Updating Labor Benchmarks

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Labor Measures

Measure	Formula	Interpretation
Labor Efficiency	$\left(\dfrac{Total\ Labor\ Cost}{Value\ of\ Farm\ Production}\right)$	Labor input cost per unit of output
Labor Productivity	$\left(\dfrac{Value\ of\ Farm\ Production}{\#\ workers}\right)$	Output per worker

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Why Does This Matter?

- Labor is a prevailing expense
  - ~ 13% of non-irrigated crop farm
  - ~ 9% of irrigated crop farm

- Labor is directly related to profit margins
  - VFP – expenses (including employee labor) = NFI
  - (NFI – operator and family labor) used in profitability ratios
  - Economizing on labor increases profitability measures

In the Literature..

- Lower labor cost is associated with higher operator earnings (Johnston, 1951)

- Greater labor productivity and efficiency are associated with better financial performance (Yi and Ifft, 2019)

- Labor efficiency and productivity are significantly correlated with profitability, financial efficiency, and crop machinery investment per acre (Langemeier, 2018)
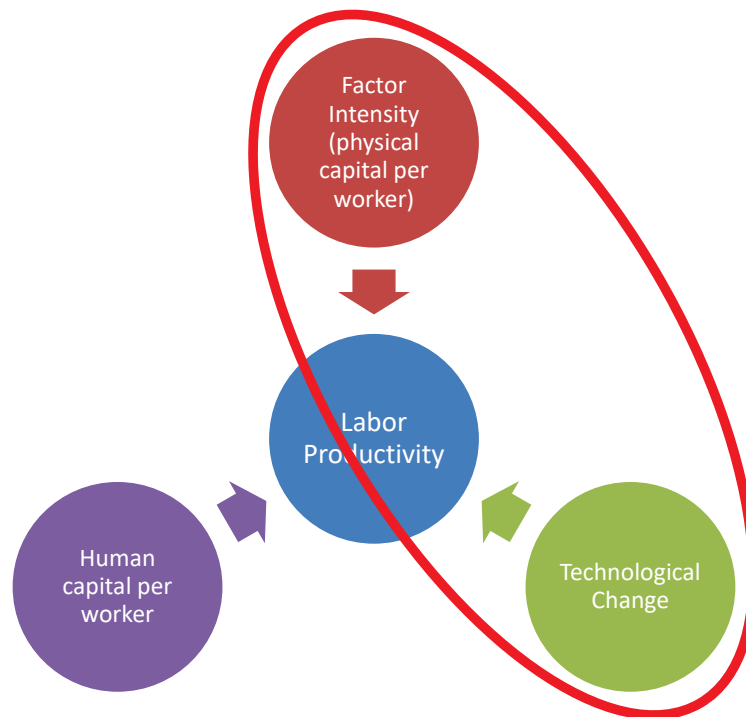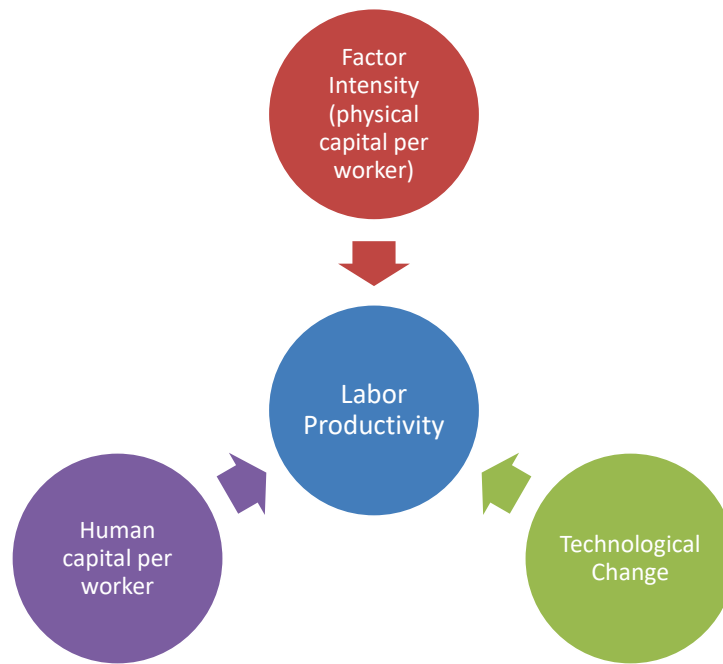
Machinery Costs/Investment

Average Crop Machinery Cost and Crop Machinery Investment by Year

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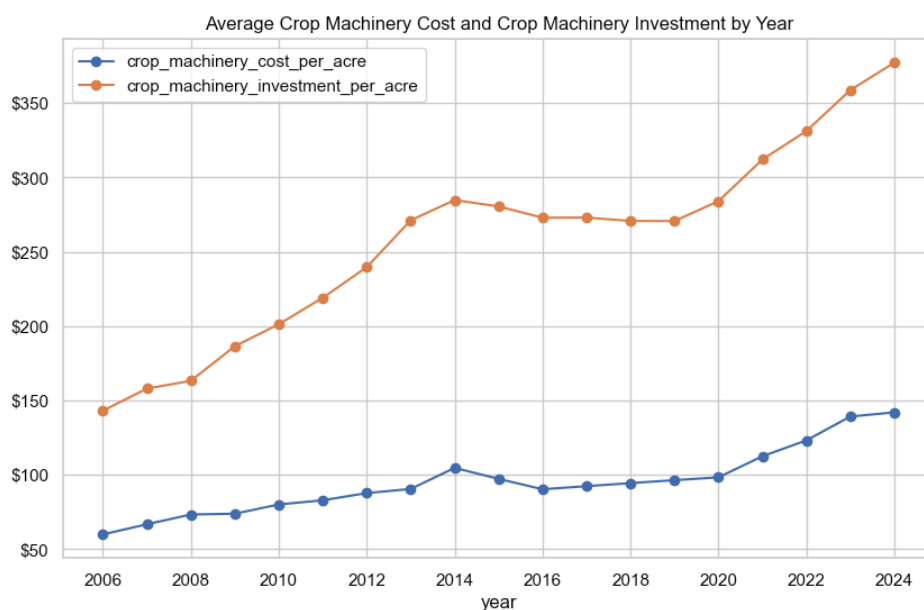
Labor Measures

Measure	Formula	Interpretation	Objective
Labor Efficiency	$\left(\dfrac{Total\ Labor\ Cost}{Value\ of\ Farm\ Production}\right)$	Labor input cost per unit of output	Minimize (labor is a smaller share of VFP)
Labor Productivity	$\left(\dfrac{Value\ of\ Farm\ Production}{\#\ workers}\right)$	Output per worker	Maximize (more output per worker)

Labor Costs
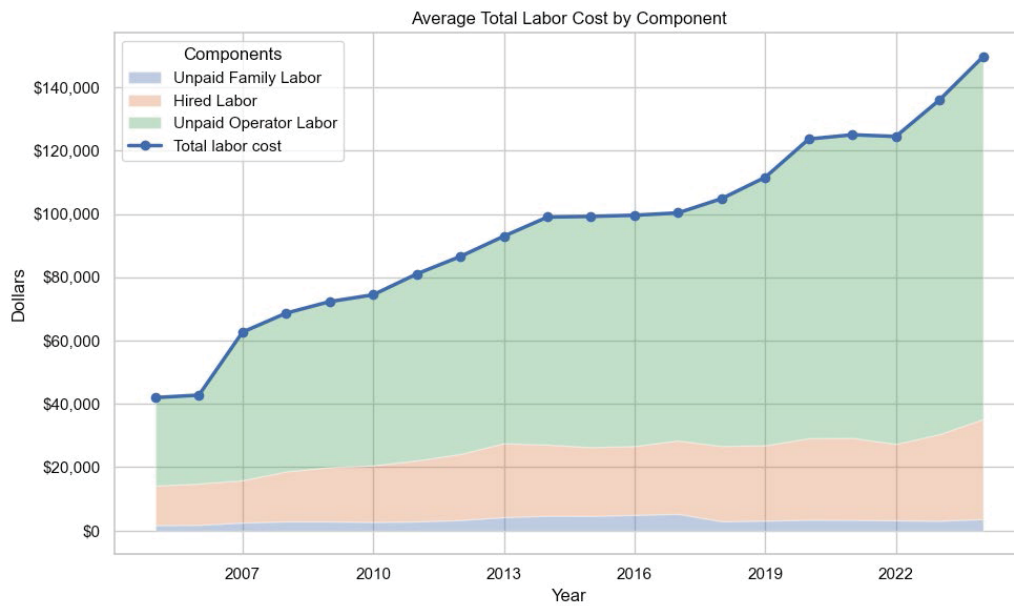
Number of Workers

Top Line and Bottom Line
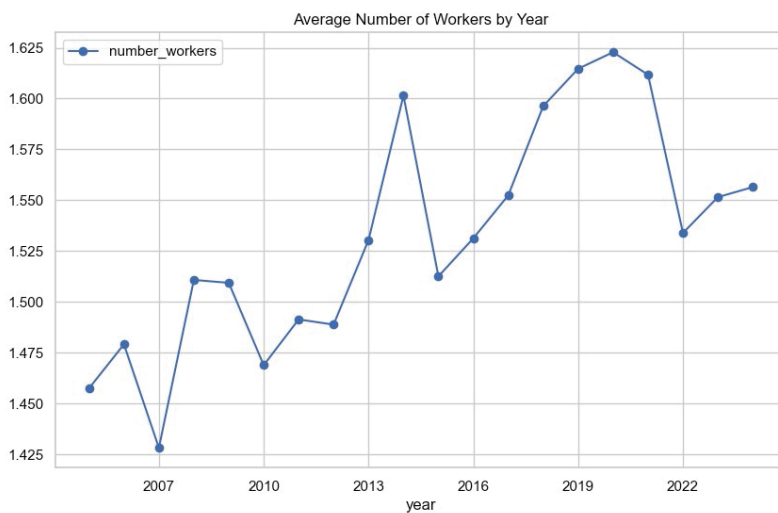
Value of Farm Production and NFI by Year
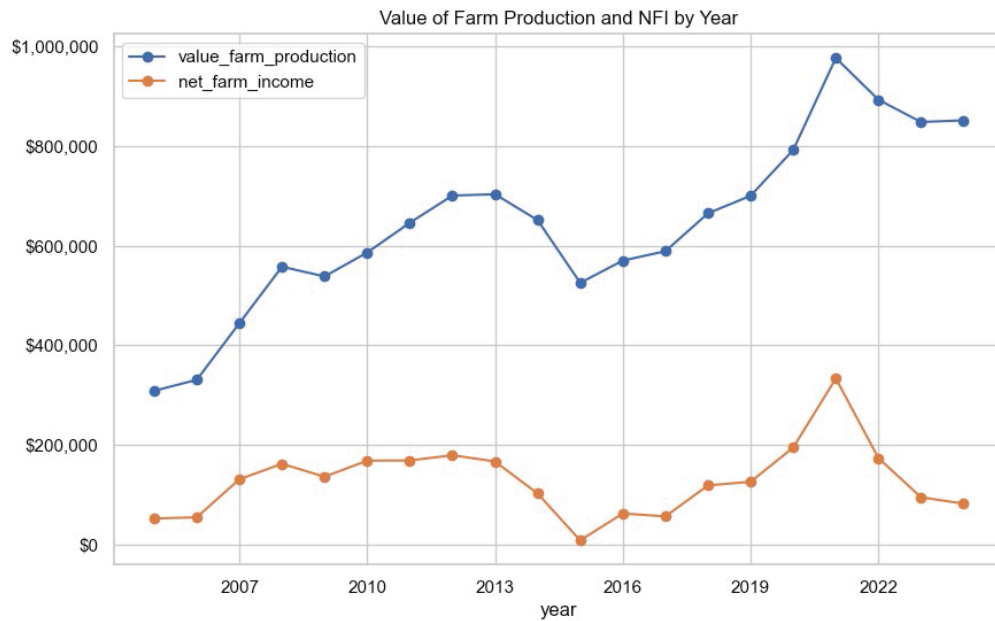
Labor Measures- Prediction

Measure	Formula	Change
Labor Efficiency	$\left(\dfrac{Total\ Labor\ Cost}{Value\ of\ Farm\ Production}\right)$	$\left(\dfrac{\uparrow}{\uparrow}\right)$
Labor Productivity	$\left(\dfrac{Value\ of\ Farm\ Production}{\#\ workers}\right)$	$\left(\dfrac{\uparrow}{\rightarrow}\right)$

Background- KFMA

Kansas Farm Management Association (KFMA)
- Serving Producers in Kansas since 1930's
- 6 Associations 24 Economists across Kansas
- Part of Department of Agricultural Economics at K-State
- Provide members with information to make decisions on their farm
  - Accounting systems and recordkeeping
  - On-farm visits
  - Accrual analysis
  - Tax planning and preparation
  - Financial benchmarking

Background- KFMA

KFMA Databank
- K-MAR-105 Association
  - Central information processing unit
  - Maintains data banks
  - Used for agricultural economics research and extension activities

Method

- Calculate yearly averages of labor measures
- Calculate 5-year averages of labor measures
  - Farms must have 5 years of data for inclusion
- Calculate quartiles of measures for benchmarks
  - Based on VFP
- Correlation between labor measures and selected variables
- Summarize updated benchmarks

Data

- Non-irrigated crop farms (>= 80% crop labor to dryland crops)
- Years: 2005 - 2024
  - Sample Size:

Year	Farms in Sample
2005 – 2009	599
2010 – 2014	504
2015 – 2019	355
2020 – 2024	271

Labor Productivity Over Time

Labor Efficiency Over Time

Labor Ratios (5 Year Avg)

Time Period	Average Labor Efficiency (st. dev)	Average Labor Productivity (st. dev)
2005 – 2009	0.17 (0.145)	$300,528 (186,320)
2010 – 2014	0.17 (0.11)	$438,785 (220,993)
2015 – 2019	0.21 (0.14)	$406,371 (197,829)
2020 – 2024	0.19 (0.136)	$577,739 (280,160)

VFP Distribution and Labor Measures by VFP Quartile
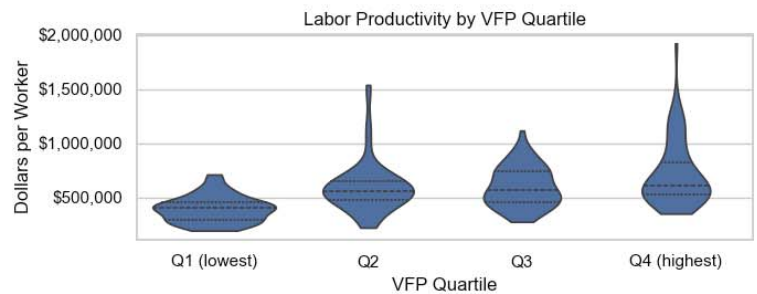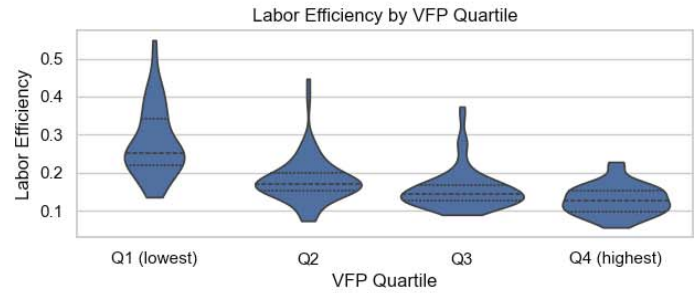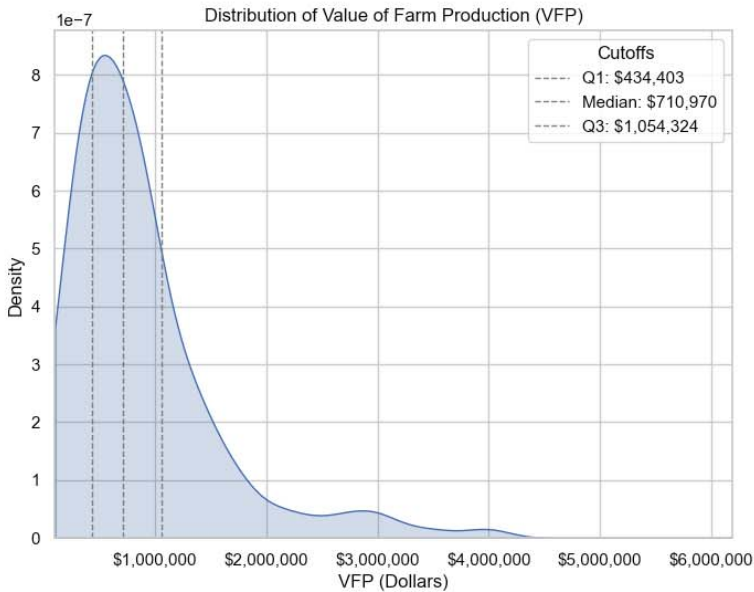
Correlation: Labor Measures

	Labor Productivity	As LP ⬆	Objective
Labor Efficiency	-0.746	⬇	Minimize

- Labor measures are highly correlated
  - As labor productivity increases, labor efficiency decreases
    - Matches desired outcomes (max LP and min LE)
    - Means as LP "improves", so does LE

Correlation: Farm Demographics

	Labor Efficiency	As LE ⬇	Labor Productivity	As LP ⬆
operator_age	0.266	⇩	-0.263	⇩
total_acres	-0.469	⇧	0.346	⇧
crop_intensity	-0.322	⇧	0.306	⇧
percent_acres_owned	0.213	⇩	-0.217	⇩
value_farm_production	-0.493	⇧	0.4	⇧

Correlation: Profitability Measures

	Variable Objective	Labor Efficiency	As LE ⬇	Labor Productivity	As LP ⬆
net_farm_income	max	-0.423	⇧	0.38	⇧
profit_margin_ratio	max	-0.698	⇧	0.466	⇧
rate_of_return_on_assets	max	-0.522	⇧	0.452	⇧

Correlation: Efficiency Measures

	Variable Objective	Labor Efficiency	As LE ⬇	Labor Productivity	As LP ⬆
asset_turnover_ratio	max	-0.261	⇧	0.302	⇧
total_expense_ratio	min	0.152	⇩	-0.106	⇩
operating_expense_ratio	min	0.187	⇩	-0.117	⇩

Correlation: Machinery Expenditure

	Labor Efficiency	As LE ⬇	Labor Productivity	As LP ⬆
crop_machinery_investment_per_acre	-0.179	⇧	0.141	⇧
crop_machinery_cost_per_acre	-0.21	⇧	0.195	⇧

2016 Benchmarks

	Below Average	Above Average
Labor Efficiency	30.6%	9.10%
Labor Productivity	$202,808	$650,116

- KFMA non-irrigated crop farms
  - 10 year average from 2007 – 2016
  - Langemeier (2018)

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2024 Benchmarks (2020-2024 Avg)

	Below Average	Above Average
Labor Efficiency	30.6%	10.6%
Labor Productivity	$331,140	$907,417

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Trends

Efficiency	→	Slightly more $ spent on labor per $ of output
Productivity	↑	More $ of output per worker

2024 Benchmarks by VFP Quartile

VFP Quartile	VFP Range	Average Labor Efficiency	Average Labor Productivity
Q1 (Lowest)	$0 - $434,402	27.9%	$394,688
Q2	$434,403 - $710,969	18.2%	$594,436
Q3	$710,970 – $1,054,324	15.7%	$600,415
Q4	> $1,054,324	12.9%	$721,750

Summary

- Farms are spending slightly more on labor per $ of output
- Top farms are generating more $ of output per worker
- More labor efficient farms are:
  - More profitable
  - More financially efficient
- Higher labor productivity is correlated with machinery cost & investment

Improving Labor Productivity (Langemeier 2018)

- Resource Allocation
  - Is the workforce being fully utilized?
  - Optimal input combination for level of labor
- Increases in Physical Capital
  - "Make sure the benefits of every asset purchased outweigh the costs"
  - Have changes in physical capital/asset purchases led to improvements in labor efficiency
- Increases in Human Capital
  - Farm managers require many competencies (production, financial management, risk management, etc.)
  - Gaps in skill sets should be filled through education, or hiring someone with those skills
- Technological Change
  - Can our operation evaluate and invest in new technologies?

Thank you!

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