500	
	Monthly Payment (calculated from above)	$ 4,606	
	Repairs & Maintenance Cost per PMH	$ 9.00	
##	Fuel Cost Per Gallon ($)	$ 2.80	
	Fuel Consumption Rate (gallons/hour)	5	
	Lube Costs per 1,000 hours of service	$ 1,500	
	Hourly Operator Costs ($)	$ 30.00	
	Ratio of Machine Hours to Operator Time	100%	
	Annual Insurance Costs ($)	$ 2,500	

		$/PMH
6 Machine Name	bulldozer	$ 80.30

Acquisition Cost	$ 65,000	opportunity cost
Financed Amount	$ 40,000	1%
Loan Interest Rate	5.00%	
Loan Term (years)	4.0	
Machine Ownership Life	5,000	
Machine Hours until Significant Repairs	2,500	
% of cost to depreciate	65%	
Expected Annual Use (hours)	300	
Monthly Payment (calculated from above)	$ 921	
Repairs & Maintenance Cost per PMH	$ 9.00	
Fuel Cost Per Gallon ($)	$ 2.80	
Fuel Consumption Rate (gallons/hour)	4.5	
Lube Costs per 1,000 hours of service	$ 1,500	
Hourly Operator Costs ($)	$ 30.00	
Ratio of Machine Hours to Operator Time	85%	
Annual Insurance Costs ($)	$ 1,000	

	Equipment Name	$/PMH	Fixed$/PMH	Variable $/PMH	Dep $/PMH
1	feller buncher	$ 127.20	$ 7.73	$119.47	$ 38.00
2	loader-slasher	$ 72.38	$ 1.89	$70.49	$ 12.00
3	skidder 1	$ 86.82	$ 3.58	$83.23	$ 25.00
4	older skidder	$ 97.28	$ 5.71	$91.57	$ 26.67
5	st. delimber	$ 75.84	$ 7.05	$68.79	$ 14.29
6	bulldozer	$ 80.30	$ 5.01	$75.29	$ 16.90
7					
8					
9					
10					
11					
12					

Daily Overhead Calculations (look familiar?)

(input data in white cells only)

Main Index

Daiy Overhead **$439**

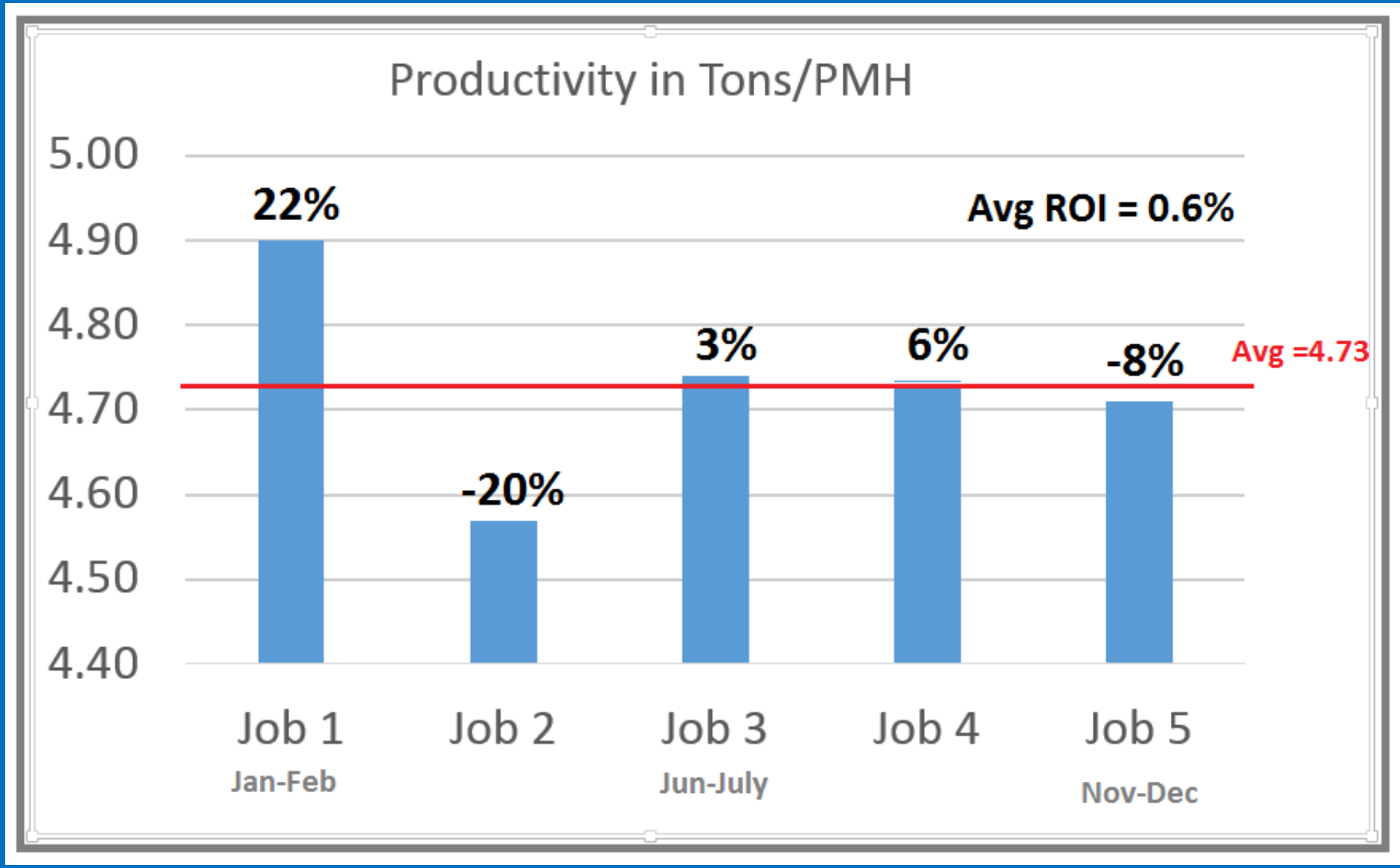
This looks just like a section of Form 1040, Schedule C of a federal income tax return. Follow the pop-up instructions carefully - there are some important differences!

Part II	Expenses				Enter expenses for business use of your home only on line 30.			
8	Advertising	8	1,000	18	Office Expense (See instructions)	18	3,000
9	Car and truck expenses (see instructions)	9	24,000	19	Pension and profit sharing plans	19	
10	Commissions and fees	10		20	Rent or lease (see instructions):		
11	Contract labor (see instructions)	11	2,500	a	Vehicles, machinery and equipment	20a	
12	Depletion	12		b	Other business property	20b	
13	Depreciation - enter annual depreciation for any business assets other than equipment.	13	4,000	21	Repairs and maintenance	21	1,200
14	Employee benefit programs (other than on line 19)	14		22	Supplies (not included in Part III)	22	12,000
15	Insurance (other than health).	15	10,000	23	Taxes and licenses	23	2,000
16	Interest:			24	Travel, meals and entertainment:		
a	Mortgage (paid to banks, etc.)	16a		a	Travel	24a	500
b	Other	16b		b	Deductable meals and entertainment (see instructions)	24b	300
17	Legal and professional services	17	1,500	25	Utilities	25	3,000
				26	Wages (less employment credits).	26	12,000
				27 a	Other expenses (from line 48)	27a	2,000
				b	**Reserved for future use**	27b	
28	**Total expenses** before expenses for business use of home. Add lines 8 through 27a					28	**79,000**
29	Formatting Deleted! Enter nothing here.					29	
30	Expenses for business use of your home. Do not report these expenses elsewhere. Attach Form 8829						

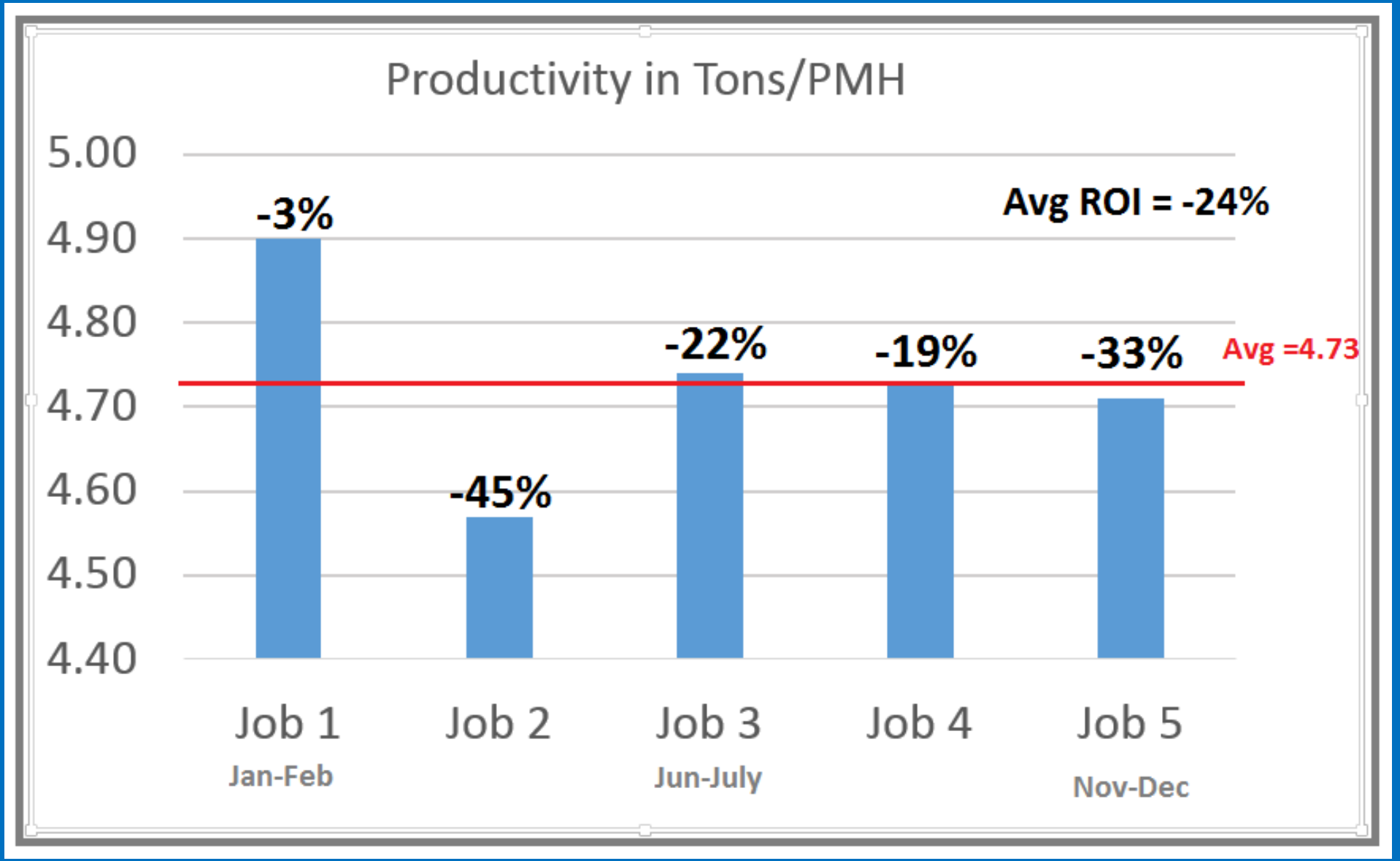
How many productive working days in your working year? 180

Total Annual Expenses $79,000

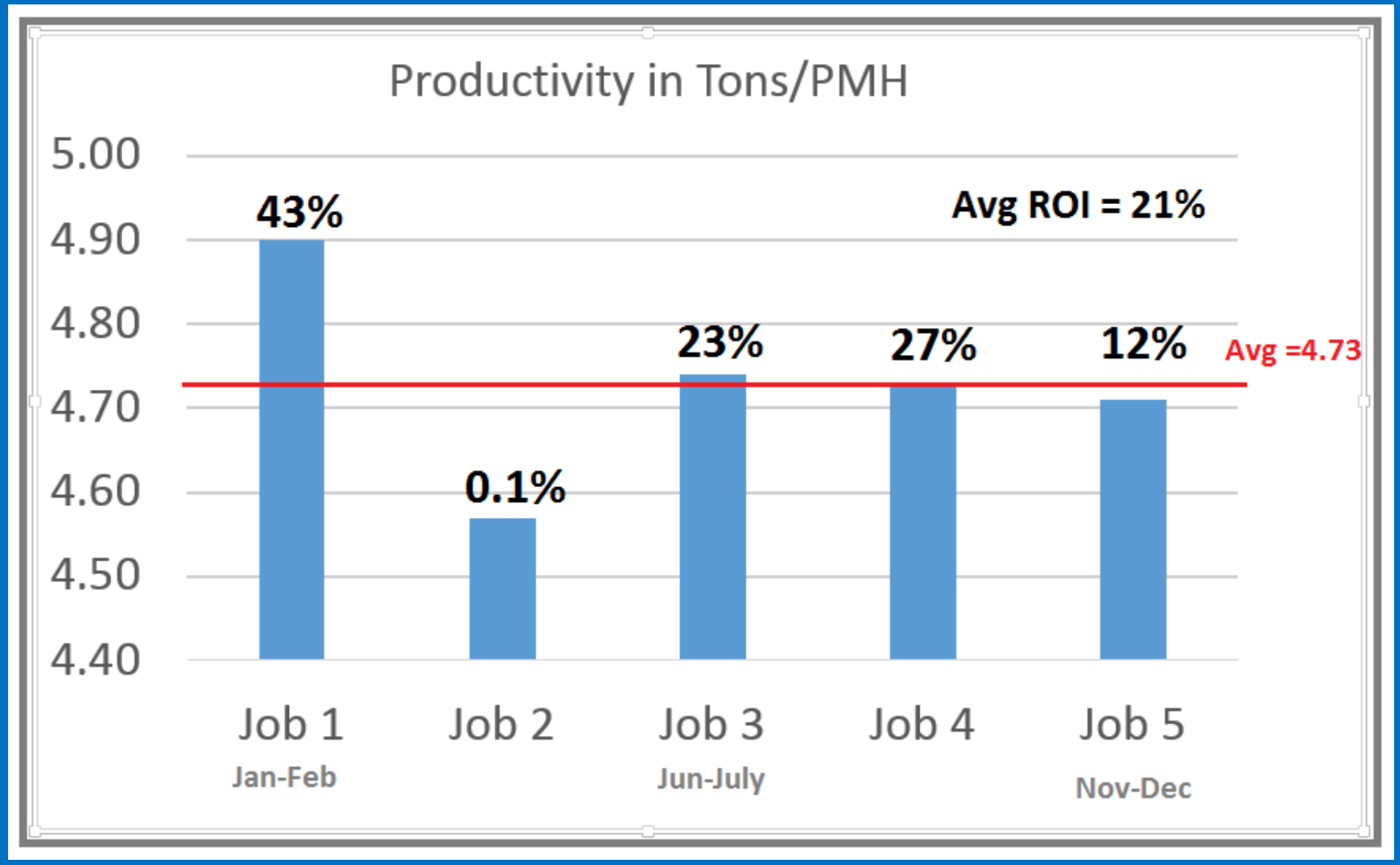
Baseline Production



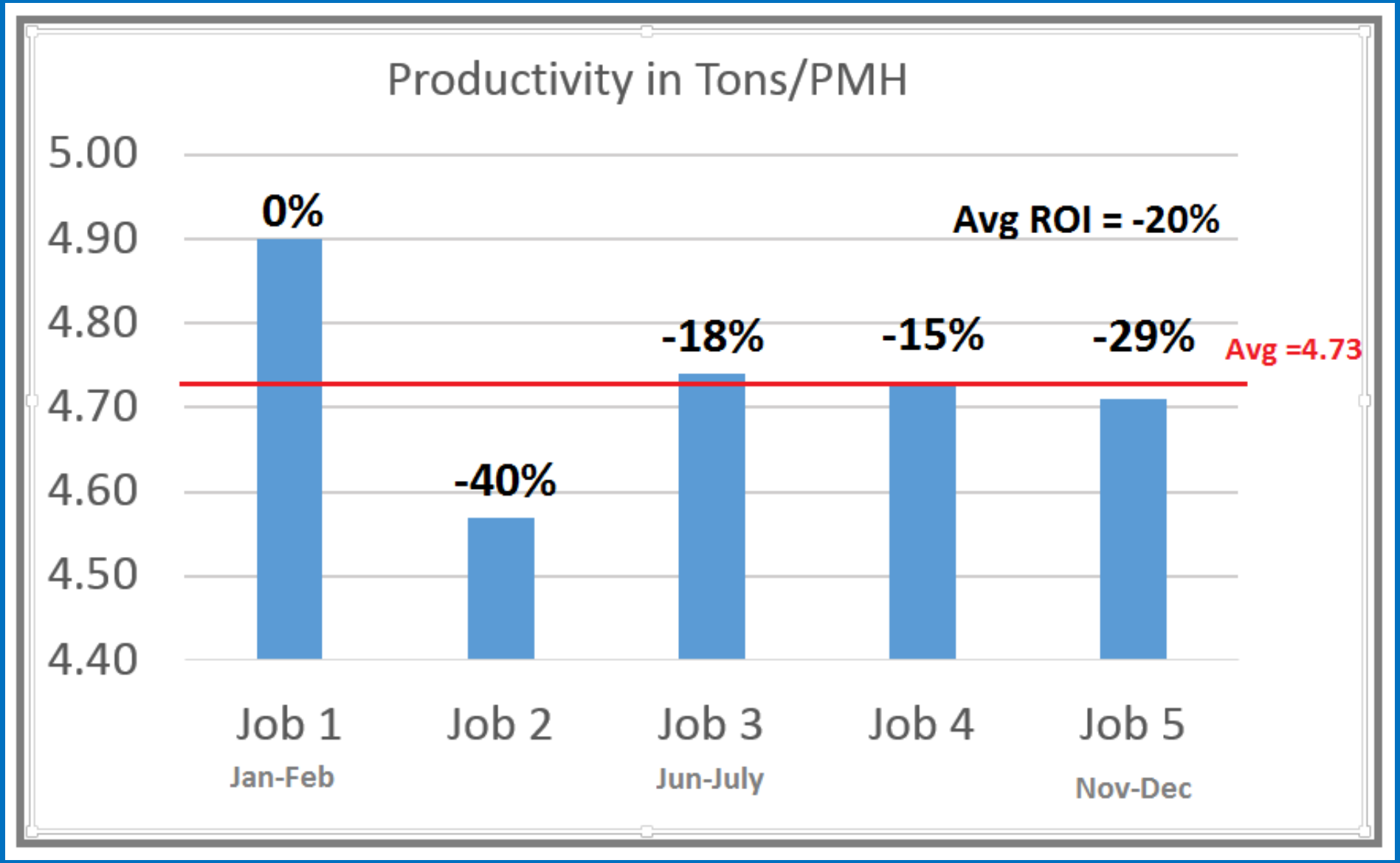
What if the fuel price goes up by $1/gallon?



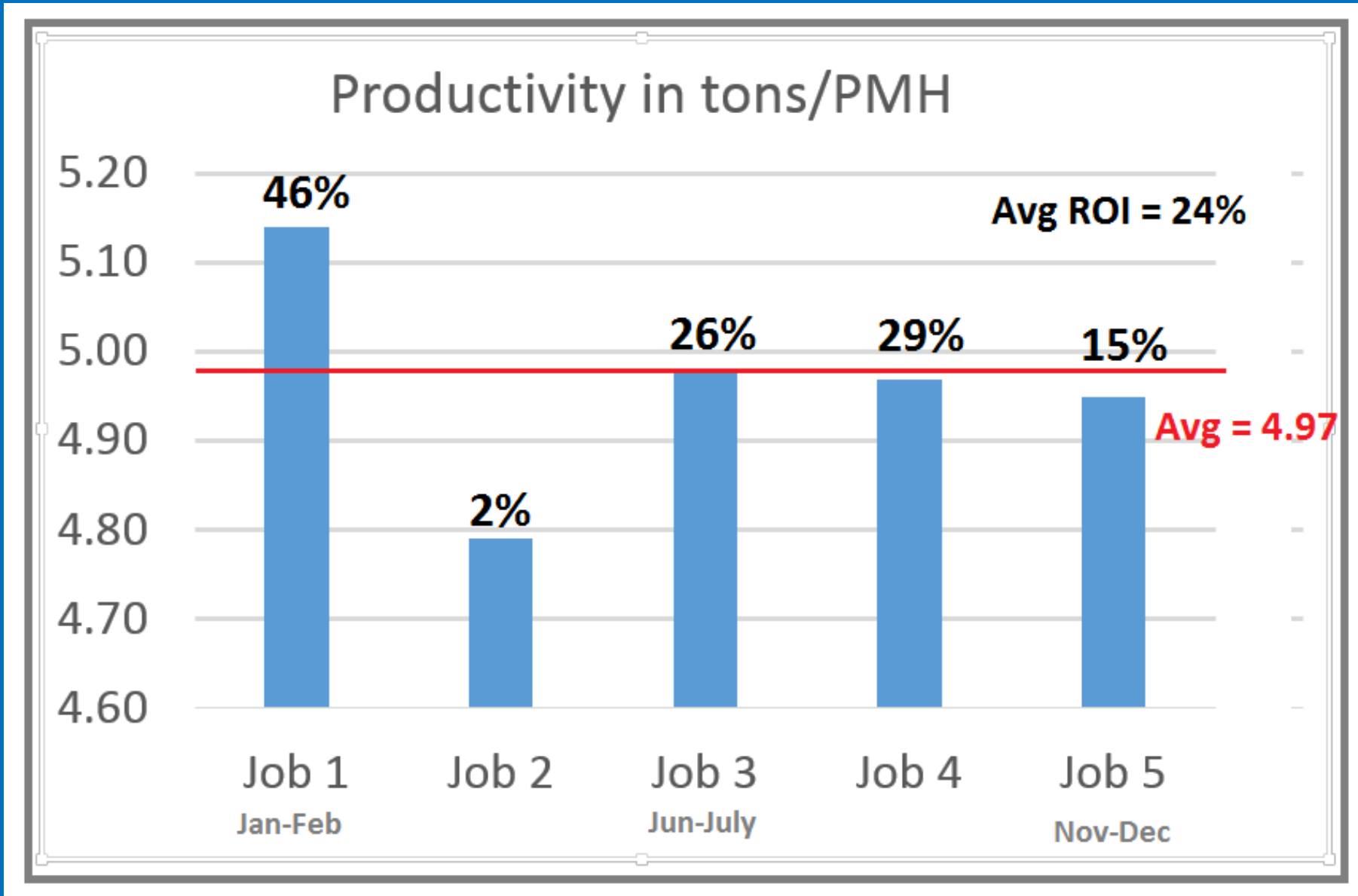
What if product prices increase by $1/ton?



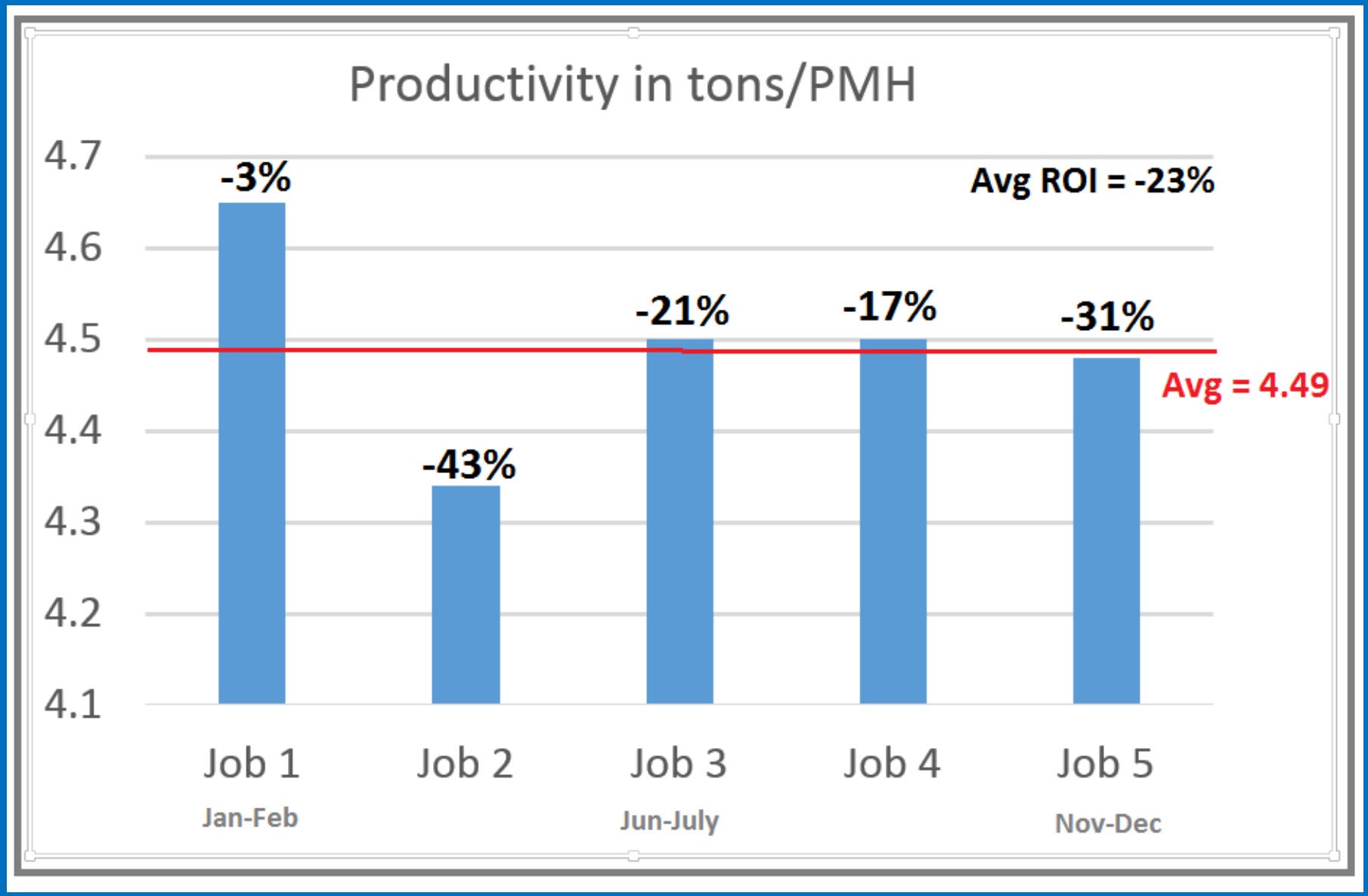
What if product prices decrease by $1/ton?



What if production rates increase by 5%?



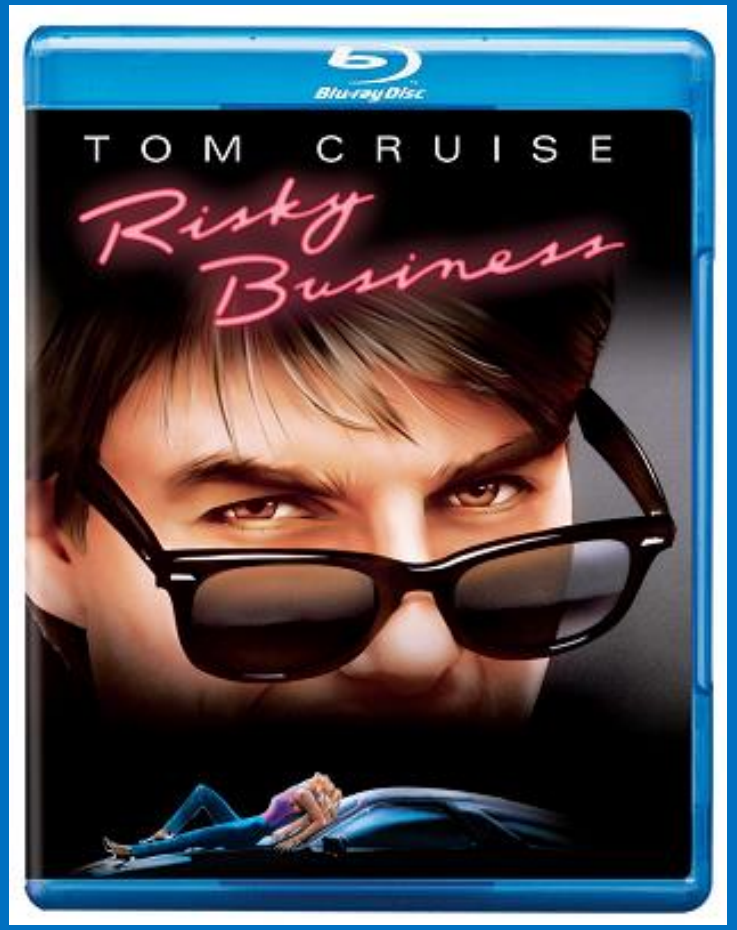
What if production rates decrease by 5%?



Summary

- Normal-ish conditions: ROI = 0.6%
- Fuel price increase by $1/gallon: ROI = -24.4%
- Product prices increase by $1/ton: ROI = 21%
- Product prices decrease by $1/ton: ROI = -20.4%
- Production increases by 5%: ROI = 23.6%
- Production decreases by 5%: ROI = -23%

Conclusion from PATH analysis:



What are the risks?

Losing money:

- No return on investment is bad enough, but……
- Loss of equity undermines business motives
- Loss of equity removes incentives to replace equipment
- Loss of harvesting capacity makes it difficult to manage and operate timberlands

What is loss of equity?

Running on Equity

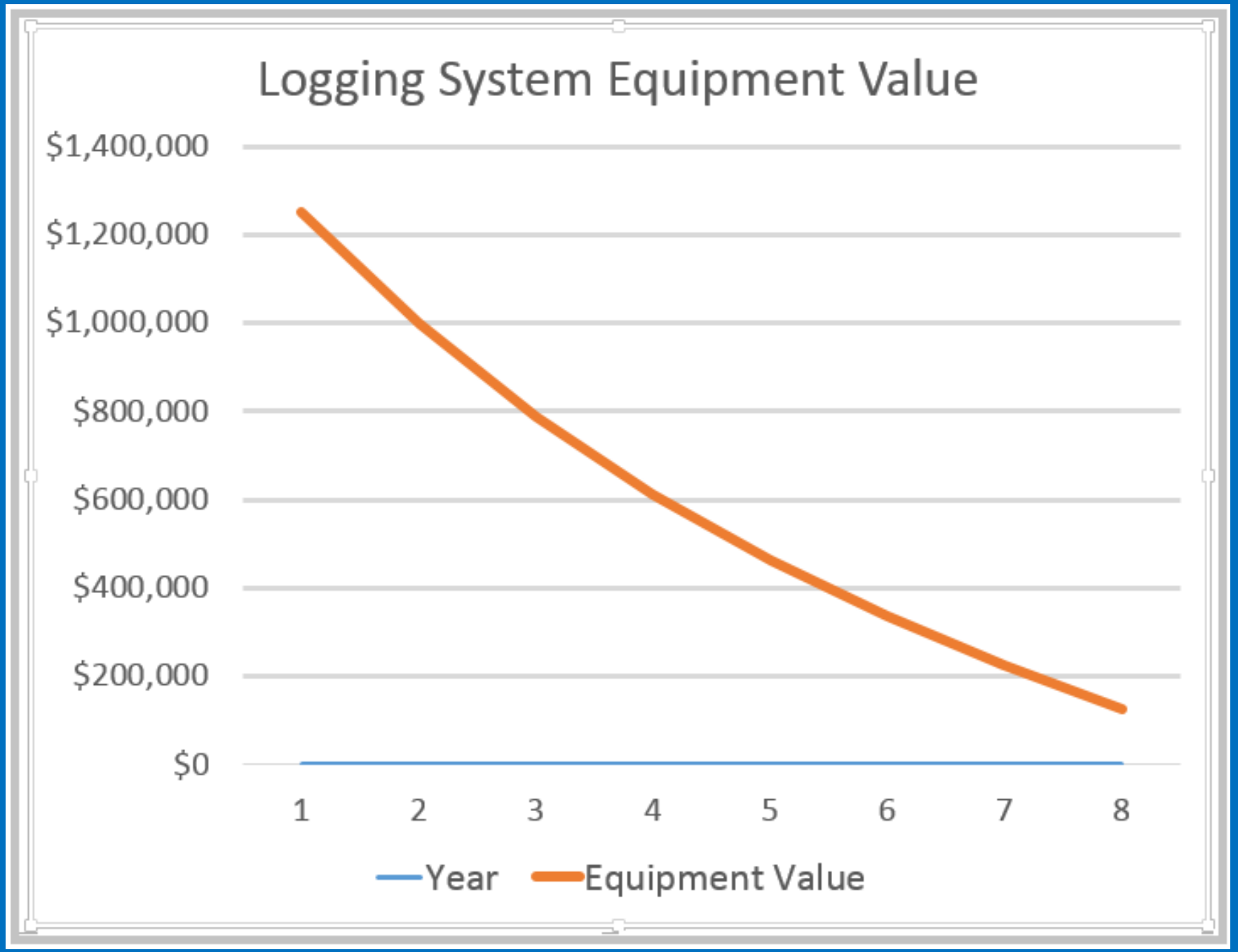
- *“When you start running your business with equity, its not fun.”*
- *“To do it productively and profitably, you know, you can squeak through bad times, if they’re not forever. Somewhere you’ve got to make up for what you haven’t been. You use your resources and your equity. You use up your equity, to survive.”*

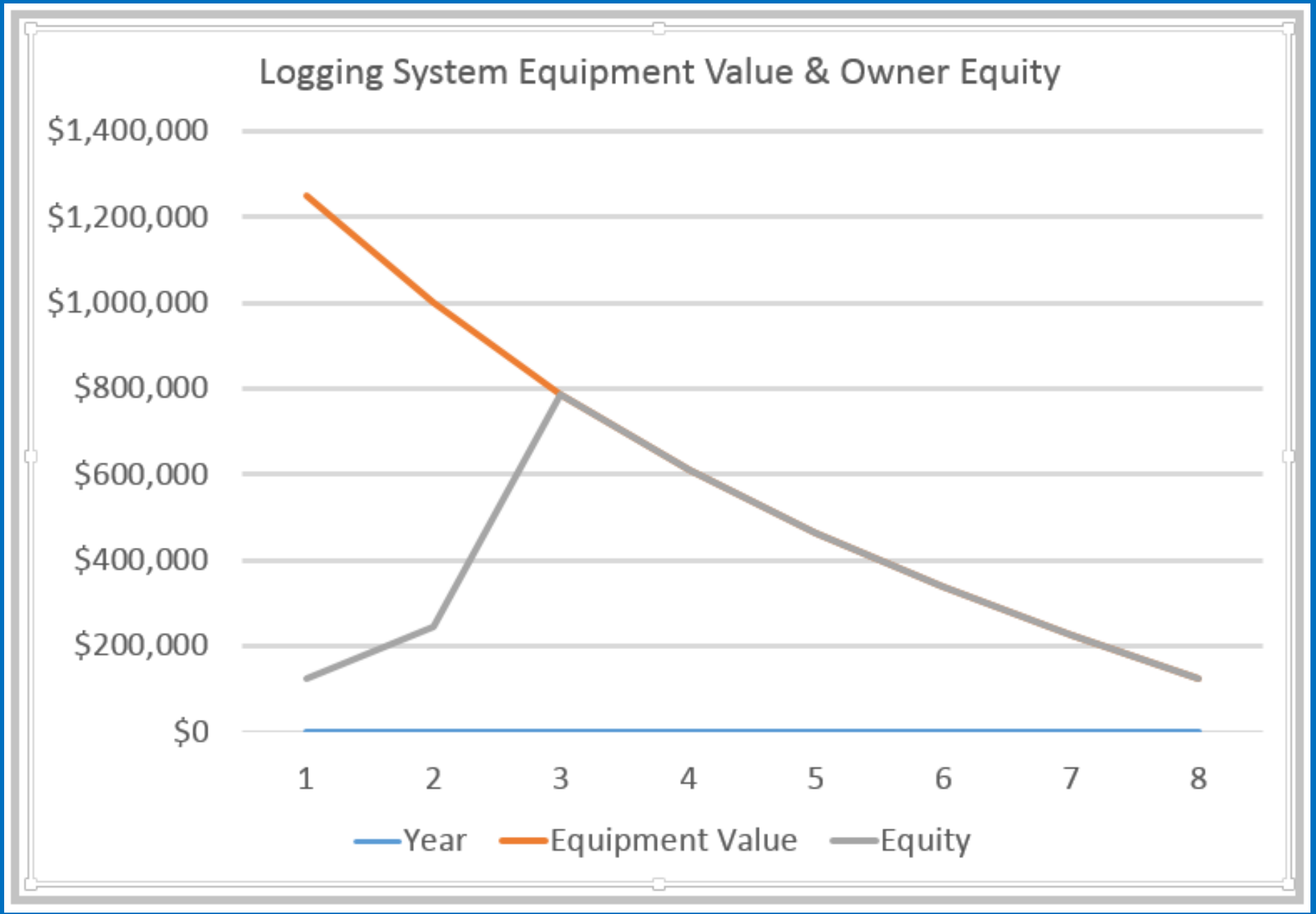
Running on Equity = Uncompensated Depreciation

- Once full ownership in equipment is achieved, positive cash flows can disguise the erosion of equipment equity
- Compensated depreciation puts loggers in a position to replace equipment – to roll equity into new equipment
- ROI rewards loggers for the risk involved in purchasing, owning and operating equipment

Running on Equity Quantified

- WTH harvesting system purchased for $1,250,000 and financed for 5 years at 5% interest
- How is equity built and what happens to it?


Logging System Equipment Value
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
1
2
3
4
5
6
7
8
Year
Equipment Value


Logging System Equipment Value & Owner Equity
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
1
2
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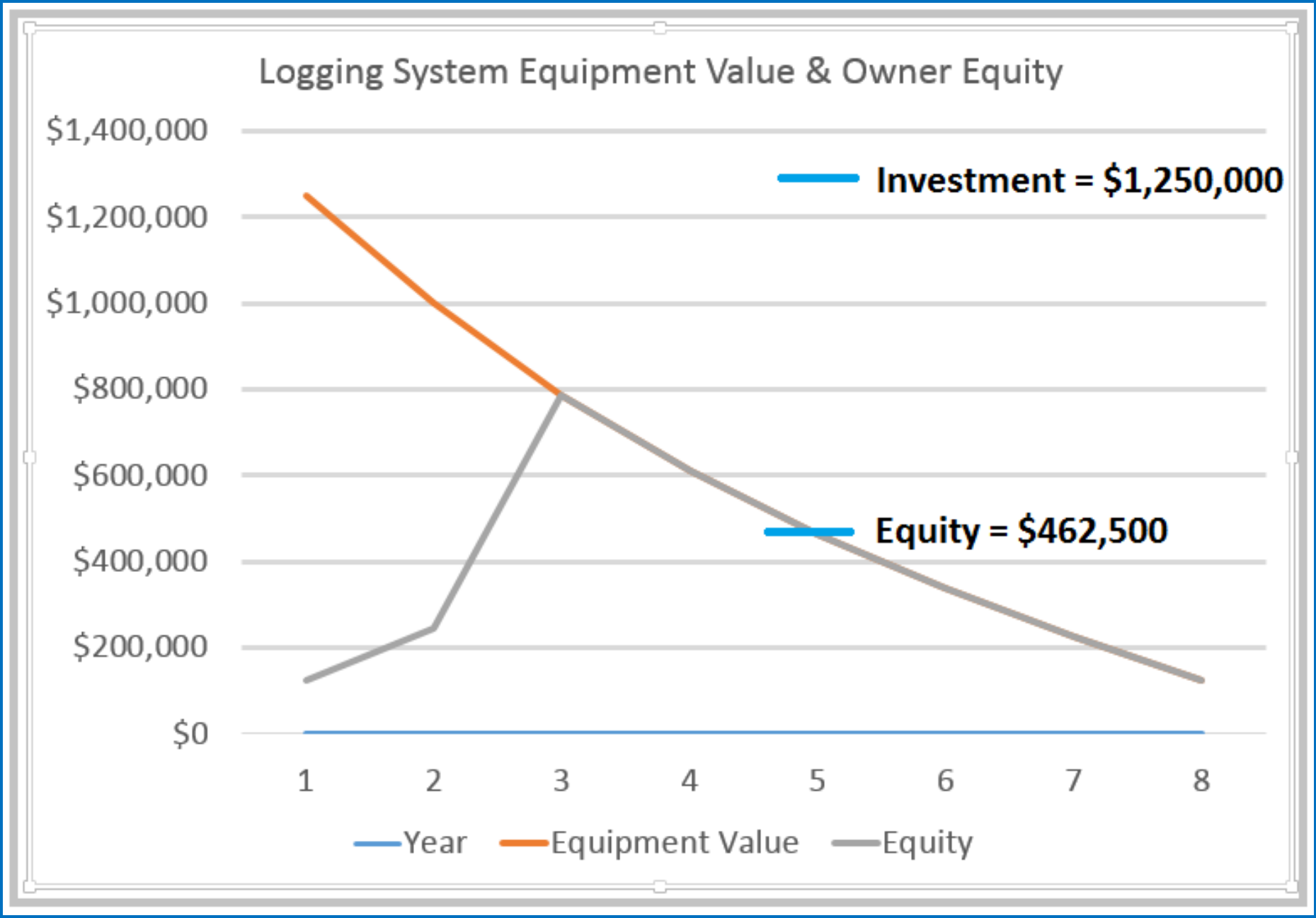
Year
Equipment Value
Equity


Logging System Equipment Value & Owner Equity
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
Investment = $1,250,000
Equity = $462,500
1
2
3
4
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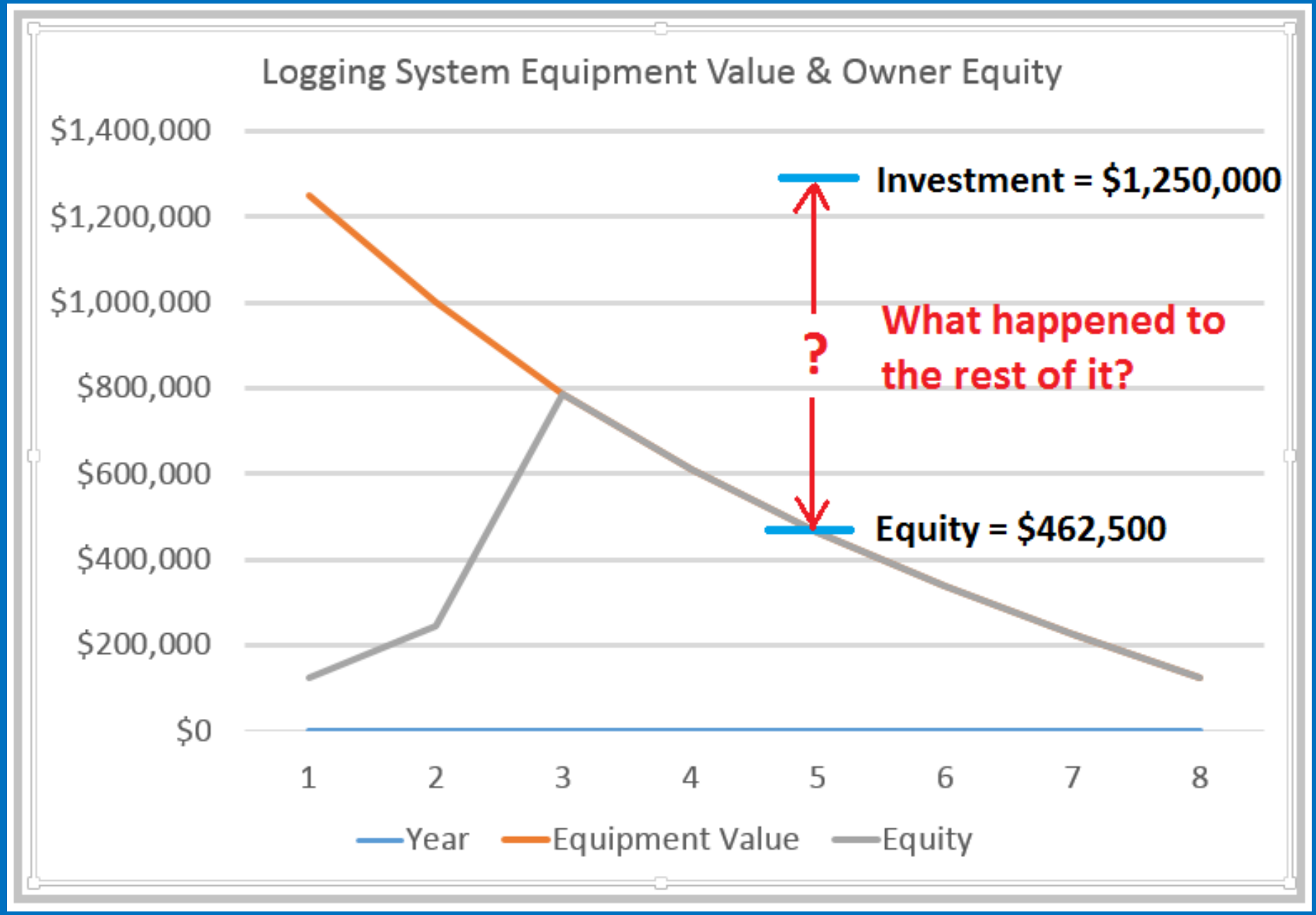
8
Year
Equipment Value
Equity


Logging System Equipment Value & Owner Equity
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
1
2
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8
Investment = $1,250,000
What happened to the rest of it?
?
Equity = $462,500
Year
Equipment Value
Equity

What happened?

By the end of year 5 the business owner has paid a total of **$1,250,000** for equipment that is worth only **$462,500**.

This equipment must produce revenue equal to **$787,500** (after all other expenses) just to break even!

Where does equity go?

1. It is recovered by revenue from production, with cash flows that are somewhat like a fixed term annuity; or
2. If revenue is insufficient, it is consumed like fuel and lost forever.

Which alternative is sustainable?


RISK

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