

**Advancing Agroecology to Build Agricultural Resilience:
Insights from Purdue Research and Extension Programs**

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Introduction

Agroecology is promoted as a holistic and transdisciplinary approach that offers a multi-scale and long-term perspective, with the potential to drive transformative changes toward a sustainable food system (Belmin et al., 2022; Rahman et al., 2021). It has recently gained attention for its capacity to promote more sustainable agricultural practices (HLPE, 2019). While agroecology provides an alternative to industrial agricultural methods, research on the meaningful and dignified aspects of agroecological work remains limited (Bezner et al., 2022). Moreover, although the growing body of agroecological research shows promise in addressing climate change, ecosystem services, and food insecurity, its widespread adoption has been slow (DeLonge et al., 2020). To further develop underutilized agroecology and climate practices (ACP) and markets, it requires stakeholders to recognize their added value to quality, health, sustainability, and producer profitability (Loconto & Hatanaka, 2018). Equally important is understanding the factors that shape farmers' decisions to adopt new practices and strategies (Darnhofer et al., 2010; Rizzo et al., 2024). These factors can then inform scenario planning and macroeconomic analyses relevant to farmers' long-term decision-making (Deguine et al., 2023). By gathering insights from a diverse range of stakeholders, this study examined key factors that influence the resilience of farming systems, focusing on adoption behaviors, resource needs, and the ecosystem benefits of soil health practices. The overall purpose of the study was to investigate how Purdue's applied research and extension support the adoption of agroecological practices. Specifically, the objectives were to (1) identify the social and economic factors influencing farmer adoption of resilience practices; (2) understand outreach efforts in addressing barriers to adoption; and (3) assess how these efforts contribute to strengthening agricultural resilience in Indiana.

Theoretical Framework

This study is grounded in the Social-Ecological Resilience Framework, which conceptualizes agricultural systems as dynamic systems in which human and environmental stressors are deeply interconnected (González-Quintero & Avila-Foucat, 2019). Resilience is defined as the capacity of these systems to absorb disturbances, adapt to change and transform in ways that enhance sustainability (Folke, 2016). The framework highlights the importance of enduring external shocks such as climate change, but also adapting and innovating to effectively respond to these challenges (González-Quintero & Avila-Foucat, 2019).

Methodology

The study was conducted using convenience sampling. A total of 85 responses were recruited through the Pest and Crop newsletter. A five-section survey instrument suitable for administration via Qualtrics was developed to collect data. The instrument was designed to evaluate factors influencing the adoption of resilience practices and the perceived impact of Purdue's applied research and extension efforts. Section one asked questions on demographics, while section two elicited information related to carbon sequestration. Sections three and four elicited information on soil health and biodiversity respectively and section five gathered

information on participants' attitudes and practices related to agricultural resiliency. The survey instrument was reviewed by panel of experts consisting of three faculty members and a postdoc scholar. The questions on the survey were measured using nominal and ordinal scales. Before conducting data analysis, data cleaning procedures were applied to ensure accuracy and consistency. Data were analyzed using descriptive statistics. The study was approved by the Institutional Review Board (IRB) of Purdue.

Results

Participants (N = 56) included 27 farmers (48%), 10 company agronomists or consultants (18%), eight university or government representatives (14%), six independent crop consultants (11%), and five individuals from other professional categories (9%). The largest proportion of respondents (38%) reported influencing crop production decisions on 5,000 acres or more, followed by 23% on 100–999 acres, 14% on both 1–99 and 1,000–4,999 acres, and 11% who indicated that this question did not apply to them. Additionally, 57% of respondents reported that over 25% of the practices they use are guided by resilience principles such as soil health, carbon sequestration, and biodiversity indicators. Across all respondent groups, top resource needs from Purdue's applied research and extension programs were ranked as access to research and data, opportunities for networking and collaboration, workshops and training sessions, and technical assistance. Respondents who had implemented soil health practices reported noticeable benefits such as improved soil structure, enhanced water infiltration, greater drought resilience, and reduced fertilizer use. However, several barriers to adopting resilient practices were also identified including financial constraints, limited access to information, time limitations, and a lack of necessary resources.

Conclusions

The findings from this study underscore the pivotal role Purdue plays in advancing agroecological practices by advancing research and extension initiatives while delivering key resources such as workshops, training sessions, and technical assistance. These efforts are seen as a critical avenue for addressing the multifaceted needs and challenges faced by stakeholders in building resilient farming systems. There is a strong demand for accessible research, technical guidance, and collaborative platforms to support decision-making. Despite the significant financial and informational barriers, farmers remain motivated to adopt resilient practices, especially when tangible benefits such as improved soil structure, better water management, and enhanced drought tolerance are evident. The diversity in participant backgrounds and land influences further highlights the importance of tailored outreach and support strategies. However, continued investment in education and resource development will be essential to accelerate the adoption of sustainable practices and strengthen resilience across the agricultural landscape.

Implications and Recommendations

The results stress the need for a multipronged approach to support resilient farming practices. Purdue University should lead by expanding access to research, enhancing technical assistance, and fostering peer-to-peer collaboration. This includes developing user-friendly databases and farmer-led learning networks focused on experience-based knowledge. Given that financial and informational barriers are key obstacles, Purdue University should work with policymakers and industry to promote funding programs, cost-share incentives, and training. Small and medium-sized producers deserve targeted support as they may lack resources to adopt resilience practices. By aligning efforts with stakeholder needs, Purdue University can advance sustainable agriculture across Indiana and beyond.

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