Labor Efficiency and Productivity

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Outline of Presentation

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- Previous Research
- Overall Efficiency Indices
- KFMA Data
- Results
  - Non-Irrigated Crop Farms
  - Irrigated Crop Farms
  - Crop/Beef Farms
- Summary and Conclusions

Introduction

- In a competitive industry, continual improvements in performance are essential.
- Benchmarking is one of the comparative analysis tools that can be used to assess improvements in performance.

Introduction

- Benchmarking Complications
  - Items to benchmark?
  - Computation of benchmarks?
  - Impact of fluctuations due to weather?
- This presentation focuses on labor benchmarks.
  - Value of farm production per worker
  - Labor efficiency index

Labor Benchmarks

- Value of Farm Production per Worker
  - Value of Farm Production / Number of Workers
  - Higher Value » Higher Labor Productivity
- Labor Efficiency Index
  - Total Labor Expense / Value of Farm Production
  - Lower Index » Improved Labor Efficiency

Previous Research

- Fuglie et al. (2007)
  - Gains in labor productivity have been a driving force for output growth in U.S. Agriculture.
  - Each farmer in 2000 produced on average 12 times as much farm output per hour worked as a farmer did in 1950.

Previous Research

Fuglie et al. (2007) 1960-2004	**U.S. Agriculture**	**All U.S. Industries**
Annual Output Growth	1.67%	3.20%
Share due to growth in nonlabor inputs	11.8	54.1
Share due to growth in labor hours	-34.2	23.7
Share due to growth in labor quality	5.6	8.8
Share due to efficiency and technology	116.8	13.4

Previous Research

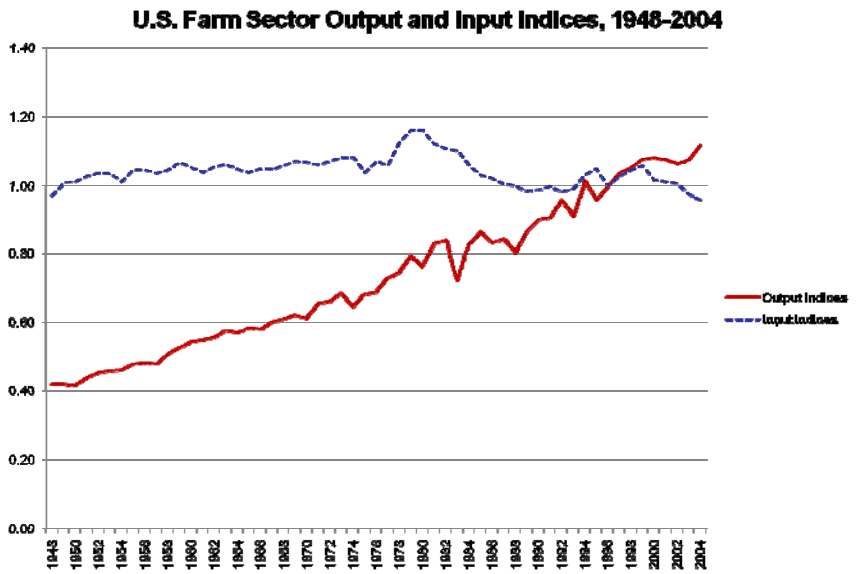
Fuglie et al. (2007) U.S. Agriculture	**1948-2004**	**1948-1980**	**1981-2004**
Share of growth in labor productivity due to:			
Increase in inputs per worker	60	74	33
Improvements in labor quality	2	3	1
Efficiency and technology	37	24	66

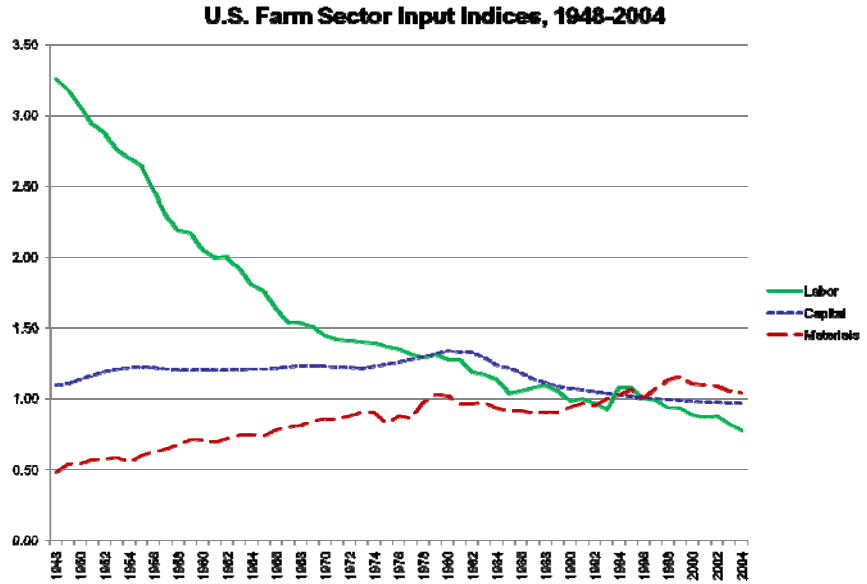
Previous Research

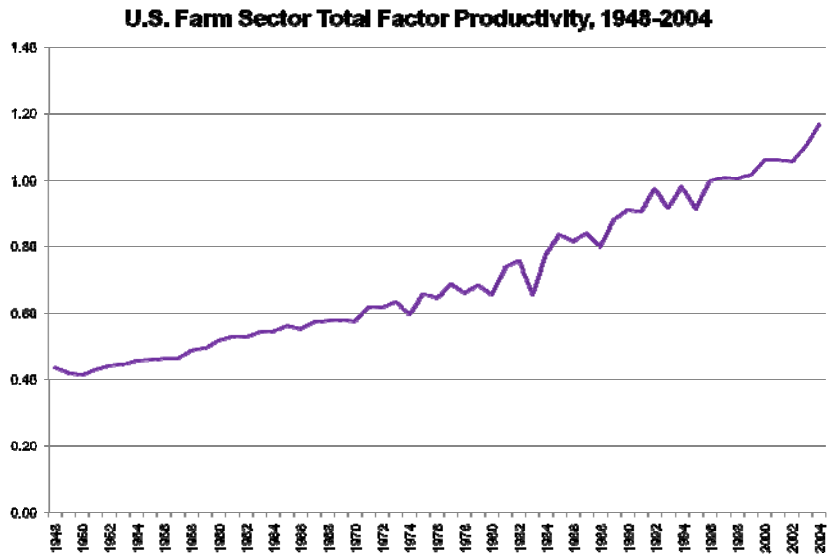
Amin Mugera, 2009 Ph.D. Dissertation	
Value of Farm Production Category, KFMA Databank, 1993-2007	Labor Productivity, Annual Growth Rate
Less than $100,000	0.99%
$100,000 to $250,000	4.08%
$250,000 to $500,000	6.03%
Greater than $500,000	7.53%
Weighted Average	5.00%

Previous Research

- Total Factor Productivity
  - Growth of outputs minus growth of inputs
  - Output index divided by input index
  - U.S. Farm Sector (Rates of Growth; 1948-2004)
    - Aggregate Output 1.74%
    - Aggregate Input -0.03%
    - Total Factor Productivity 1.77%
    - Source: USDA-ERS







Importance of Productivity

"Productivity isn't everything, but in the long-run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker."

Paul Krugman

The Age of Diminished Expectations

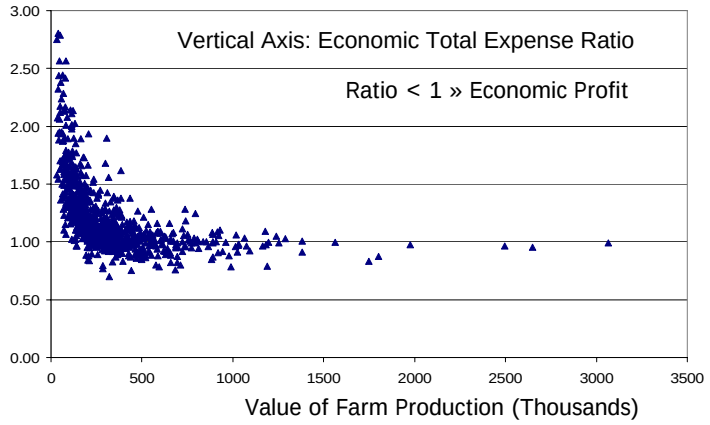
KFMA Data

- 781 KFMA Farms
  - Continuous whole-farm data from 2003 to 2007
  - Averages
    - Value of Farm Production = $330,272
    - Net Farm Income = $76,951
    - Value of Farm Production per Worker = $217,786
    - Labor Efficiency Index = 0.1814

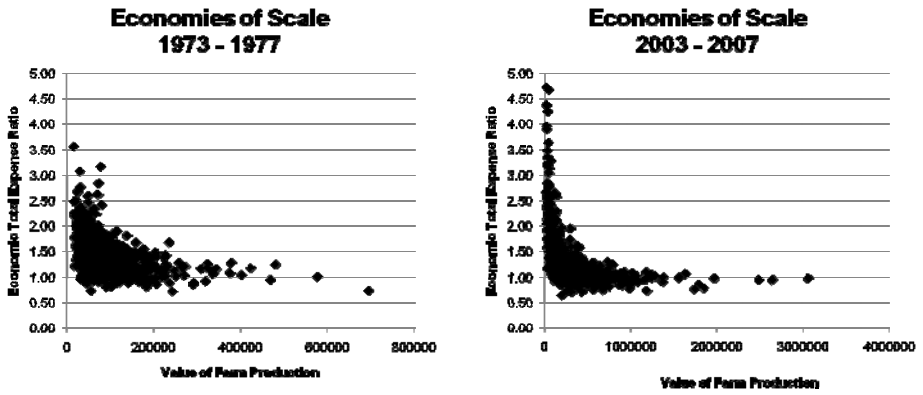
Overall Efficiency Indices

- Measure differences in cost per unit of output among farms
- Range from zero to one
  - Farms with an index of one are producing at the lowest cost per unit of output
  - Farms with an index below one could lower cost per unit of output by improving efficiency
- Closely related to measurement of economies of scale.

Economies of Scale: KFMA Farms



Changes in Economies of Scale KFMA Databank



Measurement of Overall Efficiency

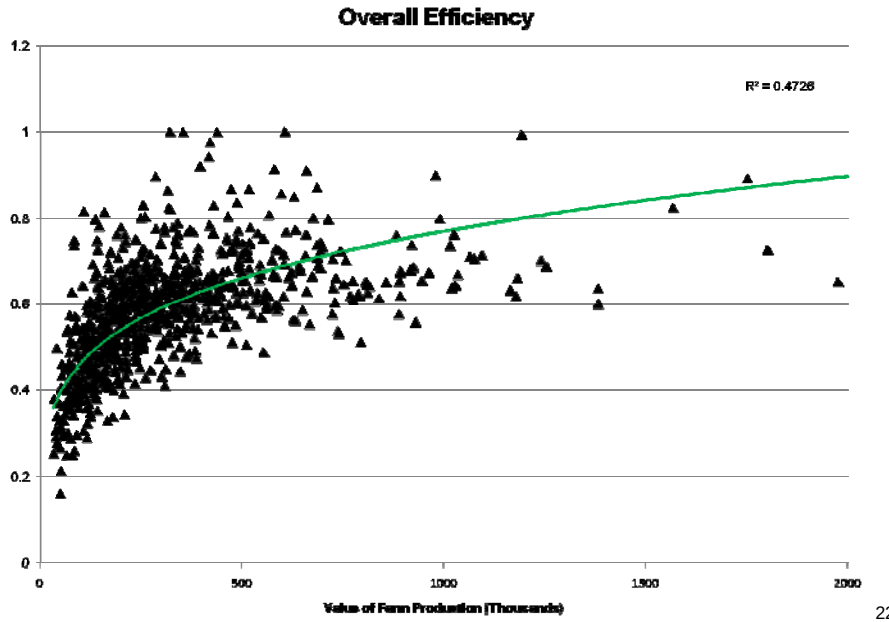
- Outputs
  - Crop
  - Livestock
- Inputs
  - Labor
  - Livestock
  - Seed
  - Fertilizer
  - Herbicide and Insecticide
  - Capital

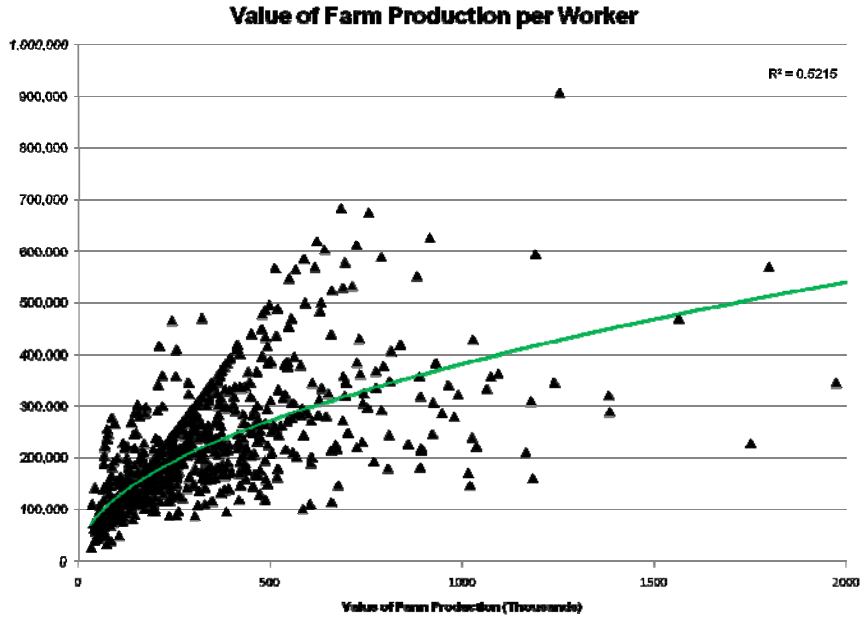
Variables Related to Overall Efficiency

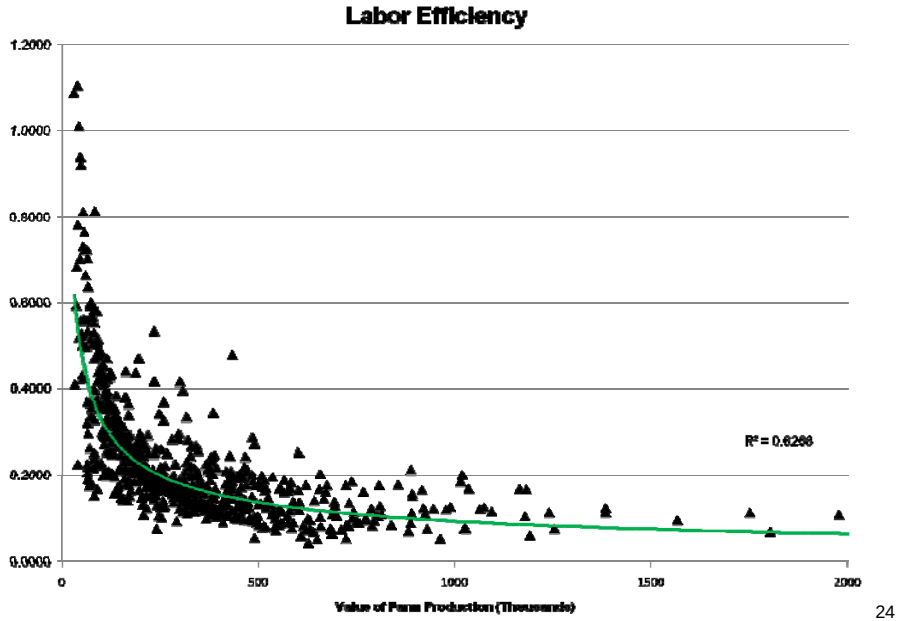
- Gross Farm Income
- Value of Farm Production
- Net Farm Income
- Value of Farm Production per Worker
- Labor Efficiency Index
- Crop Intensity Index
- Less Tillage Index
- Crop Machinery Investment per Acre
- Percent of Income Derived from Specific Enterprises
- Expense Ratios
- Operating Profit Margin Ratio
- Asset Turnover Ratio

Benchmark Results

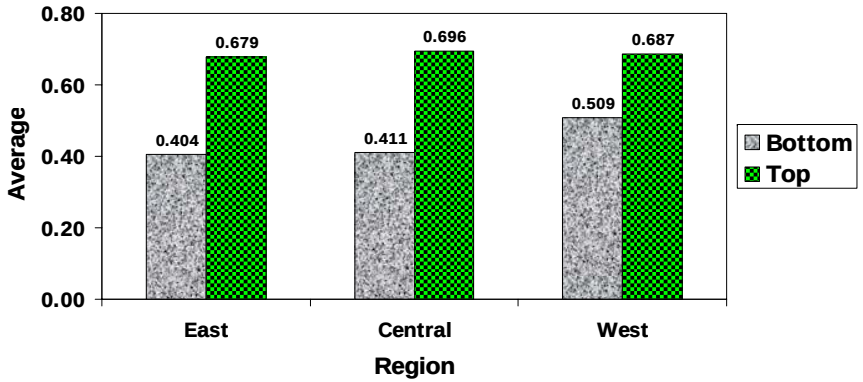
- Number of Farms
  - All Farms – 781
  - Non-Irrigated Crop Farms
    - East – 249
    - Central – 234
    - West - 41
  - Irrigated Crop Farms – 15
  - Crop/Beef Cow Farms – 37







Non-Irrigated Crop Farms Overall Efficiency Index



Non-Irrigated Crop Farms Western Kansas

- Bottom Overall Efficiency Group
  - Difference in Overall Efficiency
    - -0.178
  - Possible Improvement in VFP per Worker
    - $89,111
    - 50% increase
  - Possible Improvement in Economic Profit
    - $79,472 (VFP = 223,801)

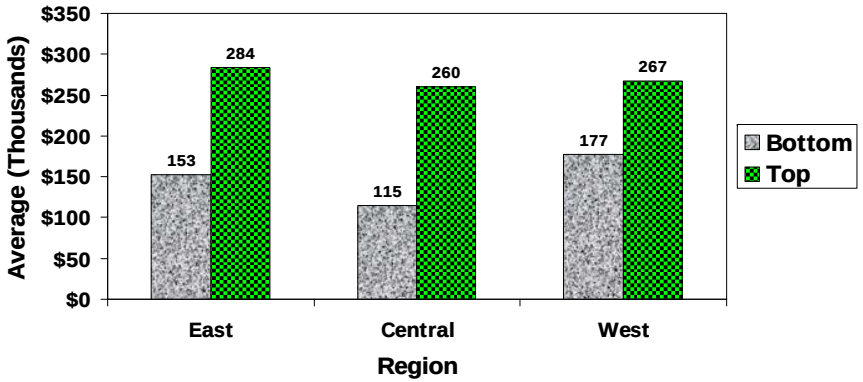
Non-Irrigated Crop Farms Elasticities: Overall Efficiency

Income Share	East	Central	West
Feed Grains	0.054	0.033	-0.009
Hay and Forage	-0.027	0.009	-0.030
Oilseeds	-0.086	-0.002	0.008
Wheat	-0.006	-0.108	**-0.219**

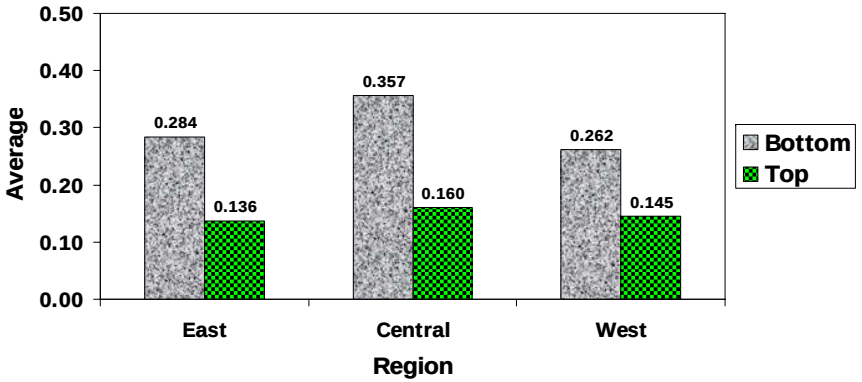
Non-Irrigated Crop Farms Elasticities: Overall Efficiency

Cost Share	East	Central	West
Labor	-0.178	-0.199	**-0.160**
Livestock	0.003	0.000	-0.004
Seed	-0.081	-0.069	-0.050
Fertilizer	-0.062	-0.081	-0.032
Chemicals	-0.059	-0.042	-0.067
Capital	-0.555	-0.554	**-0.605**

Non-Irrigated Crop Farms
Value of Farm Production per Worker



Non-Irrigated Crop Farms
Labor Efficiency Index



Non-Irrigated Crop Farms
Correlation Coefficients

	Overall Efficiency and Farm Size	Overall Efficiency and Profit Margin
East	0.566	0.770
Central	0.586	0.766
West	0.559	0.655

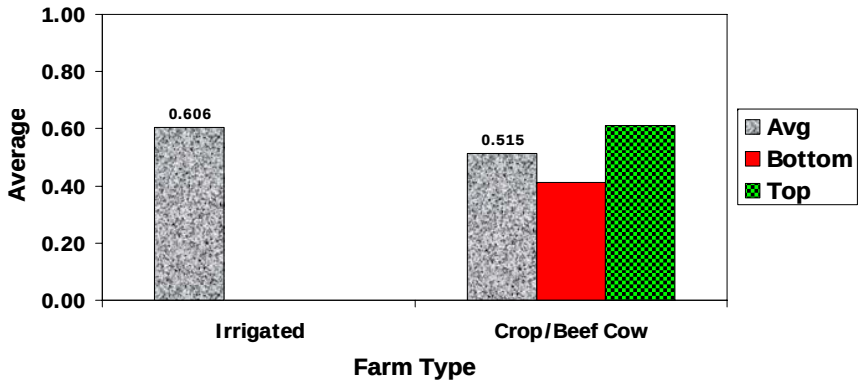
Non-Irrigated Crop Farms
Correlation Coefficients

	Labor Efficiency and Farm Size	VFP per Worker and Farm Size
East	-0.525	0.560
Central	-0.572	0.667
West	-0.594	0.729

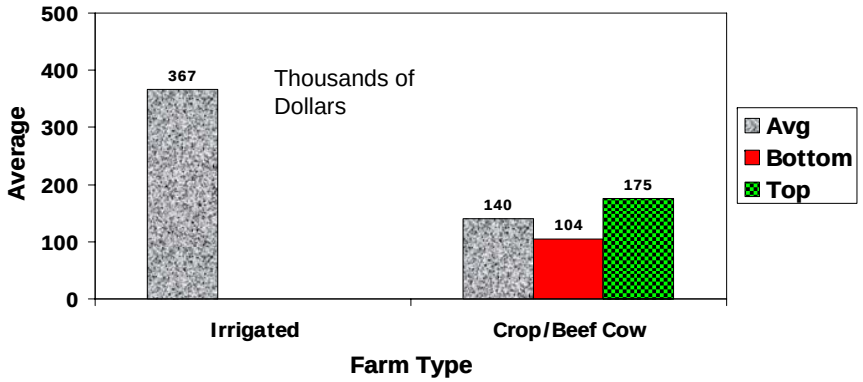
Non-Irrigated Crop Farms
Other Crop Benchmarks

Category	Crop Intensity Index	Less Tillage Index	Mach Inv per Acre
East: Bottom	1.022	0.074	$184.20
East: Top	**1.124**	**0.106**	**$153.65**
Central: Bottom	0.944	0.078	$138.37
Central: Top	**1.011**	**0.133**	**$108.22**
West: Bottom	0.637	0.108	$86.07
West: Top	**0.709**	**0.158**	**$66.57**

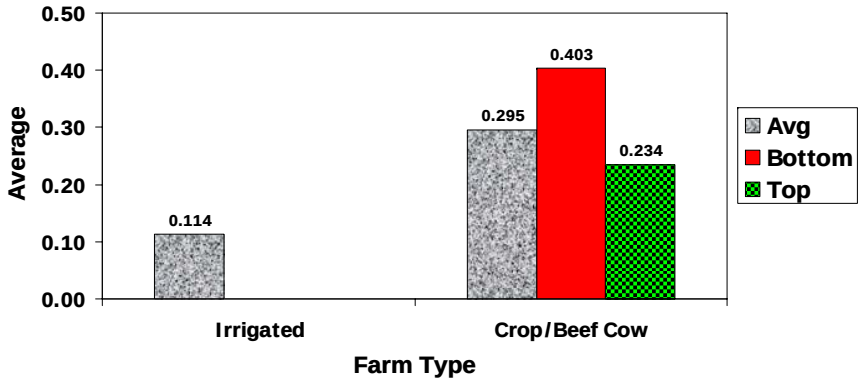
Irrigated and Crop/Beef Farms
Overall Efficiency Index



Irrigated and Crop/Beef Farms
Value of Farm Production per Worker



Irrigated and Crop/Beef Farms
Labor Efficiency Index



Summary of Labor Benchmarks

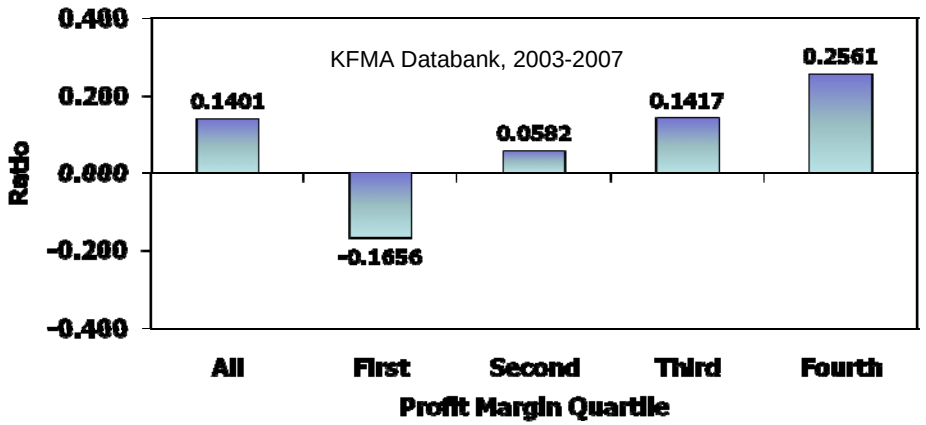
Farm Type	Labor Efficiency	Labor Productivity
Dry: East	**0.136**	**$283,521**
Dry: Central	**0.160**	**$260,290**
Dry: West	**0.145**	**$267,013**
Irrigated	**< 0.114**	**> $367,065**
Crop/Beef Cow	**0.235**	**$174,898**

Competitive Advantage

Relative Cost Per-Unit \ Relative Price Per-Unit	Lower	Average	Higher
Lower	1 Indeterminate Position	2 **Competitive Advantage**	3 **Competitive Advantage**
Average	4 **Competitive Disadvantage**	5 Parity Position	6 **Competitive Advantage**
Higher	7 **Competitive Disadvantage**	8 **Competitive Disadvantage**	9 Indeterminate Position

Hunt, 2000

Profit Margin Ratio: All Farms



Financial Ratio Benchmarks KFMA Databank, 2003-2007

- Non-Irrigated Crop Farms
  - Operating Profit Margin Ratio
    - 0.2386
  - Asset Turnover Ratio
    - 0.3453
- Crop/Beef Cow Farms
  - Operating Profit Margin Ratio
    - 0.1796
  - Asset Turnover Ratio
    - 0.2319

Summary and Conclusions

- This presentation examined differences in labor efficiency and productivity among KFMA farms.
- Farms in the top overall efficiency category had significantly higher labor productivity (measured using value of farm production per worker) and significantly lower labor expense as a percent of value of farm production.
- In addition, farms in the top category tended to be larger, had higher operating profit margins, and higher asset turnover ratios.

Contact Information

- Publications and Data:
  - www.agmanager.info
    - KFMA Summaries
    - KFMA Newsletter
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