

Impact of region and year on profitability across the United States

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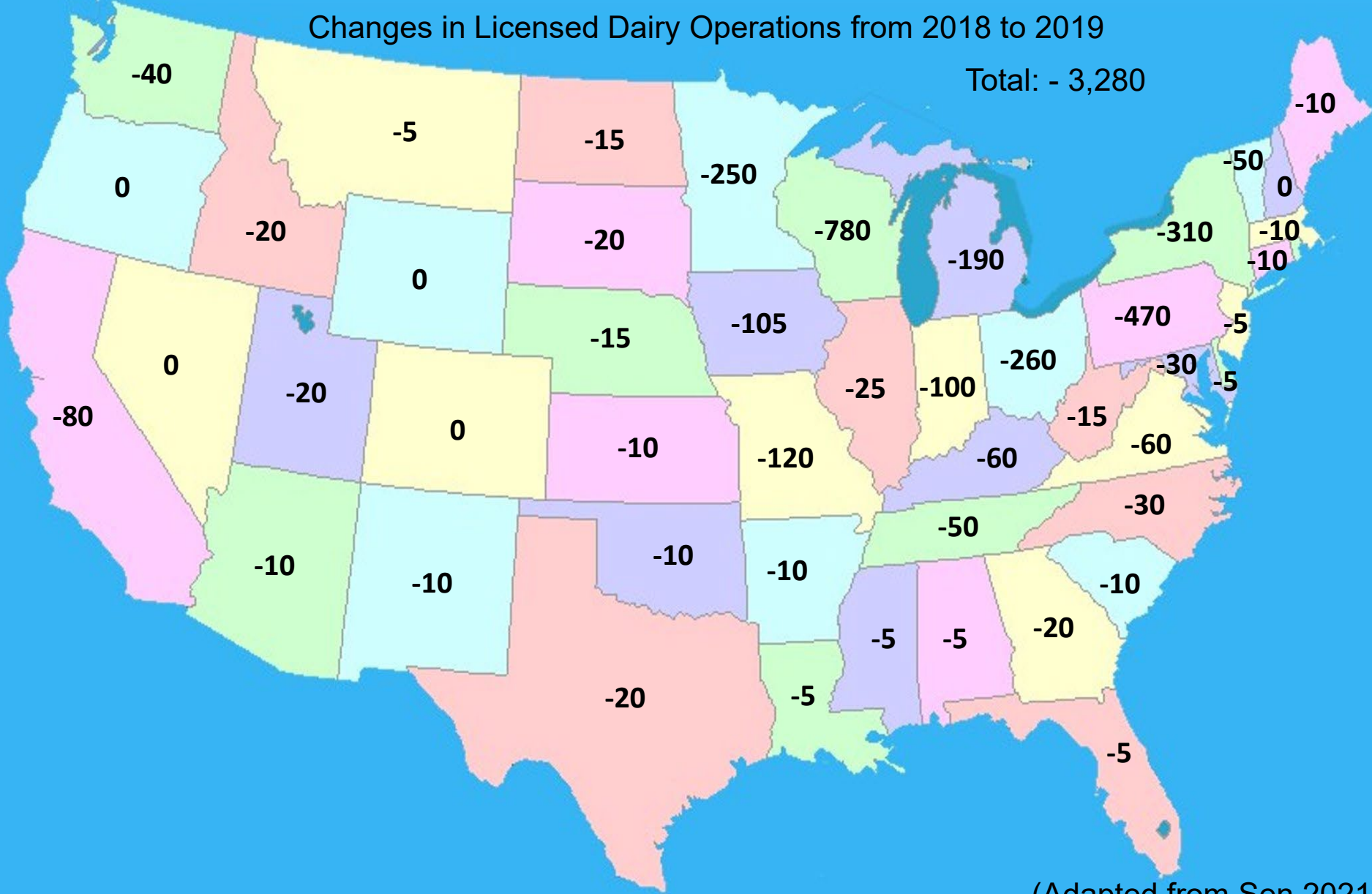
ADSA-SAD 2022

Background

- The number of operating dairy farms has been steadily declining over the past 30 years¹.
- Input prices have also steadily increased².
- Some regions have been able to retain more operable dairies than others².

Changes in Licensed Dairy Operations from 2018 to 2019

Total: - 3,280



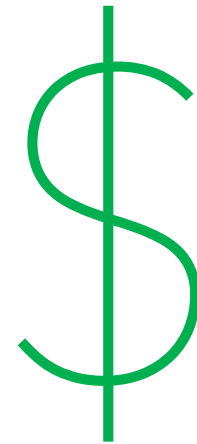
(Adapted from Sen, 2021)

Objective and hypothesis

- Objective: To observe differences in input prices as well as milk prices across all regions.
- Hypothesis: There will be a significant difference in input pricing across regions, profit margin will decrease across time, and input costs will increase across time.

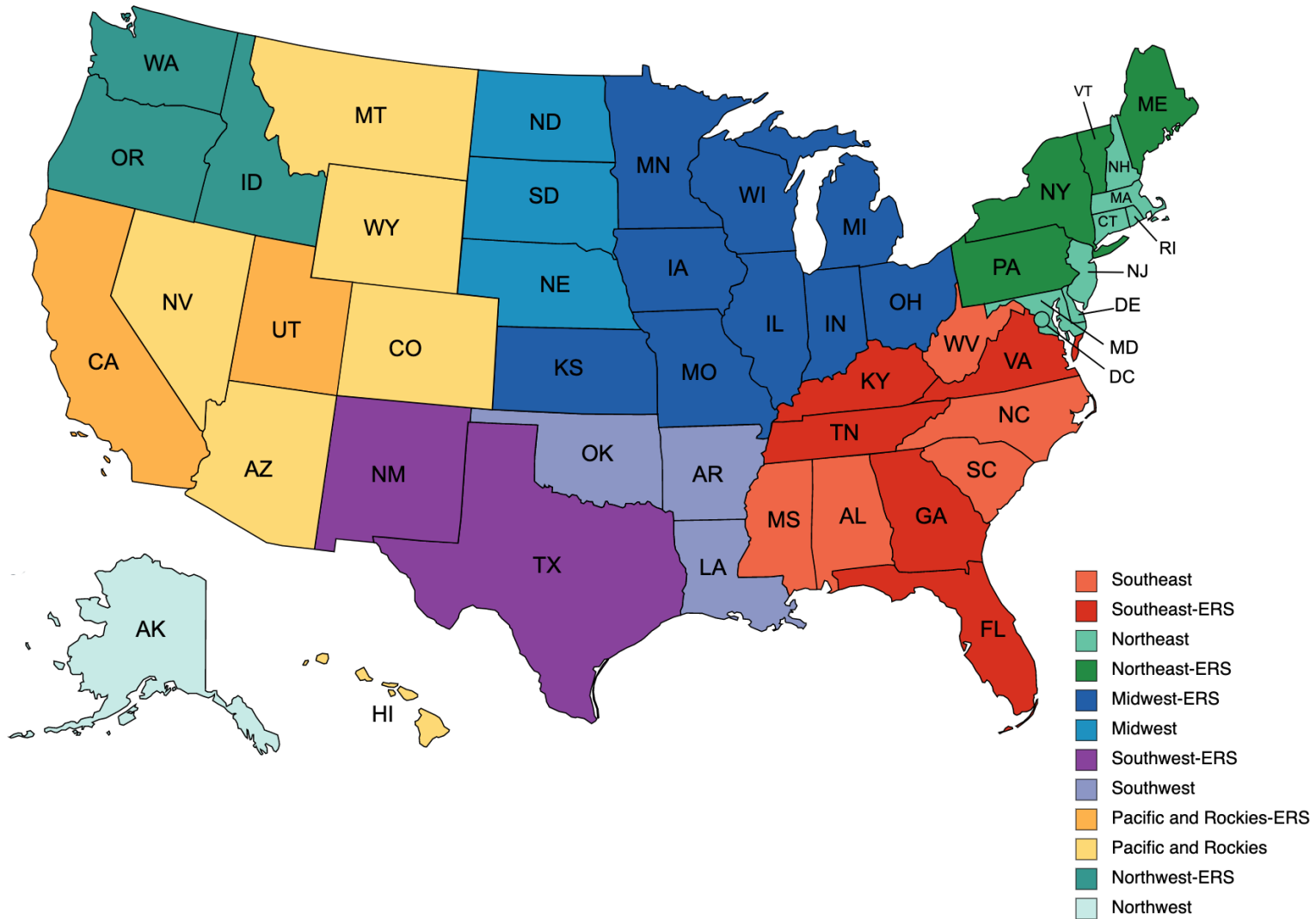
Materials and methods

- Data was sourced from USDA Economic Research Service
 - Years 2005 to 2020
 - 26 variables for 24 dairy states per year are recorded on a per cwt basis
 - Milk price
 - Total value of production
 - Input costs including:
 - Feed
 - Labor
 - Overhead
 - Profit margin



Statistical analyses

- Merged individual states (25 total represented) into regions:
 - Northeast (ME, NY, VT, PA)
 - Midwest (IL, IN, MI, OH, WI, IA, KS, MN, MO)
 - Southeast (FL, GA, KY, TN, VA)
 - Southwest (TX, NM)
 - Northwest (ID, OR, WA)
 - Pacific and Rockies (CA, UT)
- Created a total labor cost variable from hired labor and opportunity cost of unpaid labor.



Statistical analyses

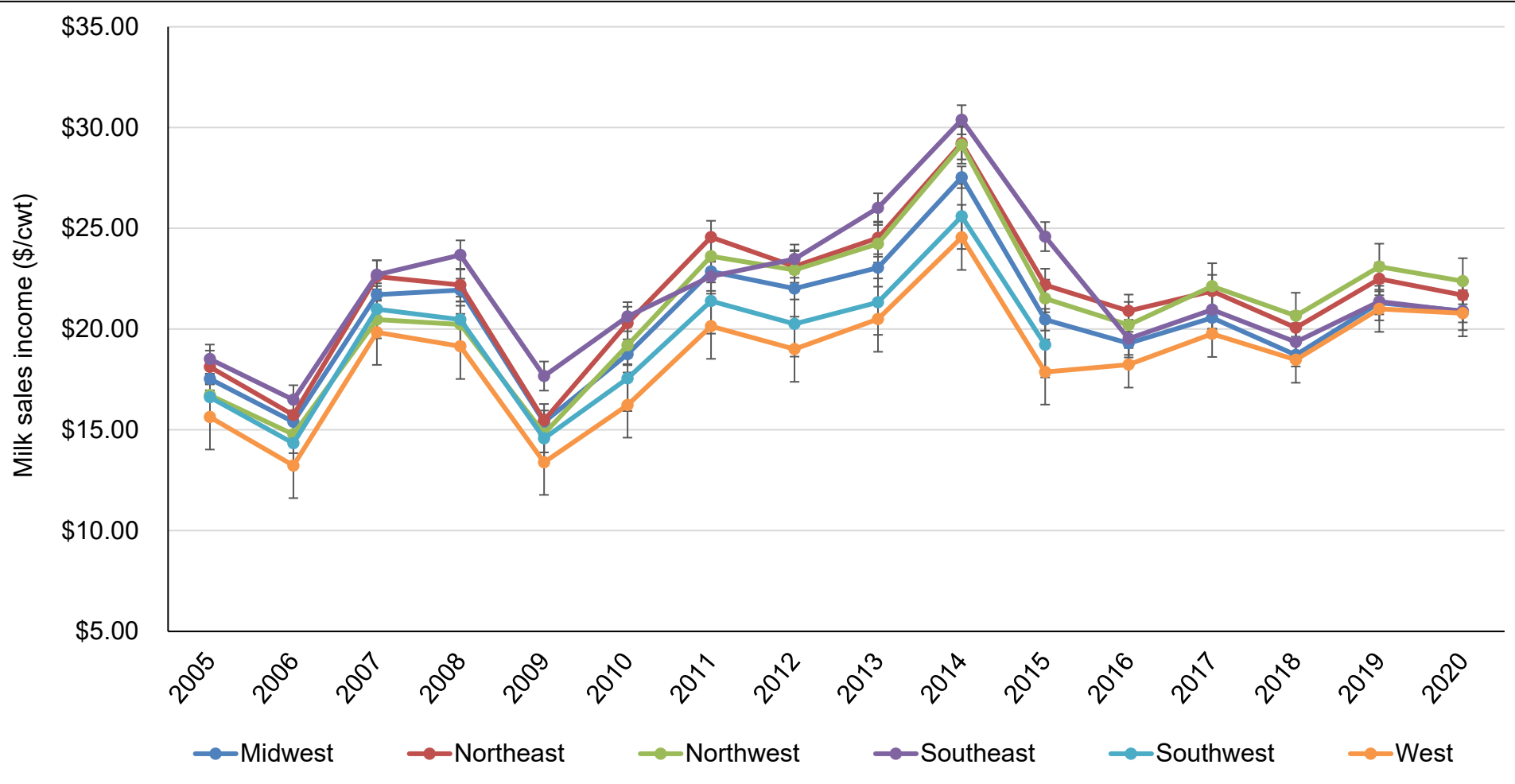
- GLIMMIX procedure of SAS 9.4 (Raleigh, NC)
 - Significance determined at $P \leq 0.05$
 - Determine the impact of year, region, and their 2-way interaction on target variables (14 of the original 26)
 - Milk price
 - Total farm revenue
 - Cost of production
 - Feed cost (total, harvested, purchased, and grazed)
 - Labor cost (total, hired, and opportunity cost of unpaid labor)
 - Income less total and variable costs
 - Herd size
 - Rolling herd average milk production



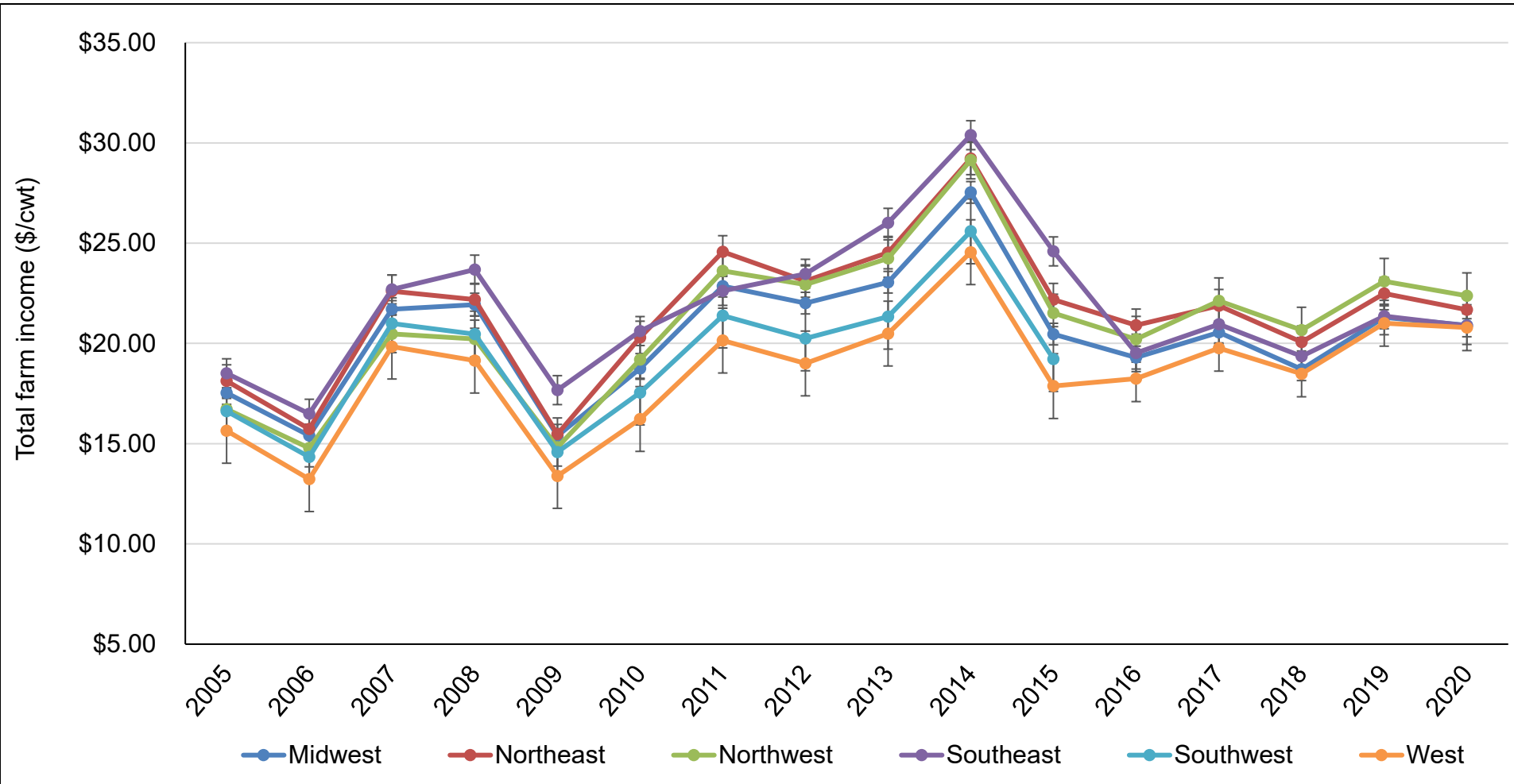
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Results

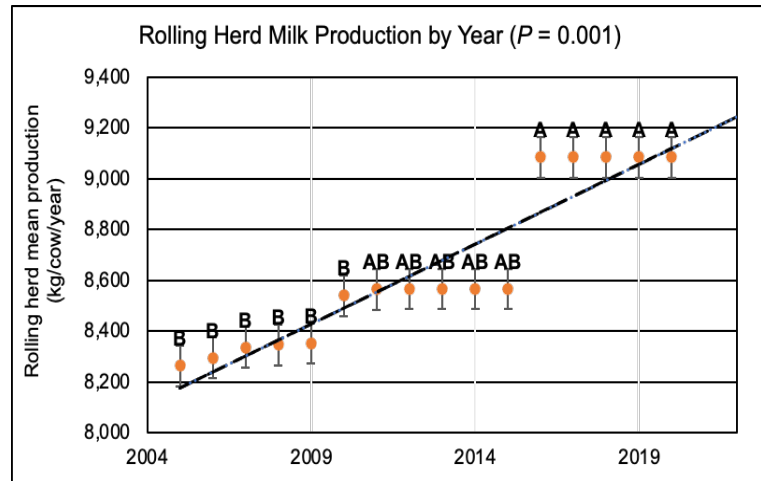
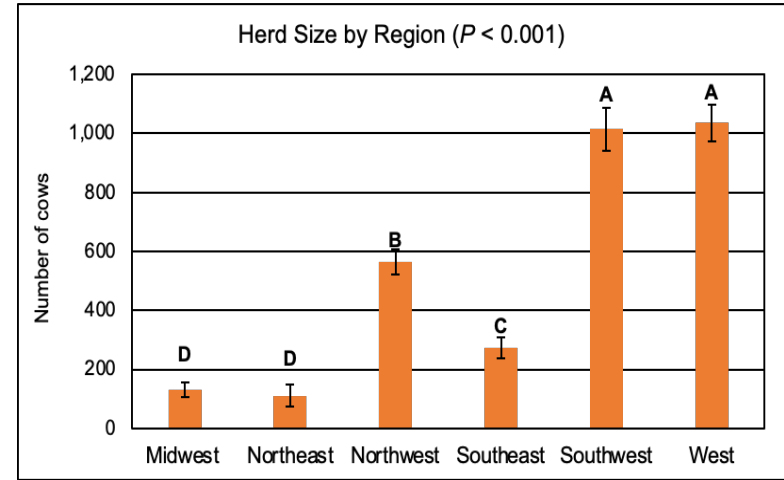
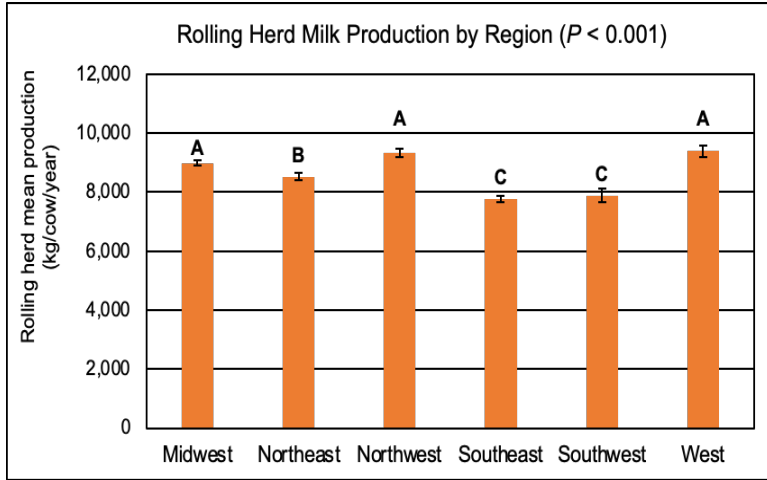
Impact of region and year on milk income ($P < 0.001$)



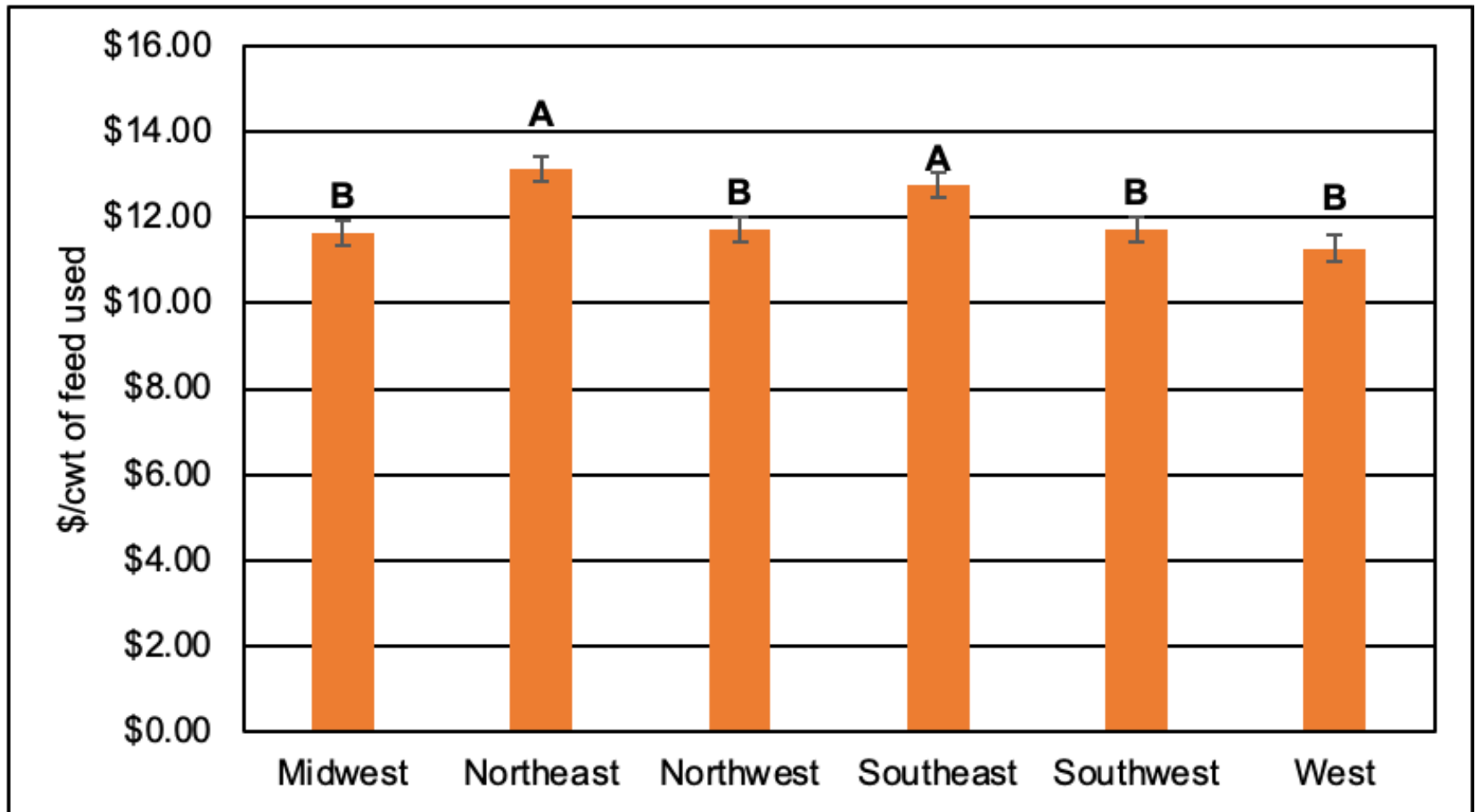
Impact of region and year on total farm income ($P < 0.001$)



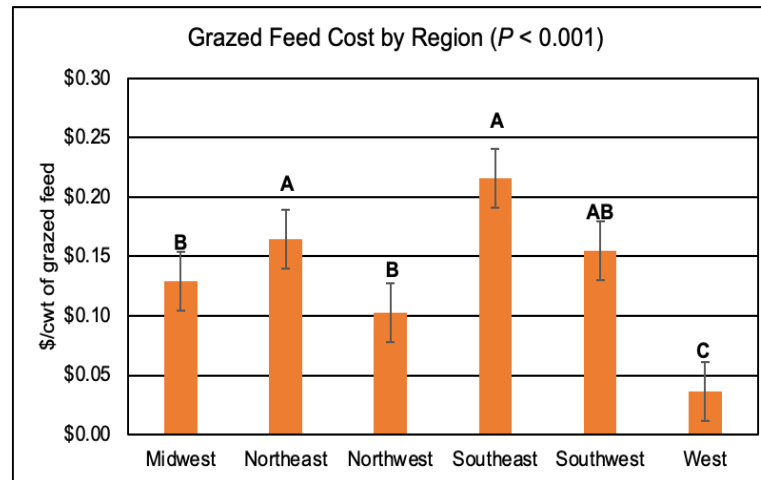
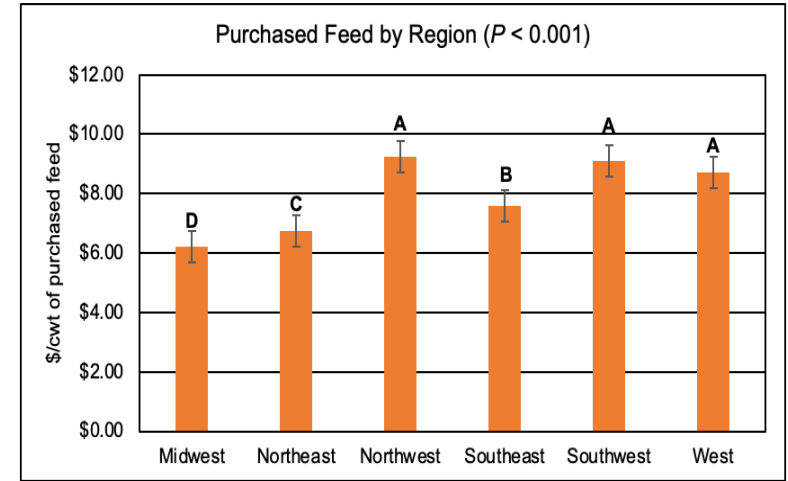
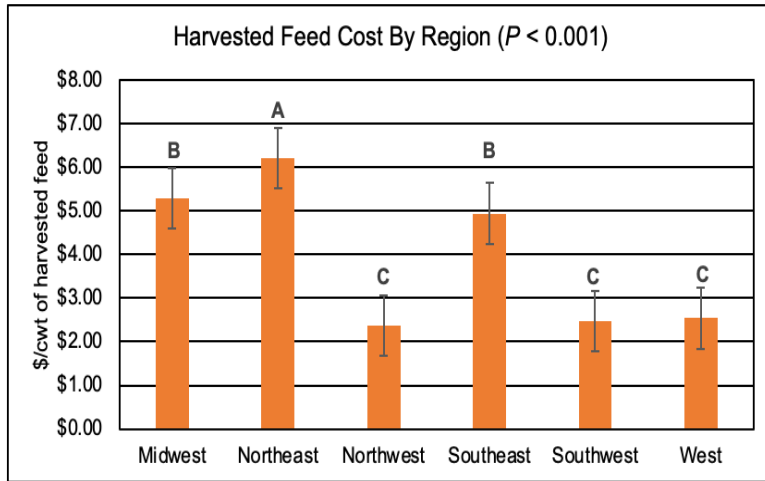
Impact on herd size & production



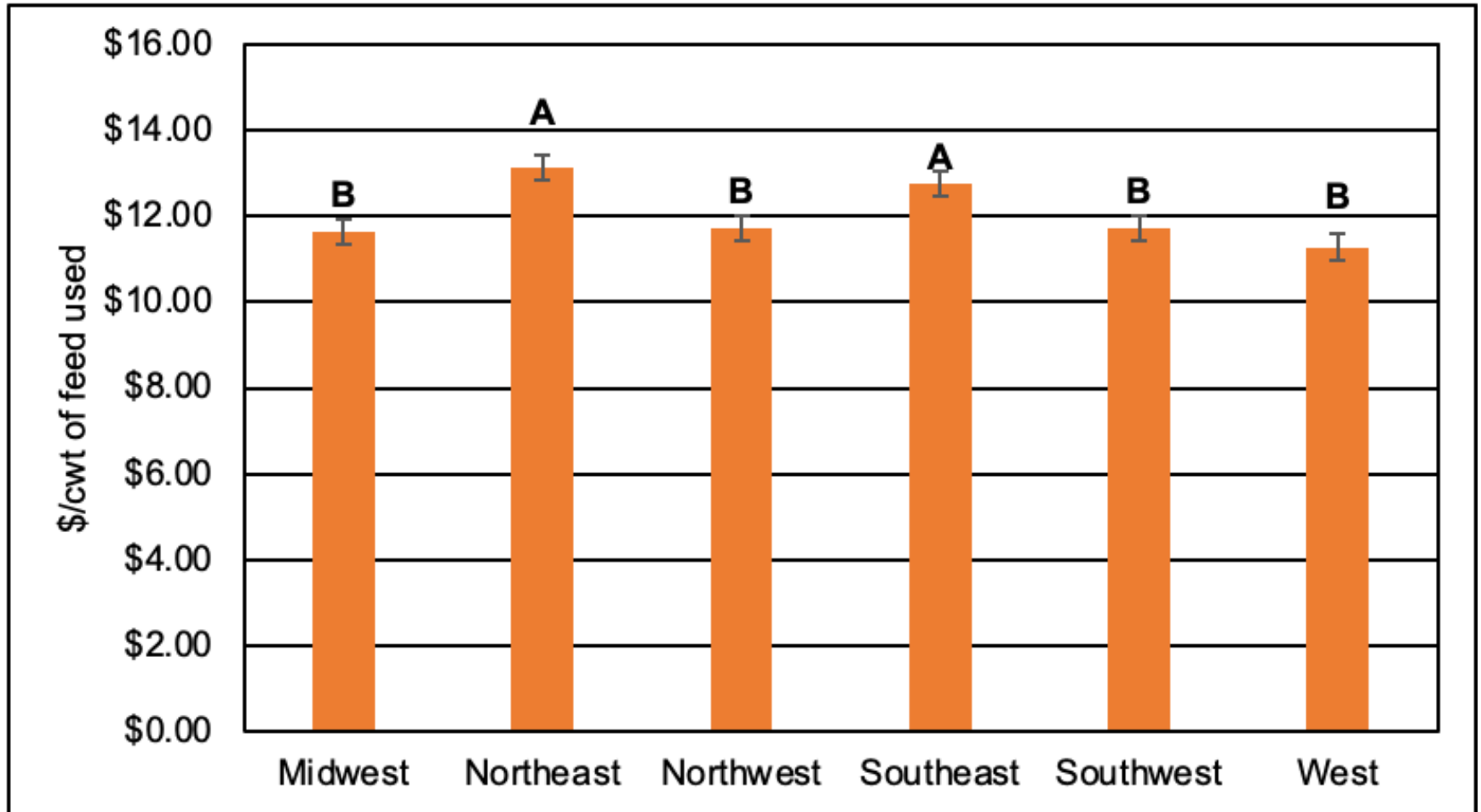
Total feed cost by region ($P < 0.001$)



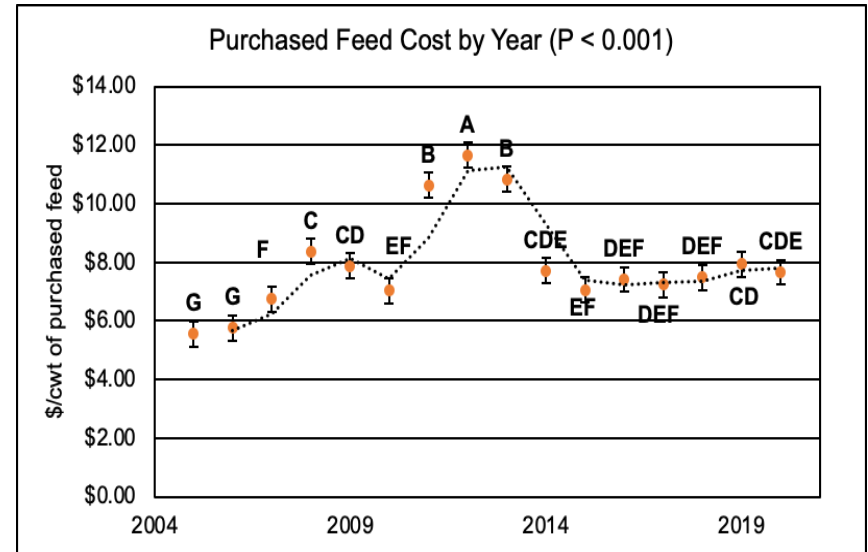
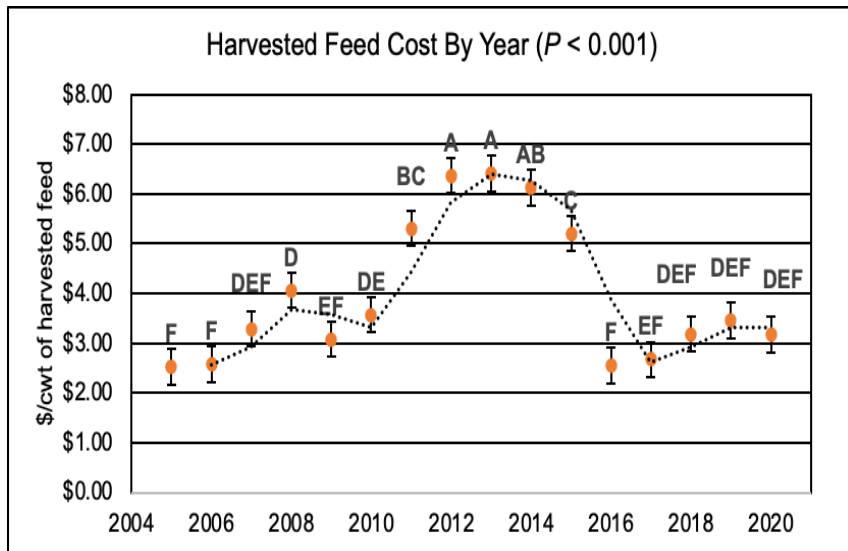
Feed component costs by region



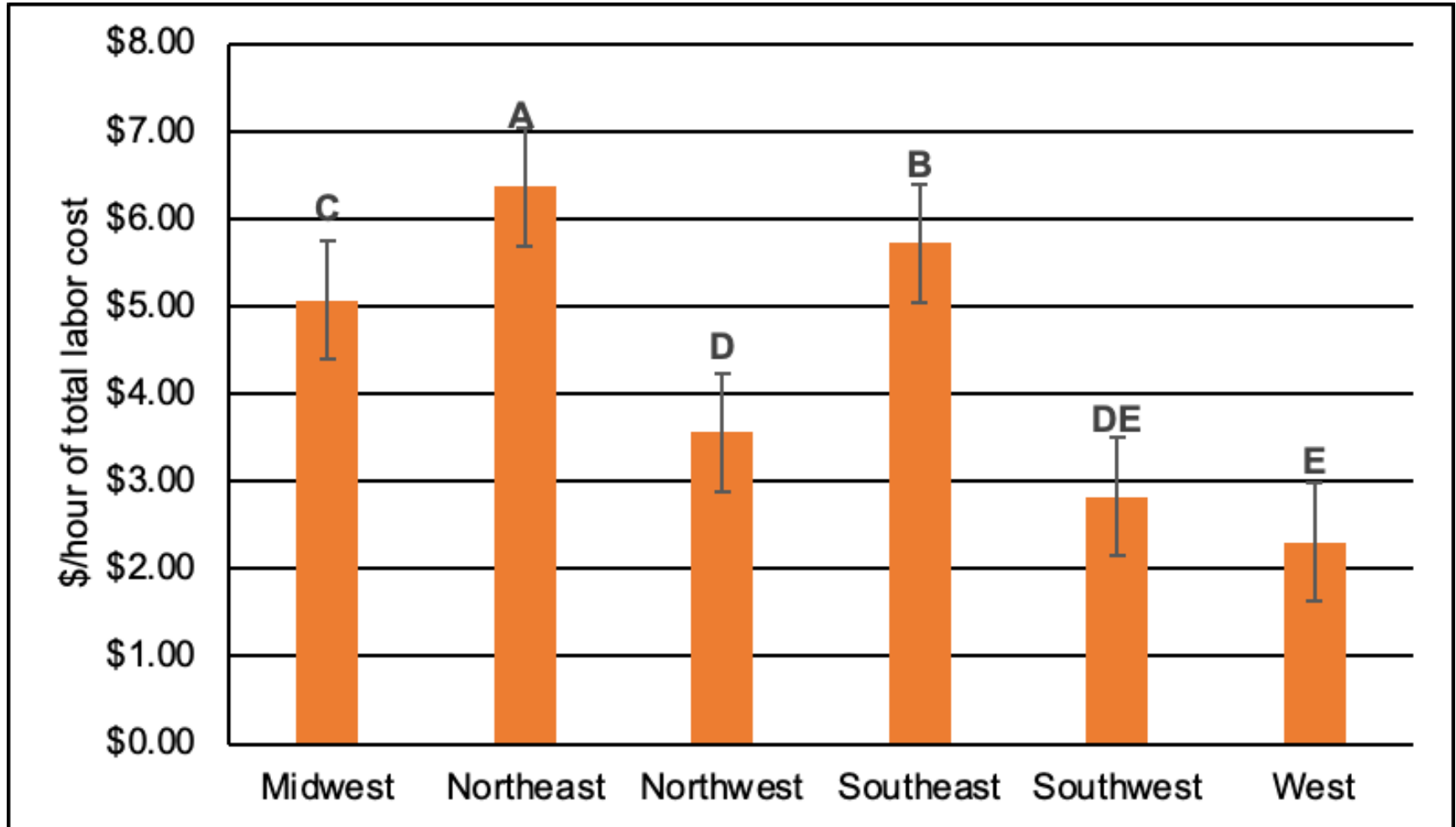
Total feed cost by year ($P < 0.001$)



Feed component costs by year

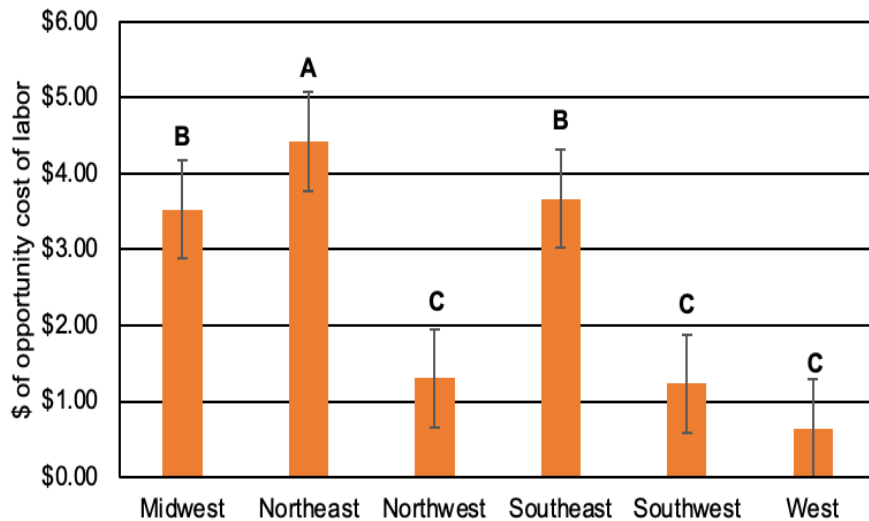


Total labor cost by region ($P < 0.001$)

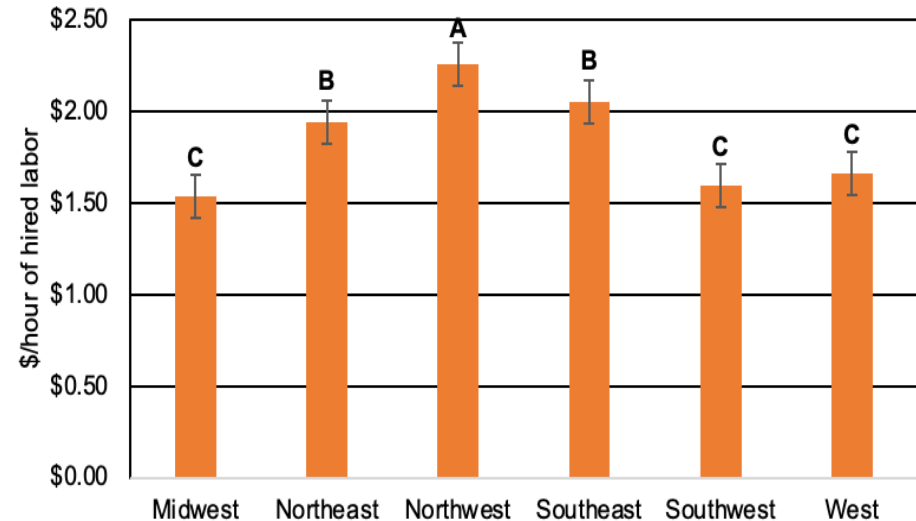


Labor component costs by region

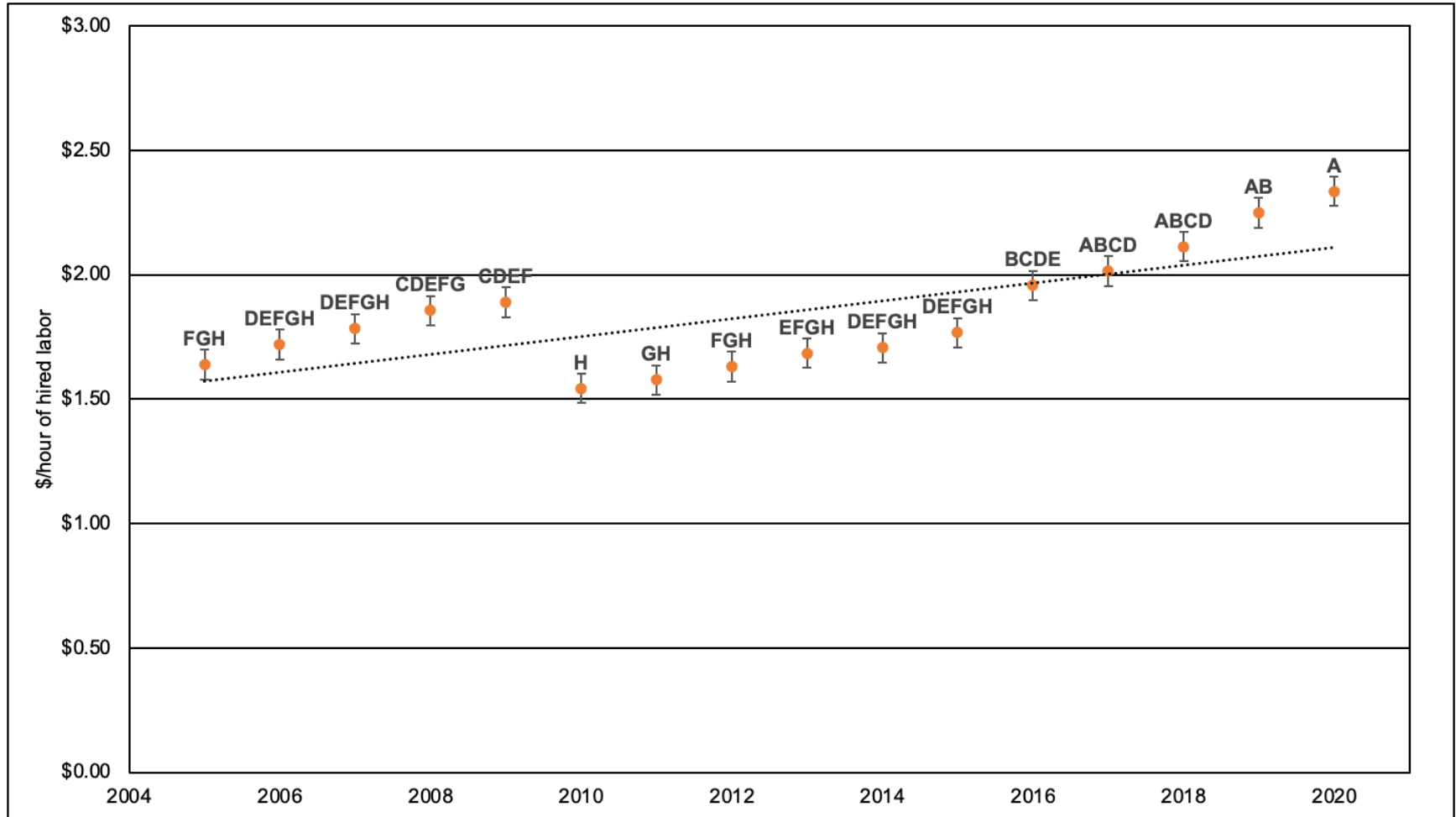
Opportunity Cost of Unpaid Labor by Region ($P < 0.001$)



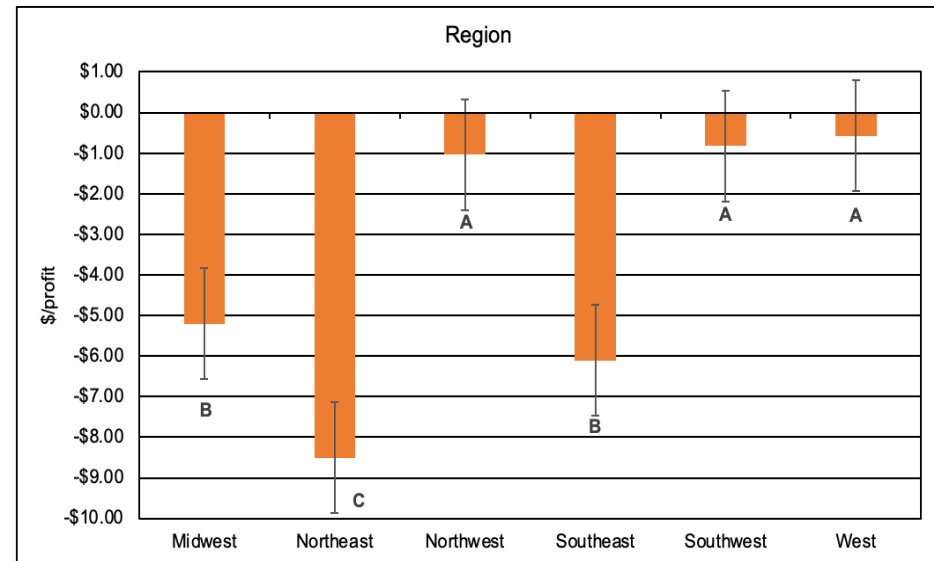
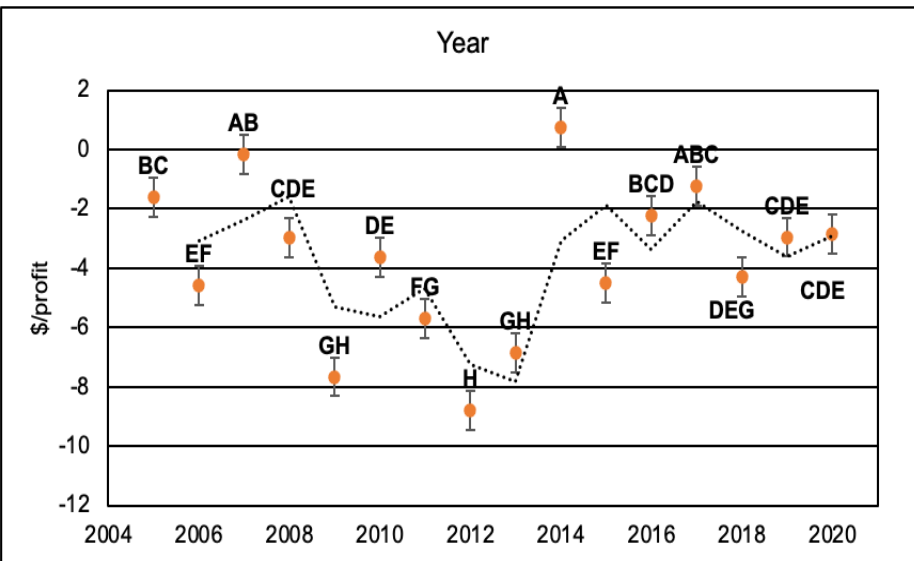
Hired Labor by Region ($P < 0.001$)



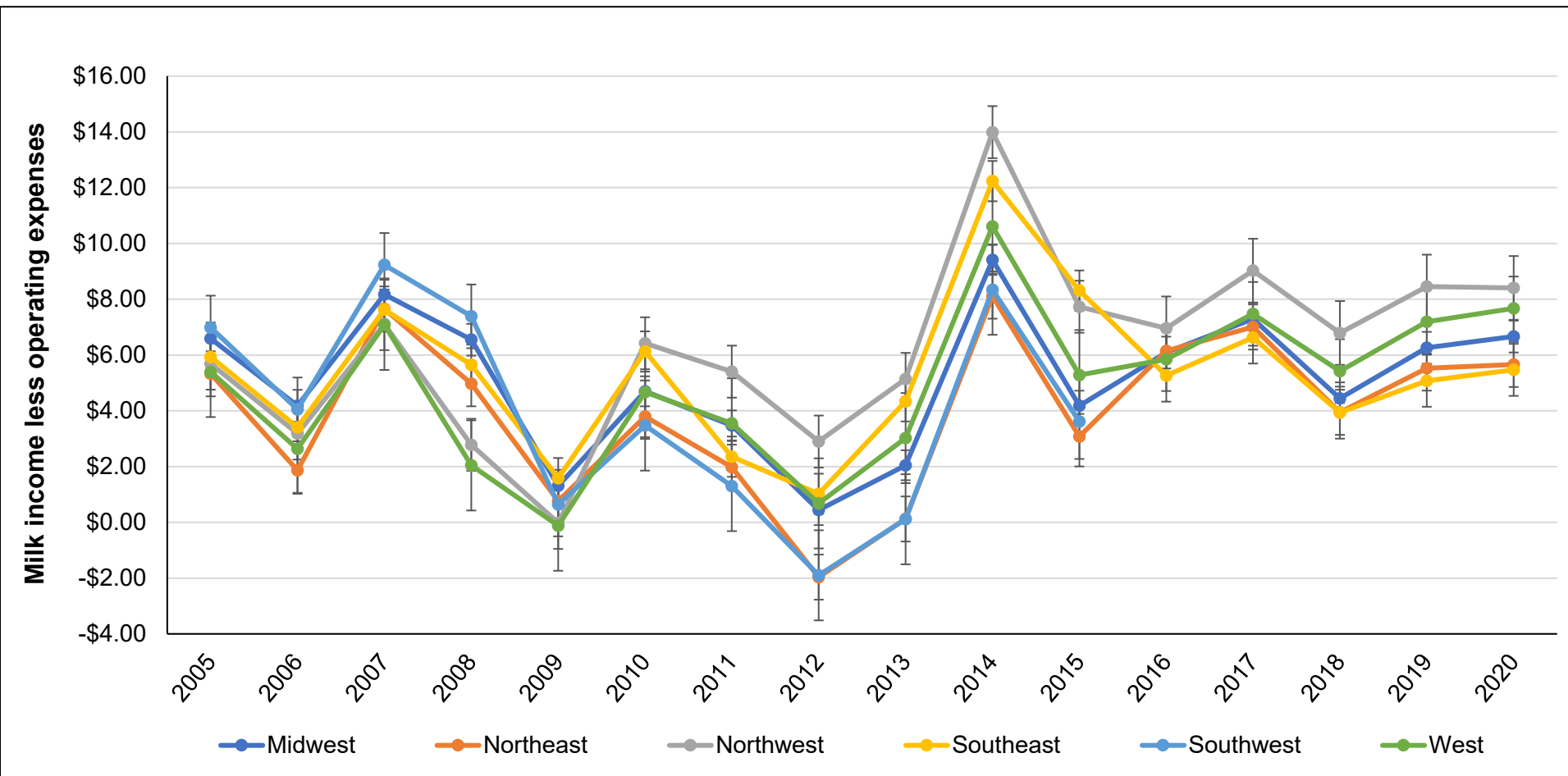
Hired labor costs by year ($P < 0.001$)



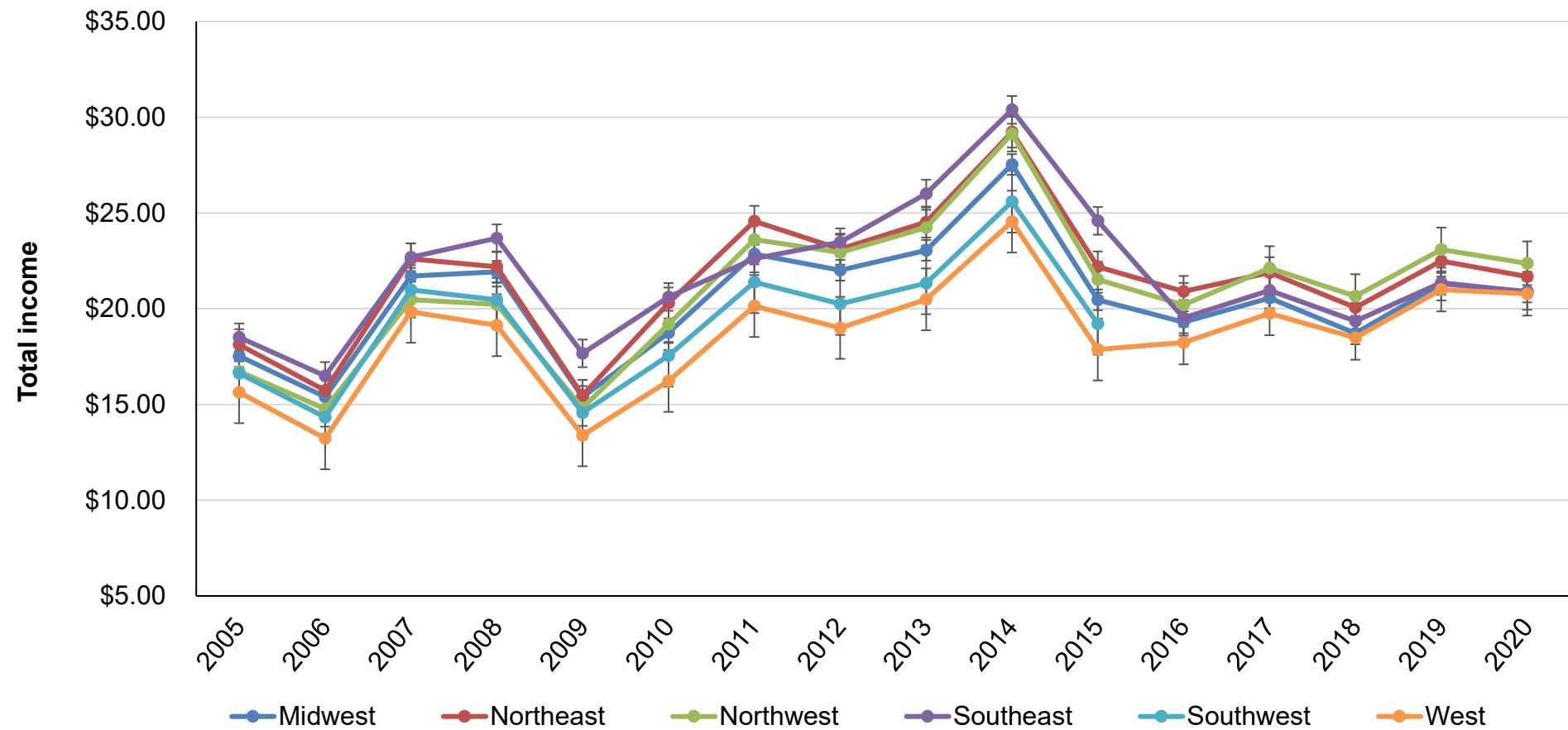
Impact of region and year on net income ($P < 0.001$)



Impact of region and year on milk income less operating expenses ($P < 0.001$)



Impact of region and year on total income ($P < 0.001$)



Conclusions

- The hypothesis was partially correct:
 - Significant difference in input pricing across regions
 - Input costs increase across time
 - Profit margins increase and decrease erratically across time, but overall trend is increasing
 - Dips in production estimates and spikes in input pricing match 2008-2009 recession

Conclusions

- Other observations:
 - National herd size has not changed at any noticeable rate, but where the cows are is vastly different
 - Northwest, West and Southwest are most profitable regions
 - Production efficiency continues to increase

Future Possibilities

- Tracing events to see what causes trends in major drivers of profitability
 - Policy changes
 - Interrelated market changes
 - World events, recessions, etc.
- Further search into common causes of changes in efficiency by region
 - Heat stress
 - Proximity to markets and other economic factors
 - Input production factors

Acknowledgements and Questions?

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- Thank you to Drs. Elizabeth Eckelkamp and Charles Martinez



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References

1. United States Department of Agriculture National Agricultural Statistics Service. Dairy Data. 1990 to 2019.
2. United States Department of Agriculture Economic Research Service. Milk Production Data. 2005 to 2020.