Agricultural Technology Utilization Across Generations

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What were we motivated by?

• Interest in
  – who is adopting technology and how quickly
  – why is technology being adopted
  – what can technology provide
  – who will be using ag tech in the future
The generations defined

- Born 1997-2012: Generation Z, ages 7-22*
- Born 1965-80: Generation X, ages 39-54
- Born 1946-64: Boomers, ages 55-73
- Born 1928-45: Silent, ages 74-91

*No chronological endpoint has been set for this group. For this analysis, Generation Z is defined as those ages 7 to 22 in 2019.

PEW RESEARCH CENTER
• Kansas Farm Management Association (KFMA)
  – Agronomic production & financial data, 1973 - present
  – >2,000 farmer-members, ~1,000 suitable for economic analysis

• KFMA precision agriculture project initiated 2015
  – past & current adoption/abandonment
  – information-intensive & embodied-knowledge technologies

• 656 respondents regarding technology adoption
Analysis based on Kansas Farm Management Association data

Proportion of farm operators (%)

- Baby Boomer
- Generation X
- Generation Z
- Millennial
- Silent

Years: 2012 to 2018
“Anything that is in the world when you're born is normal and ordinary and is just a natural part of the way the world works. Anything that's invented between when you're fifteen and thirty-five is new and exciting and revolutionary and you can probably get a career in it. Anything invented after you're thirty-five is against the natural order of things.”

Douglas Adams in *The Salmon of Doubt: Hitchhiking the Galaxy One Last Time*
Analysis based on Kansas Farm Management Association data

Percent of farms

Year:
- 1990
- 1995
- 2000
- 2005
- 2010
- 2015

Legend:
- Automated Guidance
- Combine Yield Monitor (w/ GNSS)
- Grid Soil Sampling
- Variable Rate Fertility
- Automated Section Control
- Combine Yield Monitor (w/out GNSS)
- Lightbar Guidance
- Variable Rate Seeding

n = 656
The basic question: B > C?

Where does FOMO go?
Number of technologies used on the farm

Analysis based on KFMA data

Number of technologies on farm, n = 463
Net farm income by generation

[Graph showing net farm income deviation from mean by generation for different years.]
Distribution of Ag Tech: Sole proprietor farms

- Silent
- Baby Boomer
- Generation X
- Millennial

- Yield mapping
- Yield monitor
- Automated guidance
- Automated section control
- Lightbar
- Grid soil sampling
- Variable rate fertility
- Variable rate seeding
Distribution of Ag Tech: Multiple-operator farms

- Silent
  - Yield mapping
  - Automated section control
  - Variable rate fertility

- Baby Boomer
  - Yield monitor
  - Automated guidance
  - Lightbar

- Generation X
  - Variable rate seeding
  - Grid soil sampling

- Millennial
  - Yield mapping
  - Automated section control
  - Lightbar
  - Variable rate fertility

Percent
Sole proprietor farms

- Silent
- Baby Boomer
- Generation X
- Millennial

Yield mapping
Yield monitor
Automated guidance
Automated section control
Lightbar
Variable rate fertility
Grid soil sampling
Variable rate seeding
Incentivizing Kansas farmers to adopt VR

- Code 104 Nutrient Plan Written
  - By a Technical Service Provider
- 590 Nutrient Management Basic Precision
  - $31.42 per acre capped at $30k per contract
- Costs relatively lower and assumed to be:
  - $20 per soil sample ($8 per acre for 2.5 acre grid)
  - VR upcharge $1.50 (dry) and $3 (liquid) above uniform

check with your local NRCS office for eligibility requirements (not everyone may qualify)
Why farmers NOT adopting VR N?

• Benefits may not clearly outweigh costs
• Increased uncertainty of correct rates
  – Farmer’s risk preference
• Lack of human capital capacity
  – On-farm or 3rd party service providers
Summing up returns to precision ag

• Evaluate if benefits outweigh the costs
  – Remember: farmers should not be in a hurry
  – FOMO not part of benefit-cost decision

• Ag tech isn’t for every grower on every field
  – Where, when, what, and who!

• Sometimes waiting is optimal decision
  – Until benefit:cost ratio favorably indicates
Future Work

• Is precision technology profitable?
  – Do I

• Ag tech across generations
  – Do Millennials influence Baby Boomers?
Defining Precision Agriculture

“Precision Agriculture is a management strategy that gathers, processes and analyzes temporal, spatial and individual data and combines it with other information to support management decisions according to estimated variability for improved resource use efficiency, productivity, quality, profitability and sustainability of agricultural production.”

https://ispag.org/
The International Society of Precision Agriculture (ISPA) is a non-profit professional scientific organization. The mission of ISPA is to advance the science of precision agriculture globally.

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