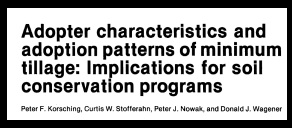
Meta-Review of Barriers and Motivations for Farmers to Adopt Conservation Practices

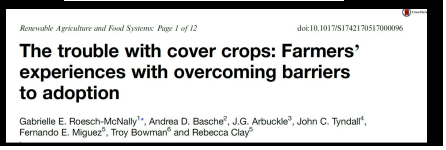
Linda Prokopy, J. Arbuckle, Kristin Floress, Ben Gramig, Sarah Church, Francis Eanes, Yuling Gao, Pranay Ranjan, Ajay Singh

Journal of Environmental Quality SPECIAL SECTION
IMPROVING NITROGEN USE EFFICIENCY IN CROP AND LIVESTOCK PRODUCTION SYSTEMS
Farmers' Use of Nutrient Management: Lessons from Watershed Case Studies
Deanna L. Osmond,* Dana L. K. Hoag, Al E. Luloff, Donald W. Meals, and Kathy Neas

Attitudes and Farmer Conservation Behavior
Gary D. Lynne, J. S. Shonkwiler, and Leandro R. Rola

Land Use Policy
journal homepage: www.elsevier.com/locate/landusepol
Agricultural landowners' willingness to participate in a filter strip program for watershed protection
Felix Kwame Yeboah, Frank Lupi, Michael D. Kaplowitz


Adopter characteristics and adoption patterns of minimum tillage: Implications for soil conservation programs
Peter F. Korsching, Curtis W. Stofferahn, Peter J. Nowak, and Donald J. Wagener


Renewable Agriculture and Food Systems: Page 1 of 12 doi:10.1017/S1742170517000096
The trouble with cover crops: Farmers' experiences with overcoming barriers to adoption
Gabrielle E. Roesch-McNally, Andrea D. Basche, J.G. Arbuckle, John C. Tyndall, Fernando E. Miguez, Troy Bowman and Rebecca Clay

Genesis of This Project

- Prokopy et al. 2008, Baumgart-Getz et al. 2012:
  - Reviewed 55 studies published from 1982-2007 in the U.S.

JOURNAL OF SOIL AND WATER CONSERVATION
The science and art of natural resource management for sustainability
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Most-Cited Articles as of March 1, 2019 -- updated monthly
Rankings based on citations to online articles from HighWire-hosted articles.
Research Section:
L.S. Prokopy, K. Floress, D. Klotthor-Weinkauf, and A. Baumgart-Getz
Determinants of agricultural best management practice adoption: Evidence from the literature
Journal of Soil and Water Conservation 2008 63(5):300-311; doi:10.2489/jswc.63.5.300
»Abstract »Full Text (PDF) »References

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- Findings:
  - No consistent determinants of conservation adoption
  - Most often positively associated with conservation adoption: education, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and social networks
- Since publication:
  - Increasing numbers of qualitative papers
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  - Overall explosion of research in this area
- Walton Family Foundation interest

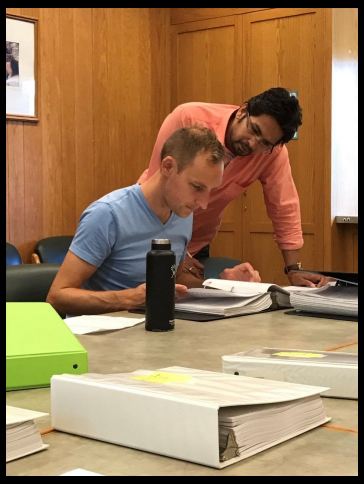
Overview

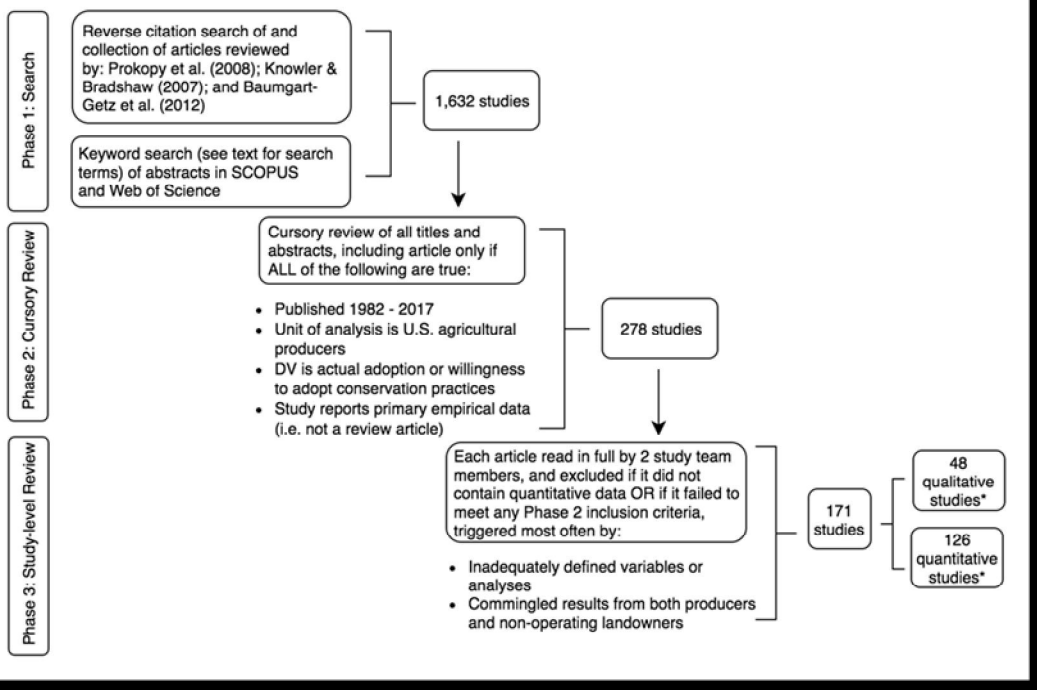
- Generating data
- Coding studies
- Selective results
- What this means for practice
- What this means for research
- Your questions and comments

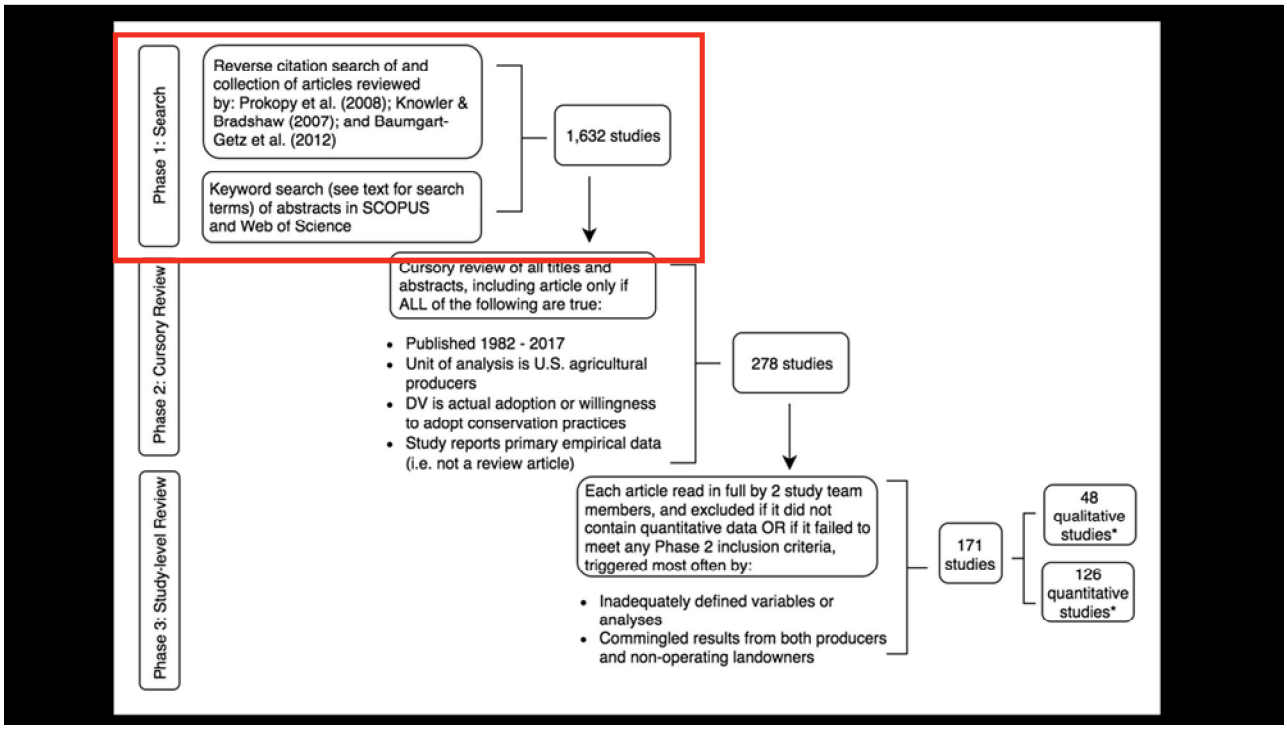
Generating Rows of Data: Finding Papers

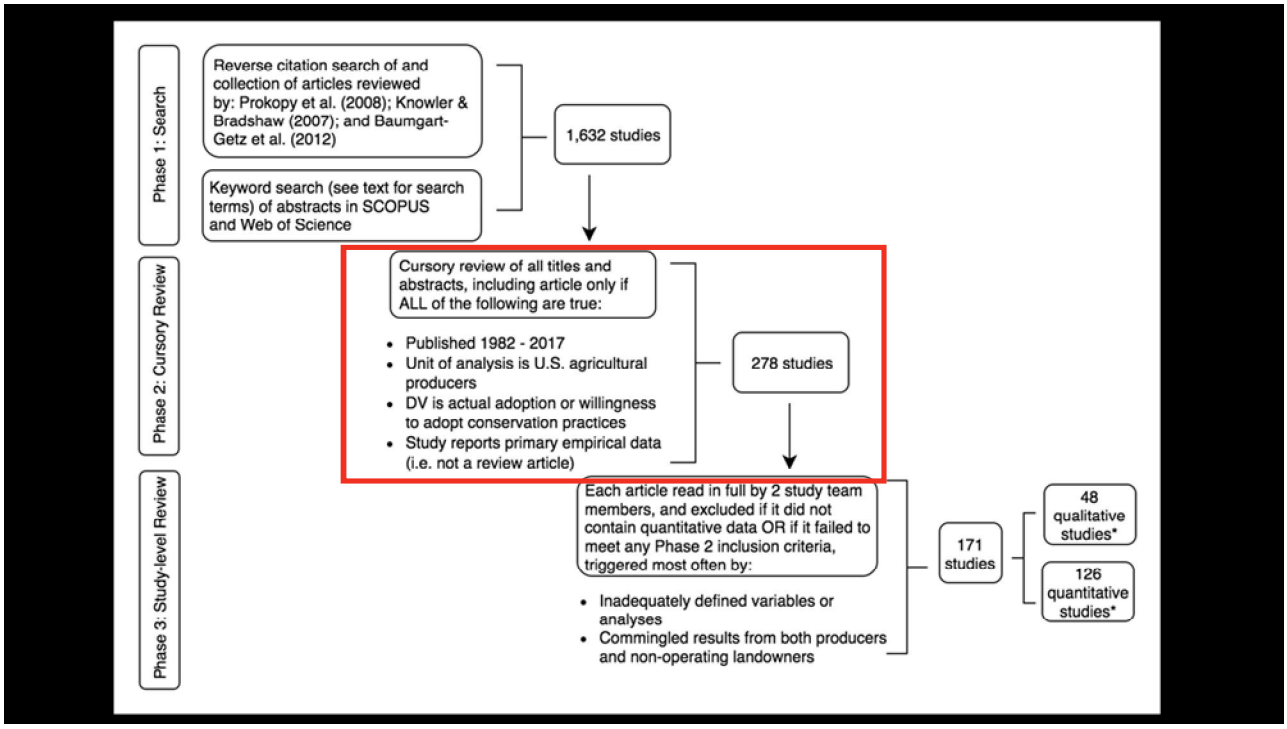
Overview

- Inclusion/exclusion criteria
- Total: 171 studies; 126 quantitative, 48 qualitative
- For quantitative:
  - 2 reviewers on every paper
  - Collected all study level and individual analysis data
  - Recorded variables in authors' words






Phase 1: Search
Reverse citation search of and collection of articles reviewed by: Prokopy et al. (2008); Knowler & Bradshaw (2007); and Baumgart-Getz et al. (2012)
Keyword search (see text for search terms) of abstracts in SCOPUS and Web of Science
1,632 studies
Phase 2: Cursory Review
Cursory review of all titles and abstracts, including article only if ALL of the following are true:
Published 1982 - 2017
Unit of analysis is U.S. agricultural producers
DV is actual adoption or willingness to adopt conservation practices
Study reports primary empirical data (i.e. not a review article)
278 studies
Phase 3: Study-level Review
Each article read in full by 2 study team members, and excluded if it did not contain quantitative data OR if it failed to meet any Phase 2 inclusion criteria, triggered most often by:
Inadequately defined variables or analyses
Commingled results from both producers and non-operating landowners
171 studies
48 qualitative studies*
126 quantitative studies*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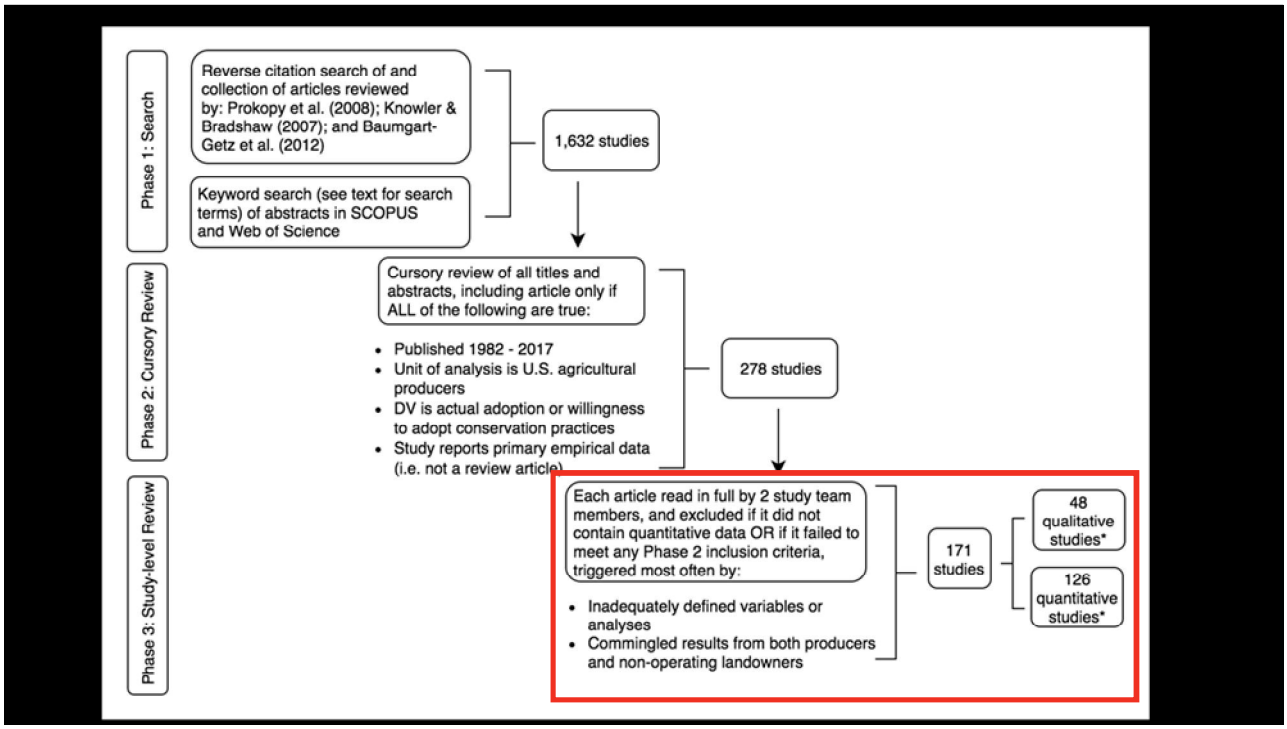


Coding Papers, aka where did the last 2 years of our lives go??

Coding Methods

- Primary and secondary coder for each paper
- Coding – excel template with dropdowns
- Study-level and individual level study sheets
- Each study on its own sheet for easy tracking
- Primary coded, then sent code sheet to secondary
  - Secondary reviewed coding, agreed or disagreed with primary
  - All disagreements discussed between primary and secondary until resolved
  - Remaining issues brought to full group

Image credit: by Stephen Kirkpatrick, organic crops in high tunnel. Courtesy of USDA NRCS.

Study Level Characteristics

- Key characteristics of each study (39 data fields)
- Theoretical grounding, data collection method, sampling method, response rate, population description, geographic scope, types of crops/livestock…
- 107 quantitative studies looking at adoption (excluding willingness)

Image credit: by Lance Cheung, taken at Sunny Ridge Farm, MD. Courtesy of USDA NRCS.

Dependent variables	Target population	Exclusion criteria
• Adoption/behaviors • Willingness to adopt • Willingness to accept payments • Interest in participating in practices, programs	• Agricultural producers: • Conventional • Specialty • Organic • Agroforestry • Livestock • Row crops • Urban	• Reviews, discussions • Sample selectivity models • >1 paper reporting on same model

Individual Study Results Coding

Image credit: by Jeff Vanuga, lagoon waste management system for 900 head hog farm. Courtesy of USDA NRCS.

- Some papers had multiple analyses
- DV, DV measure type and IV/IV measure type
- For all DVs and IVs
  - Binary, categorical, ordinal, continuous *as described by authors*
  - Measure notes – scales used, meaning of coding (e.g. 0/1 =not adopt/adopt; 1-5 agreement from strongly disagree to strongly agree)
  - Analysis # and method
  - Vote count (pos, neg, insig)
  - p-value range, threshold used in paper, p-value
  - Model results (coefficients, t statistics, R2, etc.)

Coding Methods

- DV, IV category and subcategories NOT assigned during coding
- Full team meeting – 2 days in-person
- Weekly calls with majority

- **Attitudes**
- **Awareness**
- **Behavior**
- **Economic Factors**
- **Information**
- **Operator Characteristics**
- **Farm Characteristics**

Coding Qualitative Papers – work led by Dr. Sarah Church and Dr. Pranay Ranjan

Qualitative data: *What and why?*

- More and more qualitative studies since 2008
- Additional perspective
- Farmer voice
- Provides understanding and nuance

Coding Methods

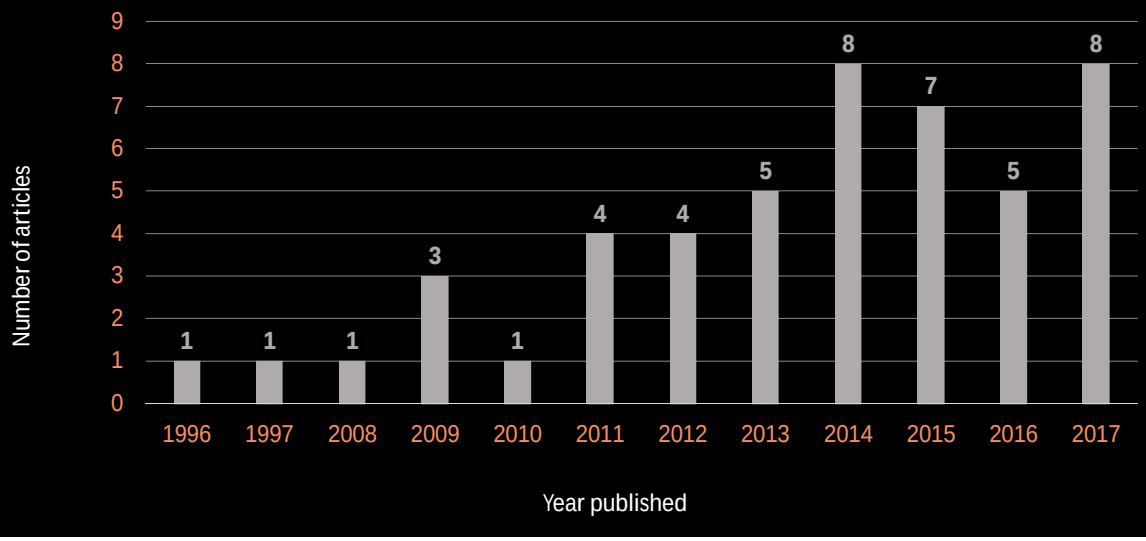
- Coding framework
  - Quantitative foundation
  - Refined inductively
- 48 articles
  - 2 researchers
  - 24 per researcher
- 2nd review on 24 articles
- Codebook refinement - definitions
- Reports to full group

Attitudes
(10 subcategories)

Barriers
(16 subcategories)

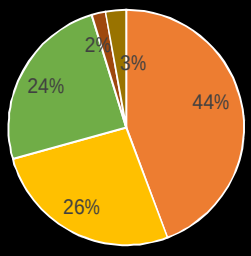
Motivations
(18 subcategories)

Results



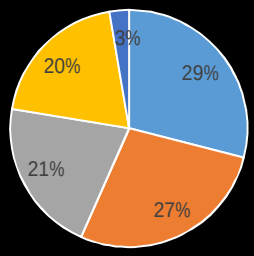
Study Level Characteristics

Theoretical grounding



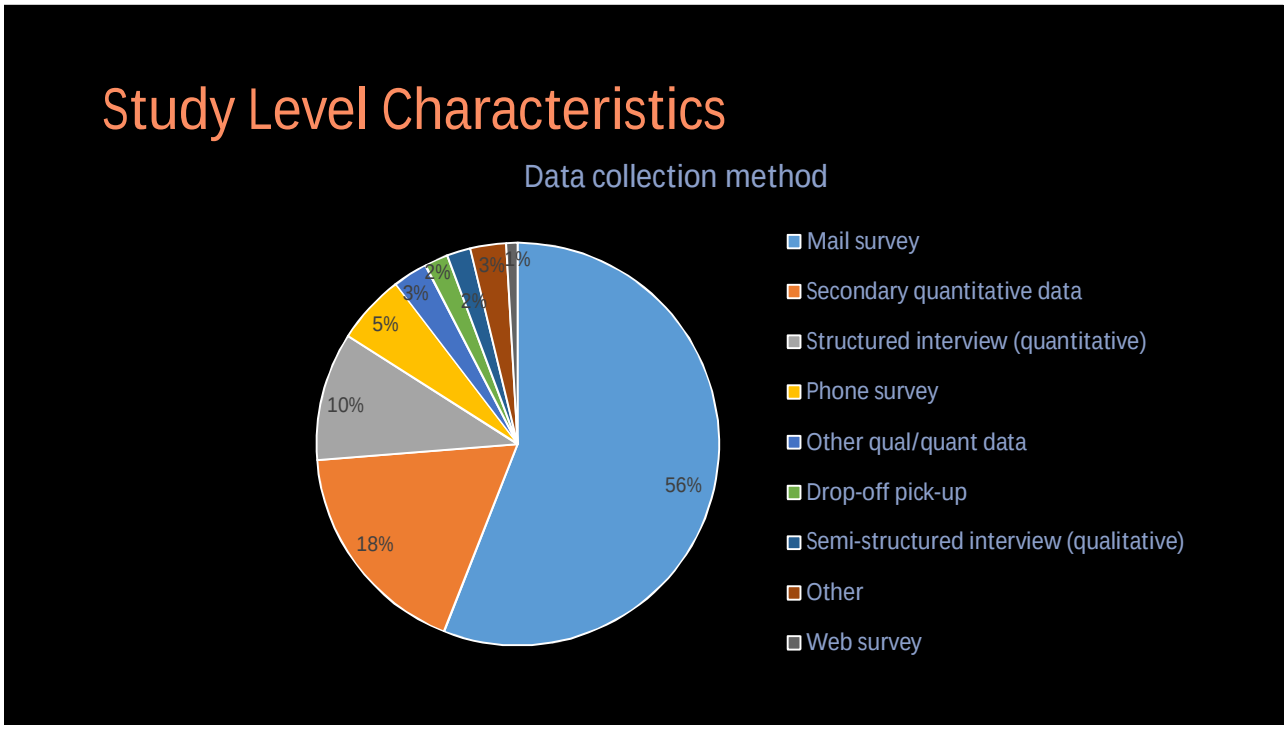
- Complete theoretical framework
- No theory employed
- Theory used in lit review
- Theory incorporated into discussion
- Other

Specific theory



- Multiple
- Microeconomic theory
- Other
- Diffusion/innovation
- Theory of Planned Behavior

Study Level Characteristics



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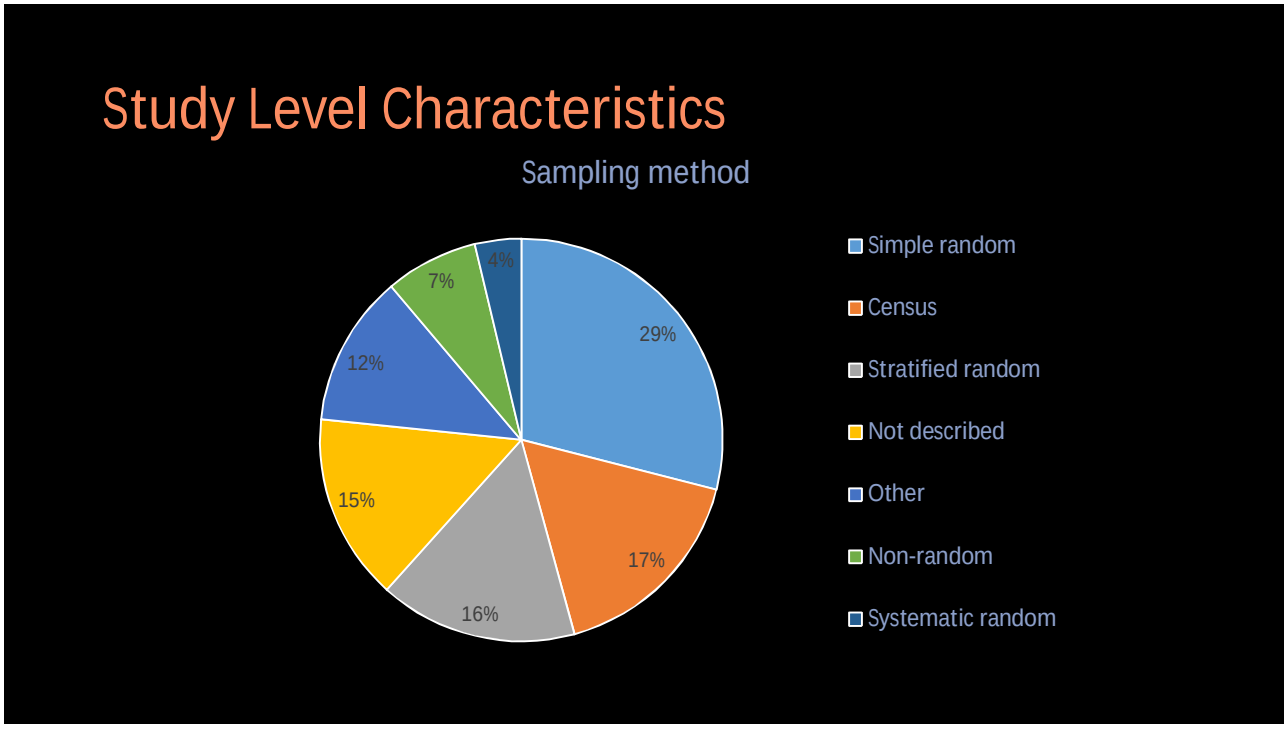
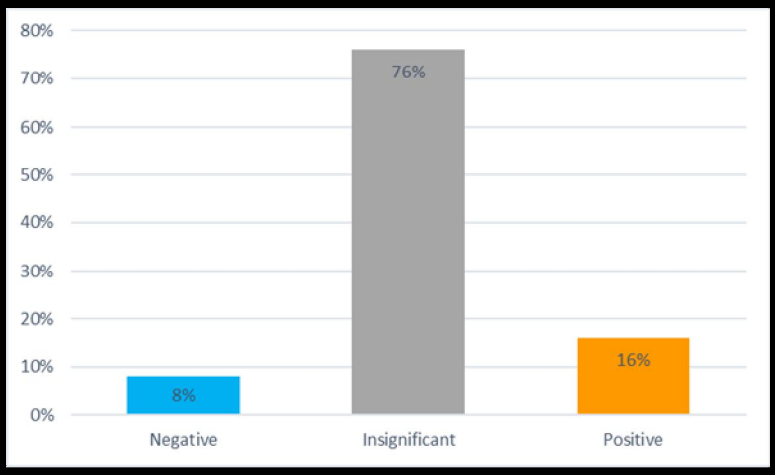


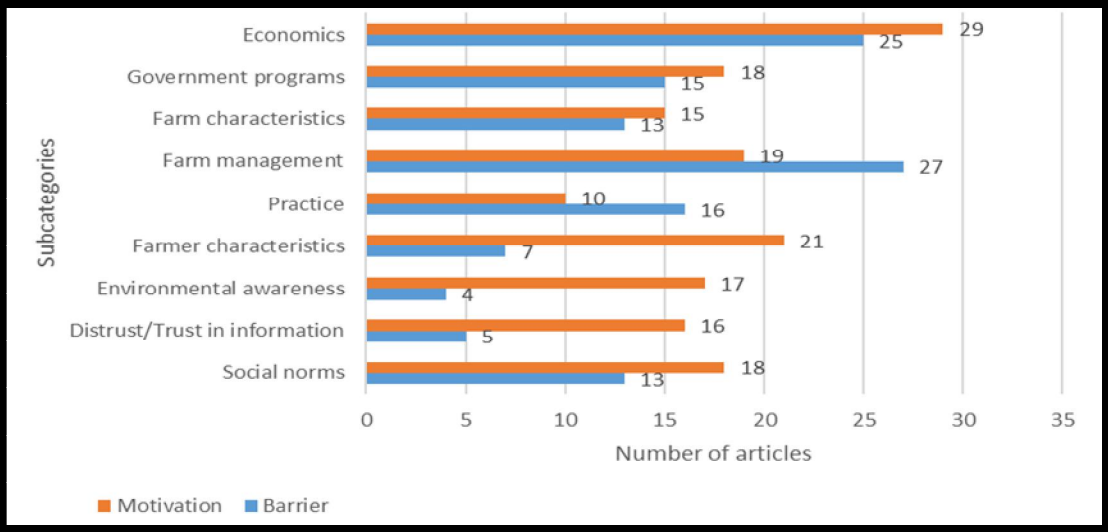
Results

Overall Quantitative Vote Count: Statistical Significance of IVs All Models, 5757 rows of data, 78 Studies, 1982-2017



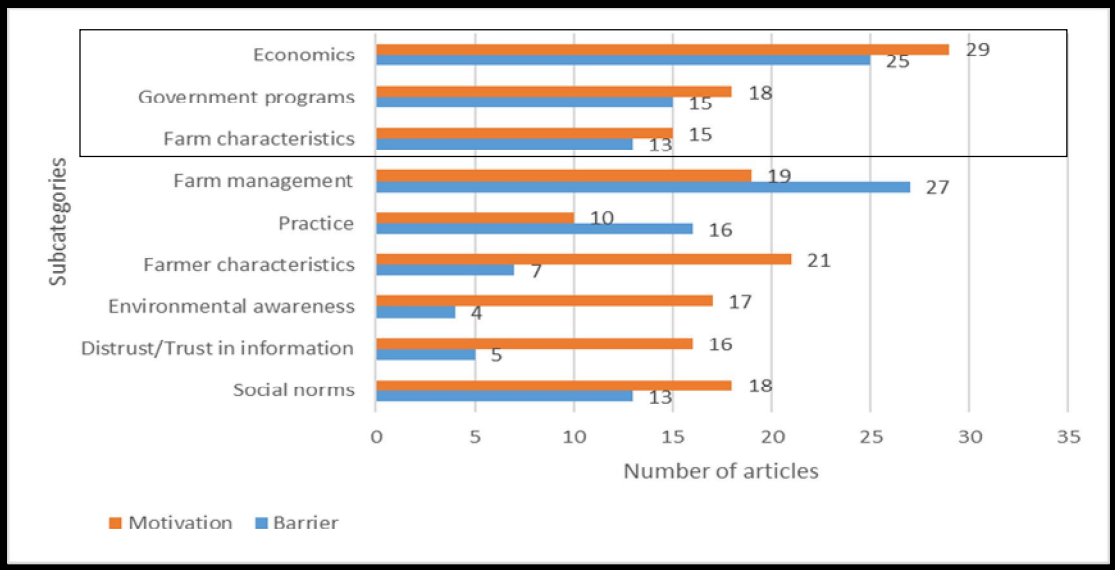
Prokopy et al., In Review, *Journal of Soil and Water Conservation*

Qualitative Results: *Motivations and barriers, overview*
48 papers, 1996-2017



Ranjan, Church, et al., In Review, *Society and Natural Resources*

Results: *Motivations and barriers, overview*



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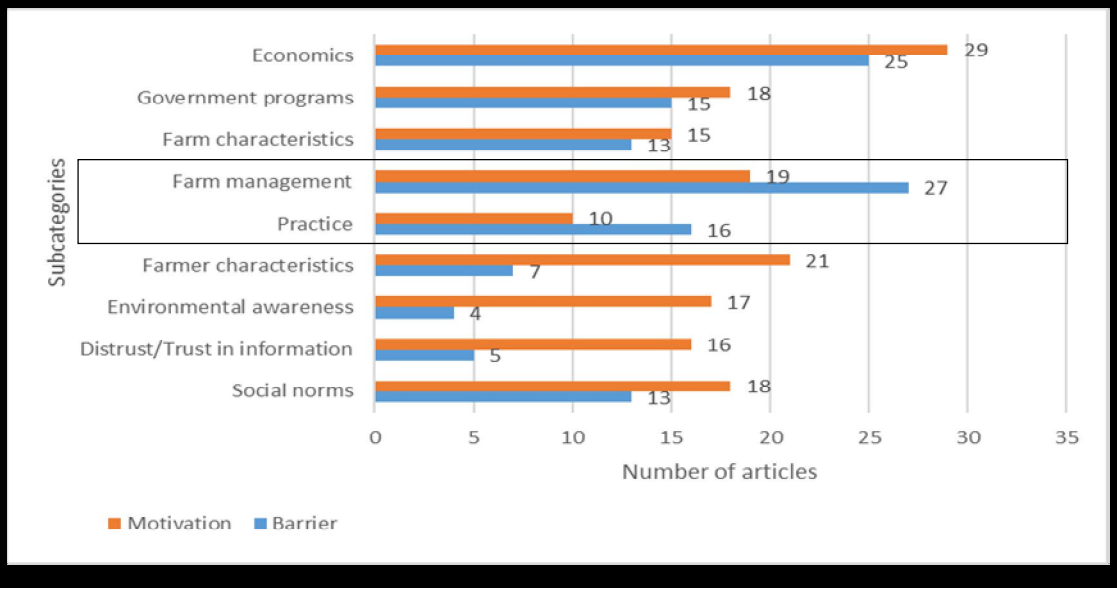

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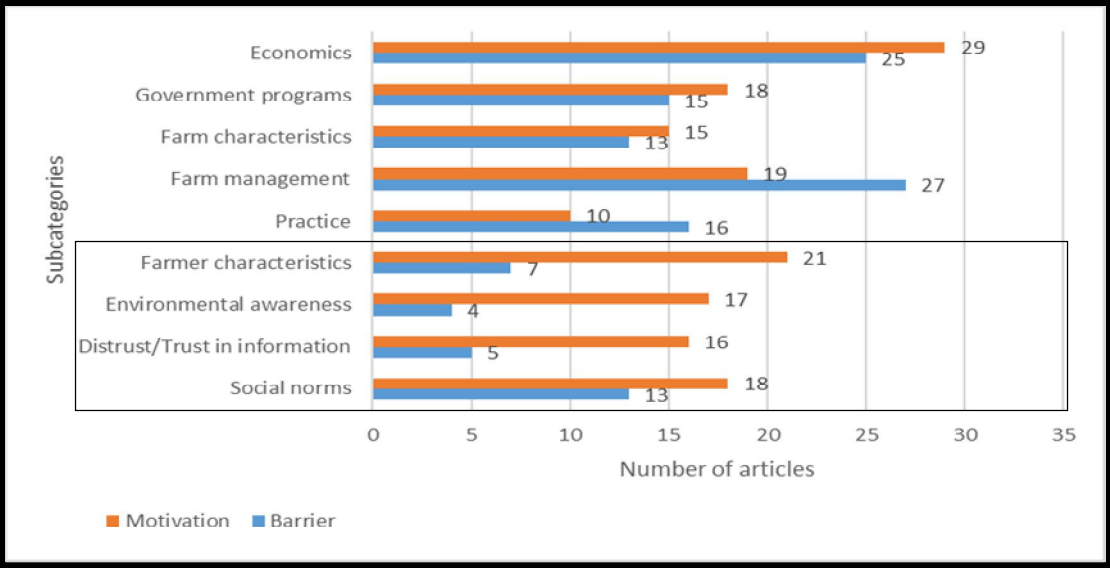
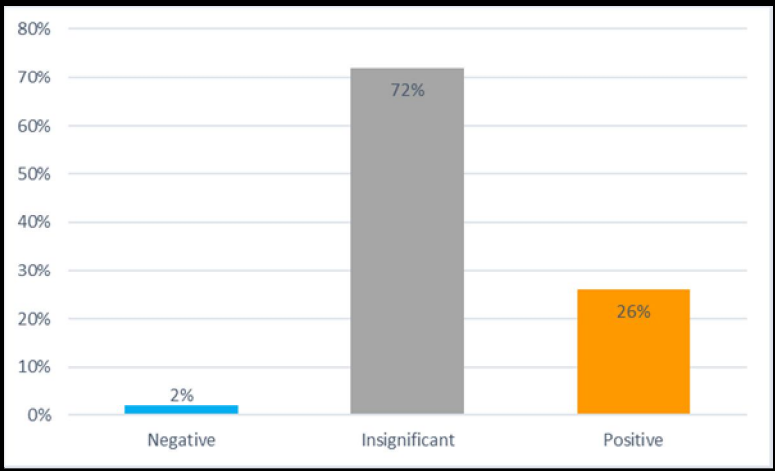
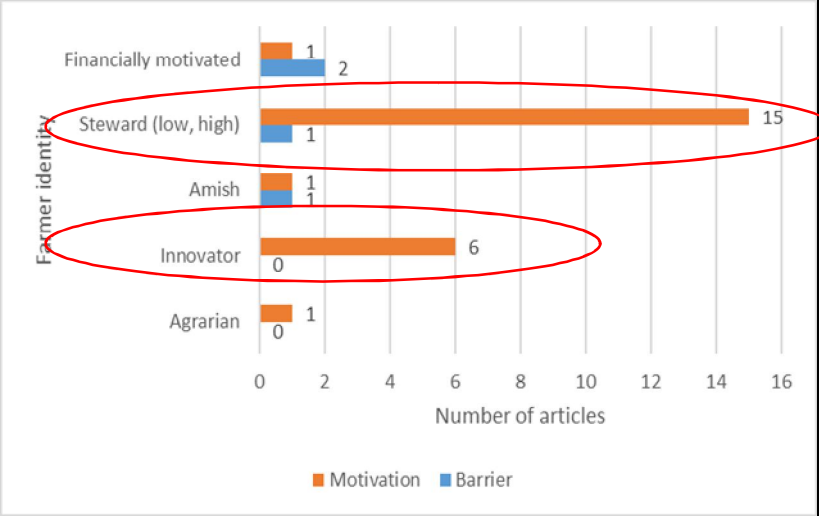


Non-Financially Motivated Identity

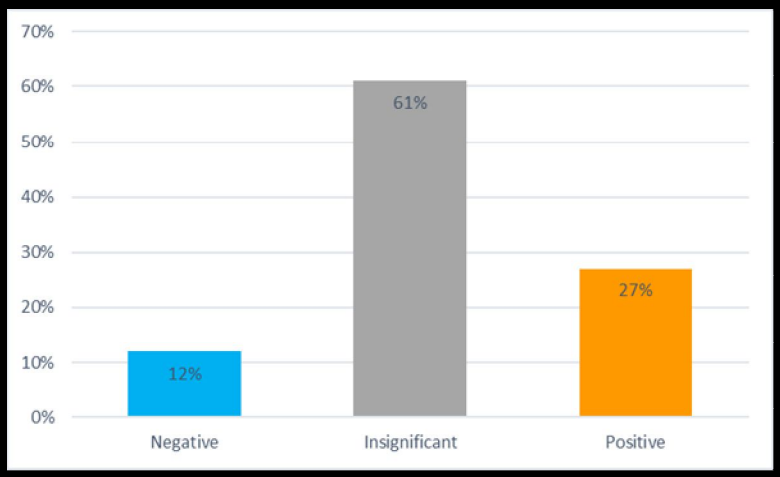


Results: *Farmer identity*

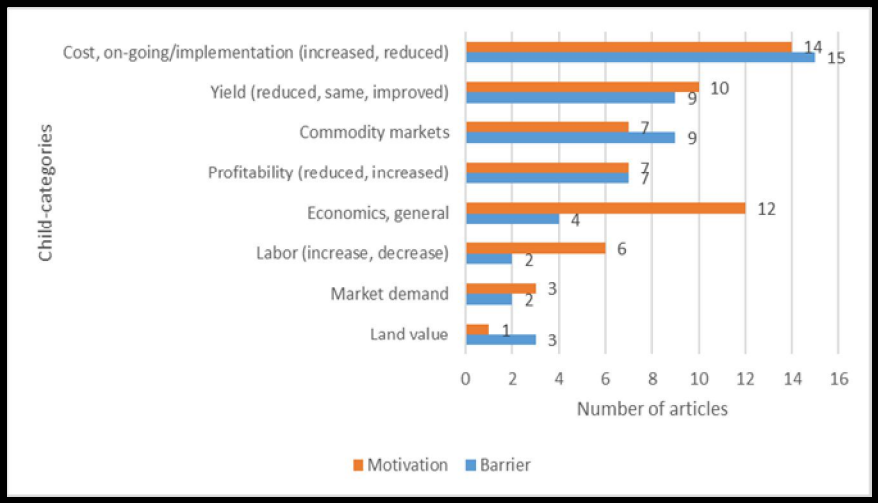


"I wanna see the land preserved as much as possible. So we don't farm it to death or farm it in a way that it washes away or whatever."
(Druschke, 2013)

Positive Attitudes towards Practice



Results: *Economics child-categories*



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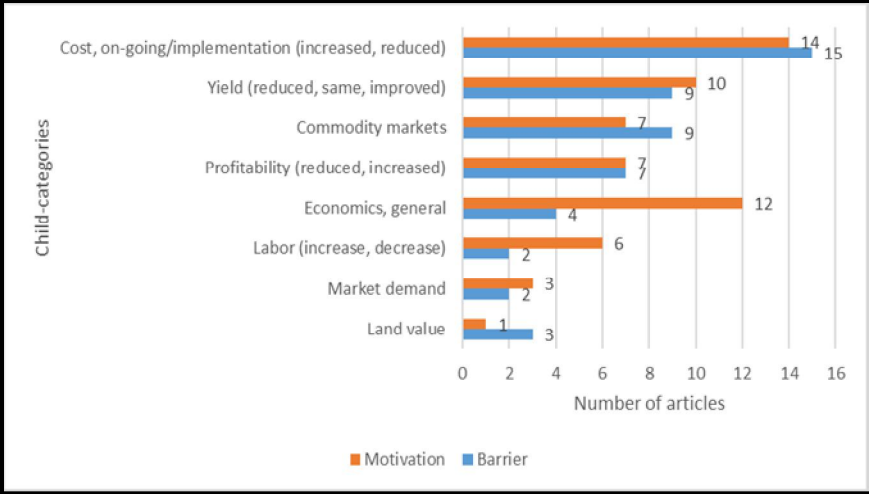
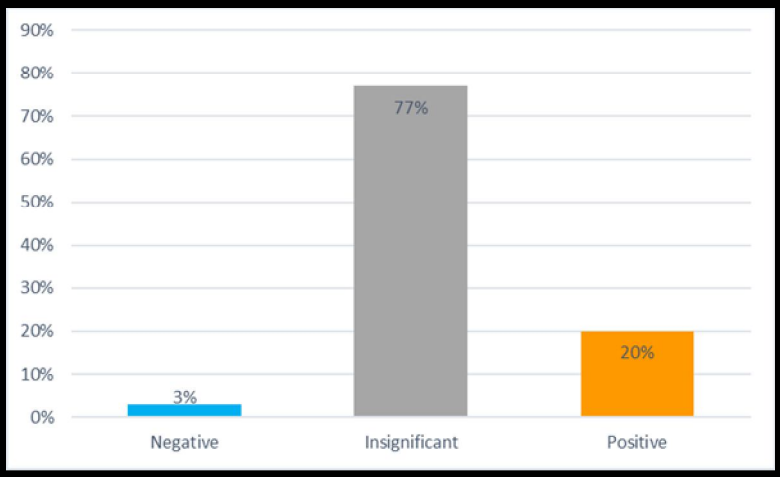
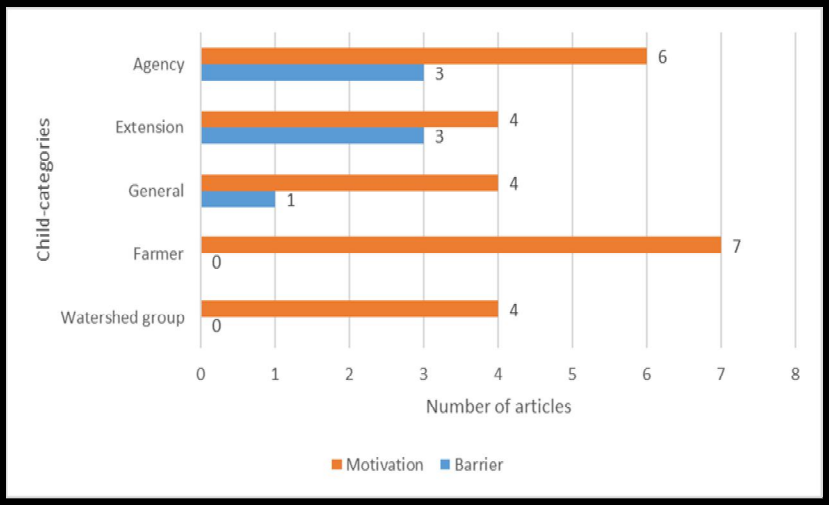


"Cost. I'm doing the numbers for cover crops right now and it's a lot of money for establishment."
(Krajewski, 2017)

Seeking/Using Information



Results: *Trust/distrust in information child-categories*



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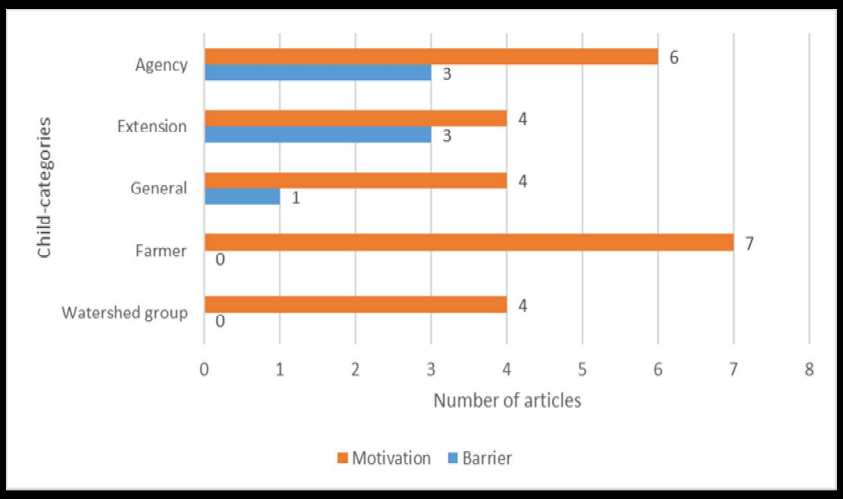
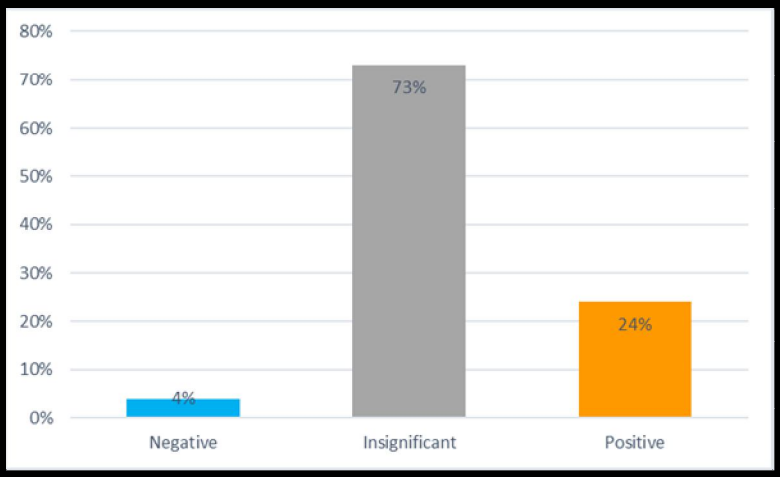
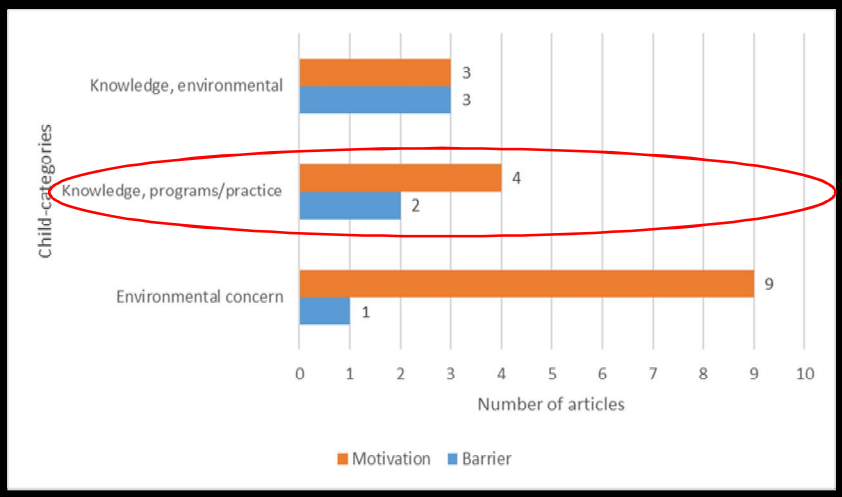


"Six farmers who had positive experiences with conservation programs mentioned the helpful nature of conservation personnel."
(Atwell et al., 2009)

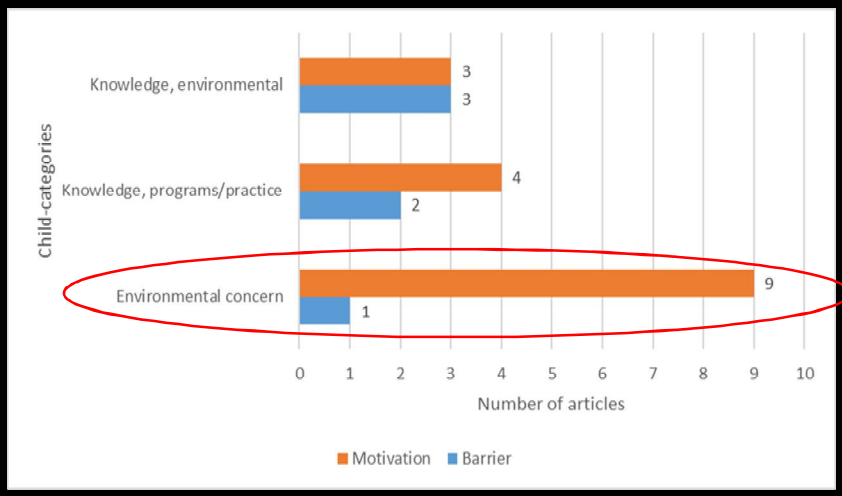
Awareness of Program/Practice



Results: *Environmental awareness child-categories*

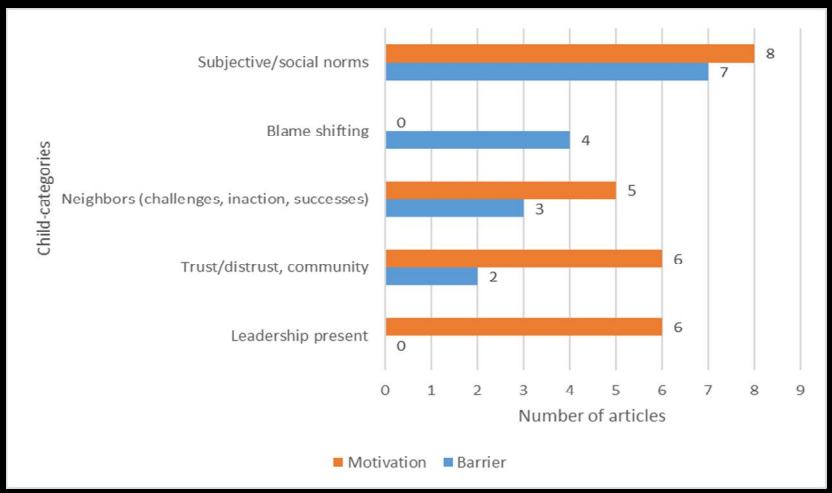


Results: *Environmental awareness child-categories*



"If there was a practice that showed a great economic return, but yet resulted in, losing nitrogen, or losing nutrients or, you know, something that was really bad for water quality, I would think twice about it." (David et al., 2015)

Results: *Social norms child-categories*



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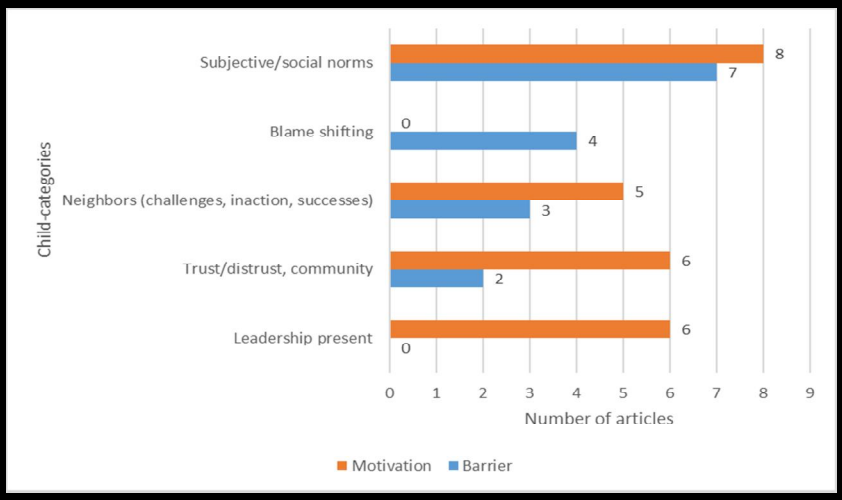
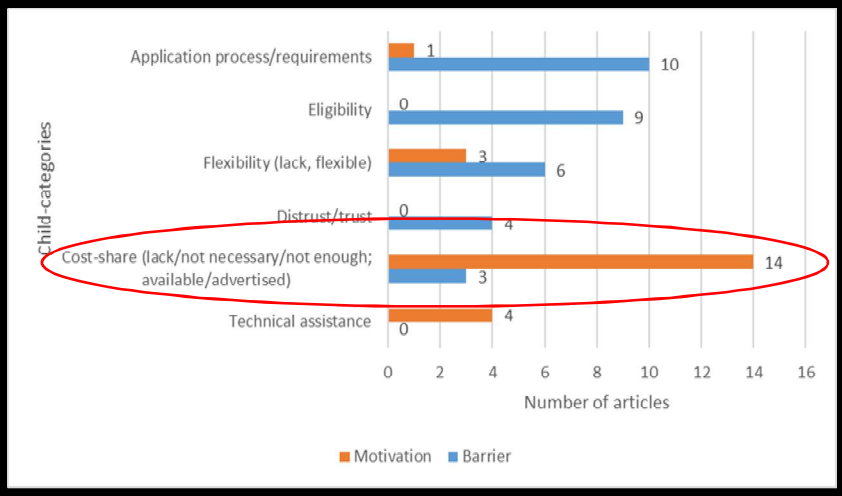


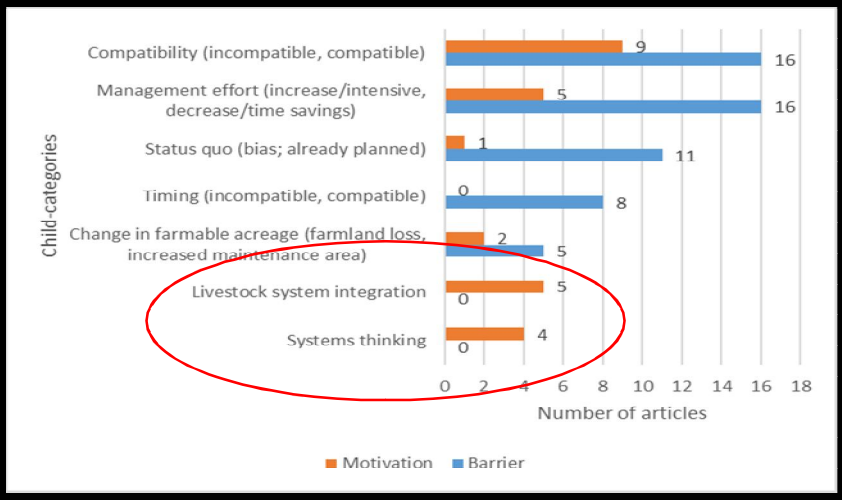
"Producers in this watershed discussed grassed waterways as if they were common sense and they needed them to control erosion, reflecting a commonly held belief as well as a perceived norm."
(Reimer et al., 2012)

Results: *Government programs child-categories*



"Agency staff and farmers alike noted the importance of cost-share programs and the agency's ability to advertise as critical in farmer decisions to adopt BMPs."
(Campbell et al. 2011)

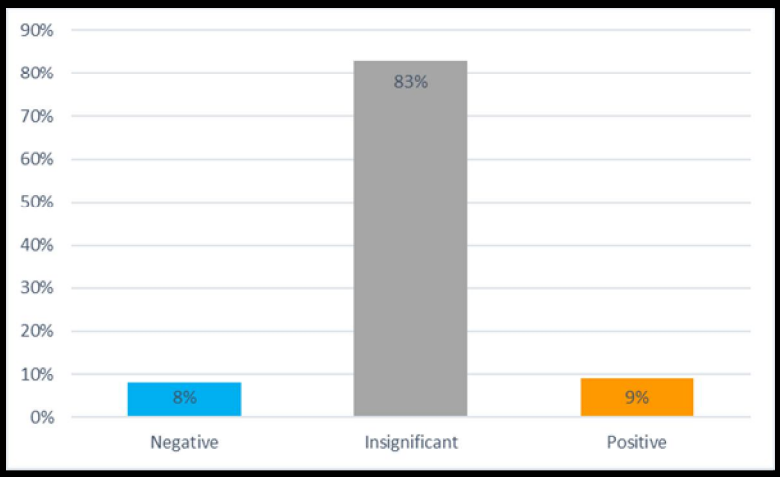
Results: *Farm management child-categories*



Select Findings - Summary

- IMPORTANT =
  - Positive attitudes towards programs and practices
  - Awareness of programs/practices
  - Seeking and using information
  - Identity not driven solely by financial motives
  - Trust and social norms
  - Government programs – cost share
  - Systems thinking

Tenure: Ownership vs. Renting



Lessons Learned

Lessons Learned—Implications for Diffusion

- Information seeking/networking:
  - seeking and using information is critical!!!!
  - more info needed about role of training
  - more info about trust, change agents needed
    - better funding for Extension, more use of non-traditional actors?
- Positive attitudes toward programs and practices:
  - inadequacy of "information deficit" approach re: water quality problems and conservation adoption
  - economics of practice
- Stewardship identity:
  - more strategic/targeted message-framing
- Wherefore land tenure?
  - larger operators adopting a practice on all acres, no matter what
  - oversimplified measurement

Lessons Learned—For Technology Transfer

- No consistently strong predictors
- Many generally "not significant"
- Most predictor variable "positive" predictors. What about barriers?

Lessons Learned—Future Adoption Research

- Survey space and time are limited, can't ask about or measure all potential factors
- Many adoption studies have major weaknesses
  - lack of theoretical foundations, theory building
  - need for clarity in research design, data collection, and analysis
  - non-scientific sampling
  - lack of measurement consistency across studies, not validated
  - measurement error
- Bottom line: Quantitative adoption studies are not as helpful as we would like
  - Need for collaborative effort to address weaknesses, build consistency to compare results

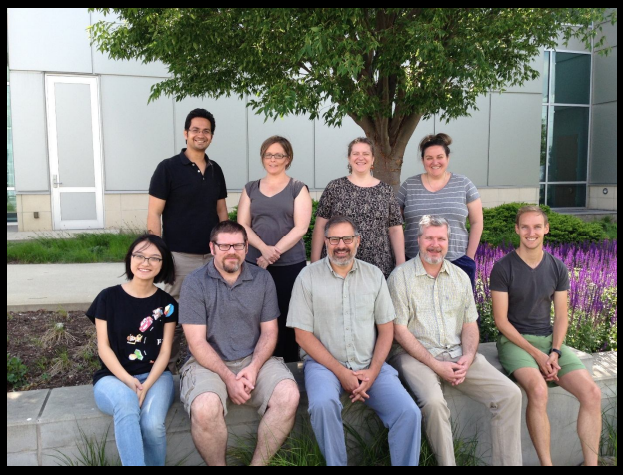
Future Analyses

- Does the dependent variable (the actual practice or program) matter?
- Effect size analysis
- Willingness vs. adoption
- Drilling down into the independent variables
- Have explanatory variables changed over time?

Acknowledgments

- Study Team: J. Arbuckle, Kristin Floress, Ben Gramig, Sarah Church, Francis Eanes, Yuling Gao, Linda Prokopy, Pranay Ranjan, Ajay Singh

- Funding: Walton Family Foundation, USDA-NIFA multi-state project NC1190



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USDA United States Department of Agriculture National Institute of Food and Agriculture

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