Table S2: Social and behavioral science theoretical approaches utilized to explore the transitions to sustainable agricultural practices.

Theoretical Framework	References
The Theory of Planned Behavior (TPB) (Ajzen, 1991): TPB posits that attitude, social norms, and perceived behavioral control predict behavioral intention. It can be applied to understand how farmers' attitudes towards sustainable farming, the influence of social norms, and their perceived control over farming practices affect their decision to adopt such methods. The TPB has been used and tested as a suitable framework for predicting agricultural producers' intention and behaviors regarding the adoption of sustainable agricultural practices.	(Ajzen, 1991; Christopher, 2024; DeDecker et al., 2022; Doran et al., 2020; Lang & Rabotyagov, 2022; Li et al., 2023)
Cognitive Social Learning Theory (CSLT) (Bandura, 1977, 1986): This theory emphasizes the importance of observational learning, imitation, and modeling. It suggests that learning occurs in a social context through the dynamic and reciprocal interaction of the person, environment, and behavior. CSLT is relevant for exploring how farmers learn and adopt new practices by observing others in their community or agrifood industry. It helps assess the impact of peer influence and expert demonstrations in promoting sustainable farming practices among farmers.	(Bandura, 1986; Christopher, 2024)
Diffusion of Innovations Theory (Rogers, 1983): This theory explains how, over time, an idea or product gains momentum and diffuses (or spreads) through a population or social system. Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behavior, etc.). The key to adoption is that the person must perceive the idea, behavior, or product as new or innovative. The theory is relevant for studying sustainable farming practices as it helps identify why certain innovations are adopted by farmers while others are not. It provides a framework for analyzing how information about new sustainable practices is disseminated and adopted within farming communities.	(Asprooth, Norton, & Galt, 2023; Christopher, 2024; Lang & Rabotyagov, 2022; Linder et al., 2023)
Social Network Theory (SNT) (Prell, 2012): SNT states that an individual's social network is central to the diffusion of new ideas and practices. Information about innovations spreads through social networks, and the presence of key actors within these networks influences whether an individual adopts new practices.	(Asprooth et al., 2023)
Sense of Place (SOP) (Eaton et al., 2019): SOP is a conceptual framework that provides theoretical and empirical evidence on how people's connection to a place influences their pro-environmental or conservation behavior. Researchers have adapted and applied SOP to better understand farmers'	(Avemegah et al., 2024; E. A. Bennett et al., 2023; Eaton et al., 2019;

Theoretical Framework	References
unique and complex relationships with their land and how this connection affects their voluntary adoption of conservation practices.	Mullendore, Ulrich-Schad, & Prokopy, 2015)
The Concept of Social Responsibility (SR): SR was designed to evaluate the responsibility that farmers feel toward various stakeholders (themselves, family, neighbors, people in their watershed, and future generations) when making land management decisions.	(Avemegah et al., 2024; Eaton et al., 2019)
The Concept of Perceived Efficacy: This concept includes two sub-categories, self-efficacy (one's perceived ability to produce an effect) and response efficacy (one's belief that certain actions will produce the intended result, both farm and watershed scales).	(Arbuckle & Roesch-McNally, 2015; Bandura & Wessels, 1997; Beetstra, Wilson, & Doidge, 2022; Gebrehiwot & Van Der Veen, 2015; Wilson, Schlea, Boles, & Redder, 2018)
The Theory of Basic Human Values (Schwartz, 2012): Human values refer to psychological needs that people consider important in their lives. Ten values are identified: (conformity, tradition, benevolence, universalism, self-direction, stimulation, hedonism, achievement, power, and security). Farmer decisions on management practices have been associated with farmers' basic human values, such as tradition, stimulation, and security.	(Cheng et al., 2023; Schwartz, 2012)
Conceptual Model of Individual Conservation Decision-Making on Private Lands (Epanchin-Niell et al., 2022): This model integrates theoretical perspectives from three dominant disciplines: economics, sociology, and psychology to enhance communication, collaboration, and integration among different disciplines. It is used to understand decision-making processes on private lands and to design interventions targeting different drivers of environmentally and socially beneficial actions on privately owned lands.	(Epanchin-Niell et al., 2022)
Norm Activation Theory (NAT) (Schwartz, 1973, 1977): NAT explores the conditions under which personal norms affect behavior, including pro-environmental behavior.	(Vaske, Landon, & Miller, 2020)
Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977, 2011): TRA suggests that volitional behavior is influenced by intentions, which are guided by social norms and attitudes. Subjective (i.e., social) norms identify what individuals believe others think they should do, while the individual's	(Vaske et al., 2020)

Theoretical Framework	References
attitudes clarify their beliefs and evaluations about an object (e.g., situation, context).	
Values, Beliefs, and Norms Approach (VBN): VBN provides a social-psychological framework for understanding environmental decision-making, particularly how cultural factors influence decision-making. It helps predict and explain how value orientations based on self-interest, altruism, and openness to change influence environmental beliefs and behavior.	(Bergtold et al., 2022; Sanderson, Bergtold, Heier Stamm, Caldas, & Ramsey, 2017; Walpole & Wilson, 2022)
Participatory and Culturally Responsive Framework: This framework involves trained evaluators working with stakeholders in participatory needs assessment, while culturally responsive evaluation recognizes the importance of context, values, and beliefs in decision-making.	(Ikendi et al., 2024; Koundinya et al., 2023)
Social Network Analysis (SNA): SNA uses graph theory to investigate social structures and explore how key actors, their roles, and interactions influence behavioral change. It has gained interest in policy and agricultural development.	(Dingkuhn et al., 2024)
Adaptive Decision-Making Framework (Lubell et al., 2013): This framework combines perspectives from economics, psychology, social networks, and ecological systems to examine farmer decision-making in conservation-program participation. It emphasizes adaptation to climate change and highlights the importance of information networks and social values surrounding a farm community that influence adaptation.	(Golden et al., 2024; Lubell et al., 2013; Marshall & Smajgl, 2013; Munden-Dixon, Tate, Cutts, & Roche, 2019; Roche, 2016)
Behavioral/Informational Nudges: Behavioral nudges are relatively small, and low-cost interventions that can steer decisions in a desired direction without changing incentives or choices significantly. They are increasingly recognized as tool for enhancing the sustainability of food production systems.	(Benartzi et al., 2017; Congiu & Moscati, 2022; Ferrari, Cavaliere, De Marchi, & Banterle, 2019; Wallander et al., 2023)
Stated Choice Approach: Stated choice experiments have been utilized to study the effect of varying incentive payments and program attributes on the adoption of sustainable agricultural practices.	(Canales et al., 2024)

Theoretical Framework	References
Critical Physical Geography (CPG): CPG examines the interrelated social, political, chemical, and geomorphological aspects associated with sustainable agricultural practices like no-till farming.	(Malone & McClintock, 2023)
Cultural Theory of Risk (CTR) (Douglas & Wildavsky, 1983): CTR helps explain how social organizations and institutional cultures frame risks differently, allowing for heterogenous interpretations based on beliefs, ways of life, practices, and institutional discourses .	(Petersen-Rockney, 2022)
Asset-Based Community Development (ABCD): ABCD is a theoretical approach to building community capacity and relies on three principles of positive community change (Kretzman & McKnight, 1993). It informs how to build effective relationships between conservation professionals and community members, including farmers.	(Oliver & Stout, 2022)
Holistic Community Capital Framework (HCCF): HCCF identifies eight forms of community capital (natural, cultural, human, social, political, financial, built, and organizational) and provides an integrated framework for natural resource management, community development, and economic development theory can be integrated.	(Oliver & Stout, 2022; Stout, 2019)
Choice Experiment (CE): CE is a method used to research consumer behaviors, preferences, and willingness to pay (WTP) for various goods. The method has been applied to understand what sustainable agricultural program features are important to consumers.	(Yue et al., 2020)
Integrated Moral Obligation Model: This model integrates Norm Activation Theory (NAT) and Value-Belief-Norm (VBN) theory to examine the relationships among values, beliefs, norms, and conservation practice adoption in the context of water resource management. Personal norms are a useful predictor of high-cost behaviors such as the adoption of conservation practices.	(Pradhananga & Davenport, 2019)
Reasoned Action Approach (RRA) (Fishbein & Ajzen, 2010): The RAA measures individuals' attitudes towards a behavior, including the perceived benefits and drawbacks associated with it; perceived social norms, including injunctive perceptions of whether or not a behavior should or should not be performed; and individuals' real and perceived ability to perform the behavior, conceptualized as perceived behavioral control.	(Eanes et al., 2019; Fishbein & Ajzen, 2010)
Analytic Hierarchy Process (AHP) (Saaty, 1977): The AHP is a multicriteria decision making methodology that allows individuals to assess the relative importance of factors associated with decisions characterized by complexity, uncertainty, and/or conflicting goals. It draws on theories from psychology and mathematics to enable the systematic assessment, evaluation, and analysis of the relative importance of priorities, criteria, or outcomes that influence decision-making. The AHP provides valuable insights into the relative importance of priorities related to adoption of conservation practices	(A. S. Singh et al., 2018)

Theoretical Framework	References
and has the potential to deliver tailored conservation advice and information to farmers.	
Principal–Agent Theory (PAT): This theory describes the complex intra-organizational and inter-organizational relationships in which a principal (e.g., government) contracts with an agent (e.g., farmers) to accomplish tasks and goals that the principal is otherwise unable to undertake (e.g., wildlife conservation on private lands). PAT has been used as a conceptual foundation to describe the current conservation paradigm and investigate the possibilities and implications of nontraditional actors, such as crop advisers, within a new paradigm.	(Eanes et al., 2017)
The Social-Ecological System (SES) framework: The SES is a valuable tool for analyzing complex resource systems operating at various spatial and temporal scales (McGinnis & Ostrom, 2014; Ostrom, 2007). This framework can be applied to diverse agricultural systems, which exist within interacting social, institutional, and biophysical contexts. These contextual factors establish the ecological, legal, societal, and economic limitations within which an agricultural producer can operate. The SES framework is particularly useful for assessment of feedbacks between social and ecological components of the system, and for predicting how these interactions may change system components over different time periods.	(Duff, Zedler, Barzen, & Knuteson, 2017)