

Milling Performance and Grain Procurement Practices

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JAG Services, Inc.

"Training, Service, Process Management Programs, Consulting"

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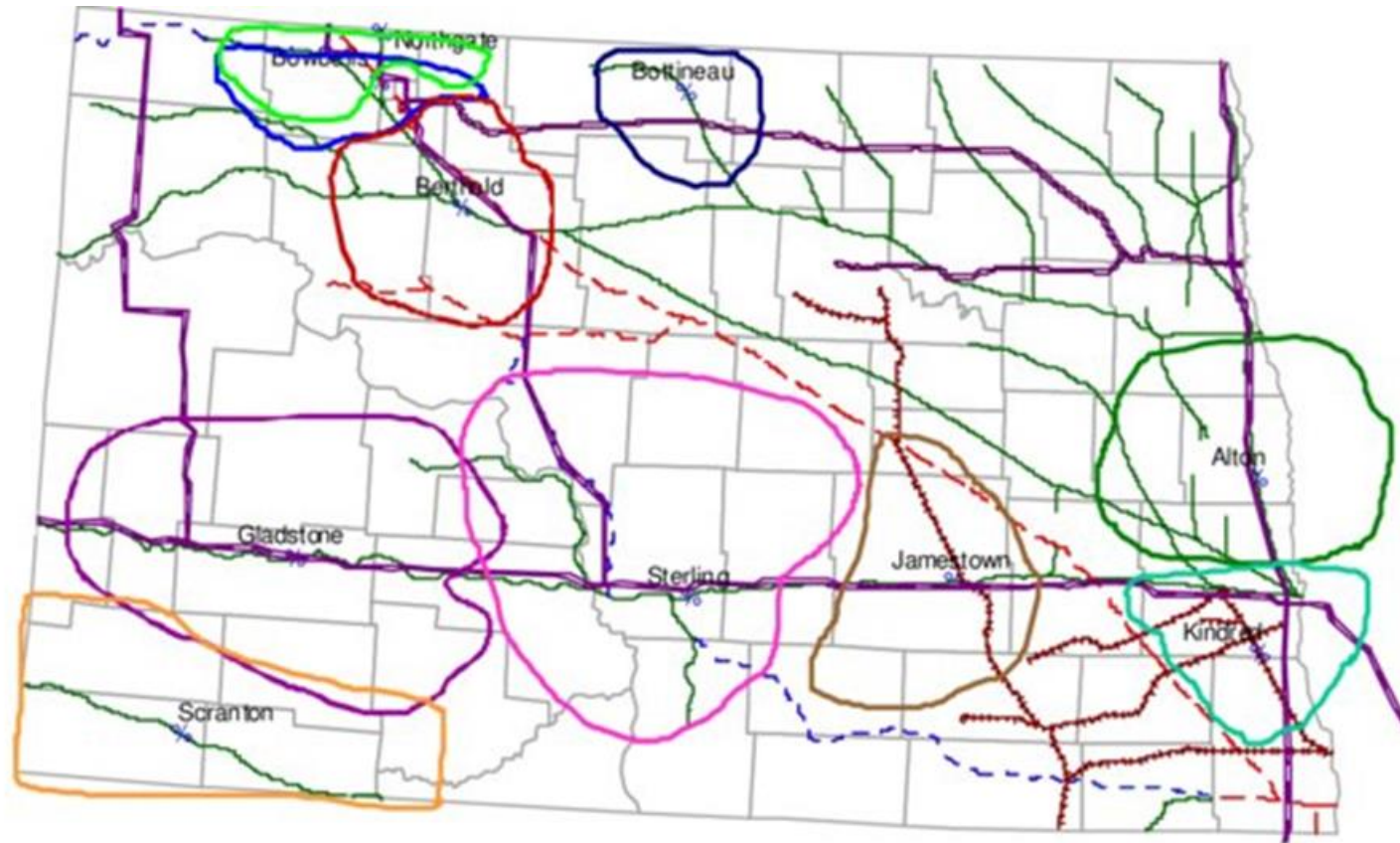
Flour Miller Perspective: Hedging The Wheat Market

- **Action:** Sell Flour
- **Reaction:** Buy Futures Wheat Contract



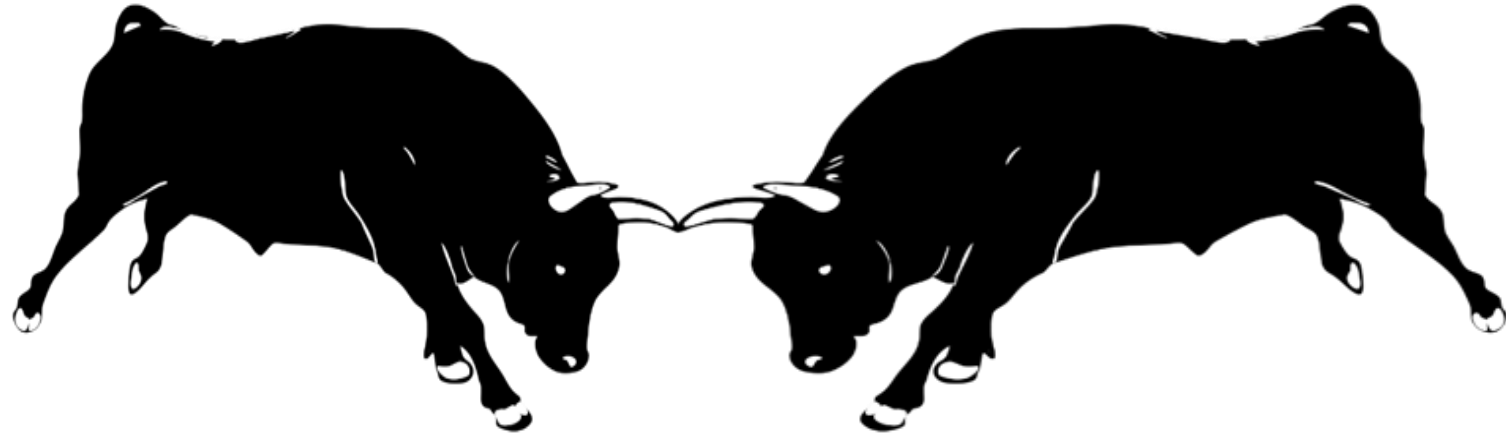
- **Action:** Purchase Cash Wheat
- **Reaction:** Sell Wheat Futures Contract

Wheat Draw Area Example: North Dakota



[https://www.researchgate.net/publication/237730219 NORTH DAKOTA STRATEGIC FREIGHT ANALYSIS Item III Shuttle Trains/figures?lo=1](https://www.researchgate.net/publication/237730219_NORTH_DAKOTA_STRATEGIC_FREIGHT_ANALYSIS_Item_III_Shuttle_Trains/figures?lo=1)

Conflict Between Procurement and Production



Differing Perspectives of Success Creates Conflict!

Results in failure to maximize opportunity and profit for the company!

A large majority (72%), of C-suite executives surveyed ranked cost savings and cost avoidance as their primary measure for procurement success.

Measures of Success

Grain Buyer-Acquisition

- Cost
 - Lowest Cash Market Cost
- Delivery
 - On Time
 - Low cost
- Quality
 - Meets Grain Grading Standards
 - Meets Technical Standards

Miller-Transformation

- Yield
 - Low Cleaning Loss
 - High Flour Yield
 - Moisture Gain
- Rate
 - Uninterrupted
 - Maximum
- Quality
 - Meets Flour Specifications

Technical Standards Impact Fixed Cost

Transformation Costs-Fixed

- General & Administrative
- Maintenance
- Insurance
- Property Taxes
- Depreciation
- Interest

Technical Standards Impact Variable Cost

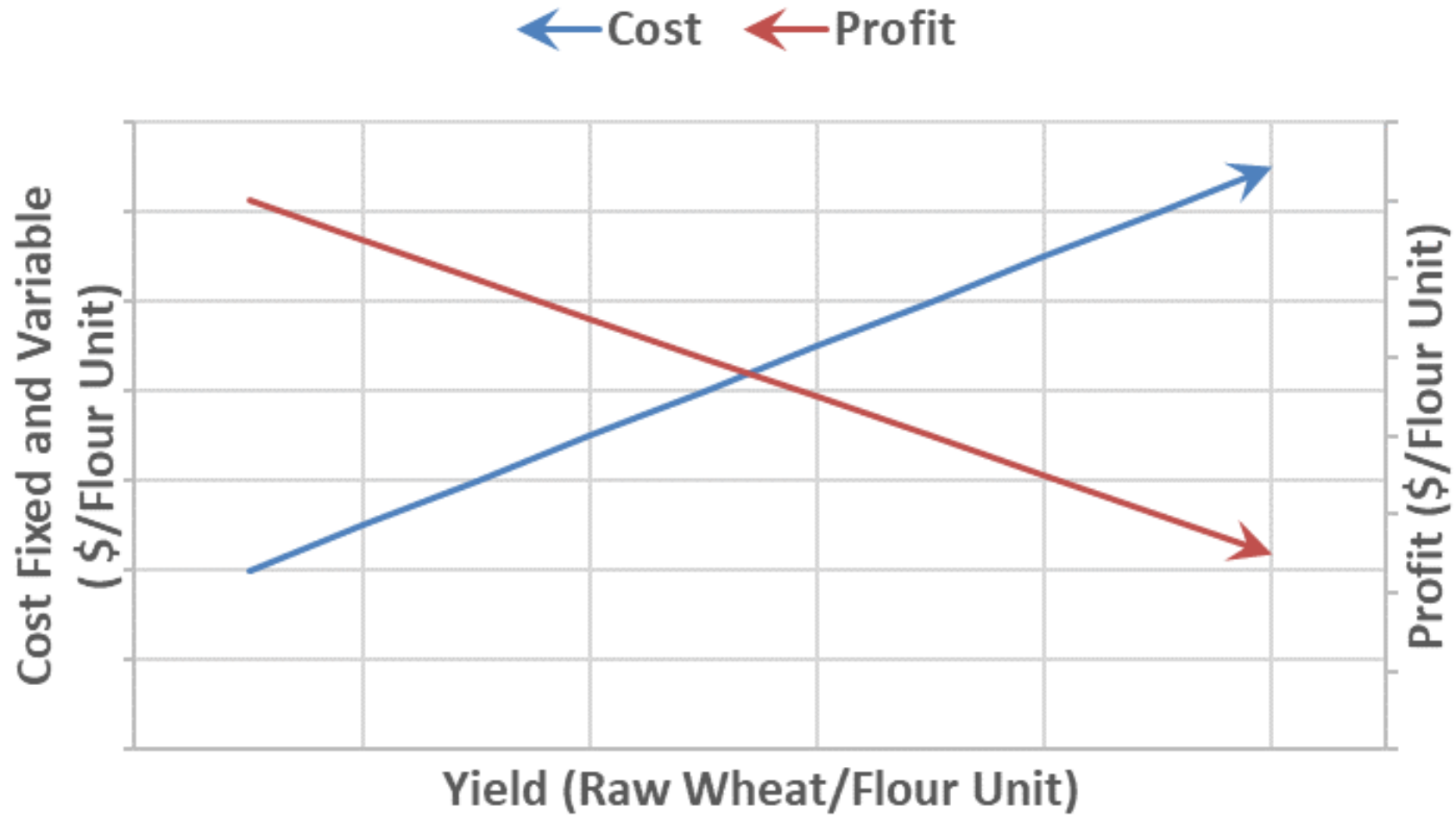
Transformation Costs-Variable

- Labor: Yearly Wages Benefits, Overtime
- Utilities: Electricity, Water, Fuel
- Cost of Goods Sold*
 - Wheat Price FOB elevator
 - Transportation cost
 - Insurance transportation cost
 - Demurrage
 - Elevation cost
 - Switching cost

Cost of Goods Sold* Cont'd

- Unloading cost
- Other wheat delivery costs
- In-elevator handling cost
- Storage cost
- Fumigation cost
- Shrinkage cost
- Bagging material

Gross Margin: Cost and Profit



Some Technical Standards beyond Official Grade

Suitability or Quality

- Moisture
- Protein
- Falling Number
- DON-Vomitoxin
- Pesticide Residue

Premium/Discount Schedule Differentiation

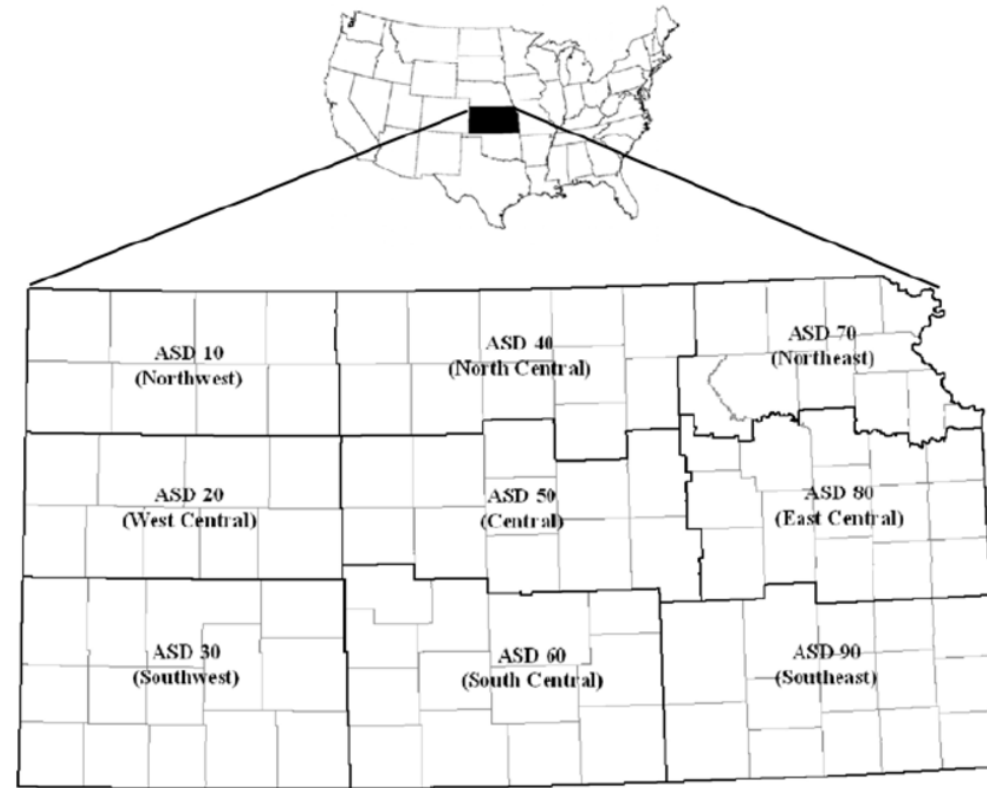
- Test Weight (lbs./bu.)
- Kernel Weight (TKW)
- Kernel Size

What is the Impact on Yield and Value

- Test Weight
- Kernel Weight
- Kernel Diameter

VS.

- Yield
- Value



https://www.researchgate.net/figure/The-state-of-Kansas-study-area-map-and-USDA-NASS-Agricultural-Statistics-District-ASD_fig1_222511209 [accessed 7 Apr, 2019]

Kansas Crop Quality Samples: N= 153

Mill Management Economic Model developed by Flores et. al at Kansas State University
See Transactions of the ASAE vol. 36(4):1143-1149, July-August 1993

The Wheat Crop

N=153	Weight (mg)	Size (mm)	Test Weight (lbs./bu.)	Flour Yield (%)	Income (\$/bu)
Average	27.84	2.28	76.3	71.60	4.25
St.Dev.	2.55	0.12	2.7	1.70	13.75
Minimum	22.75	2.03	69.5	65.08	-28.64
Maximum	35.53	2.65	81.1	75.07	31.33

Simple Linear Regression

$$\hat{y} = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\hat{y}_1 = \beta_0 + \beta_1 X_1$$

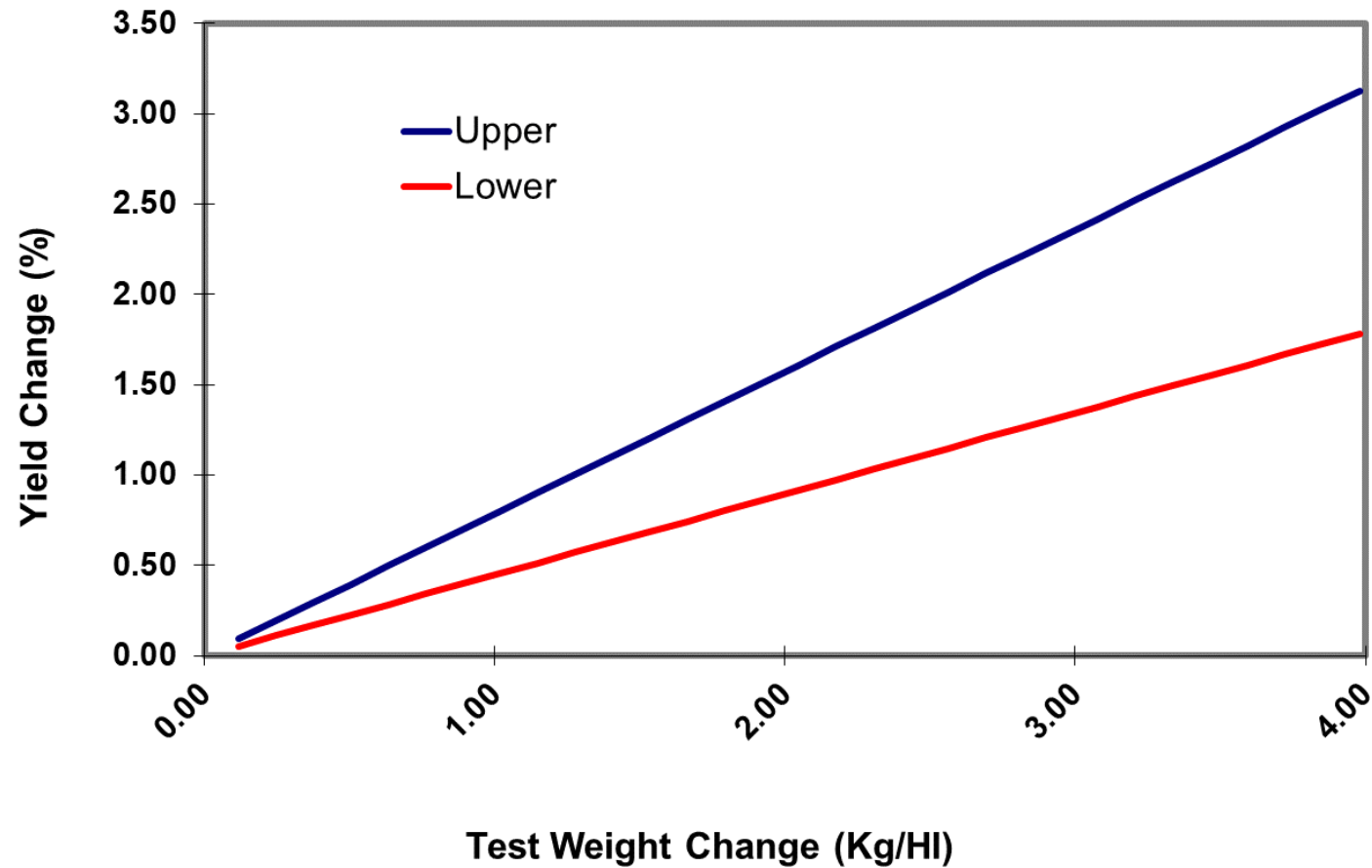
$$\hat{y}_2 = \beta_0 + \beta_1 X_2$$

$$\hat{y}_1 - \hat{y}_2 = (\beta_0 + \beta_1 X_1) - (\beta_0 + \beta_1 X_2)$$

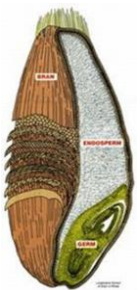
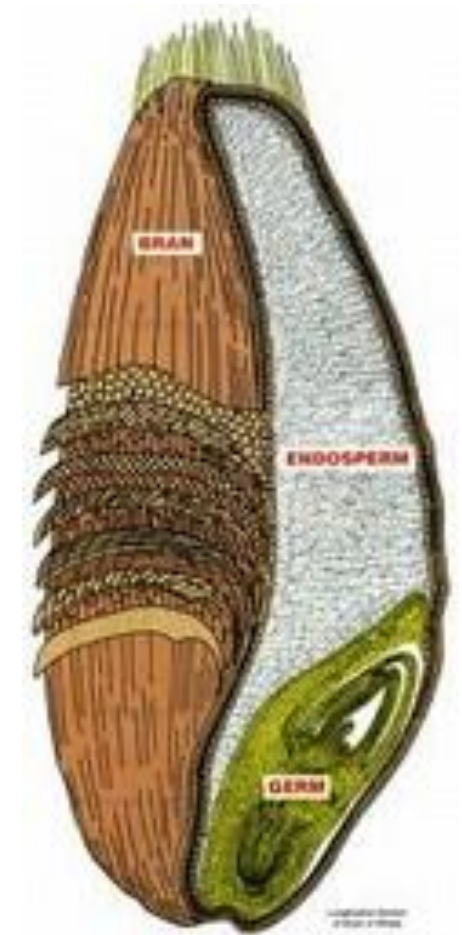
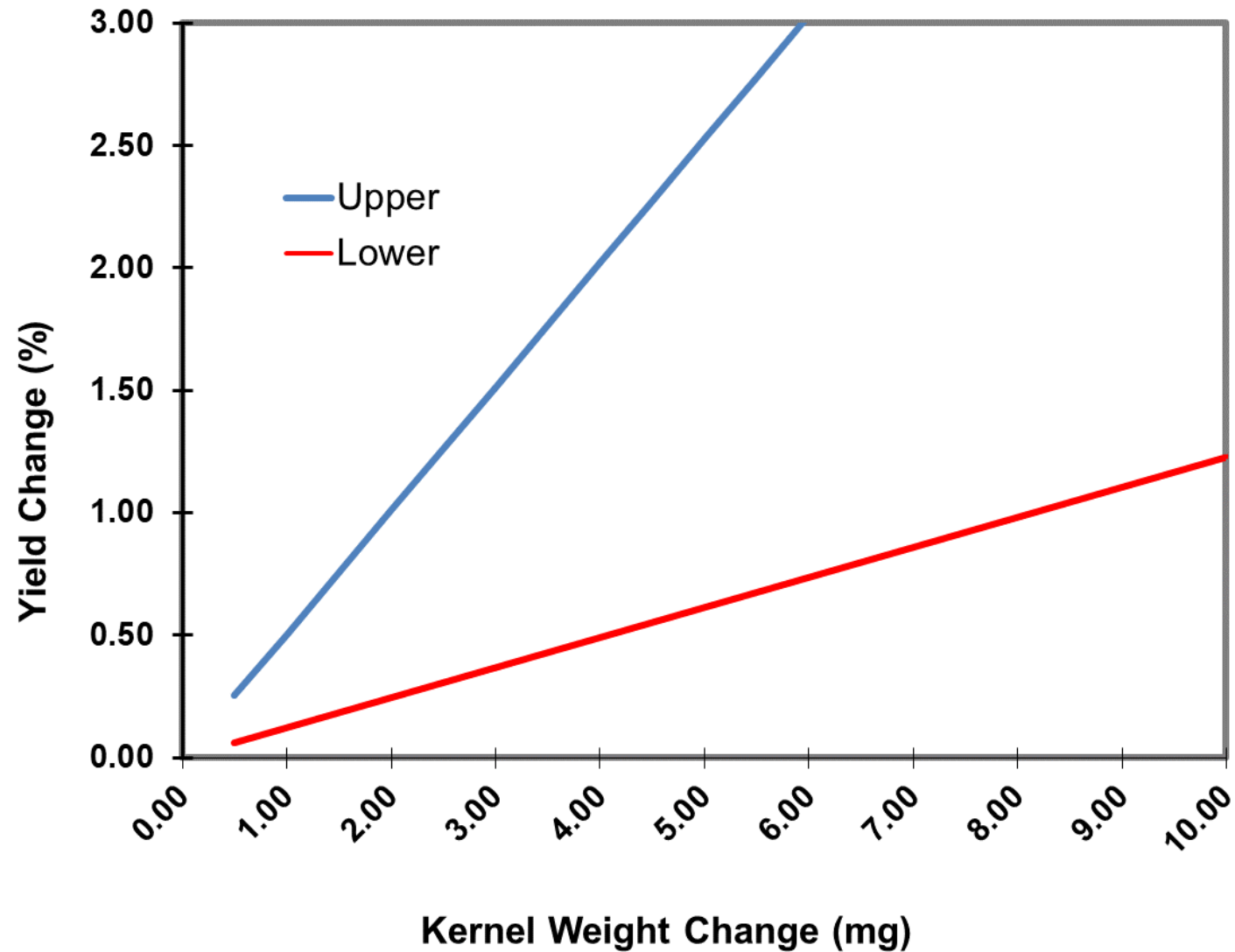
$$\hat{y}_1 - \hat{y}_2 = \beta_1 (X_1 - X_2)$$

β_1 Confidence Interval is the key

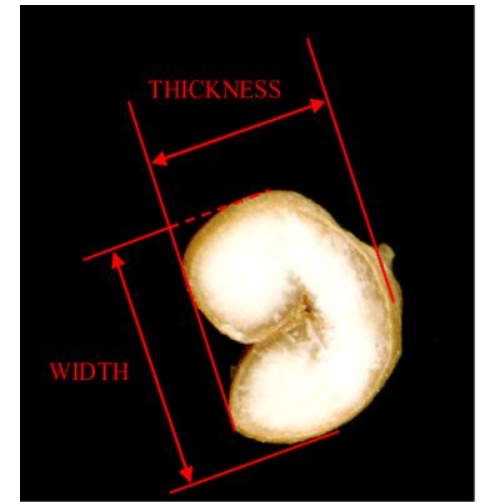
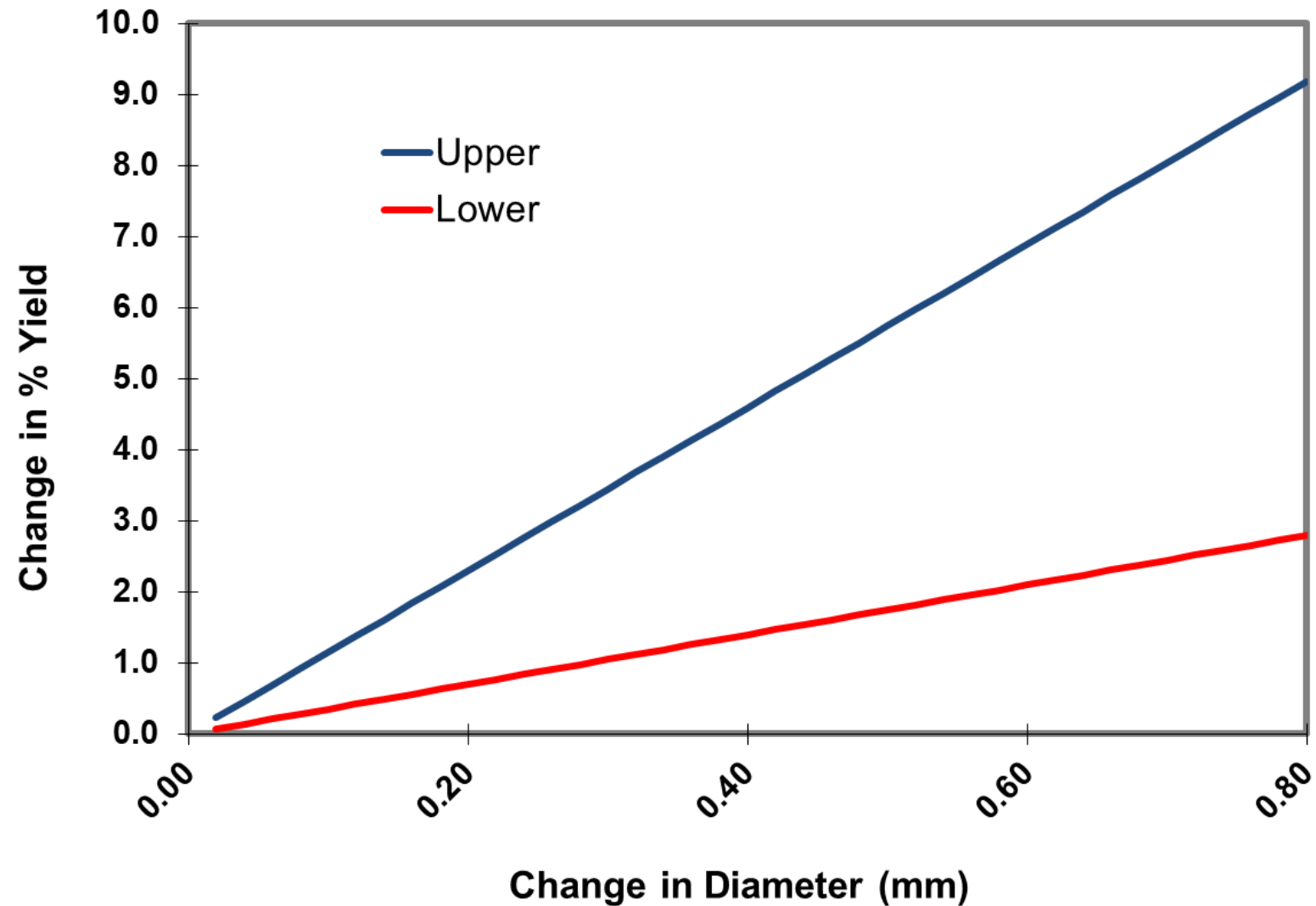
Yield and Test Weight



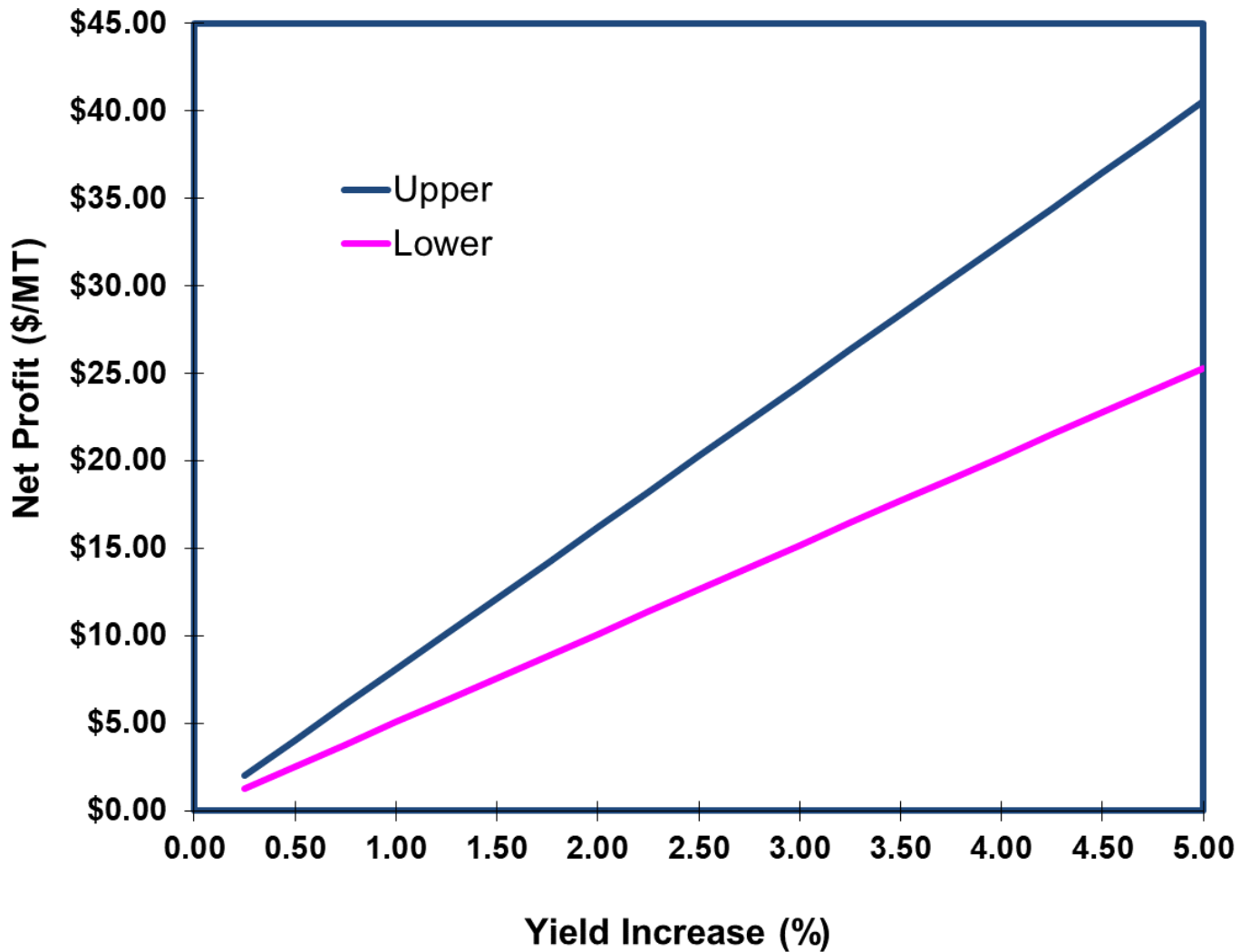
Yield and Kernel Weight



Yield and Kernel Diameter



Yield and Profit



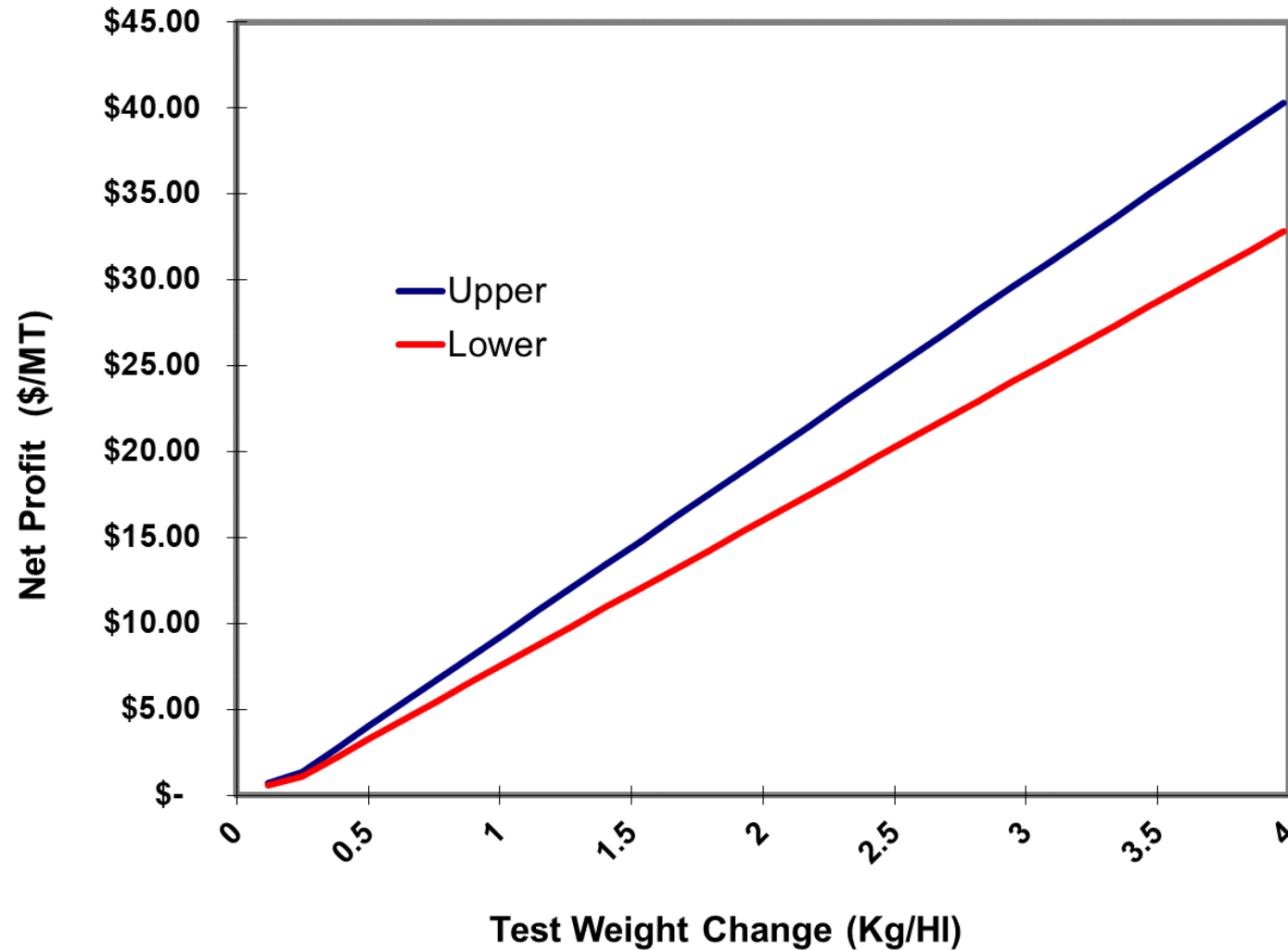
What is the impact of improvement and what is it worth?

Attribute	Average	5% Increase	Improvement	
			Yield (%)	Profit (\$/MT)
Test Weight (Kg/Hl)	76.33	3.8165	1.34 — 2.36	16.53 — 20.21
Kernel Weight (mg)	27.8	1.39	0.18 — 0.76	2.57 — 6.98
Kernel Diameter (mm)	2.28	0.114	0.42 — 1.38	5.14 — 12.13

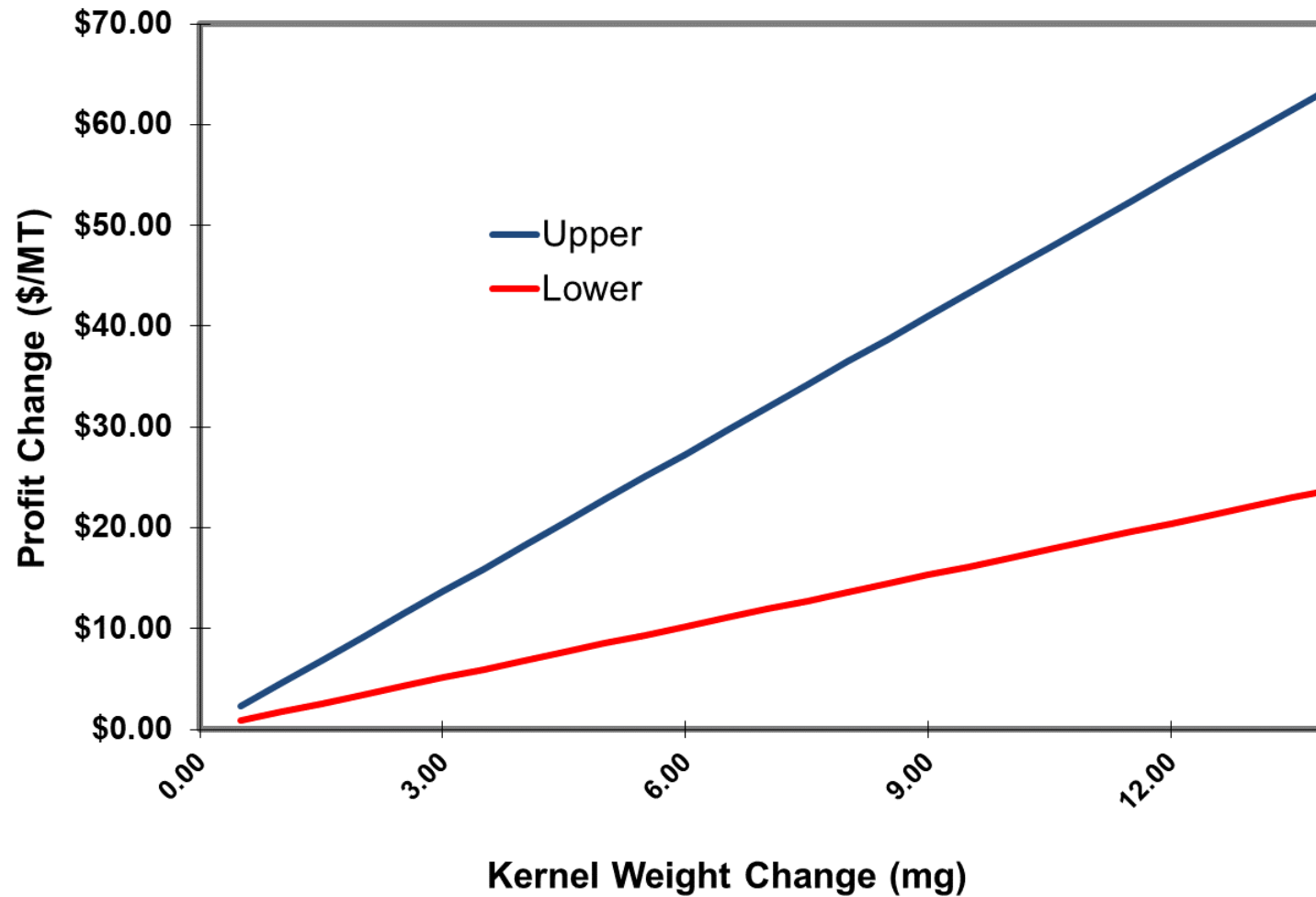
R and R² Values

Measure	Yield (%)		Profit (\$/MT)	
	R	R ²	R	R ²
Test Weight (Kg/Hl)	0.76	0.58	0.93	0.87
Kernel Weight (mg)	0.47	0.22	0.58	0.33
Kernel Diameter (mm)	0.52	0.25	0.63	0.39
Profit (\$/MT)	0.81	0.66	NA	NA

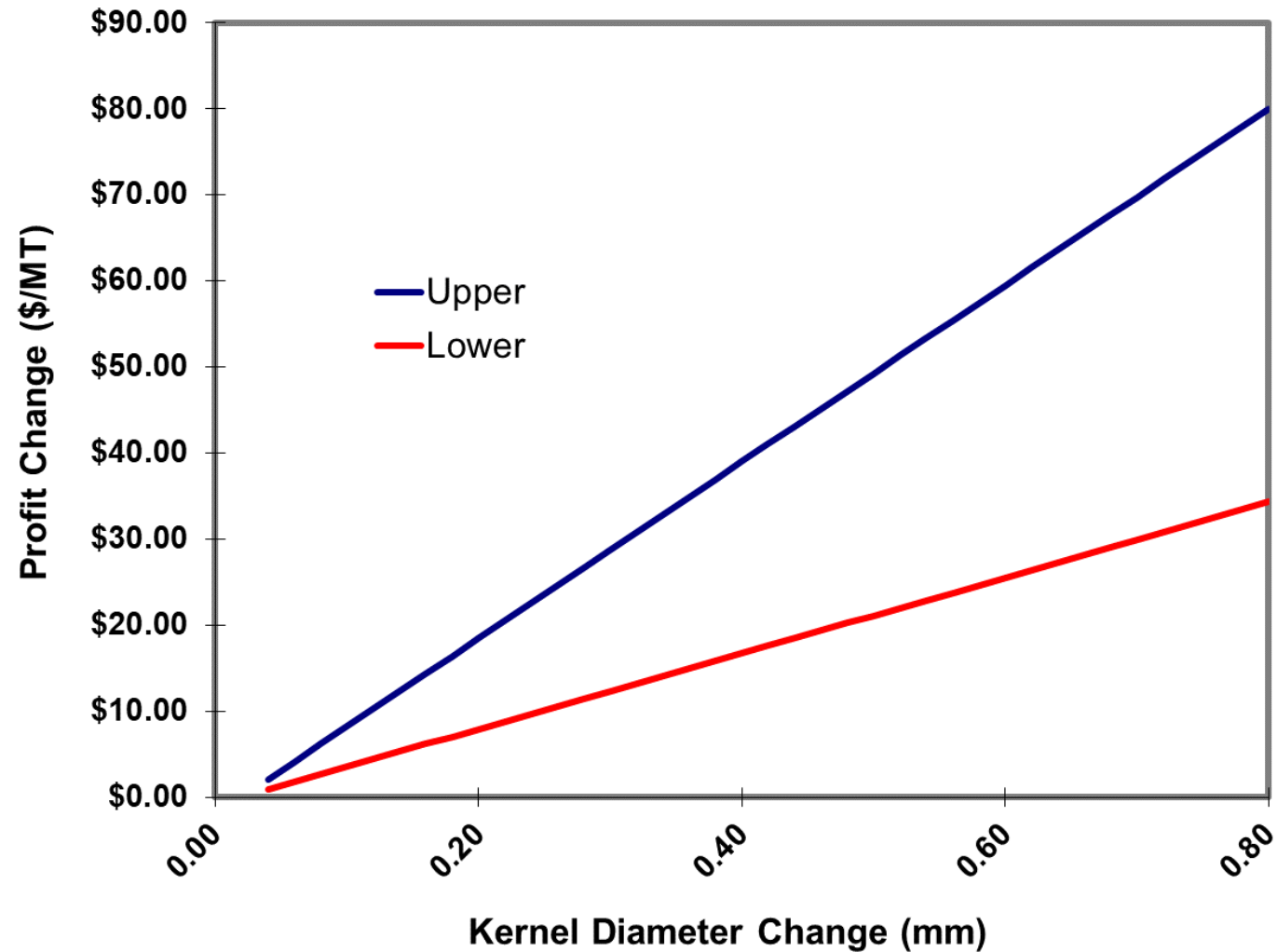
Profit and Test Weight



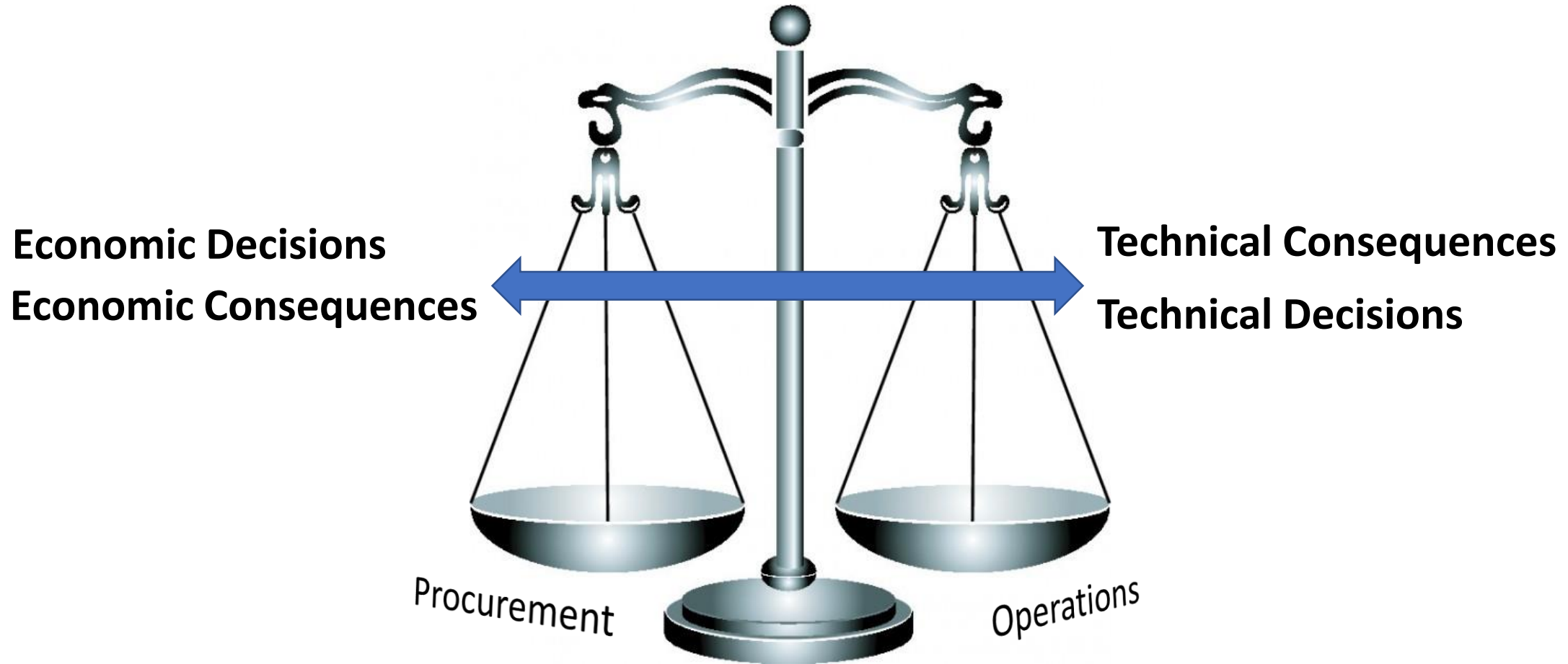
Profit and Kernel Weight



Profit and Kernel Diameter



Balancing Act: Whose Success Counts?



The Company

Operations: Monetize Impact of Raw Materials on Costs and Productivity



**Fixed and Variable Cost as
a Result of**

- Yields
- Quality Cost
- Flow Rates
- Unplanned Down Time
- Repair Cost



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