



**Michigan
Technological
University**

Michigan Technological University
Digital Commons @ Michigan Tech

Michigan Tech Publications

12-10-2020

Training future agriculture professionals in landowner–tenant conservation decision-making

Andrea Basche
College of Agricultural Sciences and Natural Resources

Angela Carter
Michigan Technological University, ancarter@mtu.edu

Follow this and additional works at: <https://digitalcommons.mtu.edu/michigantech-p>



Part of the [Agriculture Commons](#), and the [Environmental Studies Commons](#)

Recommended Citation

Basche, A., & Carter, A. (2020). Training future agriculture professionals in landowner–tenant conservation decision-making. *Natural Sciences Education*, 50(1). <http://doi.org/10.1002/nse2.20035>
Retrieved from: <https://digitalcommons.mtu.edu/michigantech-p/15458>

Follow this and additional works at: <https://digitalcommons.mtu.edu/michigantech-p>



Part of the [Agriculture Commons](#), and the [Environmental Studies Commons](#)

ORIGINAL RESEARCH ARTICLE

Undergraduate Education

Training future agriculture professionals in landowner–tenant conservation decision-making

Andrea Basche¹  | Angie Carter² 

¹ Dep. of Agronomy and Horticulture, Univ. of Nebraska, 1875 N. 38th Street, Lincoln, NE 68583, USA

² Dep. of Social Sciences, Michigan Tech Univ., 1400 Townsend Dr., Houghton, MI 49931, USA

Correspondence

Andrea Basche, Dep. of Agronomy and Horticulture, Univ. of Nebraska, 1875 N. 38th Street, Lincoln, NE 68583, USA.

Email: abasche2@unl.edu

Assigned to Associate Editor Kulbhushan Grover.

Abstract

The landowner–tenant relationship is important to the implementation of conservation on agricultural lands. Women own or co-own a significant portion of U.S. farmland yet are underrepresented in conservation research. The next generation of agriculture professionals can benefit from first-hand experience in assisting women landowners and their tenants in navigating the complexities of conservation decision-making. This article analyzes undergraduate student perceptions of landowner–tenant relationships in conservation management through their engagement in case studies with women landowner–tenant pairs in the Western Corn Belt. Student groups were asked to complete a management improvement plan that both incorporated the agronomic and conservation goals discussed by the landowners and tenants, following a field trip and interviews with the landowners, tenants, and other key stakeholders. Assessment data included a quantitative survey of career goals and conservation attitudes, qualitative reflections at start and end of course, and autoethnographic observations. The case studies presented students with new knowledge challenging previously held assumptions, leading some students to reconsider landowner–tenant relationships and conservation decision-making. However, students returned to existing gendered norms and production-oriented stereotypes when applying this knowledge in real-world farm management plans. Although students gained firsthand valuable experience from the case studies, a one-semester case study was insufficient to significantly shift student perceptions. We recommend that more curricular experiences incorporate the complexities of agricultural decision-making to better equip future agricultural professionals with skills to ensure environmental and social sustainability outcomes.

1 | INTRODUCTION

Nebraska is the fourth-ranked state for the total value of agricultural products sold and ranks among the top five cash producers for major U.S. commodities including cattle, corn (*Zea mays* L.), and soybean [*Glycine max* (L.) Merr.] (USDA-ERS, 2020). Geographically, it is located in a unique

Abbreviations: USDA-NRCS, U.S. Department of Agriculture–Natural Resources Conservation Service; USDA-SARE, U.S. Department of Agriculture–Sustainable Agriculture Research and Education.

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2020 The Authors. *Natural Sciences Education* published by Wiley Periodicals, LLC on behalf of American Society of Agronomy

position in the Northern Great Plains, at the western edge of the Corn Belt and adjacent to the major wheat-producing states across the Plains and Mountain West, and therefore represents a nexus of several major U.S. agricultural commodities. Agriculture dominates its land use, with 91% of the state either in cropland or grassland utilized for livestock (Nebraska Department of Agriculture, 2019) and corn or soybean representing approximately 70% of harvested cropland (USDA-NASS, 2020). Although these commodities represent economic drivers in the state, they also contribute to significant soil and water degradation challenges, where a number of surface waters are above the safe drinking water levels for nitrate and smaller municipalities require costly water treatment infrastructure (City of Hastings, 2020; Mittelstet, Gilmore, Messer, Rudnick, & Heatherly, 2019). Such challenges are ubiquitous across agricultural regions in the United States, where watersheds with greater amounts of cropland are found to contribute more to flood frequency, discharge, and nitrate-nitrogen concentrations in surface waters (Broussard & Turner, 2009; Raymond, Oh, Turner, & Broussard, 2008; Zhang & Schilling, 2006). Significant soil degradation over just the last several decades is a result of more intensified crop management including decreased crop diversity, more intensive tillage, and increased use of chemical-based fertilizers (Veenstra & Burras, 2015). Further, these trends in soil and water degradation are expected to intensify with climate change (Gowda et al., 2018). In spite of decades of conservation research and billions of dollars annually spent on conservation, it is difficult to pinpoint individual attitudes or characteristics that predict farmer adoption of conservation practices (Prokopy et al., 2019), and negative environmental consequences from agricultural production persist (Broussard, Turner, & Westra, 2012; Prokopy et al., 2020).

Farmer–operators have been the focus of much conservation adoption research; however, scholars argue that a more critical study of land ownership and tenure is needed to advance conservation goals (Carolan, 2005; Carter, 2019; Petrzela & Marquart-Pyatt, 2011). Thirty-nine percent of agricultural land in the United States is farmed by someone other than the landowner (USDA-NASS, 2014), yet the tenant–farmland owner relationship is understudied in agricultural research (Barnett, Spangler, Petrzela, & Filipiak, 2020). Furthermore, 42% of Nebraska landowners (including co-owners) are women (USDA-NASS, 2020), yet women landowners are an underrepresented demographic in conservation adoption outreach and research (Eells & Soulis, 2013; Wells & Eells, 2011). The large percentage of rented hectares (acres), paired with the lack of research on women landowners, poses challenges to agricultural advisors, conservation professionals, and agribusiness, who are tasked with enrolling more hectares (acres) in conservation programs and initiatives. This is particularly important in the

Core Ideas

- Conservation implementation depends upon landowner–tenant relationships.
- Women landowner–tenant case studies provided real-life scenarios for undergraduate students.
- Students recognized the importance of landowner–tenant relationships to their careers.
- Students typically defaulted to gendered and production-oriented mindsets.
- Social components of diversification and sustainability need emphasis in curriculum.

context of women landowners, as gendered power dynamics in this relationship may influence if and how women landowners access and utilize information about conservation (Carter, 2017; Druschke & Secchi, 2014; Wells & Eells, 2011).

Beginning farmers and early career professionals are in both a unique and challenging situation, at present, in terms of entering the agricultural and farming workforce. It is estimated that through 2030, 70% of U.S. private farm and ranchland will change ownership, as up to 25% of farmers and ranchers retire (Parsons et al., 2010). Additionally, recent research notes that if farm incomes continue to fall, as they have been for the last several years, young and beginning farmers are more likely to experience extreme financial stress (Key, 2019). This is occurring within the context of continued farm consolidation and increasing farm sizes across many agricultural enterprises (MacDonald, 2020). The students in today's undergraduate agronomy courses will soon be navigating complex social relationships and decision-making, whether it is in respect to their own families' farm operations or as agricultural advisors.

Although content delivery in agronomy classes often focuses on technical or cognitive domain skills, such as quantifying crop management recommendations (i.e., how much fertilizer to apply, which products to include in an herbicide program), there are a number of skills more associated with the affective domain that are important in discerning the complexity of factors that influence decision-making on farms, including the economic, social, and environmental components (Bloom, 1956). Skills in the affective domain, associated with values, attitudes, and emotions, are of particular importance for future farmers and consultants in navigating landowner–tenant relationships and for implementing conservation, where there are known to be a multitude of factors that impact decision-making (Prokopy, Floress, Klotthor-Weinkauff, & Baumgart-Getz, 2008). Additionally, there are pedagogical approaches shown to be effective for gaining

such skills in undergraduate education. Authentic or experiential learning associated with field-based courses, involving stakeholders and community groups, have been shown to improve student learning, engagement, and professional development in undergraduate agriculture courses (Jelinski, Perrone, Blair, & Fabian, 2020; Mann & Schroeder, 2019; Sorensen, Corral, Dauer, & Fontaine, 2018; Yates & Hodgson, 2018).

Given the urgency of climate change adaptation, soil conservation, and water quality improvements, as well as concerns about land tenure, it is critical the next generation of agricultural advisors be well equipped in navigating the complexities of the landowner–tenant relationship if we are to implement more practices on the ground. In this project, we analyze a model for training and educating future agricultural advisors and conservation professionals in the social dynamics of on-farm conservation. We focus on a senior capstone course taught by the first author at the University of Nebraska-Lincoln, analyzing a case study project involving three pairs of women landowners and their tenants in eastern Nebraska and northwestern Missouri. As we explain further in the following section, we partnered purposefully with women farmland owners in the case study creation; this was an effort to increase students' exposure to a demographic often underrepresented in agricultural programs, yet who are influential in conservation implementation. To understand how students learn about the landowner–tenant relationship and view its importance to their careers, we asked the following questions:

- How do agronomy students' understandings of the landowner–tenant relationship shift throughout the semester as they learn more about this relationship and work on a conservation plan that fits the goals of both landowner and tenant?
- How do these understandings inform students' own career and education goals beyond this class?
- How do student definitions of conservation-related terms shift throughout this course experience?

2 | MATERIALS AND METHODS

2.1 | Course overview

The course described in this research project is a capstone (culminating or summative experience) intended to integrate knowledge from prior courses and experiences into a major project. The course has been taught for several decades within the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln in a similar experiential-learning format; students participate in a pre-semester field trip to learn about the challenges and goals of a farm opera-

tion for which they will develop a farm improvement plan over the course of the semester. The final course assignment asked students to focus on at least two production challenges as well as one more conservation-oriented goal (although these elements were noted as not needing to be mutually exclusive). In the past, this farm improvement plan focused only on the primary farmer operator and did not include intentional emphasis on the role of the landowners in decision-making. Thirty-two students were enrolled in the course; course enrollment typically ranges from 20 to 40 students and is usually comprised of senior-level students majoring or minoring in agronomy, the majority of whom intended to farm and/or advise farmers in the future (Table 1). We did not collect racial/ethnic identity information though the class seemed to reflect consistency with the broader college's student demographics, which are approximately 86% White–Non Hispanic and 8% minority student (Asian, Black–Non Hispanic, Hispanic, American Indian/Alaska Native, or Two or More Races) (UNL-CASNR, 2016).

2.2 | Landowner-farmer collaboration

In summer–fall 2018, the co-authors recruited three Nebraska women farmland owners through the Center for Rural Affairs' network (Center for Rural Affairs, 2020; the Center for Rural Affairs is a non-profit dedicated to strengthening rural communities, social and economic justice, and environmental stewardship, with headquarters in Lyons, NE) to collaborate on a U.S. Department of Agriculture–North Central Region–Sustainable Agriculture Research and Education (USDA-NCR-SARE) Partnership proposal. To participate, landowners' tenants needed to agree to sharing agronomic farm management data with students in a University of Nebraska-Lincoln senior agronomy capstone course and farms needed to be located within a day's drive from the University campus. We did not collect demographic information about the women farmland owners beyond gender identity, and therefore can make no statements as to their racial or class identities. The project proposed to analyze tenant–landowner conservation decision-making through the development of three different farm case studies to be created by students in the senior agronomy capstone course. The aim was to create a management plan for use by the landowner–tenant teams and to educate students about the importance of social relationships in conservation and farm management more broadly. We strategically chose to focus on women farmland owners knowing that they are underrepresented in scientific study and agricultural outreach (Eells & Soulis, 2013; Wells & Eells, 2011) despite owning or co-owning 42% of Nebraska farmland (USDA-NASS, 2020). The project was funded in spring of 2019; USDA-NCR-SARE grant award ONC19-052 funding provided compensation to landowners and tenants for

TABLE 1 Overview of student demographic information

Student major or co-major	Count	Demographics	Count	
Agronomy	31	Male	29	
Plant biology	1	Female	3	
Fisheries and wildlife	1			
Student minors	Count	Career intentions	Yes	No
Agronomy	1	I expect to farm land that I own	22	9
Agricultural business	1	I expect to farm land that I rent	22	9
Agricultural economics	1	I expect to own farm land that others farm but I do not farm myself	5	26
Mechanized systems	1	I anticipate that in my future work I will advise/educate producers	26	5
Turf and landscape management	1	I anticipate that in my future work I will advise/educate landowners	25	6

their participation in this project, supplemented the costs of course travel for students, and the integration and collection of sociological and agronomic data from the landowners and tenants.

The co-authors began conference calls with the landowners in early 2019 to plan for summer 2019 visits. In summer 2019, the co-authors visited each farm and conducted individual in-person interviews with each landowner and tenant to identify land management goals and needed agronomic information for the fall field course component. In August 2019, the instructor of the course (co-author Basche) and students spent one day visiting each farm and interviewing the landowners, farmers, and other related professionals including agriculture industry representatives and Natural Resources Conservation Service (NRCS) conservationists. Students worked throughout the semester on the preparation of a final written report that included three primary elements of improvement that needed not be mutually exclusive: at least two crop management improvements (i.e., nutrient management, crop rotations, integrated pest management) based on the goals and challenges of the landowners and tenants, as well as one management improvement that was specifically targeted to more conservation-oriented goals (i.e., flood mitigation through crop to grassland conversion, integrating buffer strips or grassed waterways). Students presented their reports to the landowners and tenants in December 2019 during the final in-person meeting of the course. Table 2 summarizes the three different case study scenarios. Each farm was owned or co-owned by a woman. Here, and throughout, we refer to the farms as “Southern Farm,” “Eastern Farm,” and “Northern Farm” so as to protect the confidentiality of the case study participants.

2.3 | Assessments

Our goal in this project was to assess student learning and attitudes about the complex social relationships involved in expanding and implementing conservation on agricultural lands. The University of Nebraska-Lincoln Institutional Review Board approved our protocol to include student survey results and writing assignments from the course in our research inquiry (Project ID 19457). Students attended a course orientation immediately before the field trip in August 2019, during which time an educational assessment specialist presented students with the informed consent information and a survey with questions about career intentions, perceptions of conservation, and factors influencing on-farm decision-making. All students ($n = 32$) consented to taking part in the project. During the semester, students submitted reflection assignments that asked a series of questions about their perceptions of landowner–tenant relationships, impressions of the field trip, how they envisioned the course could support their future work, and general attitudes about conservation, diversification, and sustainability.

2.4 | Analysis

Data informing this article include quantitative assessments collected at the start of the course, qualitative reflective student data collected prior to and after completing the field component, and then again at the conclusion of the course, as well as autoethnographic data (Ellingson & Ellis, 2008) from the first author’s experience teaching the course. Basche collected individual-level data from students through different modes

TABLE 2 Overview of case studies included in the senior agronomy course and research

Location	Stated landowner and/or tenant goals	Landowner information	Tenant information	Lease agreement	Proposed ideas by students
Southern farm	Fertility/nutrient use, cover crop management, water management/drainage concerns	Sole owner; lives out-of-town but visits frequently; land was purchased by mother as an investment	Father-son farming two fields for this landowner, primarily corn-soybean, farming ~809 hectares (~2,000 acres) together	Crop-share	Fertility management with in-season N application, grassed waterways, shifting crop rotations to include winter annual crops, herbicide management through diversifying corn/soybean varieties, diversifying cover crops
Eastern farm	Converting row crop land area to grass for water management and livestock, land/business transition, water management/drainage concerns	Sole owner, working on transitioning daughter more actively; lives on the farm; widow now managing farm after husband's death	Neighbor farming for several other landowners, farms crops primarily but has cattle on other land	Cash rent	Adding tile drainage, nutrient management, increasing pollinator habitat, shifting crop rotation to include more corn/residue for erosion control, enrollment in Conservation Reserve Program to address water/drainage
Northern farm	Organic transition, land/business transition, increasing alfalfa production, alfalfa nutrient management	Sole owner; has a small house on the property as a second home; inherited farmland where she grew up	Neighbor farming for other landowners including his family, farms corn, soybean, alfalfa and helps maintain a cattle feedlot. Alfalfa on this land used for his own cattle feed	Cash rent	Incorporation of more perennial forage crops, buffer strip to address erosion, alfalfa nutrient management, converting cropland to pasture

and at different times throughout the semester; however, the learning was collective and iterative, informed through the field visits, presentations, in-class discussions, class visitors, and preparation of the final farm improvement report. Therefore, the focus of assessment is not upon measuring students' individual learning or progress; rather, these different data points reflect moments in time that speak to students' shared learning processes throughout the course.

The co-authors met biweekly by phone throughout the academic year of 2019–2020 to discuss the course and data collections, taking notes to document Basche's own reflective observations throughout the experience of teaching the course. In addition, Basche also wrote a summary upon conclusion of the semester recording her end-of-project reflections and questions. The student survey was analyzed using descriptive statistics. At the end of the semester, co-authors collaboratively developed descriptive coding schemas from the combined data using the adapted Grounded Theory (Corbin & Strauss, 1990) process that involved three steps: individual coding, comparative coding, and synthesis of codes into conceptual categories. First, each co-author read through the data individually, developing codes from the students' learning reflections. The co-authors then engaged in comparative coding, noting exceptions and points of commonality through a series of iterative discussions, developing conceptual categories. Through these comparative discussions, the co-authors reached intercoder agreement and created the final, comprehensive synthesis of conceptual categories describing students' learning and process of understanding the importance of agricultural advisors, which emerged from and were repeated across the data analyzed.

Basche was directly embedded within the project and the day-to-day management of the teaching and student evaluation, whereas Carter was further removed from the course, providing one guest lecture to the class (related to women landowners) and then observing the students' end-of-semester presentations, both via Zoom. The findings present only one example or case and are not meant to be generalized to or representative of all students in agronomy; rather, we present an example of how experiential learning and partnerships may inform and influence agronomy students' learning about social relationships, to inform future education, outreach, and research.

3 | RESULTS AND DISCUSSION

3.1 | Students identified the landowner–tenant relationship as important to collaborative conservation planning

Students identified new recognition of the landowner–tenant relationship's importance to both their future careers and to

the implementation of conservation on the ground. Overall, students seemed to easily identify how the case studies, and specifically learning more about the landowner–tenant relationship, contributed to what they envision to be their future careers in farming or agricultural consulting (Table 1). Students reported learning more about approaches to support collaborative conservation planning, including emphasizing communication between women landowners and tenants, altering lease agreements, and utilizing conservation programs. They recognized how critical these relationships were for the long-term viability of farming operations. Additionally, students recognized that the women landowners taking part in the case studies shared a passion and interest in land management that differed from the students' previous encounters with or expectations of landowners. Table 3 details illustrative examples of students' quotes. Students identified three specific components of relationship-building as key to collaborative conservation planning among landowners and tenants: taking into account both landowner and tenant concerns, women landowners' engagement in the land and passion for sustainability, and the importance of a shared vision or ethic to ensure long-term viability of an operation. We discuss these sub-themes below.

“Taking into consideration both parties' concerns.” Throughout the course, students stressed the importance of taking into account the concerns of both the farmer and landowner when developing conservation plans. Students recognized that exposure to this relationship—specifically, the realities of conservation decision-making as a negotiation—was an important value of the case studies to their future careers. For example, some students noted that having learned about the importance of this relationship would support innovation and conservation on their own farms or in their future careers as agricultural consultants. Other students recognized the role of lease rental agreements in facilitating positive relationships and avoiding conflict between landowners and tenants. Additionally, nearly one-third of students directly commented on the value that NRCS or other government program supports could provide in conservation collaboration and that they were previously unaware of the value of such programs. Specifically in this context, students recognized that the programs' financial assistance could allow tenants to take actions to meet conservation goals that could otherwise be considered to be too financially risky.

“Even if a landowner is away from the farm they still care deeply.” About a third of the students expressed that they were surprised to learn that there are so many women landowners, and surprised that these landowners have a deep passion for their land and are willing to work with tenants, even if the landowners do not live on or near the farm. The students explained that they expect landowners to “just want a check,” or to only be engaged with the farm only as an economic endeavor. Students also identified how the cases were

TABLE 3 Quotes from student reflection assignments categorized by learning theme

Learning theme	Illustrative student quotes
<p>“Taking into consideration both parties’ concerns”: Collaborative conservation planning requires negotiation</p>	<p>“As I will be working as an agronomist at a coop when I graduate this knowledge will help me make better recommendations and fill the needs of our customers better.” Student no. 28</p> <p>“In the future, I would like to be a crop consultant which would put me in the middle of some operator/landowner relationships. The knowledge gained would help me to make appropriate recommendations taking into consideration both parties’ concerns.” Student no. 7</p> <p>“I honestly never really heard much of a crop share system. I can see how that works efficiently for both the landowner and producer to keep each other honest because it is affecting both their checkbooks.” Student no. 29</p>
<p>“Even if a landowner is away they still care deeply”: Surprised to find engaged, passionate women landowners</p>	<p>“None of these case studies are similar to the landowner and tenant relationships that I see back home. Back where I am from the landowners don’t have much say in what is done on their property. Most everything is cash rented so the tenant gets all they say in what gets planted where. Landowners are not as worried about soil conservation like these landowners were.” Student no. 28</p> <p>“[I was surprised by] how much land is currently owned by women. I think this number was surprising because many people don’t really talk about women landowners when it comes to farming.” Student no. 8</p> <p>“The most surprising thing that I learned in this course was how much these women landowners cared for their farmland even though some of them were away from the farm for many years. They all cared deeply about their land and wanted what was best for it. I think I was unaware of this before because I always perceived people that inherited ground just wanted the money from the land and that they didn’t care what happened to it. I always thought they would rent the ground to the highest bidder and not care what happened to it. I learned that even if a landowner is away from the farm they still care deeply about their land.” Student no. 24</p> <p>“In this course I was very surprised that these landowners could have such defined goals because they care so much about the land without knowing much about farming practices.” Student no. 30</p>
<p>“One doesn’t work without the other”: Importance and interdependence of landowner–tenant relationships for long-term viability of operations</p>	<p>“These relationships are important because one doesn’t work without the other. I think that the tenant needs to be transparent with his/her expenses and income to show that some years doing something new isn’t in the budget and they need to know that. Most farmers have an ego the size of Texas but need to learn to put that aside and show that not doing something new this year but maybe next year will better improve the relationships and improve long-term financial health along with the health of the field.” Student no. 3</p> <p>“If even one of these relationships become unhealthy it can greatly impact the farming operation, especially the family relationship, because most likely if this relationship becomes unhealthy than [sic] the farming operation can be split up throughout the family.” Student no. 31</p> <p>“All of these layers must have good communication in order to make sure all the goals and long-term plans mesh together. Each of these people has a certain vision for the future of the land and decisions must be made in the best interest of the farm. This is why these ‘layers’ are critical because they will determine how much money the farm makes, how healthy the soil is for future generations, and who will be passed the farm in the future. All of these are extremely important and are happening all over Nebraska and the U.S. every day.” Student no. 11</p>

(Continues)

TABLE 3 (Continued)

Learning theme	Illustrative student quotes
<p>“Spent more time on conservation discussions than agronomic discussions”: Orientation toward short-term profit over long-term conservation goals</p>	<p>“I understand that conservation is important, but I feel like we spent a lot of time on it. I feel that we could have spent more time on agronomic strategies.” Student no. 32</p> <p>“As we saw in our case studies, sometimes the landowner has bigger plans for conservation that can negatively affect the tenant’s production.” Student no. 25</p> <p>“The main challenges is the ‘farmability’ of the conservation practice. If the conservation practice makes it hard for the producer to farm around, then it can be a nuisance for them. For example, building a terrace that is sized for a 12 row planter when the producer uses a 24 row planter would make it a nuisance for the producer to put a crop in. This particular challenge can be solved with communication.” Student no. 7</p>
<p>“Landowners often have unrealistic goals”: Landowner expectations believed to be incongruent with production</p>	<p>“Landowners often have unrealistic goals of what they want their land to look like. This can become a problem for a tenant because a tenant has to make a living off of the land, whereas a landowner is making the same amount of money off of the land regardless of how productive it is. These challenges can be reduced by educating landowners on profitable agricultural production practices.” Student no. 24</p> <p>“One major challenge is some landowners do not know how farming works and they can hear good things about conservation and want it done, but it may not always work for them and the tenant.” Student no. 12</p> <p>“They want it done their way and the way of the landowners are not always right when they think they are. Farmers have been doing it a way for a long time and have a landowner come in and tell how to run their operation doesn’t set right [sic] with the farmer especially if the landowner has no knowledge in the farming world.” Student no. 23</p>
<p>“Learned too much about was the history of the farms”: Family history perceived to be biased and unimportant to course goals</p>	<p>“I felt like we may have learned too much about the landowner’s family history and why they want the land to be more diverse or turned to more of a conservational system. The stories about their family’s history of the land may add some bias to some possible management answers and persuade us from looking at certain alternatives.” Student no. 14</p> <p>“In my complete honest opinion I did not get much real information from any of the actual landlords although I found the history of each farm very interesting and I love hearing those kinds of stories, I do not quite see at this point how they are applicable to the project. They just didn’t seem like they really truly understood what was happening on the farm.” Student no. 9</p> <p>“I feel for what we learned too much about was the history of the farms. Instead of gathering more precise information needed for inputs...” Student no. 5</p>

similar to or different from those in their own family or with which they are most familiar from where they grew up, with many noting surprise that the landowners involved in the case studies were deeply engaged in the long-term sustainability of the farm.

“One doesn’t work without the other.” Repeatedly, students highlighted that landowners and tenants needed to be “on the same page,” or share a similar perspective about land use, as this is critical to long-term viability of an operation. They cited examples from their case studies about the challenges of developing a plan for landowner–tenant pairs in which there seemed to be different or competing goals, or in which the landowner and tenants misunderstood one another’s goals. Similarly, students identified examples of landowner–tenant pairs as better matches when both landowner and tenant seemed to have similar goals or outcomes in mind. Students observed the precariousness of the landowner–tenant relationship; for example, if the landowner is not happy, then the tenant may lose the ability to farm the land. Several students noted that this was particularly important for their own families or in general to sustain the farm for the next generation.

3.2 | Gendered stereotypes and production-oriented mindsets shape student perceptions of landowner agency and conservation implementation

Although students reported valuing their observations of the landowner–tenant relationship in the case studies, we observed that students relied upon gendered stereotypes and undervalued the role of conservation and familial ties to the land in favor of more profit-oriented perspectives. Even though students recognized that positive landowner relationships are important for the long-term viability of the operations, their reflections and assignments generally prioritized short-term profits over longer-term conservation goals. Their views of conservation and production as opposing priorities, rather than complimentary influences, characterize a production-oriented mindset that prioritizes the authority of the farmer. In the applied work of the case studies, students tended to fall back on such assumptions; in this instance we again noted dissonance between what students reported as important and how they applied that to a real-world scenario. We describe three components of how students minimized landowner agency and the implementation of conservation through their reliance upon gendered stereotypes and production-oriented mindsets: oppositional framing of conservation implementation that favored tenants’ over landowners’ goals, a misconception that landowners’ conservation goals were unrealistic, and undervaluing the role of familial and land history.

“Spent more time on conservation discussions than agronomic discussions.” In reflecting upon the course and their projects, students often situated conservation in opposition to, or separate from, agronomic planning. This oppositional framing persisted despite students having responded favorably about the importance of conservation in the pre-semester survey, expressing high agreement with statements regarding soil and water conservation, soil health, and how addressing conservation can achieve both improved environmental and profitability outcomes (Figure 1). However, we did not note any student who defined sustainability or diversification as incorporating anything to do with people, relationships, or other social components of a farming operation. When asked about how they would define sustainability in their early semester reflection assignment, typical answers included mention of soil (approximately 13 students, or 40%) and/or a financial aspect of sustainability in profitability or business. Further, the majority of students (approximately 24 students, or 75%) explained diversification only in terms of crop diversification, whereas a number of students also included financial or enterprises in their definition of diversification. Although students’ provided well-defined or perceived “right answers” to the survey responses questions at the start of the class asking about conservation and sustainability, they struggled to express sustainability and conservation in their reflective answers at the end of the course in relation to the specific landowner–tenant scenarios. In spite of their favorable preconceived impressions of conservation, it was our observation from analysis of student writing and working with students throughout the semester that they were not always successful at substantively integrating conservation within their farm improvement plans. Although various conservation practices were included both during the field trip and in lecture periods (including discussion of cover crops and visits to riparian buffers at the farms, as well as a presentation from an NRCS representative about conservation programs) it may not have been enough exposure for students to consider how such on-farm integration can occur.

After students had presented their farm improvement plans at the end of the semester, landowners, in discussion with Basche, expressed a favorable view of the project outcomes; the partnership with students had strengthened the farmer–landowner relationships. However, all three landowners noted that the improvement plans offered more to the farmers than to themselves, particularly in favoring a short-term production focus over an emphasis on longer-term conservation goals. This is congruent with the instructor’s impressions of the final presentations in that students did not substantively address both agronomic and conservation goals as was asked in the assignment, and that the conservation pieces were lacking depth. Additionally, a professional agronomist in the region who observed the final presentations provided his perspective that student presentations lacked some depth and synthesis of

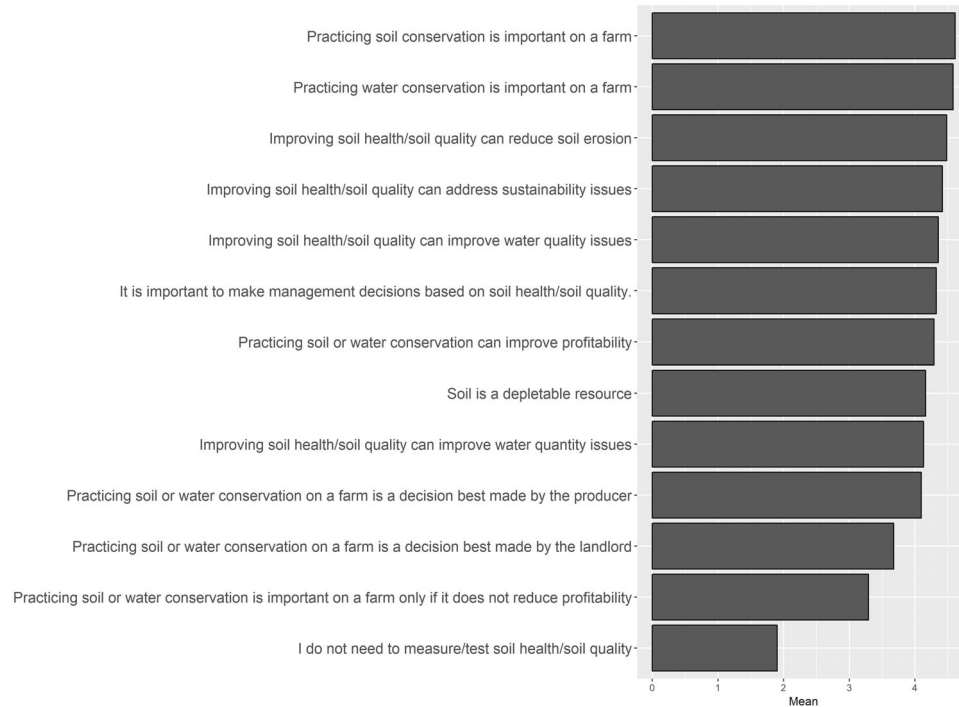


FIGURE 1 Students' mean responses ($n = 31$) to the prompt "Indicate your agreement with the following statements" regarding soil and water conservation themes, where 1 = strongly disagree and 5 = strongly agree

ideas in addressing both the farmers' and landowners' goals. For example, students found it challenging to incorporate a revised crop budget that accounted for taking a few hectares (acres) out of crop production in order to incorporate a filter strip on flooded regions of a field, even though prior instructor feedback and specific requests from the landowner asked them to investigate these costs. Additionally, students were more likely to associate conservation as an interest of the landowners, and production as an interest of the farmers, setting up a competing dichotomy in goals based on different roles rather than shared goals.

"Landowners often have unrealistic goals." Even as they recognized the importance of farmer–landowner relationships, students tended to prioritize the perspective of the farmers throughout their coursework and lean on stereotypes of landowners in their reflections of the different cases. For example, students used the following language to describe the positionality of the women landowners (in general) in relation to conservation or their relationship with their tenant: unaware, not educated, don't know how farming works, have reduced knowledge, just there to collect the rent check, may not have time, have unrealistic goals, unrealistic expectations, are disconnected, may lack agriculture background. Many of these stereotypes and assumptions about women landowners' motivations or knowledge were used also in reference to the three landowners involved in the course project, even though all of the landowners in the project were actively engaged in learning more about their farms and land, as evidenced by

their participation in this project, and had familial or previous work connections to agriculture (notably one lives on the land currently and another had grown up on the land and has a second home on it currently).

We observed that the devaluing of landowners' knowledge or goals persisted throughout the semester. In the pre-semester survey, students ranked producers as the most highly influential factor or person in on-farm decision making (Figure 2), ranking landowners below agronomists, financial markets or other agricultural consultants, illustrating this preconceived orientation toward farmer perspectives. This undervaluing of landowners continued even upon completion of the management plans and presentation of their case studies; in the post-course reflection, a number of students identified the largest barrier to farmer–landowner cooperation in conservation to be landowners' expectations of what is possible on their land. Students expressed this idea in a number of ways, citing that the landowners' ideas were "not feasible," did not account for "farmability," or that landowners do not see the farmer's perspective well or were unaware how changes might impact farmers. A number of students additionally expressed a perception that landowners are unfamiliar with production agriculture and as a result their expectations could harm profits, proposing more education of landowners as a possible solution.

"Learned too much about the history of the farms." Students devalued the place-based and historical knowledge shared by landowners about their farms; 14 of the 32 students

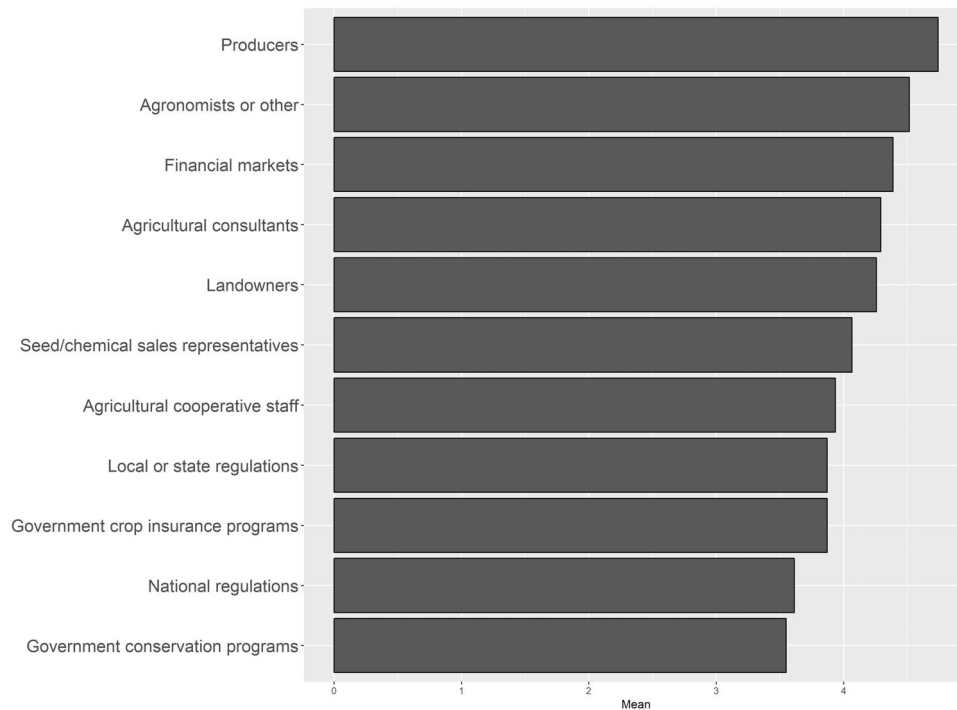


FIGURE 2 Students' mean responses ($n = 31$) to the prompt "Indicate below your impression of how influential each of the following people or factors are in on-farm decision-making." Influence can be positive or negative, where 1 = not influential, 2 = less influential, 3 = neutral, 4 = influential, and 5 = very influential

also commented in their post-trip reflection assignment that they learned too much about the history of the farms (these histories were generally presented by the women landowners). A number of students not only felt they learned too much about the land's history, but that the information provided by landowners about their familial or emotional connections to the land was unnecessary. Students also argued that landowners' sharing these connections reflected a bias or that the landowners did not know truly what was happening on their farms.

Although students recognized the importance of the social relationships, they may not have had enough previous exposure to social aspects of conservation decision-making to be able to integrate or reconcile the landowners' emotional or familial connections to the land with the tenants' production needs in their case study recommendations. Students instead often emphasized the importance of landowners and tenants "being on the same page" when discussing the landowner-tenant relationships; however, students' comments diminishing the landowners' goals and connections to the land reflected a prioritization of the tenants' concerns. Rather than recognizing the importance of mutuality in working toward agreed upon goals that respect both the landowners' respect for the land's past and hopes for its future with tenants' shorter-term production needs, "on the same page" often implied that landowners should follow the lead of the

farmers. Students then struggled to successfully make recommendations for navigating or negotiating landowner-tenant goals, as they were tasked to do throughout the course, falling back instead upon preconceptions or stereotypes that diminished the place-based knowledge of the women landowners; this is consistent with previous studies finding conservation professionals and tenants may devalue women's knowledge of the land (Carter, 2019; Wells & Eells, 2011). For example, they relied upon perceived or stereotypical binaries (e.g., landowners value conservation and tenants value production, conservation is always at the expense of production, landowners only want their checks whereas tenants care about the long-term viability of the operation, landowners do not know about agriculture and tenants are the only ones who do; Table 3) rather than engaging with the more nuanced relationship dynamics presented to them in the case studies. This resulted in case study recommendations that favored the tenants.

3.3 | Implications for future education and research efforts

Agricultural policy makers, educators, and agency staff widely recognize the need for more rapid expansion of agricultural conservation. Training the next generation of

farmers, consultants, and agriculture professionals is critical to this expansion. Based upon our study, we recommend that training, specifically in undergraduate education, more substantively incorporate the social complexities of agricultural decision-making. In addition, there is a need to integrate the social components of diversification more thoroughly in conceptualizations of sustainability and teaching about conservation. We discuss these recommendations below. Both will require equipping students not only to understand economic and production considerations, but also social components that include the gendered dynamics that can impact landowner–tenant relationships. Further, this training requires us, as teachers and scholars, to examine how curricula—and especially the exclusions from existing curricula—maintain the status quo. This training must recognize that many students in agricultural courses are white men who intend to have access to land to farm in the future, a particularly privileged class of individuals. We have a responsibility as educators to challenge students’ stereotypes, especially when their planned careers as farmers, consultants, or other agricultural professionals will critically impact outcomes of agricultural landscapes and communities. To be successful in their future relationships with landowners, these professionals will need to think critically and holistically about decision-making and management.

3.3.1 | Research and outreach addressing social and power dynamics in agricultural decision-making

Overall, the students prioritized the tenants’ shorter-term economic perspectives in relation to the land and diminished the landowners’ familial connections or longer-term conservation goals. These valuations align with mainstream agribusiness advertising and extension programming that tailor to the reconceptualization of the farmer as a businessman (Bell, Hullinger, & Brislen, 2015; Carter & Lopez, 2019). The majority of students not only prioritized economic data in their planning, but actively marginalized place-based knowledge, including familial heritage and personal connections to the land. The students’ readiness to classify landowners’ personal and emotional connections or histories as “biased” information in land management—and their inability to recognize the bias in privileging the tenants’ concerns—suggests educators cannot expect students to enter into the classroom ready to critically identify, much less examine, the social landscapes of agriculture. In hindsight, we recognize now that we could have designed the project to have included more information up front to ground students in the ways different forms of knowledge and experience can inform decision-making, because these observations were not obvious to the students. Further, we realize it would have been a fruitful

exercise to have included Indigenous land connections and historic and current agricultural practices in Nebraska as a way to invite students to think longer term and beyond white settlement histories on these lands. This is a challenging task given the epistemological dominance of the treadmill of production throughout agricultural education (Schnaiberg, 1980), which emphasizes progress as adoption of continuously improving technologies to maximize production. One semester is not enough to counter the cultural invisibility of women (or other underrepresented groups) in agriculture and the long-entrenched contextualization of farming as “men’s work” (Sachs, 1983).

Our results might have varied had we included landowners in our case studies who were both men and women; however, the goal of this study was to counter the invisibility of women’s agricultural decision-making and to expose students to this demographic underrepresented in agricultural conservation (Carolan, 2005; Carter, 2019; Wells & Eells, 2011). In their reflections and course work, students repeated gender-based stereotypes demonstrating expectations of invisibility and deference to their tenants. For example, students were surprised that women owned so much land and cared so much about farming “without knowing much about farming practices.” Students further recognized that their surprise was due to the fact that “many people don’t really talk about women landowners when it comes to farming.” These gender-based stereotypes reflect the numerous perceived social norms that subjugate women to inferior roles to men; women are unlikely to be the primary decision-maker on land that they own (Rogers & Vandeman, 1993), are expected to defer decision-making to men (Carter, 2017), are less likely to identify as a farm operator even they share responsibilities with men (Rosenfeld, 1985), and are less likely to be taken as seriously as male producers (Barbercheck et al., 2009). Even as students had knowledgeable women landowners in front of them sharing information about their experiences with and plans for their farmland, the students failed to hear or value the women’s knowledge and prioritized the tenants’ views over the landowners’.

Further, students defaulted to viewing conservation decision-making as an either/or power struggle concluding with what the landowner wants or what the tenant wants, rather than an “and” negotiation in which both might reach agreement in a path forward together. When discussing the importance of communication and being “on the same page,” students implied or stated explicitly that landowners should learn more in order to better understand their tenants, further evidence of a gender-based stereotype in that women are expected to defer authority to men (Carter, 2017). Students were more likely to cite landowner education as a solution to farmer–landowner collaboration rather than proposing farmer action oriented solutions, prioritizing a deficit model of education in which the landowner needs to

be “taught” how to think like the tenant. In our collective experiences in the fields of agriculture and natural resources, we observe that most education and extension is focused on such knowledge deficit models of communication, where the approach is to share knowledge with those assumed to be lacking information (i.e., such as informing people on the biophysical considerations of crop management, soil fertility, or other related topics). This approach has been widely criticized across a range of scientific disciplines, including in the realms of food and agricultural risk, due to a focus on one-way communication (De Witt, Osseweijer, & Pierce, 2017; Hansen, Holm, Frewer, Robinson, & Sandøe, 2003). Further, government messaging on beginning farmer programs following this type of technical knowledge transfer model have been shown not to address the true challenges faced by beginning farmers, which may be more structural in nature (Calo, 2018). The knowledge deficit approach, in its assumption that expert-instruction is the answer to teaching learners how to adopt specific practices, also ignores the power dynamics that may be in play when making decisions about farmland, such as gendered expectations for women to defer decision-making to their tenants and the discrimination, as well as the lack of networks and support that women in agriculture experience (Barbercheck et al., 2009; Carter, 2019; Eells, 2008; Wells & Eells, 2011). The knowledge deficit approach is positioned in contrast to less common but more participatory models where listening and learning from each other is valued in order to address the complexities of relationships and decision-making, which have proven successful in working with women landowners (Carter, 2019; Eells, 2008). Such networking models are recommended by extension practitioners for improving outreach to women (Barbercheck et al., 2009). Building elements of social capital, such as bonding and connection, are critical to the co-creation of knowledge and innovation in farmer field schools (Charatsari, Lioutas, & Koutsouris, 2020) and can be effective in the peer-to-peer learning among underrepresented groups in agriculture, such as women farmland owners (Carter, 2019; Eells, 2008).

In future course development and research, it would be helpful to analyze students’ learning and assumptions from an intersectional perspective, more specifically to analyze more deeply how students’ own experiences and identities shape their understanding of the social relationships involved in land management. This might include asking students early in the semester about family background, income, race, and gender identity. For example, it is likely that those students intending to farm grew up in families who own or have access to agricultural land, and those who are not likely to inherit land are more likely to end up in other roles (i.e., advisors, consultants, or educators). Sharing USDA agricultural census data trends and inviting reflection on the historical and contemporary reasons why one student might be more likely

to farm in the future than another might help to make visible how social inequalities shape the present agricultural landscape.

3.3.2 | Educational recommendations

It is clear that students reflected on the importance of the course in improving their understanding of landowner–tenant dynamics to inform their future work. Valuable career development skills resulting from the case studies aligns with other similar agricultural undergraduate courses and opportunities that employ experiential-learning approaches (Mathews et al., 2019; Yates & Hodgson, 2018). After reflection on the student work, it is important to recognize that the assignment and course overall might be better structured to more intentionally prompt students on valuing the relationship aspects in the case studies.

Jelinski et al. (2020) proposed a model for a soils travel course that centered the perspectives of stakeholders and the importance of place before investigating the more biophysical components of farms and landscapes. In this course, students met with stakeholders (including farmers and other agricultural professionals) for more extended periods of time (multiple days in some instances), students were given responsibilities in co-planning the travel and trip logistics, and deep conversations and unstructured discussions were encouraged. The field trip portion of this course only included an approximately 6-hour visit to each farm, with time for lunch together, but included only limited time with each farmer, landowner, and other professionals at each site. Similar approaches might be employed to help further student relationships with both landowner and farmer, to help value the role of the place and the landowners’ experiences with their land.

Finally, we further observe in our collective experiences that there is an orientation in the field of agronomy to frame conservation vs. production rather than an intentional emphasis on how they are synergistic and complimentary. Although the instructor worked to highlight these synergies, it is clear that more work must be done to combat the antagonistic framing of conservation vs. production. Further, more emphasis could be placed on the reality that diversification is not only biological or ecological, such as crop management and in-field practices, or economic, in terms of diversity of on-farm income, but also social. Sustainable land management and farm diversification today also requires diversity both in terms of social practices (e.g., rental agreements, collaborative relationships, shared responsibility to soil and water health) and diversity of decision-makers (e.g., women landowners, Latinx farmers, Indigenous nations). Especially as farmers compete for limited rental hectares (acres) and compete in precarious global markets, diversifying who we consider as important in agricultural decision-

making may strengthen relationships between farmers and landowners and translate to improved diversification in practices on the ground. Related to this, a number of scholars and teaching practitioners recognize the need for more educational emphasis on the social sciences, communication, and interdisciplinarity to support students in solving “wicked” social–environmental challenges such as those faced in the agricultural sciences (Basche et al., 2014; Pauley, McKim, & Hodbod, 2019; Wade et al., 2020). From our research we recognize this need and encourage instructors, departments, and colleges to re-evaluate how such themes can be incorporated in all aspects of the curriculum, beyond capstone or integrative courses such as the one described in this study.

4 | CONCLUSION

In this research, we analyzed the work of senior undergraduate students in a capstone course project, where they were tasked with preparing a holistic farm management plan that met both the conservation and production goals in three landowner–tenant case studies. This project was successful in exposing students to the complexities of landowner–tenant relationships and how these relationships influence the implementation of conservation; however, a semester is short and, for many students, this was their first time thinking about the role of women landowners in land management. In preparing students for success in their future careers, agricultural educators should consider how social aspects of land management are included in sustainability instruction and emphasize the realities of how existing social inequalities influence land management. Students recognized the importance of the social relationships in conservation implementation but struggled to account for these in their case studies. The effort to introduce different voices in management—in this case, women landowners interested in collaboratively planning and implementing conservation—is an important step in creating learning opportunities for students; however, it is clear that agricultural education requires many more steps to get to a point where power in decision-making is more equitably distributed.

ACKNOWLEDGMENTS

We are grateful to the students who participated in the course and agreed to participate in the research. We especially thank the landowners and farmers who shared information and time with our class and collaborated with the co-authors in the development of the project. We would also like to thank Dr. Carol Speth for administering the initial survey and informed consent information to students. We additionally thank the Center for Rural Affairs for assisting in the recruitment of project partners as well as partners with the NRCS and other industry professionals who participated in the field trip

and final student presentations. We acknowledge Gabrielle Roesch-McNally, Jean Eells, and Rebecca Christoffel for providing comments on earlier versions of this work. Finally, we thank the North Central SARE for their funding and support in this project.

AUTHOR CONTRIBUTIONS

Andrea Basche: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Writing—original draft; Writing—review & editing. Angie Carter: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Writing—original draft; Writing—review & editing.

CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a possible conflict of interest.

ORCID

Andrea Basche  <https://orcid.org/0000-0001-6805-8522>

Angie Carter  <https://orcid.org/0000-0001-9829-0074>

REFERENCES

- Barnett, M. J., Spangler, K., Petrzela, P., & Filipiak, J. (2020). Power dynamics of the non-operating landowner–renter relationship and conservation decision-making in the midwestern United States. *Journal of Rural Studies*, 78, 107–114. <https://doi.org/10.1016/j.jrurstud.2020.06.026>
- Barbercheck, M., Brasier, K., Kiernan, N. E., Sachs, C., Trauger, A., Findeis, J., ... Moist, L. (2009). Meeting the extension needs of women farmers: A perspective from Pennsylvania. *Journal of Extension*, 47(3), 82071–82000.
- Basche, A. D., Roesch-McNally, G. E., Pease, L. A., Eidson, C. D., Lahdou, G. B., Dunbar, M. W., ... Pantoja, J. (2014). Challenges and opportunities in transdisciplinary science: The experience of next generation scientists in an agriculture and climate research collaboration. *Journal of Soil and Water Conservation*, 69(6), 176A–179A. <https://doi.org/10.2489/jswc.69.6.176A>
- Bell, S. E., Hullinger, A., & Brislen, L. (2015). Manipulated masculinities: Agribusiness, deskilling, and the rise of the businessman–farmer in the United States. *Rural Sociology*, 80, 285–313. <https://doi.org/10.1111/ruso.12066>
- Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals: Handbook I cognitive domain* (Vol. 16). London, U.K: Longman.
- Broussard, W., & Turner, R. E. (2009). A century of changing land-use and water-quality relationships in the continental US. *Frontiers in Ecology and the Environment*, 7(6), 302–307. <https://doi.org/10.1890/080085>
- Broussard III, W. P., Turner, R. E., & Westra, J. V. (2012). Do federal farm policies influence surface water quality? *Agriculture, Ecosystems & Environment*, 158, 103–109.
- Calo, A. (2018). How knowledge deficit interventions fail to resolve beginning farmer challenges. *Agriculture and Human Values*, 35(2), 367–381. <https://doi.org/10.1007/s10460-017-9832-6>

- Carolan, M. S. (2005). Barriers to the adoption of sustainable agriculture on rented land: An examination of contesting social fields. *Rural Sociology*, 70, 387–413. <https://doi.org/10.1526/0036011054831233>
- Carter, A. (2017). Placeholders and changemakers: Women farmland owners navigating gendered expectations. *Rural Sociology*, 82, 499–523. <https://doi.org/10.1111/ruso.12131>
- Carter, A. (2019). “We don’t equal even just one man”: Gender and social control in conservation adoption. *Society & Natural Resources*, 32(8), 893–910. <https://doi.org/10.1080/08941920.2019.1584657>
- Carter, A., & Lopez, A. L. (2019). Rebranding the Farmer: Formula story revision and masculine symbolic boundaries in US agriculture. *Feminist Formations*, 31(3), 25–50. <https://doi.org/10.1353/ff.2019.0029>
- Center for Rural Affairs. (2020). *Our mission and our values*. Retrieved from <https://www.cfra.org/about/history-mission-values>
- Charatsari, C., Lioutas, E. D., & Koutsouris, A. (2020). Farmer field schools and the co-creation of knowledge and innovation: The mediating role of social capital. *Agriculture and Human Values*, 37, 1139–1154. <https://doi.org/10.1007/s10460-020-10115-8>
- City of Hastings. (2020). *Aquifer storage and restoration project*. Retrieved from <https://www.cityofhastings.org/departments/utilities/water/asr-project.html>
- Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13(1), 3–21. <https://doi.org/10.1007/BF00988593>
- De Witt, A., Osseweijer, P., & Pierce, R. (2017). Understanding public perceptions of biotechnology through the “Integrative World-view Framework”. *Public Understanding of Science*, 26(1), 70–88. <https://doi.org/10.1177/0963662515592364>
- Druschke, C. G., & Secchi, S. (2014). The impact of gender on agricultural conservation knowledge and attitudes in an Iowa Watershed. *Journal of Soil and Water Conservation*, 69(2), 95–106. <https://doi.org/10.2489/jswc.69.2.95>
- Eells, J. C. (2008). *The land, it’s everything: Women farmland owners and the institution of agricultural conservation in the U.S. Midwest*. (Doctoral dissertation, Iowa State University). Retrieved from <https://lib.dr.iastate.edu/rtd/15704/>
- Eells, J. C., & Soulis, J. (2013). Do women farmland owners count in agricultural conservation? A review of research on women farmland owners in the United States. *Journal of Soil and Water Conservation*, 68(5), 121A–123A. <https://doi.org/10.2489/jswc.68.5.121A>
- Ellingson, L. L., & Ellis, C. (2008). Autoethnography as constructionist project. In J. A. Holstein & J. F. Gubrium (Eds.), *Handbook of constructionist research* (pp. 445–465). New York, London: The Guilford Press.
- Gowda, P., Steiner, J. L., Olson, C., Boggess, M., Farrigan, T., & Grusak, M. A. (2018). Agriculture and rural communities. In D. R. Reidmiller, C. W. Avery, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis T. K. Maycock, & B. C. Stewart (Eds.), *Impacts, risks, and adaptation in the United States: Fourth national climate assessment, Volume II* (pp. 391–437). Washington, DC: U.S. Global Change Research Program. <https://doi.org/10.7930/NCA4.2018.CH10>
- Hansen, J., Holm, L., Frewer, L., Robinson, P., & Sandøe, P. (2003). Beyond the knowledge deficit: Recent research into lay and expert attitudes to food risks. *Appetite*, 41(2), 111–121. [https://doi.org/10.1016/S0195-6663\(03\)00079-5](https://doi.org/10.1016/S0195-6663(03)00079-5)
- Jelinski, N. A., Perrone, S. V., Blair, H. K., & Fabian, M. L. (2020). Growing hearts and minds: Linking landscapes and lifescapes in a soils field course. *Natural Sciences Education*, 49(1), e20018. <https://doi.org/10.1002/nse2.20018>
- Key, N. (2019). Larger farms and younger farmers are more vulnerable to financial stress. USDA-ERS Amber Waves Farm Economy Feature. Oct. 22, 2019. Retrieved from <https://www.ers.usda.gov/amber-waves/2019/october/larger-farms-and-younger-farmers-are-more-vulnerable-to-financial-stress>
- MacDonald, J. (2020). Consolidation in US agriculture continues. USDA-ERS Amber Waves Farm Economy Feature. Feb. 3, 2020. Retrieved from <https://www.ers.usda.gov/amber-waves/2020/february/consolidation-in-us-agriculture-continues>
- Mann, G., & Schroeder, M. (2019). Influence of service-learning site on student perceptions in a community nutrition course. *NACTA Journal*, 63(2), 288–292.
- Mathews, L., Whitlock, C., Diaz-Loar, E., Eichenlaub, B., Vicenty, T., & Hamilton, L. (2019). The contribution of undergraduate research experiences to skill and career development: A multi-institutional analysis. *NACTA Journal*, 63(2), 250–257.
- Mittelstet, A. R., Gilmore, T. E., Messer, T., Rudnick, D. R., & Heatherly, T. (2019). Evaluation of selected watershed characteristics to identify best management practices to reduce Nebraskan nitrate loads from Nebraska to the Mississippi/Atchafalaya River basin. *Agriculture, Ecosystems & Environment*, 277, 1–10.
- Nebraska Department of Agriculture. (2019). *Nebraska agriculture fact card*. Retrieved from <https://nda.nebraska.gov/facts.pdf>
- Parsons, R., Ruhf, K., Stevenson, G. W., Baker, J., Bell, M., Epley, E., ... Keller, J. (2010). The FarmLASTS Project: Farm land access, succession, tenure and stewardship. Retrieved from <http://www.uvm.edu/farmlasts/FarmLASTSResearchReport.pdf>
- Pauley, C. M., McKim, A. J., & Hodbod, J. (2019). A social-ecological resilience perspective for the social sciences of agriculture, food, and natural resources. *Journal of Agricultural Education*, 60(4), 132–148. <https://doi.org/10.5032/jae.2019.04132>
- Petrzelka, P., & Marquart-Pyatt, S. (2011). Land tenure in the U.S.: Power, gender, and consequences for conservation decision making. *Agriculture and Human Values*, 28(4), 549–560. <https://doi.org/10.1007/s10460-011-9307-0>
- Prokopy, L. S., Floress, K., Arbuckle, J. G., Church, S. P., Eanes, F. R., Gao, Y., ... Singh, A. S. (2019). Adoption of agricultural conservation practices in the United States: Evidence from 35 years of quantitative literature. *Journal of Soil and Water Conservation*, 74(5), 520–534. <https://doi.org/10.2489/jswc.74.5.520>
- Prokopy, L. S., Floress, K., Klotthor-Weinkauff, D., & Baumgart-Getz, A. (2008). Determinants of agricultural best management practice adoption: Evidence from the literature. *Journal of Soil and Water Conservation*, 63(5), 300–311. <https://doi.org/10.2489/jswc.63.5.300>
- Prokopy, L. S., Gramig, B. M., Bower, A., Church, S. P., Ellison, B., Gassman, P. W., ... Ulrich-Schad, J. D. (2020). The urgency of transforming the midwestern U.S. landscape into more than corn and soybean. *Agriculture and Human Values*, 37(3), 537–539. <https://doi.org/10.1007/s10460-020-10077-x>
- Raymond, P. A., Oh, N. H., Turner, R. E., & Broussard, W. (2008). Anthropogenically enhanced fluxes of water and carbon from the Mississippi River. *Nature*, 451(7177), 449–452. <https://doi.org/10.1038/nature06505>
- Rogers, D. M., & Vandeman, A. M. (1993). Women as farm landlords: Does gender affect environmental decision-making on leased land? *Rural Sociology*, 58(4), 560–568. <https://doi.org/10.1111/j.1549-0831.1993.tb00512.x>
- Rosenfeld, R. (1985). *Farm women: Work, farm and family in the United States*. Chapel Hill: University of North Carolina Press.

- Sachs, C. (1983). *The invisible farmers: Women in agricultural production*. Totowa, NJ: Rowman and Allanheld.
- Schnaiberg, A. (1980). *The environment: From surplus to scarcity*. New York: Oxford University Press.
- Sorensen, A. E., Corral, L., Dauer, J. M., & Fontaine, J. J. (2018). Integrating authentic scientific research in a conservation course-based undergraduate research experience. *Natural Sciences Education*, 47(1), 1–10. <https://doi.org/10.4195/nse2018.02.0004>
- University of Nebraska-Lincoln College of Agricultural Sciences and Natural Resources (UNL-CASNR). (2016). *Vice chancellor's enrollment update*. Sept. 14, 2016. Retrieved from <https://casnr.unl.edu/enrollment-update>
- U.S. Department of Agriculture–Economic Research Service (USDA-ERS). (2020). *Cash receipts by commodity, state ranking, 2018*. Retrieved from <https://data.ers.usda.gov/reports.aspx?ID=17844>
- U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). (2014). *Tenure, ownership, and transition of agricultural land survey*. Washington, DC: National Agricultural Statistics Service. Retrieved from https://www.nass.usda.gov/Publications/Highlights/2015/TOTAL_Highlights.pdf
- U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). (2020). *Quickstats database*. Washington, DC: National Agricultural Statistics Service. Retrieved from https://www.nass.usda.gov/Quick_Stats/
- Veenstra, J. J., & Burras, C. L. (2015). Soil profile transformation after 50 years of agricultural land use. *Soil Science Society of America Journal*, 79(4), 1154–1162. <https://doi.org/10.2136/sssaj2015.01.0027>
- Wade, A. A., Grant, A., Karasaki, S., Smoak, R., Cwiertny, D., Wilcox, A. C., ... Anandhi, A. (2020). Developing leaders to tackle wicked problems at the nexus of food, energy, and water systems. *Elementa Science of the Anthropocene*, 8(1), 11. <https://doi.org/10.1525/elementa.407>
- Wells, B., & Eells, J. (2011). One size does not fit all: Customizing conservation to a changing demographic. *Journal of Soil and Water Conservation*, 66(5), 136A–139A, <https://doi.org/10.2489/jswc.66.5.136A>
- Yates, T., & Hodgson, K. (2018). Professional learning experiences in a field-based course: Student perceptions and preferences. *Natural Sciences Education*, 47(1), 1–7. <https://doi.org/10.4195/nse2017.12.0024>
- Zhang, Y. K., & Schilling, K. E. (2006). Increasing streamflow and baseflow in Mississippi River since the 1940s: Effect of land use change. *Journal of Hydrology*, 324, 412–422. <https://doi.org/10.1016/j.jhydrol.2005.09.033>

How to cite this article: Basche A, Carter A. Training future agriculture professionals in landowner–tenant conservation decision-making. *Nat Sci Educ*. 2021;50:e20035. <https://doi.org/10.1002/nse2.20035>