The Impacts of Tillage and Rotations on Machinery Costs

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Executive Summary

During this session, five topics will be covered:

- Benchmark machinery values and costs are summarized from Illinois Farm Business Farm Management records. Fair market machinery values vary by farm size. In 2005, average machinery values are $297 per acre for farms with 500 to 1,000 acres, $269 per acre for 1,001 to 2,000 acre farms, $258 for 2,001 to 3,000 acre farms, $244 per acre for 3,001 to 4,000 acre farms, and $238 per acre for 4,001 to 5,000 acre farms. Power costs include utilities, machinery repairs, machinery hire and lease, fuel and oil, light vehicle, and machinery depreciation. In 2005, power costs average $70 per acre for 500 to 1,000 acre farms, $66 per acre for 1,001 to 2,000 acre farms, $68 for 2,001 to 3,000 acre farms, $70 for 3,001 to 4,000 acre farms, and $69 per acre for farms with over 4,001 acres.

- Machinery cost estimation is detailed and demonstrated using the *Machinery Economics* Microsoft Excel spreadsheet. This spreadsheet is available for download in the *FAST* section of *farmdoc* (www.farmdoc.uiuc.edu).

- Tillage has impacts on machinery costs. No tillage and strip tillage systems have lower costs than conventional tillage (use a chisel plow) and "heavy" tillage (use a primary tillage implement that goes deep in the soil) systems. Machinery inventory must be reduced in order to gain most of the cost advantages from using no-till and strip-till systems. Costs are increased by using "deep" tillage alternatives.

- Planting more corn will increase machinery costs. These cost increases will be small on most farms. Planting more corn will tighten planting windows, lengthen and complicate harvest, and add more tillage and fertilizer passes. In general, timing concerns will increase as more corn is planted.

- The costs of new combine have escalating rapidly. One way to reduce the impact of increasing costs is to use the combine over more acres, thereby spreading the costs of owning machinery over more acres. Sharing machinery may be an option.

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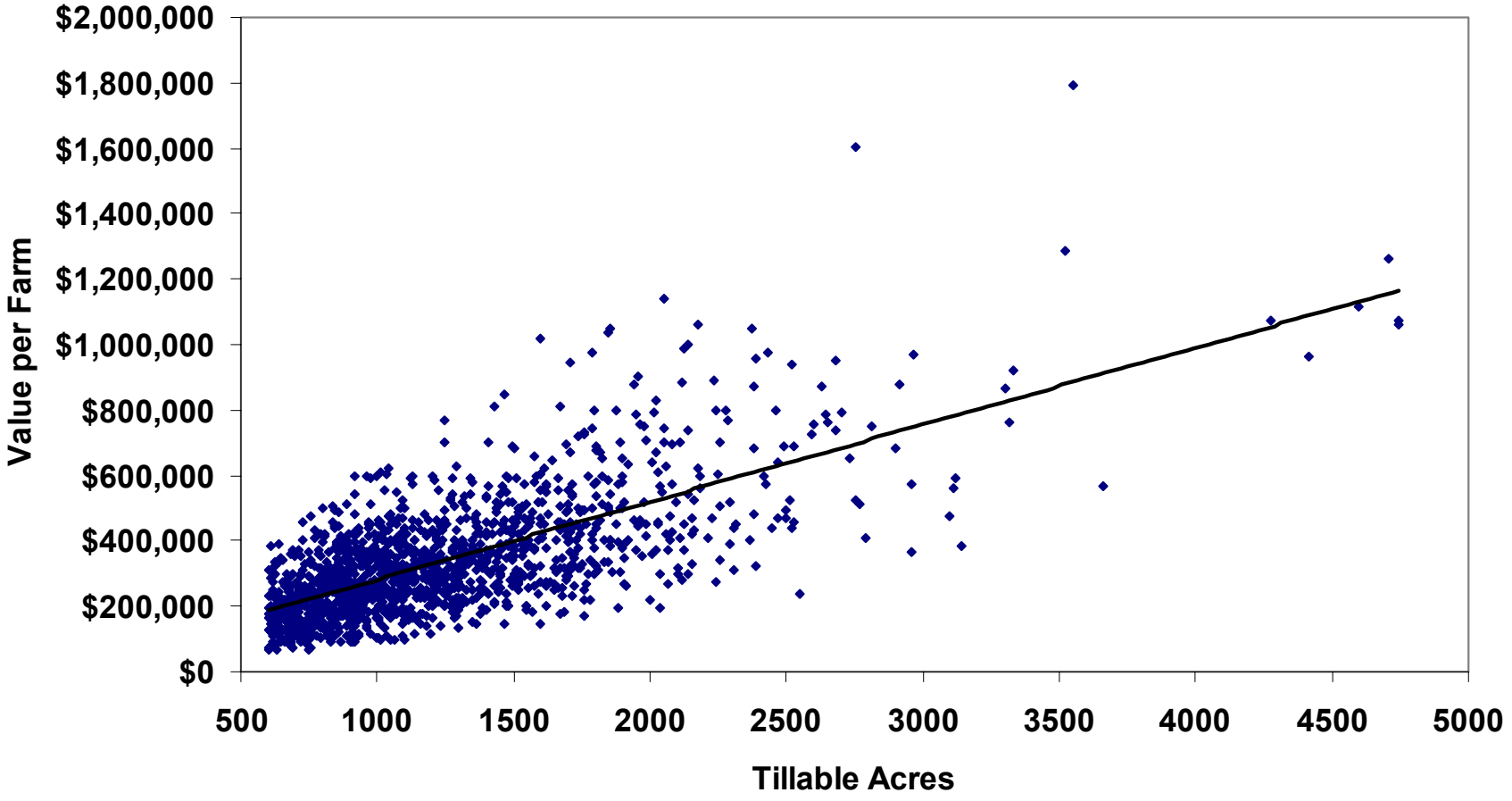
Agricultural and Consumer Economics

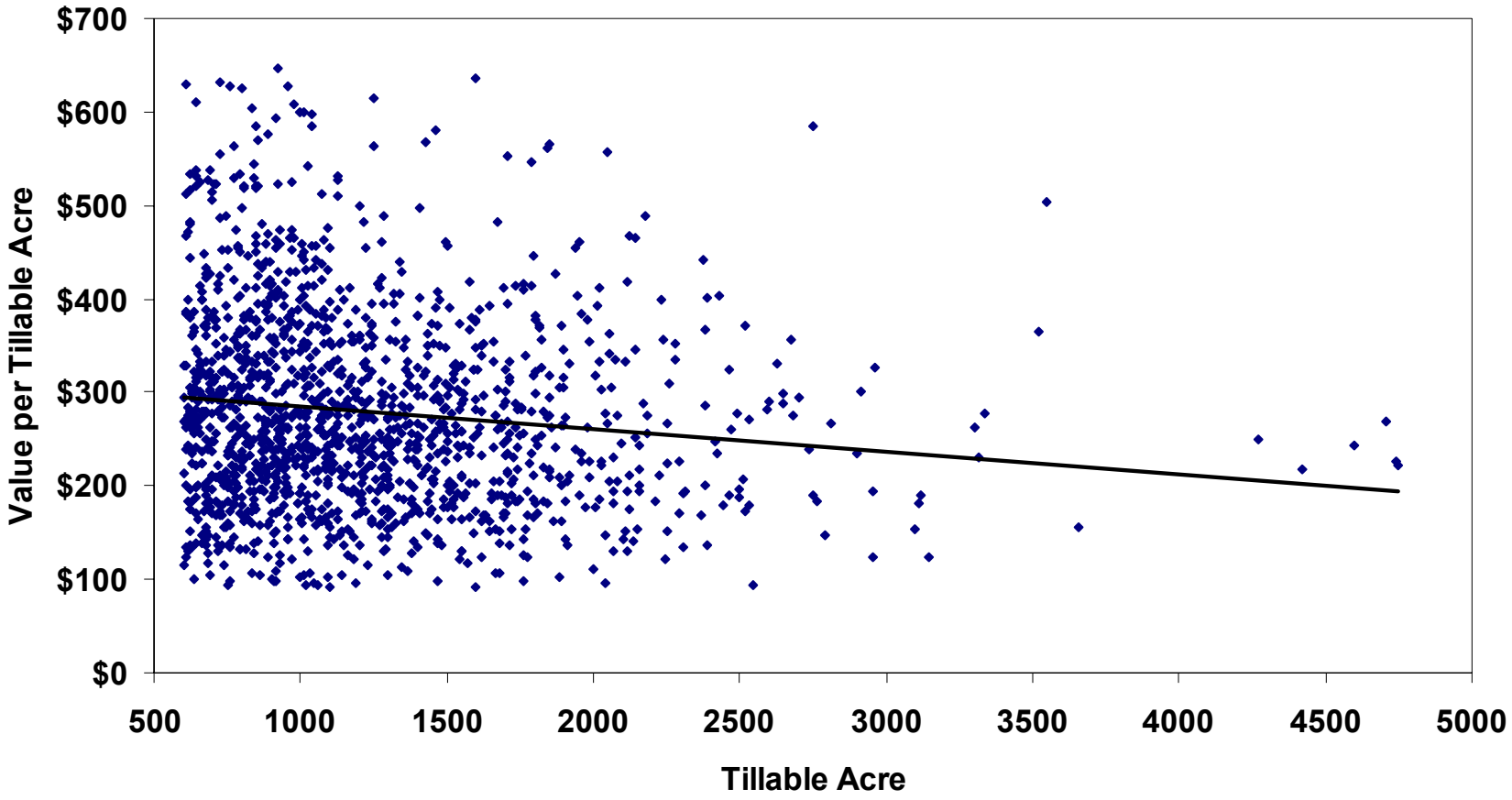
Topics

1. Benchmark machinery values
2. Machinery costs – estimation
3. Tillage impacts on machinery costs
4. More corn – costs and timing
5. Combine Costs – sharing machinery

Machinery Fair Market Value (FMV), Illinois Grain Farms, 2005



Machinery Fair Market Value Per Acre, Illinois Grain Farms, 2005



Machinery Fair Market Value (FMV) Per Acre, Illinois Grain Farms, 2005

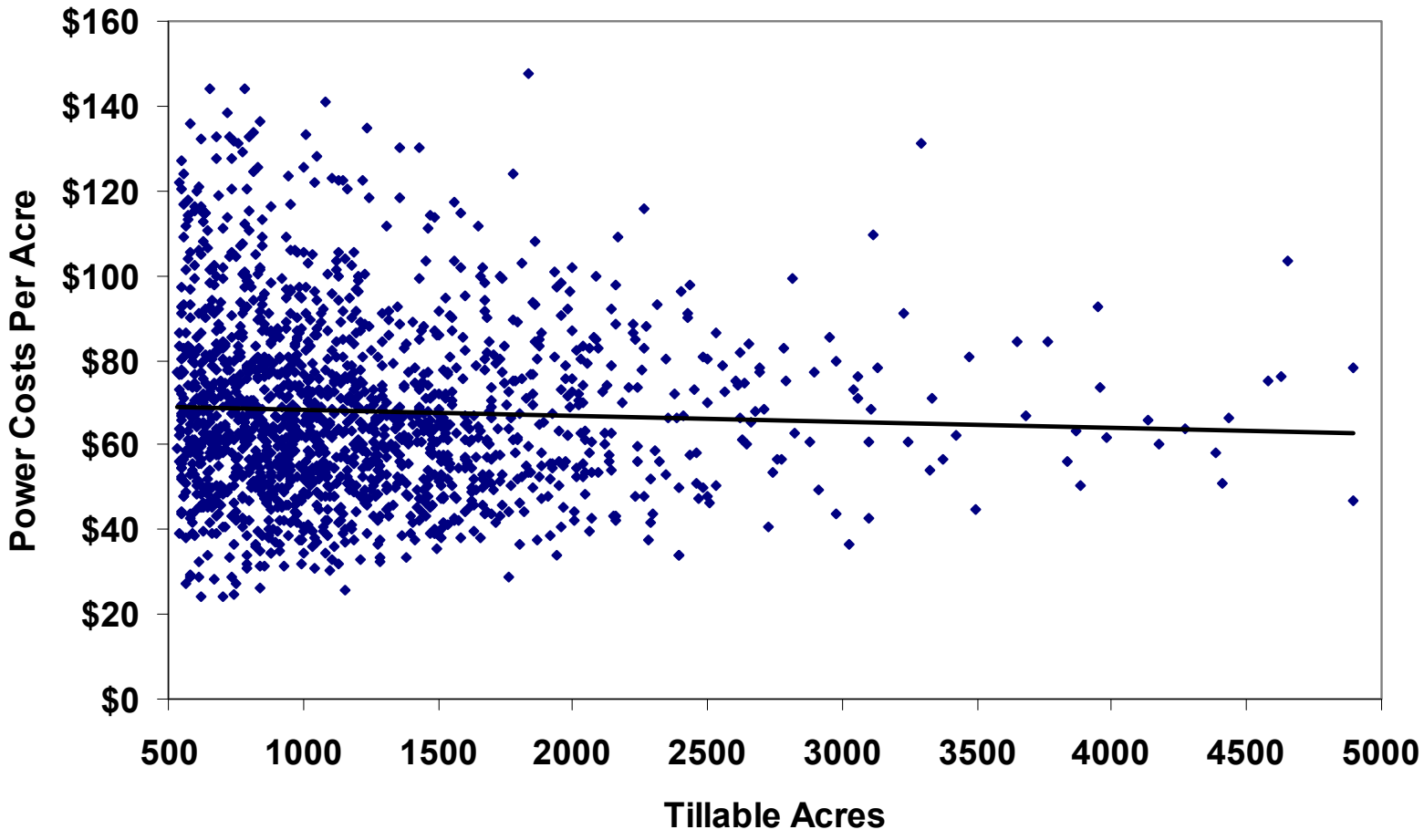
Tillable Acre Size	Low 1/3 Breakpoint	Average	High 1/3 Breakpoint
500 to 1000	$235	$297	$331
1001 to 2000	219	269	293
2001 to 3000	194	258	287
3001 to 4000	179	244	261
4001 to 5000	225	238	245

Power Costs Per Acre, Illinois Grain Farms, 2005

	Low 1/3 Breakpoint	Average	High 1/3 Breakpoint
Utilities	$4	$6	$6
Machine Repairs	13	17	19
Machine Hire/Lease	2	8	8
Fuel and Oil	13	16	17
Light Vehicle	0	2	2
Mach. Depreciation	14	19	23
Total Power Costs (1)	$57	$68	$74

(1) Breakpoint costs will not add up to total power costs.

Power Costs Per Acre, Illinois Grain Farms, 2005



Power Costs Per Acre, Illinois Grain Farms, 2005

	Tillable Acres				
	500 to 1000	1001 to 2000	2001 to 3000	3001 to 4000	> 4001
Utilities	$6	$5	$5	$5	$4
Machine Repairs	19	16	16	15	18
Machine Hire/Lease	8	8	7	6	6
Fuel and Oil	16	15	17	18	17
Light Vehicle	3	2	1	1	1
Mach. Depreciation	18	20	22	25	23
Total Power Costs	$70	$66	$68	$70	$69

Factors Influencing Costs

- **Sizing equipment to farm size**
- **Inventory, Costs increase with**
  - **Additional tractors**
  - **Additional equipment**
- **Custom farming impacting costs on some farms**

List Prices for Machinery used on a 2,500 acre farm

	List Price	Average Value	Yearly Deprec. Interest Costs
305 HP combine	$241,000	$154,800	$25,100 ($10/acre)
8-row corn head	44,000	28,300	4,590 ($2/acre)
30 ft grain platform	31,000	19,900	3,200 ($1/acre)
200 HP tractor	151,000	91,700	13,800 ($5/acre)
280 HP 4WD tractor	149,000	91,600	13,603 ($5/acre)
24-row planter	125,000	71,300	12,000 ($5/acre)
43 ft field cultivator	50,000	28,500	4,800 ($2/acre)
32 ft tandem disk	42,000	23,900	4,000 ($2/acre)
28 ft chisel plow	31,000	136,200	3,000 ($1/acre)
Grain cart	30,000	17,100	2,875 ($1/acre)

Average values and costs calculated given a 10 year life (7 year on combines) using *Machinery Economics* spreadsheet.

Factors Influencing Costs

- **Equipment trading frequency have little impact on costs, except when large amount of new equipment purchased**

- **Harvesting has large impact on costs**

Tillage Impacts on Costs

See "Machinery Costs for Alternative Systems"

Cost Estimation

See *Machinery Economics*, a *FAST* spreadsheet for analyzing machinery issues

"Typical" Tillage System

Field Operation	Costs per Acre: Fuel & Labor	Implement Overhead	Tractor Overhead	Total	Fuel Use
Corn (following soybeans)					
Dry fertilizer	0.50	0.80	0.50	1.80	0.1
A. ammonia	2.60	3.50	2.20	8.30	0.6
Field cultivate	2.90	3.10	2.90	8.90	0.8
Plant	2.50	4.90	2.10	9.50	0.5
Spray	1.20	1.30	1.10	3.60	0.2
Spray (1/3)	0.40	0.40	0.40	1.20	0.1
Combine	9.70	5.60	19.20	34.50	1.4
Total	$19.80	$19.60	$28.40	$67.80	3.7
	$21.50	**$20.60**	**$30.50**	**$72.60**	**4.2**

Average over corn and soybean acres given 50-50 rotation[1]

Tillage System Costs ($ per Acre)

	Fuel & Labor	------- Overhead ----- Implement	Tractor	Total
"Typical"	$21.50	$20.60	$30.50	$72.60
No-till	15.55	18.85	25.55	59.95
Strip	15.75	17.95	25.60	59.30
"Heavy"	22.85	20.00	31.50	74.35

Points

- **Any system can be made high/low cost (difficult to find differences from farm records)**

- **Yields are critical in determining profit difference (studies often find no statistical difference in yields)**

Points, cont.

No-till system. Key to get saving is to:

- **Get rid of tillage equipment**
- **Minimize large tractors**

- **Strip-till system.**
  - **Question: How do you spread costs of large tractor for ammonia/stripping operation**

More Corn – Costs

- **See "Machinery Costs by Crop"**

Machinery Costs by Crop ($ per Acre)

	Fuel & Labor	---- Overhead ---- Implem.	Tractor	Total
Corn-after-soybeans	$19.80	$19.60	$28.40	$67.80
Corn-after-corn	25.60	22.70	32.90	81.20
Soybeans	23.20	21.60	32.60	77.40
Wheat	14.40	19.40	25.80	59.60
Double-crop beans	10.50	14.70	21.90	47.10

Machinery Costs by Rotation ($ per Acre)

	Fuel & Labor	---- Overhead --- Implem.	Tractor	Total
Corn-beans	$21.50	$20.60	$30.50	$72.60
Corn-corn-beans	22.87	21.30	31.30	75.47
Corn-beans-wheat	19.13	20.20	28.93	68.27
Corn-beans-wht-dc	22.63	25.10	36.23	83.97

Points

- **Adding more corn will add to costs**
- **“Heavy” tillage will likely have more of an impact on costs than amount of corn**

More Corn -- Timing

- **See "Timing Handouts"**

Points

Adding more corn will:

- **Tighten planting window**
- **Lengthen and complicate harvest**
- **Add more tillage and fertilizer passes**

Drills and Split-row Planters with More Corn

- **Increasing percentage of corn acres will reduce the number of soybean acres that you can spread drill and split-row planter costs over**
- **Increases per acre costs of split-row planters and drills**

Split-row Planter Example

- 1,500 acre farm, 16-row planter
- 16-row planter
  - $59,000 list price, $50,150 purchase price
- Split-row addition
  - $38,500 list price, $32,300 purchase price

Costs of Split-row Planter

	Corn Acre	Soybean Acre
750 corn, 750 beans	$7.95	$13.36
1,000 corn, 500 beans	$7.95	$15.90

Controlling Combine Costs

- **Combine is largest equipment investment on farm**
- **Large and growing size economies**
- **Many farms below acres needed to achieve size economies**
- **May suggest combine sharing**

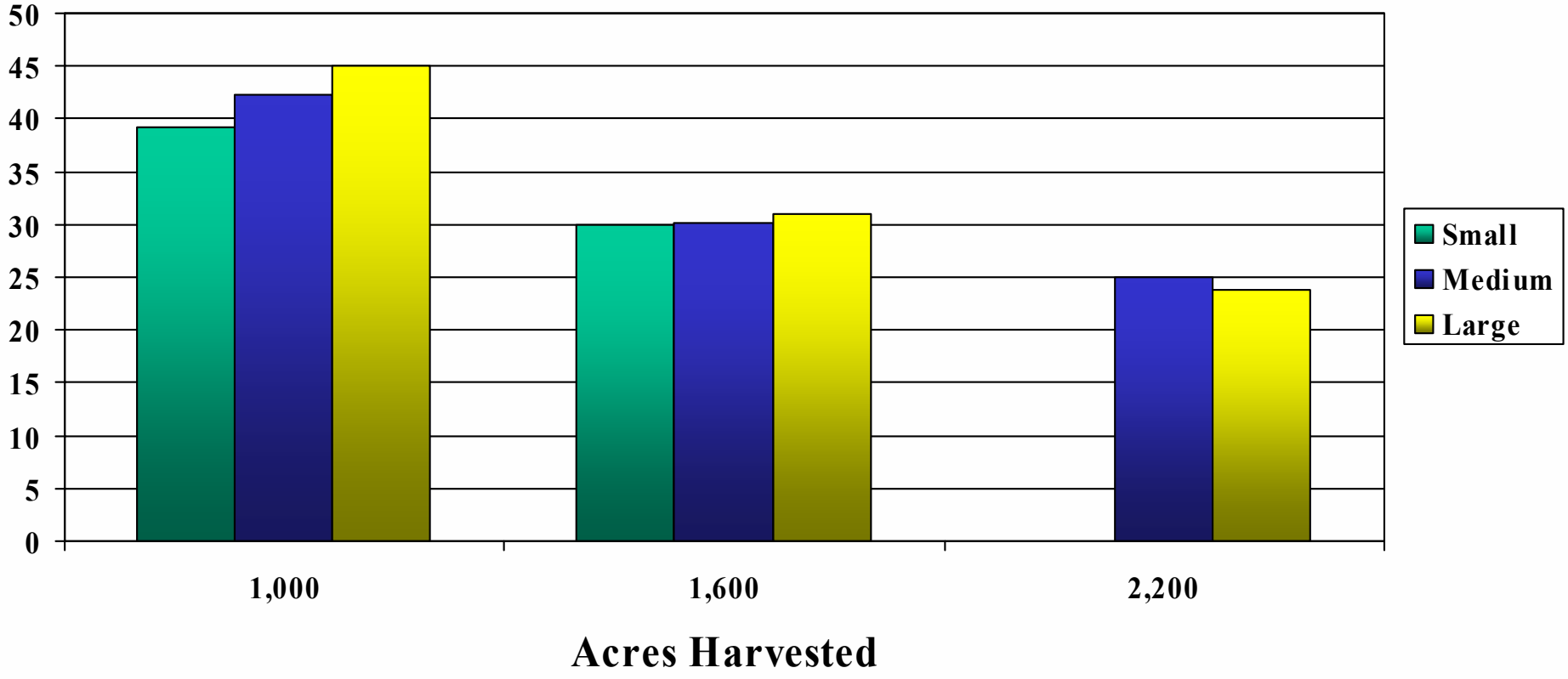
Combines Evaluated

Small	Medium	Large
•265 hp	•305 hp	•340 hp
•6-row corn hd	•8-row corn hd	•12-row corn hd
•20-ft. grain hd	•30-ft. grain hd	•30-ft. grain hd
• $224,000	• $269,000	• $300,000

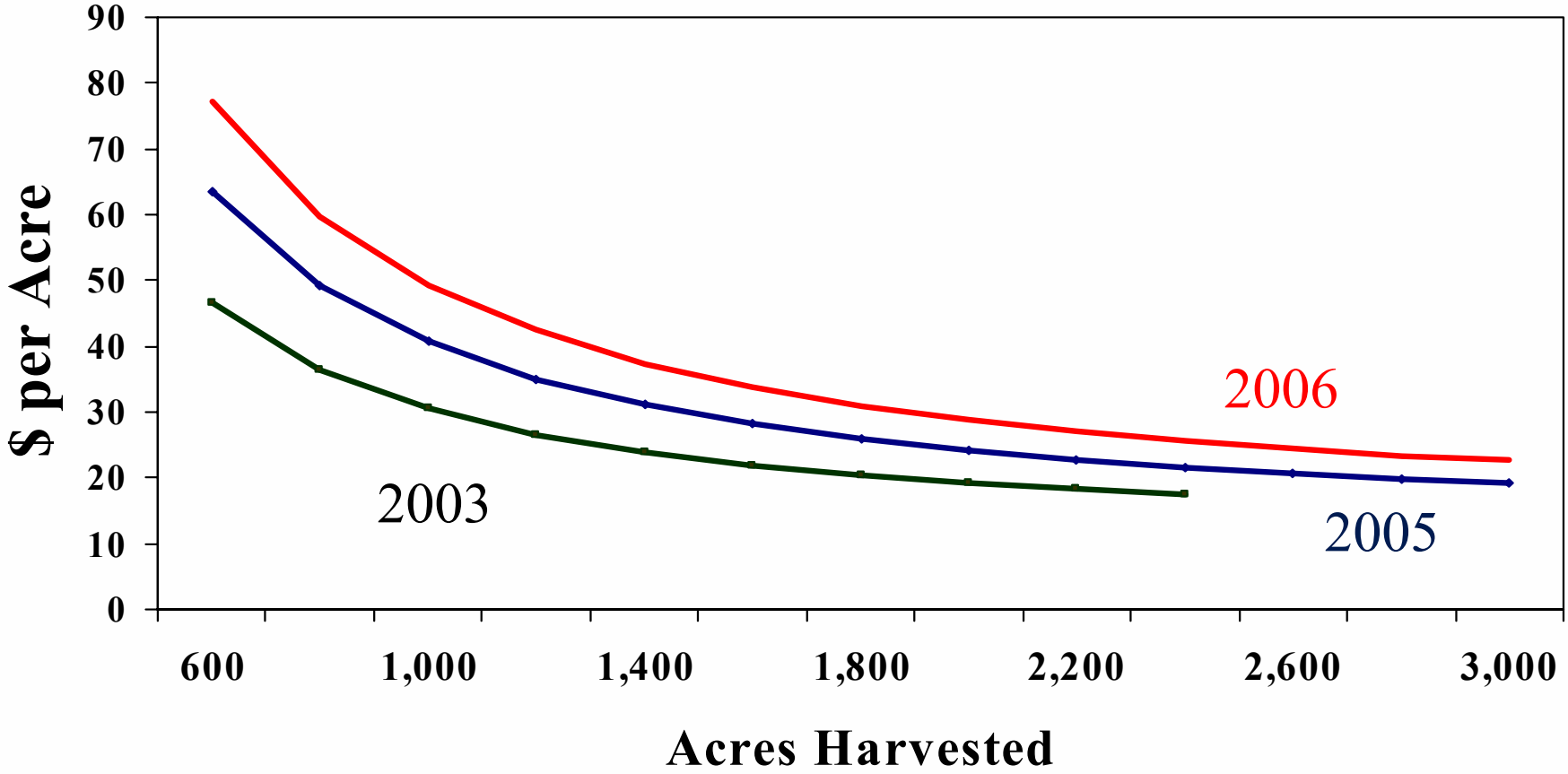
7 – year life, Salvage value is 51% of purchase price,

$2.50 fuel price, 7% interest rate

Per Acre Combine Costs



Per Acre Combine Costs, Large Combine, 2003, 2005, and 2006



Sharing Combine Over Multiple Farms, Example

- **Two 1,500 acre farms each owning a combine**
  - **$29.25 per acre combine costs (from *Machinery Cost Estimates*)**
- **Two 1,500 acre farms sharing one combine (3,000 acres)**
  - **$20.25 per acre combine costs**

Sharing Machinery, Issues

- **Schedule for sharing combine**
- **Allocating costs**
- **Who pays for repairs**
- **How do you determine when to trade combine**
- **How do you end the “partnership”**

Summary

- **Machinery management has impacts on costs**
- **Tillage system has impact on costs**
- **More corn will increase costs, also complicate management**
- **Combine has large impacts on costs**