



Machinery Cost Analysis

especially considering big square & round balers

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Background thoughts . . .

- We try to put numbers to your intuition – to give you new intuition
 - We learn a great deal from successful managers
- Hay production is quite profitable
- Hay is becoming a crop in its own right
- Competition will make better hay managers
- New technologies in hay machinery are coming fast

Profitability of hay

- **Short run:**
 - Alfalfa had the highest return over variable costs in 6 of 6 Kansas regions analyzed over the last 10 years
- **Long run:**
 - Alfalfa has been the most profitable crop (i.e., returns over total costs) in 4 of 6 Kansas regions analyzed over the last 10 years

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Why learn about machinery costs?

- **Selecting Profit-maximizing Crop Mix**
 - must prorate to crops
- **Dealing with Technological Change (no-till)**
 - alternative systems use machinery differently
- **Benchmarking**
- **Banking (tracking market value & deprec.)**
- **Minimizing Costs of Production**
 - owning vs. leasing vs. custom hire
 - optimal trade decisions
- **How do machinery costs impact revenue?**

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Machinery cost categories

- Repair and maintenance
- Labor
- Depreciation (market, not tax depreciation)
- Interest (opportunity interest)
- Fuel and lubrication
- Taxes, insurance, and shelter
- Custom hire

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How important are farm machinery costs for Kansas farmers?

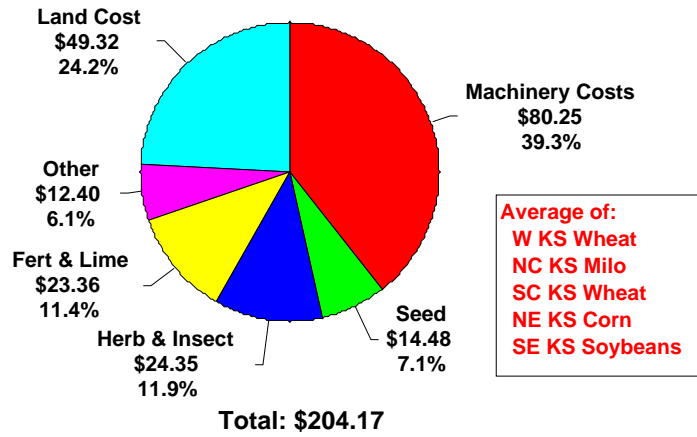
Kansas Farm Management Association Enterprise Analysis Nonirrigated Crops -- State Averages, 2001-2003

	Corn	Sorghum	Wheat	Soybean	Alfalfa	
Number of Farms	105	194	327	170	57	Total Ac
Average Acres	328	318	585	327	103	1,660
Costs, \$ per Acre						Wtd Avg
Seed	\$26.07	\$8.76	\$5.75	\$21.69	\$8.15	\$13.62
Fertilizer	32.42	20.12	17.08	3.86	8.75	17.57
Herb-Ins	22.35	18.78	4.55	16.93	10.73	13.61
Crop Ins	5.05	3.08	3.45	3.98	0.16	3.59
Machinery	68.90	53.39	54.88	62.21	79.03	60.30
Other	19.15	15.90	15.68	17.93	20.84	17.17
Land	35.40	17.39	20.50	25.31	39.05	24.94
Interest	17.90	12.52	11.17	14.83	16.06	13.78
Total Cost	\$227.24	\$149.93	\$133.05	\$166.74	\$182.76	\$164.59
Machinery, %	30.3%	35.6%	41.2%	37.3%	43.2%	36.6%

**Note – A portion of interest cost should also be allocated to machinery costs
Costs reflect operator's costs on owned and rented land**

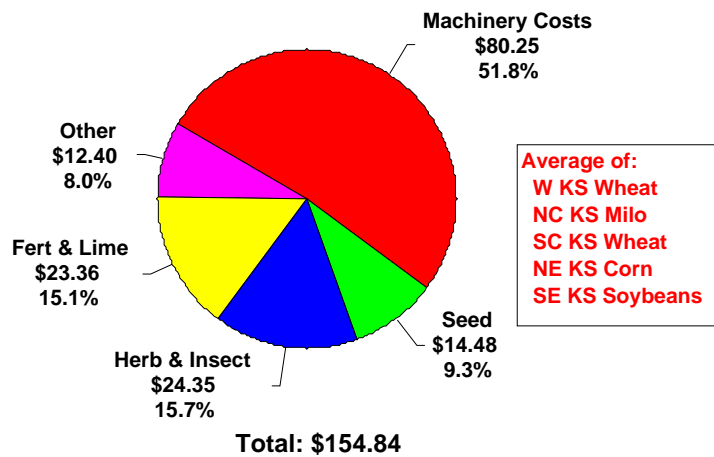
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Projected Crop Production Costs Per Acre, Kansas, 2000
Farm Management Guides



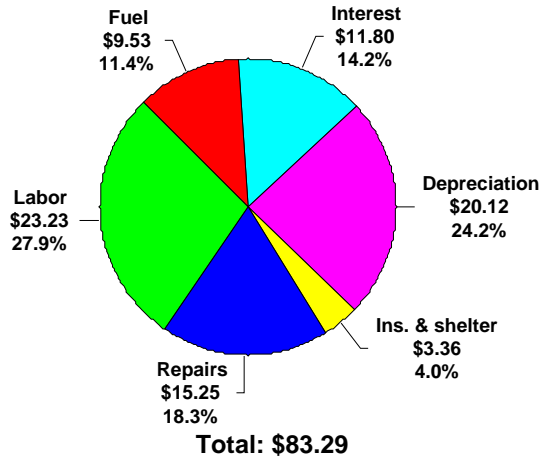
Last year machinery costs were split out in Farm Management Guides was 2000 15

Non-Land Crop Production Costs Per Acre, Kansas, 2000
Farm Management Guides



Last year machinery costs were split out in Farm Management Guides was 2000 16

Machinery Costs Per Acre, Kansas, 2001
 Source: 182 KFMA Members (Beaton)

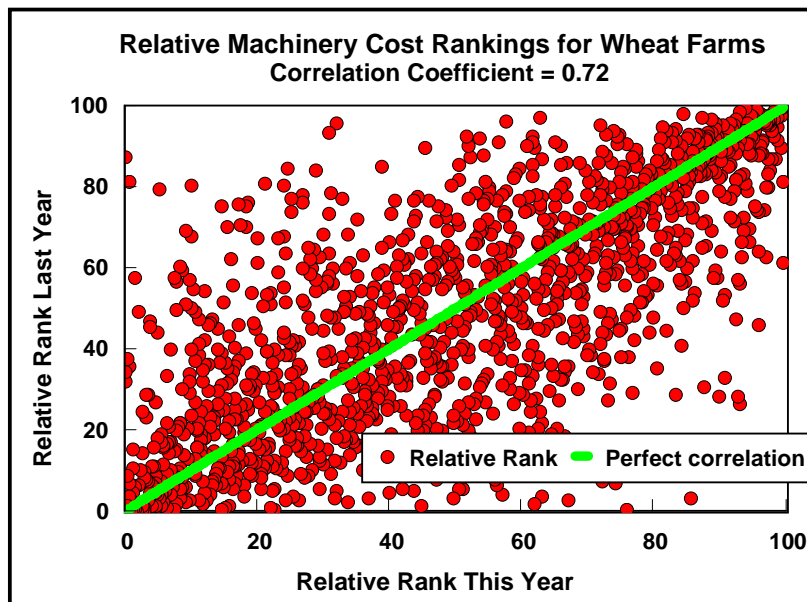


Custom hire cost has been allocated to individual categories

Machinery costs are highly variable across farms ...

Kansas Farm Management Association Enterprise Analysis
 Nonirrigated Crops -- State Averages, 2001-2003

	Corn	Sorghum	Wheat	Soybean	Alfalfa	
Number of Farms	105	194	327	170	57	
Average Acres						Total Ac
High profit farms	481	432	692	443	112	2,160
Mid profit farms	306	313	679	310	130	1,739
Low profit farms	196	208	382	228	66	1,080
Machinery Costs, \$/acre						Wtd Avg
High profit farms	\$54.32	\$42.85	\$47.58	\$50.04	\$61.30	\$49.35
Mid profit farms	\$60.73	\$51.68	\$49.26	\$60.38	\$76.77	\$55.76
Low profit farms	\$91.65	\$65.61	\$67.79	\$76.19	\$99.00	\$75.38
High less low, \$	-\$37.33	-\$22.76	-\$20.21	-\$26.16	-\$37.70	-\$26.03
High less low, %	-40.7%	-34.7%	-29.8%	-34.3%	-38.1%	-34.5%



But, relative machinery costs are somewhat repeatable

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Machinery costs are important in explaining profitability differences across farms ...

Kansas Farm Management Association Enterprise Analysis Nonirrigated Crops – State Averages, 2001-2003						
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High less low, %	-40.7%	-34.7%	-29.8%	-34.3%	-38.1%	-34.5%
Differences between high profit farms and low profit farms in ...						
Total costs	-\$89.28	-\$62.37	-\$46.46	-\$57.36	-\$75.84	-\$61.92
Net returns	\$91.29	\$73.01	\$65.97	\$78.23	\$165.55	\$80.90
Cost/net returns	97.8%	85.4%	70.4%	73.3%	45.8%	76.5%
Mach/total costs	41.8%	36.5%	43.5%	45.6%	49.7%	42.0%
Mach/net returns	40.9%	31.2%	30.6%	33.4%	22.8%	32.2%

Machinery bigger part of costs for alfalfa relative to other crops. Managing costs really matters for corn – matters for alfalfa but revenue does too.

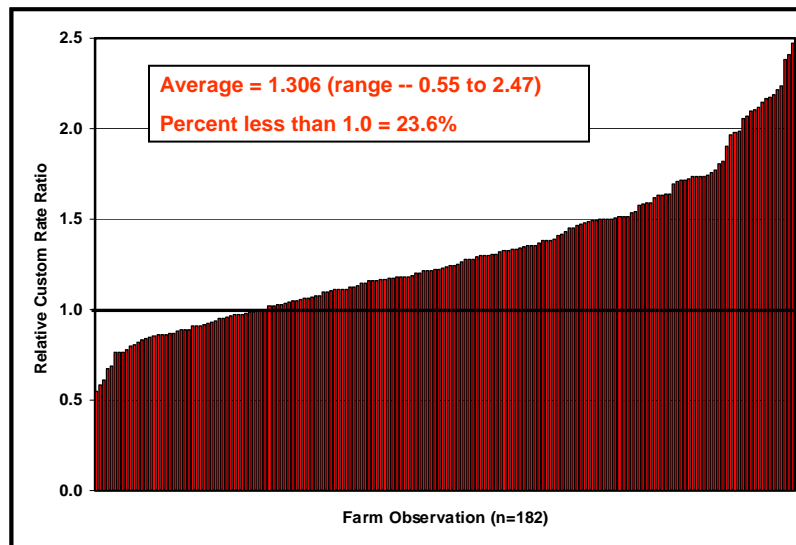
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Research comparing whole-farm costs with custom rates...

- Custom rates are an important benchmark
- Master's thesis – Aaron Beaton
- Based on KFMA database and cooperator surveys for the year 2001
- Excel spreadsheet (*KSU-MachCost*) that can be used to estimate and benchmark farm specific machinery costs
 - at www.agmanager.info

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Relative custom rate ratio

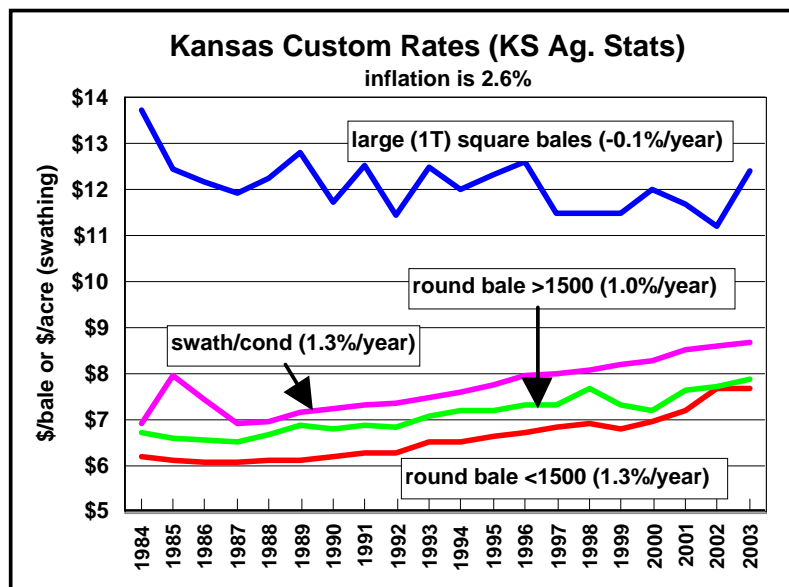


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Beaton's conclusions

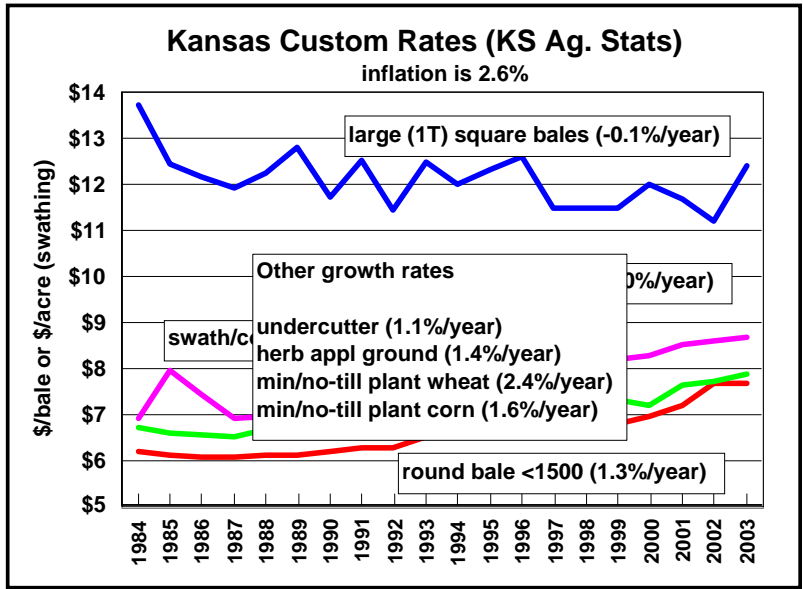
- Published custom rates need to be increased by approximately 25% (for a farm with 1,000 harvested acres)
- Economies of size exist (i.e., scale factor adjustment decreases as farm size increases)
- Thoughts...
 - Consider hiring it done
 - Consider the opportunity to do custom work

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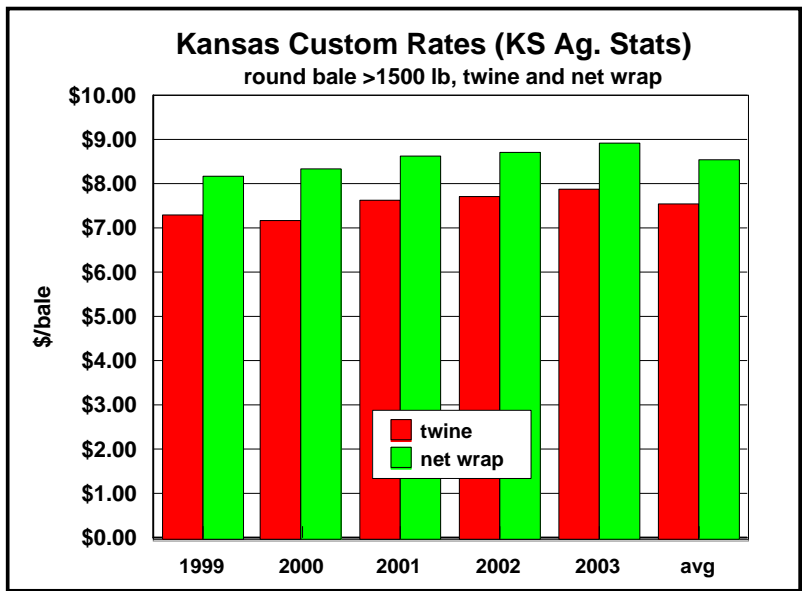


Inflation has been rising faster than machinery costs

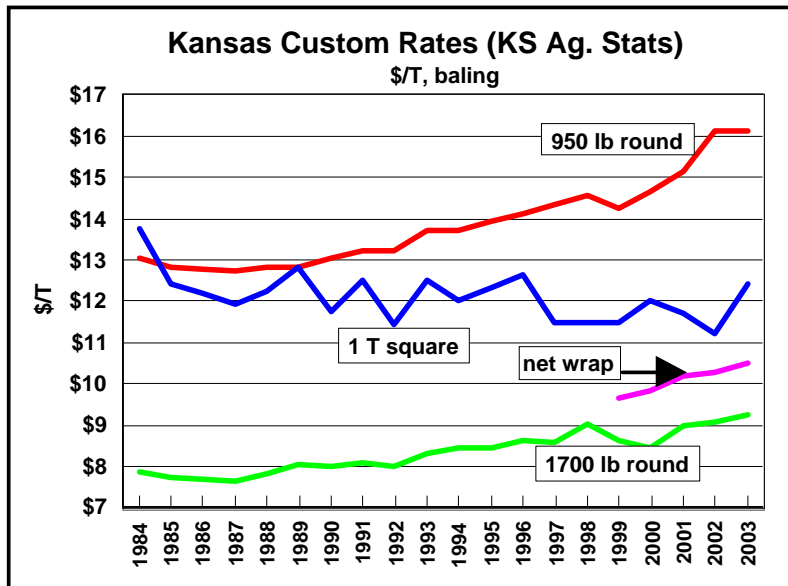
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Just for comparison purposes. . .



Net wrap costs about \$1/bale more (or hay producers willing to pay \$1 more)



2003 \$/ton: Big square (\$12.41); Big round w/twine (\$9.27); w/ net wrap (\$10.52) 30

OwnBaler.xls

A spreadsheet program to evaluate the economic cost of owning and operating a large square or large round baler

Puts numbers to some of your intuition – to give you new intuition

OwnBaler.xls

- Baler trading strategies
 - Trade frequency
 - Age of baler purchased (new vs. used)
 - Usage rate
 - Income tax issues
 - Compare to renting/leasing
- Twine vs. net wrap on round
- Round vs. square
- Production efficiencies
 - Tractor hours to baler hours ratio
 - Labor hours to tractor hours ratio
- Compare total costs with custom rates
- At www.agmanager.info (also a paper there)

OwnBaler is brand new -- we will need feedback from you folks over time

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Microsoft Excel - OwnBaler(TK).xls

how do I get a second Y-axis

File Edit View Insert Format Tools Data Window Help

Arial 12

Reply with Changes... Epd Review...

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OwnBaler.xls --- A spreadsheet program to evaluate the economic costs of owning and operating a large square or large round hay baler.

Version 12-01-04

INPUTS vs CALCULATED VALUES
In the "User input" tab all blue numbers are inputs and all black numbers are calculated from these inputs.

DESCRIPTION OF INPUTS:
Several input cells (i.e., blue number) have a red diamond in the upper right hand corner of the cell. By moving your mouse cursor over this diamond, a brief description of the input will be displayed on the screen.

MACROS
This spreadsheet uses macros to print the three different pages, however printing can also be done manually by highlighting the desired range and using the menu print commands.

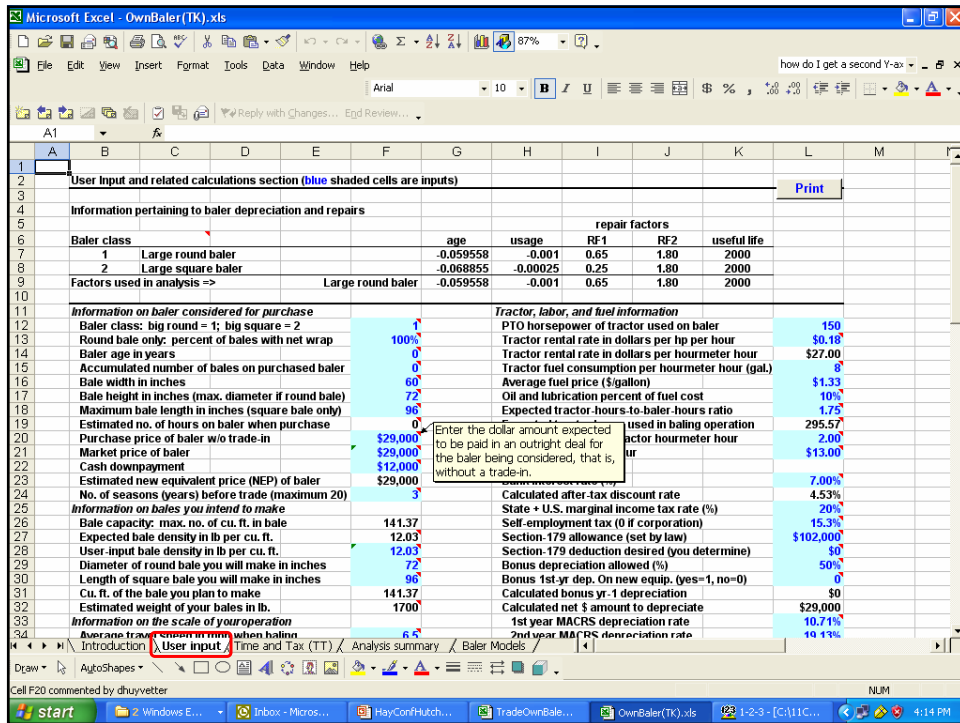
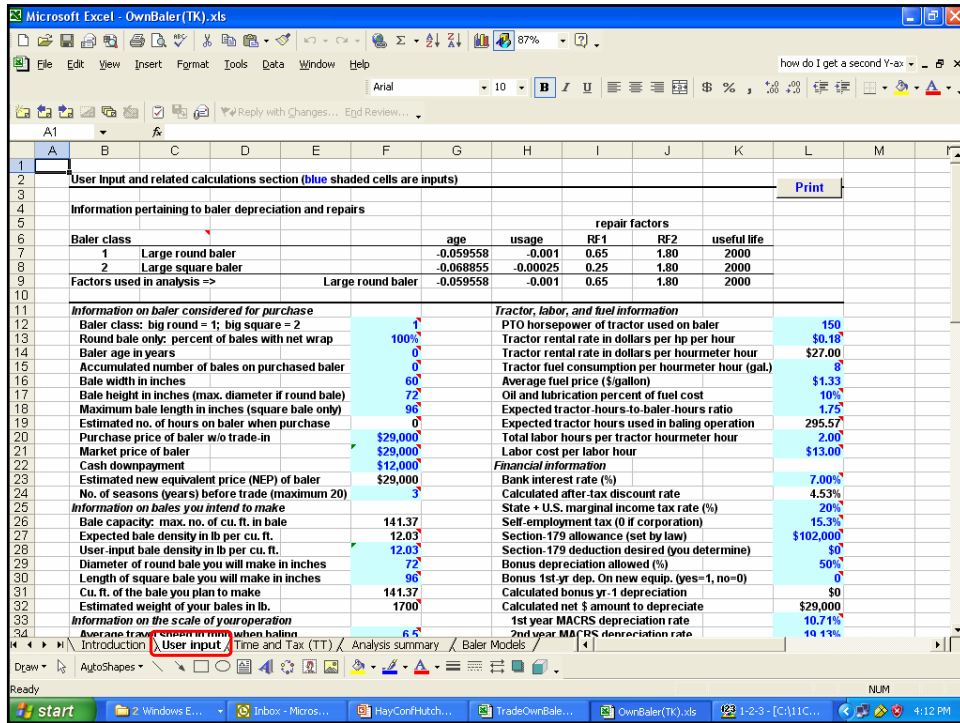
COMPANION PUBLICATION
For explanation of the inputs used in this spreadsheet see the supporting paper OwnBaler.pdf.

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Introduction User input Time and Tax (TT) Analysis summary Baler Models

Ready

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Microsoft Excel - OwnBaler(TK).xls

how do I get a second Y-axis

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Reply with Changes... Egd Review...

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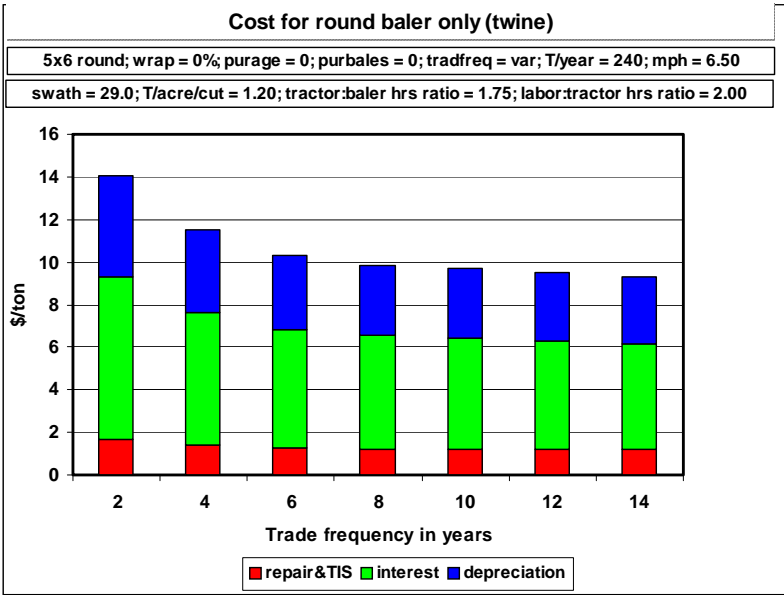
Introduction / User input / Time and Tax (TT) / Analysis summary / Baler Models

Ready NLM

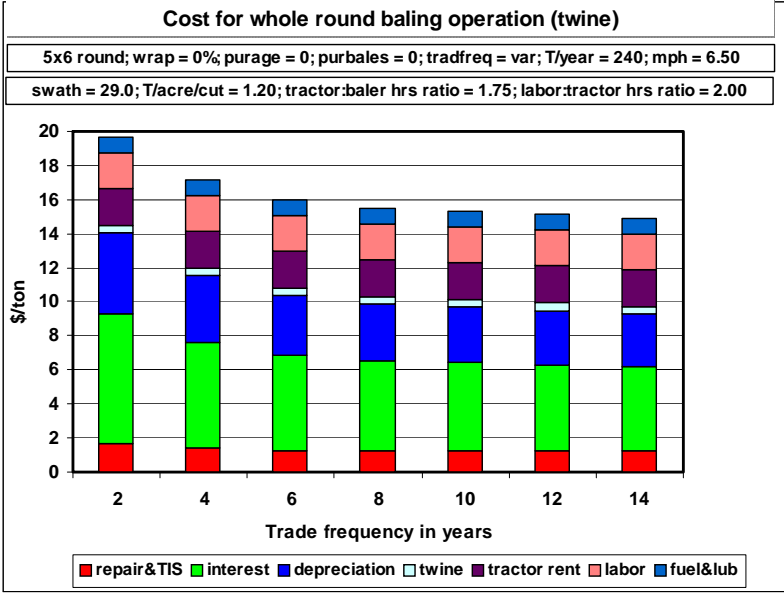
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OwnBaler simulation assumptions

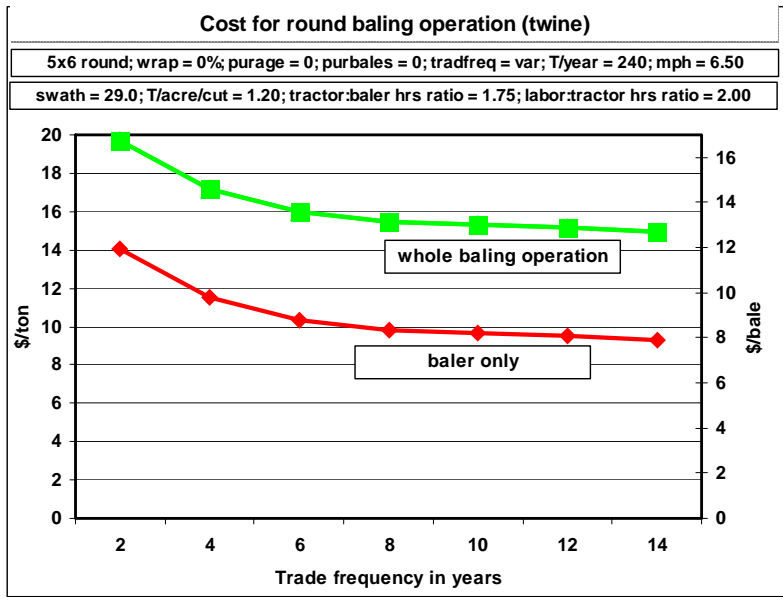
- Built valuation models from Blue Book data
- All based on Resale Cash Price (not trade premium)
 - Since repair formulas assume balers are “kept up”
 - Buy and sell at this market price
 - Assume old baler is sold and new is purchased outright
- 15.3% SE tax on top of 20% IRS+state rate
- New 5x6 round \$25,918 (\$29,418 w/ net wrap)
- New square 3x4 \$67,930; 4x4 \$79,453
- 150 hp tractor rents for \$27/hour; labor \$13/hour
- Left Sec. 179 and bonus depreciation at \$0



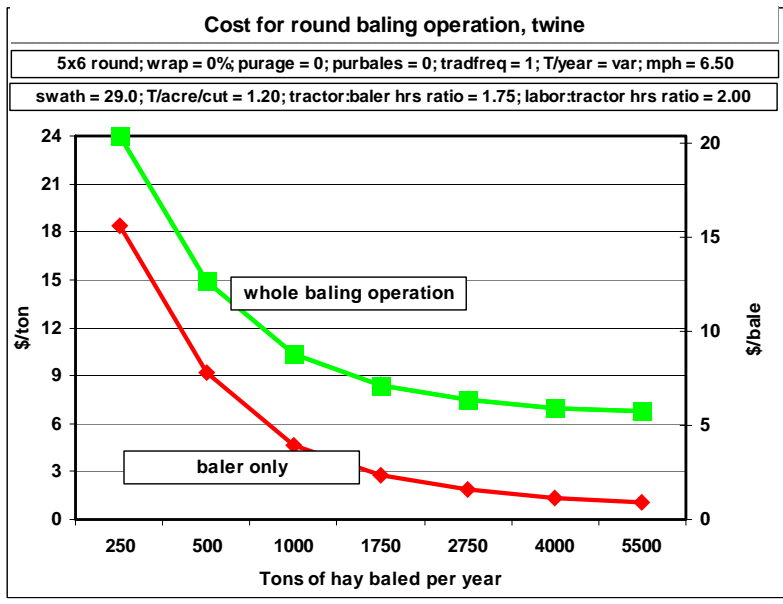
This is the baler only – not much gained holding baler more than 8 years or so



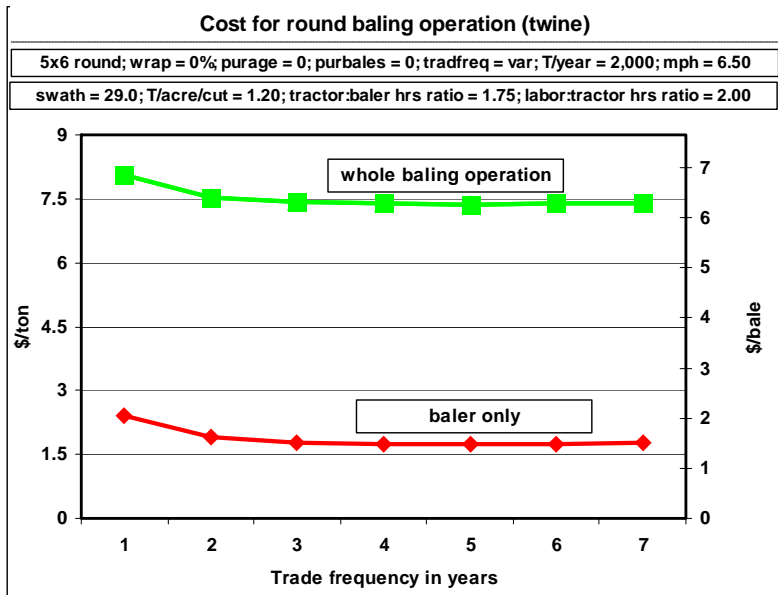
Costs seem high for this small (typical) hay operation starting with a new baler, but, really, sort of like Beaton's research showed.



Same info, but shows that the baler part is larger than the non-baler part.

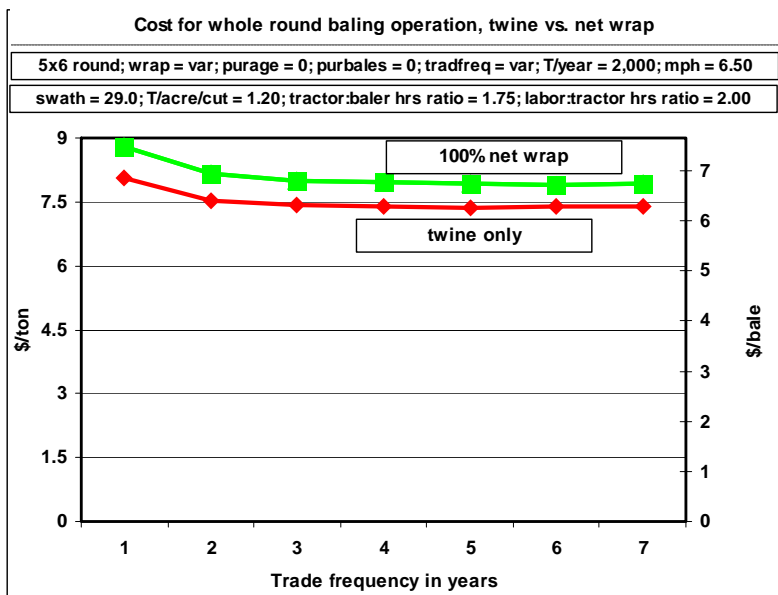


More intensive machinery operators nearly always have lower costs. But, small operators would be able to level the lines a little by buying older machinery.



New & used machinery market is generally fairly efficient. For this somewhat more intensive user, the baler part is smaller than the whole.

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Baling with net wrap costs only \$0.50/bale more than with twine in this example.

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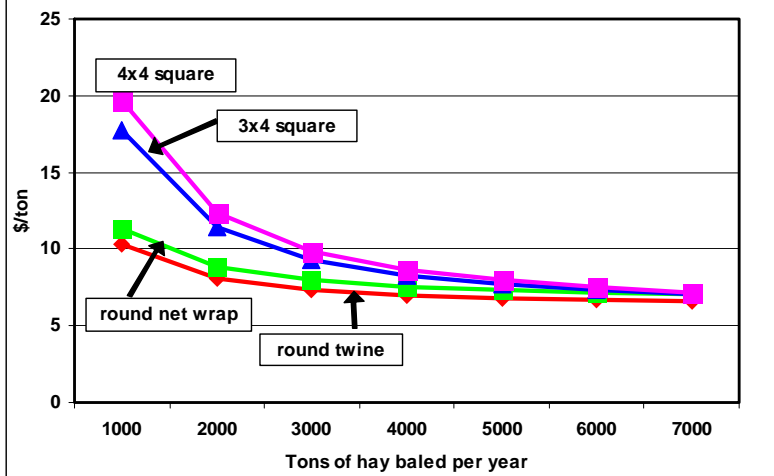
This example of extra cost for net wrap over twine

	\$/ton
Repair & TIS	-\$0.02
Interest	\$0.11
Depreciation	\$0.07
Net wrap material	\$1.13
Tractor rent	-\$0.30
Labor	-\$0.28
Fuel & lub	<u>-\$0.13</u>
– Total \$/ton	\$0.59
• Total \$/bale	\$0.50

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Cost for whole baling operation, various balers

baler = var; wrap = var; purage = 0; purbales = 0; tradfreq = 1; T/year = var; mph = 6.50
 swath = 29.0; T/acre/cut = 1.20; tractor:baler hrs ratio = 1.75; labor:tractor hrs ratio = 2.00



Matches approximately with custom rates in the 1500-2000 T/year range.

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Other observations from simulation

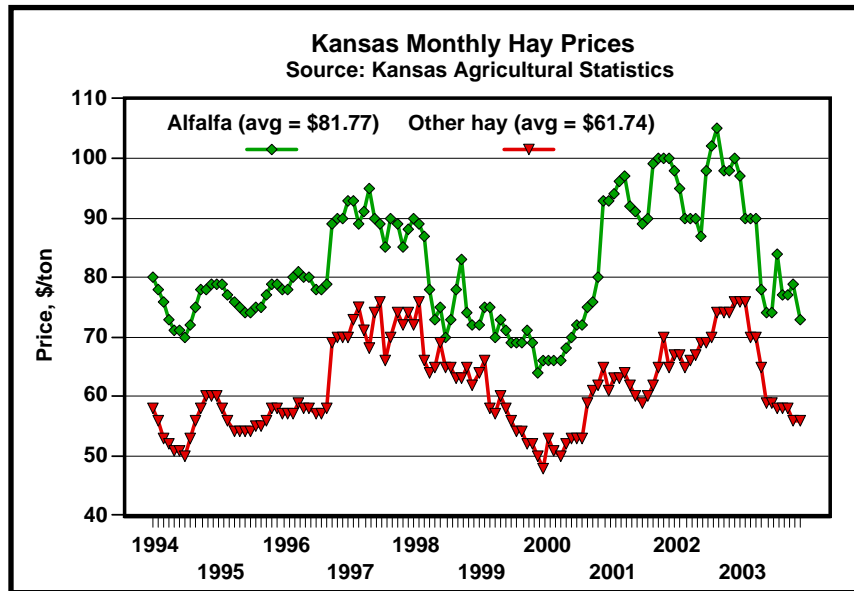
- 2500 T/yr 3x4 operator from graph = \$10.17/T
 - 14.5 ft swath rather than 29 ft = \$14.54/T
 - 10 mph rather than 6.5 but still 14.5 ft = \$11.47/T
 - Raking costs \$2.72/acre, here \$2.27/T
 - Going from an average 6.5 to 8 mph = \$9.37/T
 - Remember, your average “covering new ground” travel speed is much lower (e.g., 25%) than your “traveling down the windrow” speed
 - tractor:baler hrs ratio from 1.75 to 1.50 = \$9.58/T
 - Think about tradeoffs with trailering
- 5 vs. 4 cuttings adds \$3.75/T for s-r-b
- Odd stuff
 - Making $\frac{3}{4}$ -dia round bales (twine tie):
 - \$0.60/T higher cost, \$2.50/bale lower cost

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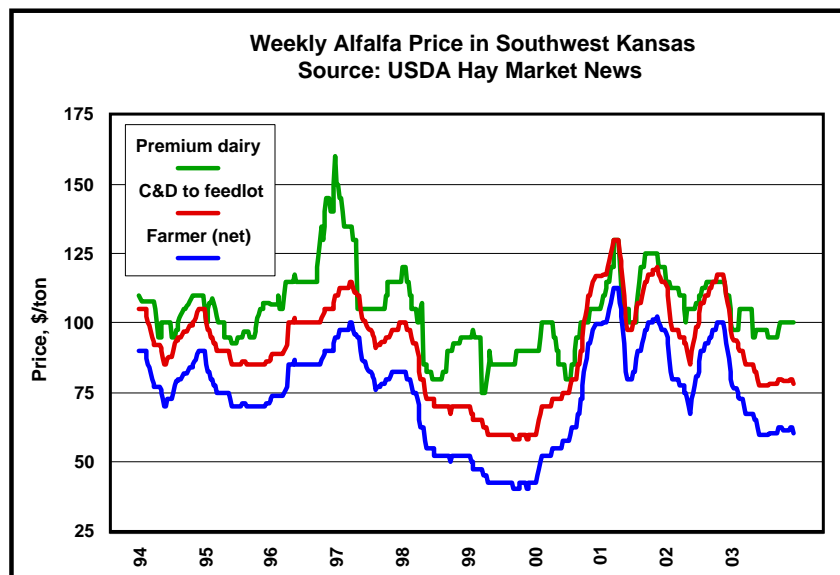
Hay Prices

(in relation to quality & packaging)

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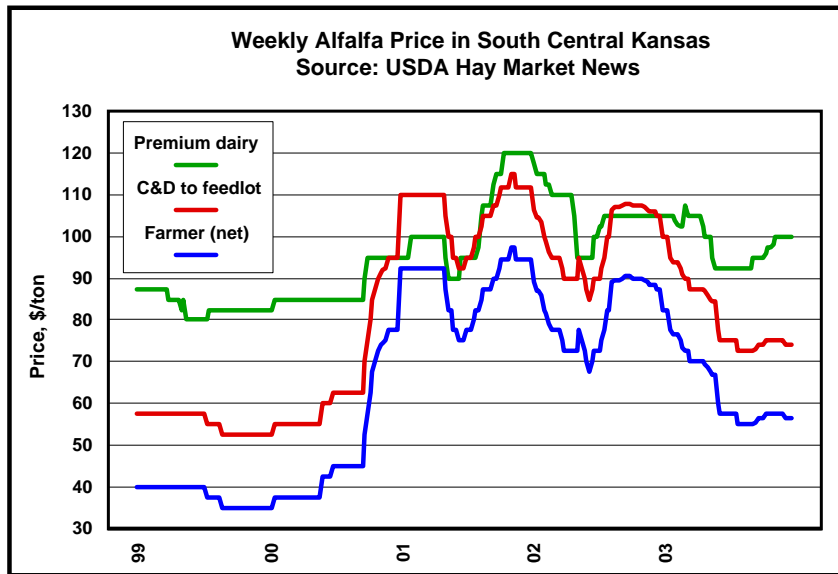


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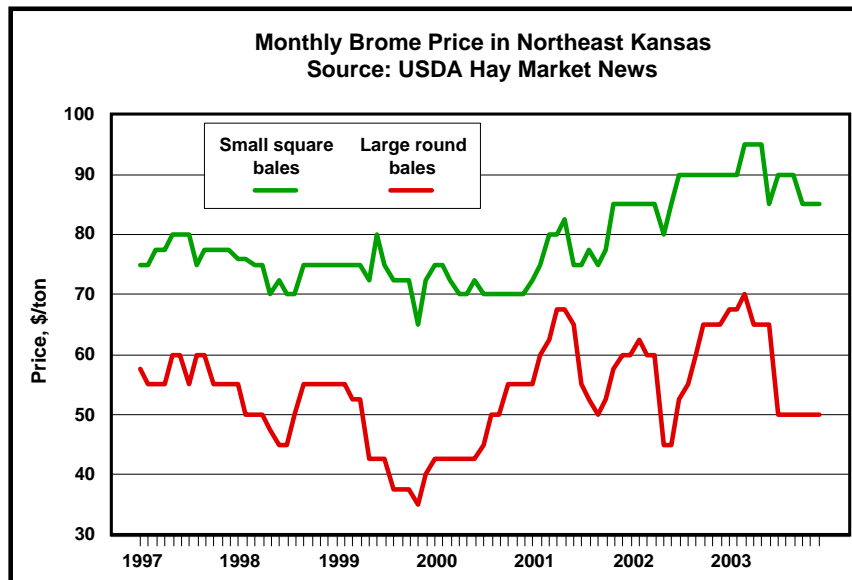
Averages – Premium dairy (\$104.50), C&D to feedlot (\$90.96), Net farmer (\$74.45).
Assumes \$15/T (before 1998) or \$17/T grinding and delivery charge.

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Averages – Premium dairy (\$95.81), C&D to feedlot (\$81.62), Net farmer (\$64.12).
Assumes \$17/T grinding and delivery charge.

53



Averages – small square bales (\$77.79); large round bales (\$52.82).

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Hay price thoughts . . .

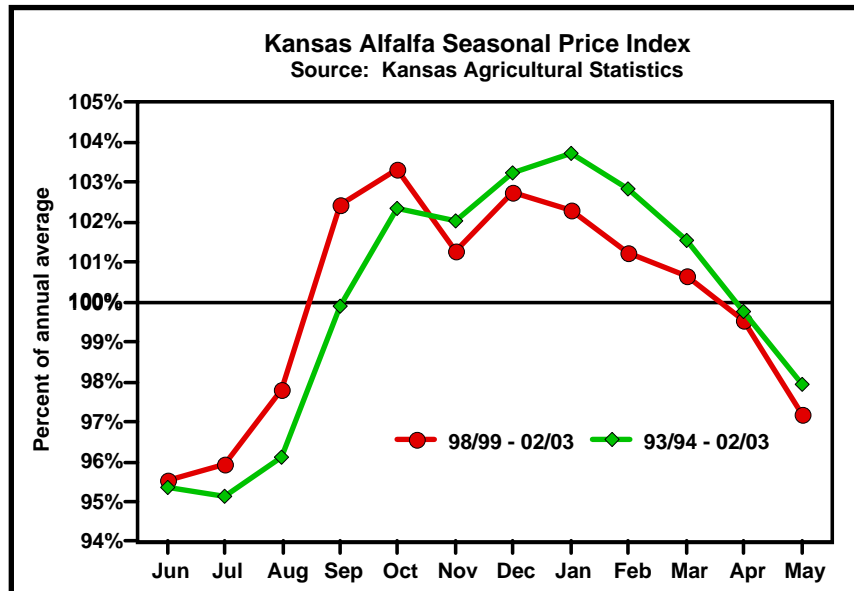
- From preceding slides:
 - Quality: dairy quality over grinder alfalfa = \$30/T
 - Package: small sq. over big round brome = \$25/T
- Steve Hessman (USDA Hay Market News) suggests:
 - Package: little sq. over big sq. alfalfa = \$15/T
 - Package: big sq. over big round alfalfa = \$10/T
 - Big square/round spread greater now (Dec04) in SE KS grass hay due to glut in area, perhaps around \$15-\$20.
 - Currently, grinders in W KS might prefer net-wrapped rounds or loose hay to big squares.

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Hay Storage

(in relation to packaging)

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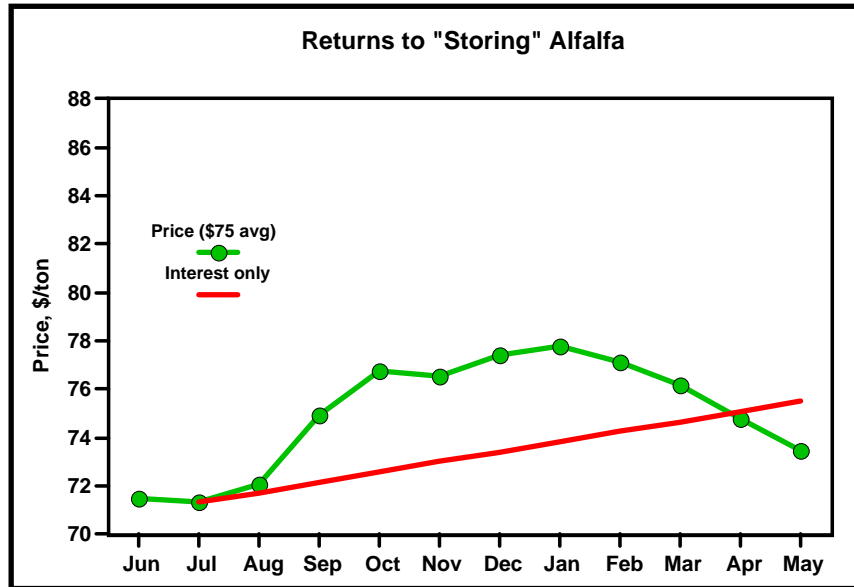
Effect of market timing

- Assume annual average price is \$75/T
 - June/July = 95% = \$71.25/T
 - Nov/Jan = 103% = \$77.25/T

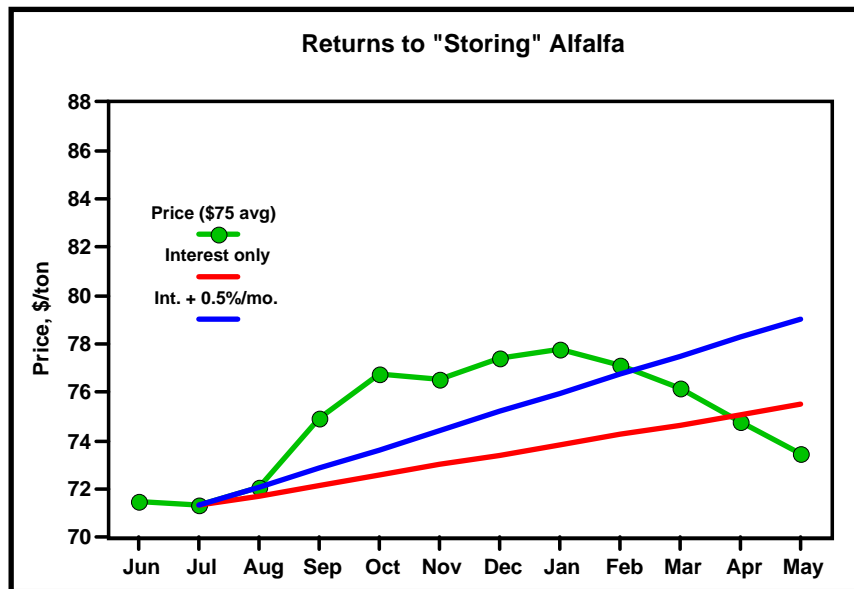
- Implies \$6.00/T premium to “storing” due to seasonality

- But, there are costs to storage
 - Interest
 - Shrink: water and dry matter
 - Perhaps quality loss

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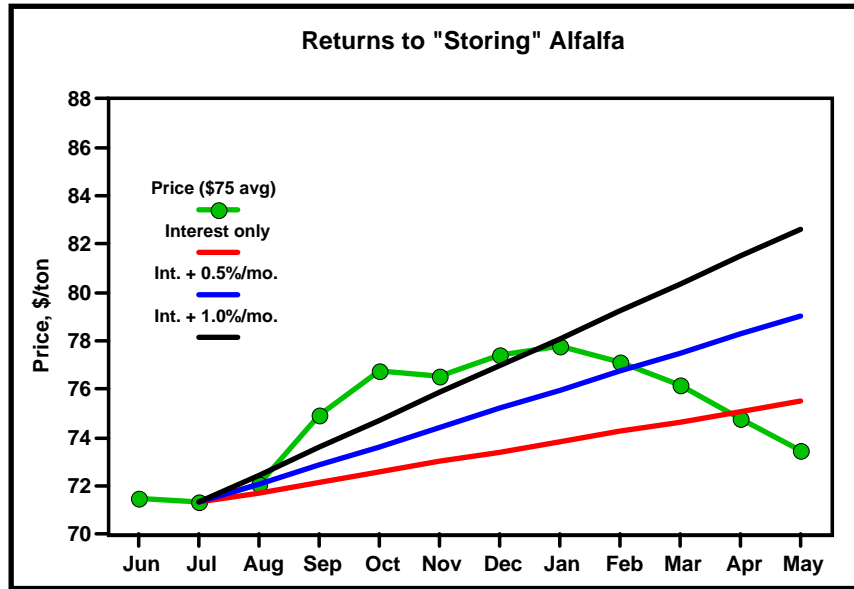


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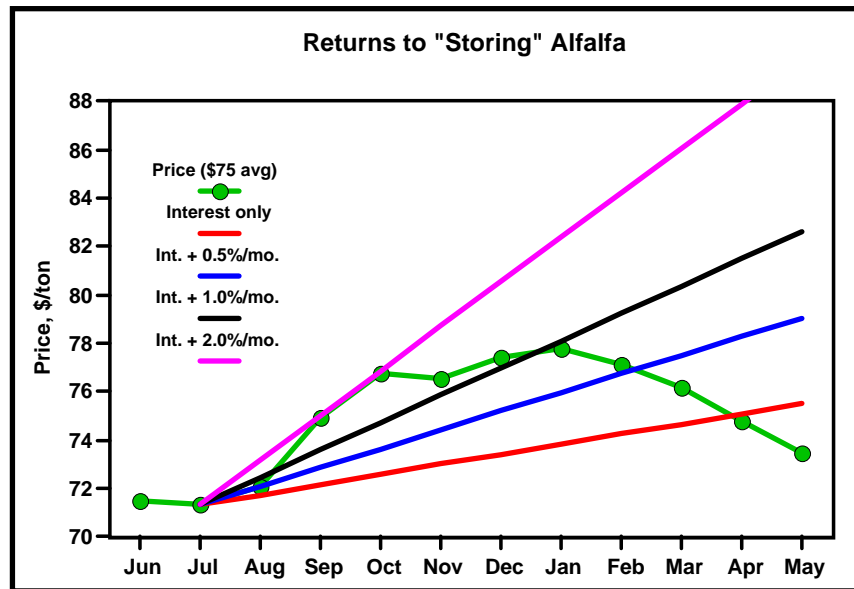


Blue line not too far off from in-barn shrink

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We've seen black-line values w/ nicely net-wrapped bales outside-stored in NW KS



Many research numbers worse than pink line when hay is stored outside

Miscellaneous hay stuff. . .

- **Big square over big round: \$10.00/T+**
 - Higher baling cost: \$0.00-\$2.00/T
 - Tarping square bales: \$1.50-\$2.00/T ??
 - Net advantage to big squares: \$6.00-\$8.50/T
- **Questions:**
 - Net-wrapped rounds storage losses?
 - KY trial showed 11% vs. 18% for twine-tied (>\$5/T)
 - Likely that tarped squares are better than net-wrap
 - Can you capture the quality value with rounds?
 - Long distance hauling favors squares
 - What about grinder loss (not in price diff.)?
 - Research reports 3%-9%
 - Will baler slicers/pre-cutters help?

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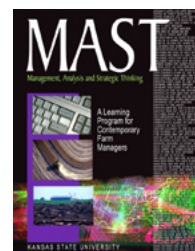
Questions ???

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