Farmer Perceptions of Precision Agriculture Technology Benefits

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Introduction/Motivation

- Despite tremendous potential, to date the ability to capitalize on precision agriculture technology has generally fallen short of expectations.
- Previous literature has belabored adoption rates and the observable farm and farmer characteristics influencing adoption, but little work has been done to identify how farmers perceive particular technologies in terms of the benefits they provide.
- Since adoption rates for different technologies vary (Schimmelpfenning, 2016), it is hypothesized that the underlying benefits of these technologies to producers also vary.

Objective

- Evaluate producers’ perspectives of the three potential benefits (increased yield, decreased production costs, increased convenience) provided by four key precision agriculture technologies (precision soil sampling, guidance/auto-steer, variable rate fertilizer application, yield monitor).

Research Methodology

- Phone survey was conducted June 5 – July 6, 2017.
- 5,295 producers were contacted and 837 respondents were randomly assigned to one of two groups (Robert et al., 1994).
- Respondents were randomly assigned to one of three pairwise best-worst choice experiments in which they were tasked with making a series of choices about the precision agriculture technology most likely to:
  - Increase yield
  - Decrease production costs
  - Increase convenience
- Responses were evaluated using a random parameters logit model (Lusk and Briggeman, 2009) and preference shares were calculated following Wolf and Tonsor (2013).

Pooled Model for Precision Agriculture Technology Most Likely to Increase Yield and Most Likely to Reduce Production Costs (n=574)

- Group 1 (increase yield) and 2 (reduce production costs) were not statistically different so these two groups were pooled for analysis – respondents viewed these generally as technologies that “increase profit.”
- Variable rate fertilizer has the largest preference share (29%) – although variable rate technology is just one component of a larger precision agriculture system, it is the culmination of the ultimate goal of precision agriculture: applying the right amounts of inputs in the right places at the right times (Robert et al., 1994).
- Yield monitor had the smallest preference share (21%) – many of the key benefits associated with yield data accrue at the whole-farm level and may extend over many years, making them difficult to quantify.

Conclusions

- Perceptions of the benefits derived from various precision agriculture technologies are heterogeneous.
- At least some producers may look beyond economic reasons when making technology adoption decisions for certain technologies.
- A distinguishable tradeoff between financial and convenience benefits was observed.
- To better understand, and possibly influence, producers’ precision agriculture technology adoption decisions, consideration of the perceived benefits these technologies provide is needed.

Note: Krinsky-Robb (1986) confidence intervals were calculated and mean preference shares within each model followed by the same letter are not statistically different at the 5% level.

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Precision Agriculture Technology Most Likely to Increase Convenience (n=263)

- Group 3 (increase convenience) was statistically different from the other two groups – the added utility associated with perceived increased convenience of precision agriculture technologies is perceived differently than the impact of these technologies on farm profit.
- Guidance and auto-steer systems (30%) and yield monitors (27%) had the largest preference shares:
  - Previous research linked guidance and auto-steer systems with convenience given their potential to reduce operator fatigue and increase operators’ ability to multi-task (Shockley et al., 2011).
  - The perception that yield monitors are a convenience technology is interesting – even if producers have yet to leverage yield data to improve farm profits, they do enjoy the convenience of being able to easily measure yield within and across fields.
- Precision soil sampling (23%) and variable rate fertilizer (20%) had the smallest preference shares.

References/Contact

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