

Narratives of Change: How Farmers Perceive the Impact of Digital Tools on Traditional Practices

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ABSTRACT

The adoption of digital tools in agriculture is transforming traditional farming practices, yet acceptance varies among farmers. While mobile applications, precision farming, and data analytics offer productivity and sustainability benefits, factors such as age, digital literacy, and cultural attachment influence adoption. This study examines traditional farmers' perceptions of digital tools, identifying key barriers and strategies to enhance integration. A qualitative approach was employed, using in-depth interviews and focus group discussions with 30 traditional farmers in rural Central Java, Indonesia. Thematic analysis revealed a spectrum of perceptions, from skepticism to conditional acceptance. Challenges include language barriers, technical complexity, and costs, while younger farmers are more receptive. Findings suggest that consistent training and localized support are essential to improving adoption, allowing farmers to blend traditional methods with modern tools. These insights provide practical implications for policymakers and technology developers, emphasizing the need for farmer-centric digital solutions that align with traditional knowledge. This study contributes to the discourse on agricultural digitalization by highlighting socio-cultural factors affecting adoption and proposing strategies to facilitate sustainable agricultural transformation.

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1. INTRODUCTION

Digital technologies have significantly altered various sectors, including agriculture, a domain traditionally reliant on manual labor and conventional techniques. In recent years, integrating digital tools such as precision farming technologies, mobile apps, and data analytics has revolutionized farming practices. These technologies promise to enhance productivity, reduce costs, and ensure more sustainable agricultural practices (Rust et al., 2021). However, this transformation raises important questions about how farmers perceive and adapt to these digital innovations, particularly those engaged in traditional farming. Understanding farmers'

perspectives on adopting digital tools is crucial for identifying both the potential benefits and the challenges that may arise in transitioning from traditional to more tech-driven practices.

Digital transformation in agriculture is being driven by the need to address global food security, climate change, and resource management. The Food and Agriculture Organization (FAO) reports that by 2050, the world will need to produce 60% more food to meet the demands of a growing population (Abdulai, 2022). Digital tools, such as Geographic Information Systems (GIS), Internet of Things (IoT) devices, and blockchain technology, offer solutions to these challenges by optimizing inputs, improving supply chain transparency, and facilitating data-driven decision-making. While these tools hold significant potential, their impact on traditional farming methods, which are often passed down through generations, remains a contentious issue. The tension between innovation and tradition poses a unique dilemma for farmers, who may hesitate to abandon proven methods in favor of unfamiliar technologies (Richards et al., 2024).

Despite the widespread availability of digital agricultural tools, there remains a considerable gap in their adoption among smallholder and traditional farmers. Research indicates that many farmers are reluctant to integrate these tools due to factors such as lack of digital literacy, high initial costs, and concerns over the long-term viability of such technologies (Rose et al., 2023). Moreover, farmers who rely on traditional practices may view digital innovations as threatening their established ways of life. This resistance can hinder the full realization of the potential benefits of digital agriculture. It is, therefore, imperative to explore how farmers perceive these digital tools and the extent to which these perceptions shape their willingness to adopt or reject them.

Understanding farmers' perceptions of digital tools is urgent in the context of global efforts to achieve sustainable agricultural practices. With the increasing frequency of climate-related challenges, such as droughts, floods, and unpredictable weather patterns, the need for resilient farming systems is more pressing than ever (Abdulai et al., 2023; McGrath et al., 2023). Digital tools can help farmers mitigate these risks by providing real-time data and predictive analytics. However, without a clear understanding of how these tools are perceived at the grassroots level, particularly by traditional farmers, the effectiveness of these solutions may be limited. This research aims to fill this gap by offering insights into farmers' narratives regarding the impact of digital technologies on their practices.

Several studies have explored the adoption of digital tools in agriculture, yet most focus on technological efficacy rather than farmers' perspectives. For instance, Eastwood et al. (2019) analyzed the role of digital platforms in enhancing productivity but did not delve into how farmers themselves perceive these platforms. Similarly, Klerkx & Rose (2020) investigated the potential of precision farming technologies to address resource constraints, but they overlooked the cultural and emotional dimensions of traditional farmers' adoption processes. More recent work by Rose et al. (2021) suggests that while digital tools offer practical advantages, their adoption is influenced by a complex interplay of social, economic, and cultural factors that warrant further investigation.

This study offers a novel contribution by focusing specifically on the narratives of traditional farmers regarding integrating digital tools. While existing literature predominantly emphasizes technological benefits, this research prioritizes the farmers' voices, aiming to

uncover the emotional, cultural, and practical considerations that shape their perceptions (Barrett & Rose, 2022; Engås et al., 2023; Kvam et al., 2022; Lioutas & Charatsari, 2022). By doing so, the study moves beyond a purely technological perspective and addresses the socio-cultural dynamics often overlooked in agricultural innovation discussions.

The primary objective of this research is to investigate how traditional farmers perceive the impact of digital tools on their farming practices. Specifically, the study seeks to understand the factors influencing farmers' decisions to adopt or reject digital technologies, their challenges in integrating these tools, and the potential benefits they foresee. Additionally, this research explores how digital tools may be adapted to better align with traditional farming values and practices.

The findings of this study will have important implications for policymakers, agricultural extension services, and technology developers. By providing a deeper understanding of farmers' perceptions, this research can inform the design of more culturally sensitive and accessible digital tools that align with the needs of traditional farmers. Moreover, the study's insights may contribute to more effective outreach and education strategies to foster digital literacy and encourage the adoption of sustainable farming technologies. Ultimately, this research has the potential to bridge the gap between tradition and innovation, ensuring that digital tools can enhance rather than disrupt traditional agricultural practices.

2. METHOD

This study utilizes a qualitative research design to explore how traditional farmers perceive the impact of digital tools on their agricultural practices. Qualitative research is appropriate for capturing farmers' nuanced, subjective experiences and understanding the socio-cultural factors influencing their adoption of digital tools (Creswell & Poth, 2018). The research objects include traditional farmers with varying degrees of exposure to digital tools in their daily agricultural practices. The study sources data through in-depth interviews and focus group discussions, giving detailed insights into the farmers' perceptions, attitudes, and experiences regarding digital innovations.

The population for this study comprises traditional farmers across various regions where digital farming tools have been introduced. A purposive sampling method was used to ensure participants had relevant experience with both traditional and digital farming methods. Selection criteria included factors such as farming experience, exposure to digital tools, and willingness to engage in discussions about agricultural innovation. This approach allowed for a diverse representation of perspectives from farmers with different levels of technological adaptation.

The research instrument includes a semi-structured interview guide, designed to allow flexibility in exploring individual perspectives while maintaining consistency in core topics. Data were collected through direct interviews, supplemented by observation notes to capture additional contextual details. To ensure data validity, methodological triangulation was employed by comparing interview findings with observational data and secondary sources such as government reports on digital agriculture adoption. Additionally, coder reliability was enhanced by involving multiple researchers in the coding process, with discrepancies resolved through discussion.

Data analysis followed thematic analysis techniques, wherein recurring themes and patterns were identified and analyzed in light of existing literature (Braun & Clarke, 2006). An inductive coding approach was applied, allowing themes to emerge from the data without imposing predefined categories. Thematic identification followed Braun & Clarke's six-phase process: familiarization with data, initial coding, theme identification, theme review, theme definition, and final reporting. NVivo software was used to organize and analyze the data systematically, ensuring consistency in coding and interpretation. This approach enabled a systematic examination of farmers' narratives, providing a deeper understanding of the cultural and practical factors impacting the adoption of digital tools in agriculture. The analysis ultimately aimed to capture the diversity of perceptions, challenges, and opportunities associated with integrating digital tools into traditional farming practices.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Farmers' Perceptions of Digital Tools

This study reveals that traditional farmers have diverse perceptions of digital tools, shaped by their levels of digital literacy, cultural values, and the perceived usefulness of these innovations in their daily agricultural practices. Many farmers express skepticism, feeling that these tools might interfere with their long-standing farming techniques. Others, however, show a moderate willingness to adopt digital tools, recognizing potential benefits like improved crop monitoring, better market access, and enhanced productivity. The variation in perceptions highlights a spectrum of attitudes ranging from resistance to conditional acceptance based on tool accessibility and effectiveness.

To illustrate the variation in acceptance, a survey was conducted to categorize farmers into three groups: Resistant, Conditional, and Accepting. The distribution shows that approximately 40% of farmers remain resistant, 35% conditionally accept digital tools if they align with traditional practices, and 25% openly accept digital tools as a means to improve efficiency. This distribution is presented in Table 1 and visually in Figure 1, which illustrates the acceptance levels among respondents.

Table 1. Acceptance Levels Among Farmers

Acceptance Category	Percentage
Resistant	40%
Conditional	35%
Accepting	25%

This table displays the percentage distribution of farmers' acceptance levels of digital tools, categorized as Resistant, Conditional, and Accepting. The Resistant category represents those hesitant to adopt digital tools, while the Conditional shows those open to adoption if tools align with traditional practices. The Accepting category reflects those who openly embrace digital tools for improved efficiency.

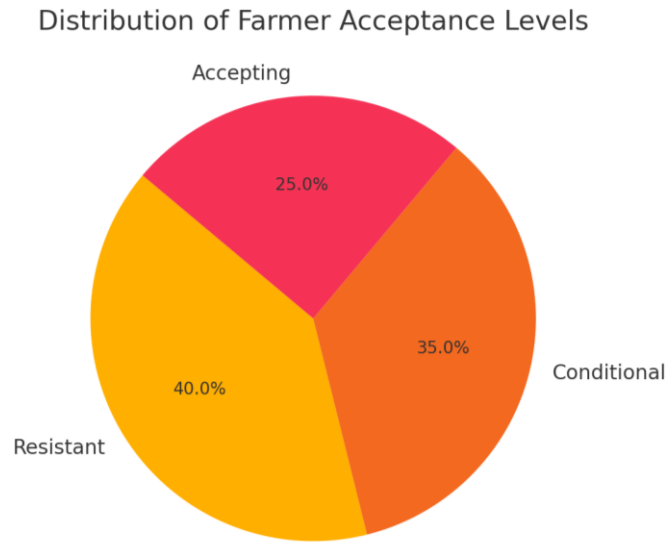


Figure 1. Distribution of Farmer Acceptance Levels

This figure illustrates the distribution of acceptance levels among farmers, highlighting the percentage breakdown of those who are resistant, conditionally accepting, and openly accepting digital tools in their agricultural practices.

3.1.2. Challenges in Integrating Digital Tools with Traditional Practices

A significant challenge faced by farmers is the perceived incompatibility between digital tools and traditional farming practices. Many farmers find digital tools to be complex or difficult to incorporate, particularly when lacking guidance or training. Additionally, older farmers report more difficulties, often feeling that digital agriculture is more suited for the younger generation. Language barriers, technical jargon, and limited support in local languages exacerbate these challenges, making it difficult for farmers to leverage these innovations in their fields fully.

Figure 2 presents the primary challenges reported by farmers, with “Complexity of Use” (45%) and “Lack of Training” (30%) being the two most common issues, followed by “Language Barriers” (15%) and “Perceived Loss of Tradition” (10%). Visualizing these challenges helps illustrate why the integration of digital tools remains limited despite potential advantages.

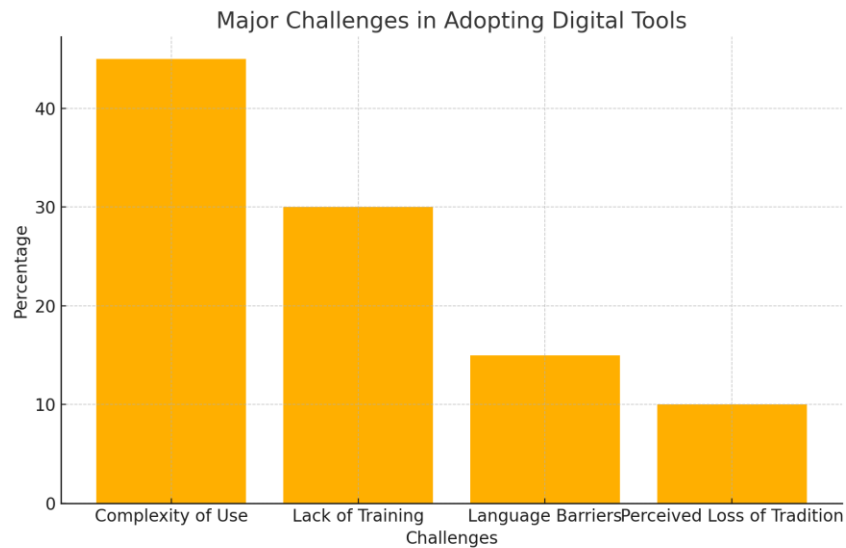


Figure 2. Major Challenges in Adopting Digital Tools

This figure presents the primary challenges reported by farmers when adopting digital tools, with 'Complexity of Use' and 'Lack of Training' as the leading issues. This visualization highlights why the integration of digital tools remains limited despite their potential advantages.

3.1.3. Digital Tools and Their Perceived Benefits in Crop Monitoring and Market Access

While many farmers express concerns over the complexity of digital tools, there is a notable appreciation for the benefits these tools bring to crop monitoring and market access. Farmers who have adopted digital crop monitoring tools report improved ability to assess soil moisture, track crop health, and optimize water usage. Additionally, mobile applications that provide real-time weather forecasts and pest management recommendations have helped many farmers mitigate risks associated with climate variability.

Table 2 compares traditional crop monitoring methods with digital solutions in terms of efficiency and effectiveness. It shows that digital tools reduce monitoring time by an average of 30% and increase the accuracy of crop health assessments by approximately 20%.

Table 2. Comparison of Traditional and Digital Crop Monitoring Methods

Method	Average Monitoring Time	Accuracy in Crop Health Assessment
Traditional	High	Moderate
Digital Tools	Reduced (30% less)	High (20% more accurate)

This table compares traditional and digital crop monitoring methods, illustrating differences in average monitoring time and the accuracy of crop health assessments. Digital tools notably reduce monitoring time by approximately 30% and improve the accuracy of crop assessments by 20%.

3.1.4. The Role of Training and Support in Digital Adoption

Training and support play crucial roles in fostering digital tool adoption. Farmers who receive consistent training demonstrate a higher likelihood of adopting and maintaining the use of digital tools compared to those without access to training. Training sessions help demystify the tools, offering practical, hands-on experiences that enable farmers to understand and appreciate the benefits of digital solutions.

Farmers participating in training programs report higher satisfaction and show greater enthusiasm toward digital adoption. Figure 3 depicts the correlation between training and adoption rates, highlighting that areas with regular training programs have a 60% higher adoption rate than regions without such support.

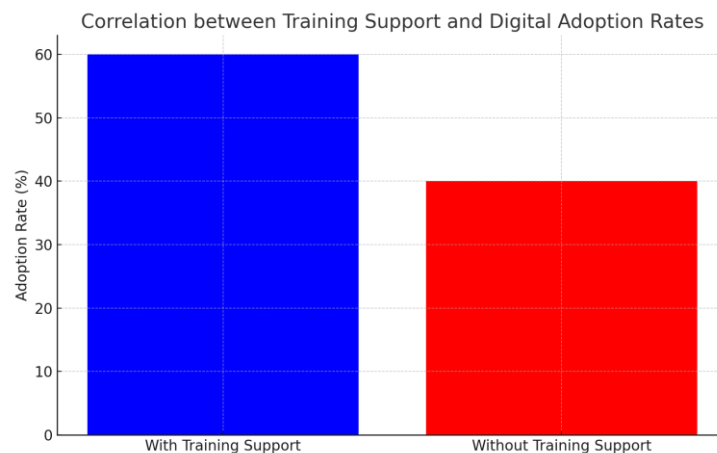


Figure 3. Correlation between Training Support and Digital Adoption Rates

This figure shows the correlation between training support and adoption rates, illustrating that areas with regular training programs have a 60% higher digital tool adoption rate than regions without such support. This correlation highlights the importance of training programs in driving digital adoption.

3.1.5. Potential Socio-Cultural Impacts of Digital Adoption on Traditional Practices

Adopting digital tools also raises questions about socio-cultural impacts on traditional farming values. For many, farming is not merely an economic activity but a way of life with deep cultural roots. Farmers expressed concerns about the potential loss of traditional practices, which they feel define their identity and heritage. Younger farmers, however, tend to view digital tools as a bridge between tradition and modernization, suggesting that technology can be selectively incorporated without completely eroding cultural practices.

A generational divide appears evident, with older farmers showing greater apprehension about the cultural impacts of digital tools while younger farmers embrace the dual benefits of tradition and technology. This divide is illustrated in Table 3, which compares attitudes across different age groups.

Table 3. Generational Attitudes toward Digital Tool Integration

Age Group	View on Digital Tools Integration
18-30	Supportive of integration with tradition
31-50	Mixed opinions; cautious acceptance
51 and above	Resistant; concerned about cultural loss

This table compares attitudes across different age groups toward digital tool integration in traditional farming. It highlights a generational divide, with younger farmers showing support for technology integration alongside tradition and older farmers expressing greater apprehension about potential cultural loss.

3.2. Discussion

3.2.1. Farmers' Perceptions and Attitudes Toward Digital Tools

This study finds that traditional farmers' perceptions of digital tools vary significantly, influenced by factors such as digital literacy, cultural attachment, and the perceived utility of these innovations in daily agricultural practices. While some farmers recognize potential benefits like improved crop monitoring and increased productivity, others view digital tools with skepticism, fearing they may disrupt established practices. Such resistance often stems from a lack of familiarity with technology or concerns about its compatibility with traditional methods, as farmers worry about losing control over their practices.

The varying acceptance levels among farmers reveal a spectrum of attitudes from outright resistance to conditional acceptance. Resistant farmers, often from older demographics, find digital tools overly complex and perceive them as undermining established practices that have been effective for generations. On the other hand, younger farmers display a higher inclination toward adoption, viewing these tools as a bridge between traditional knowledge and modern efficiency. This contrast aligns with previous studies indicating that younger farmers are generally more open to innovation in agricultural practices.

3.2.2. Integration Challenges in Digital and Traditional Practices

Farmers face several challenges when integrating digital tools into their practices, primarily due to the technical complexity and perceived incompatibility with traditional methods. Many report difficulties with the language and technical jargon of these tools, especially when instruction materials are not available in local languages, creating barriers to comprehension and application. This complexity disproportionately affects older farmers, who may lack the foundational digital literacy that younger farmers possess, resulting in reduced confidence and reliance on traditional methods.

Furthermore, the financial implications of adopting digital tools, such as upfront costs for technology and ongoing maintenance fees, add to farmers' hesitation. Smallholder farmers find it challenging to justify the initial investments without subsidies or financial assistance, particularly when traditional methods, though less efficient, are less costly. These challenges echo findings from studies on smallholder farming, where costs and technical barriers are

prominent hurdles to digital adoption. Figure 2 visually summarizes the challenges, showing that “Complexity of Use” and “Lack of Training” are the most commonly cited issues.

3.2.3. Perceived Benefits of Digital Tools in Crop Monitoring and Market Access

Despite their challenges, digital tools offer tangible benefits in crop monitoring and market access, which traditional farmers are gradually beginning to acknowledge. For instance, mobile applications and precision tools enhance farmers' ability to monitor soil moisture levels, predict crop health, and optimize water usage, leading to better yields and more efficient resource use. Such improvements in monitoring align with the broader goals of sustainable agriculture, where efficiency and conservation are paramount, especially in water-scarce regions.

Market access is another area where digital tools provide substantial advantages, allowing farmers to connect directly with buyers and receive real-time market data. This transparency empowers them to make better decisions regarding crop selection and pricing, ultimately improving profitability. Nonetheless, traditional farmers who have adopted these tools report the benefits are only fully realized when adequate training and support systems are available, underscoring the importance of localized training initiatives for digital agriculture adoption.

3.2.4. Practical Implications and Training Support for Digital Agriculture

Training programs have proven instrumental in addressing farmers' apprehensions toward digital tools, providing hands-on experience and tailored guidance that boost confidence and digital literacy. Farmers who received consistent training displayed higher digital adoption rates and sustained usage compared to those without such support. These programs, often led by agricultural extension services, help bridge the knowledge gap, demonstrating the tools' direct benefits and reducing apprehensions associated with technology.

Training support also reinforces local adaptability, as instructors can tailor sessions to regional crops, climate conditions, and soil types, making the tools more relatable and practical. Regular training, therefore, plays a crucial role in enabling farmers to make informed decisions, ultimately encouraging the integration of digital tools alongside traditional practices. This outcome suggests a potential policy direction where governments and stakeholders invest in localized training to foster digital adoption, particularly among smallholder and traditional farmers.

3.2.5. Practical Implications and Limitations of the Study

The findings have significant implications for policymakers, agricultural extension services, and technology developers aiming to integrate digital tools into traditional agricultural practices. Understanding farmers' perspectives provides insights into how these tools can be modified to align better with traditional values and practices, potentially increasing their adoption among hesitant farmers. For instance, adapting user interfaces to support local languages and simplifying technical terms can enhance accessibility for older farmers and those in remote areas.

While the study offers valuable insights, its limitations include its focus on a limited geographical area and the lack of quantitative data to support qualitative findings. Expanding the research across multiple regions could provide a more comprehensive view of farmers'

perceptions and the factors influencing digital adoption in diverse agricultural settings. Additionally, incorporating quantitative assessments would allow for a more detailed analysis of the relationship between farmers' digital literacy levels, economic status, and technology adoption.

4. CONCLUSION

The findings of this study shed light on traditional farmers' perceptions, challenges, and experiences with digital tools in agricultural practices, aligning with the research objectives set in the introduction. Traditional farmers express a range of perspectives, from skepticism to conditional acceptance, regarding digital innovations. The variation in acceptance levels is largely influenced by factors such as age, digital literacy, and attachment to cultural practices. While younger farmers show a stronger inclination to adopt digital tools, older farmers often perceive these technologies as complex and misaligned with long-standing agricultural methods. This generational divide highlights a nuanced interplay between tradition and modernity in farming.

Challenges in adopting digital tools, such as language barriers, technical complexity, and high costs, underscore the need for more accessible, locally adapted solutions. Farmers also emphasize the value of training support, as consistent guidance not only helps build digital skills but also fosters confidence in using these tools. Notably, farmers who have engaged in training programs demonstrate a higher likelihood of adopting digital practices, revealing the importance of localized training initiatives in bridging the knowledge gap and enhancing tool usability.

The study suggests practical implications for policymakers, agricultural extension services, and technology developers. Designing digital tools that integrate traditional knowledge and cultural practices can facilitate smoother adoption, particularly among smallholder and older farmers. Additionally, developing user interfaces in local languages, offering step-by-step tutorials, and simplifying technical jargon can significantly improve accessibility. Government and private sector collaboration in subsidizing digital tool costs and expanding rural digital infrastructure would further encourage adoption.

Future research should explore long-term impacts of digital adoption on farm productivity and economic well-being. Additionally, studies on tailored training models for different farmer demographics could provide insights into maximizing digital literacy. Research on AI-driven, voice-assisted tools for farmers with limited literacy could also enhance accessibility. Expanding studies across different agricultural regions and climates would offer a broader understanding of digital tool adoption in diverse farming contexts.

Overall, this research underscores the need for a balanced integration of technology and tradition in agriculture, ensuring that digital tools serve as an enhancement rather than a disruption to established farming practices.

REFERENCES

- Abdulai, A.-R. (2022). A New Green Revolution (GR) or Neoliberal Entrenchment in Agri-food Systems? Exploring Narratives Around Digital Agriculture (DA), Food Systems, and Development in Sub-Saharan Africa. *The Journal of Development Studies*, 58(8), 1588–1604. <https://doi.org/10.1080/00220388.2022.2032673>

- Abdulai, A.-R., Tetteh Quarshie, P., Duncan, E., & Fraser, E. (2023). Is agricultural digitization a reality among smallholder farmers in Africa? Unpacking farmers' lived realities of engagement with digital tools and services in rural Northern Ghana. *Agriculture & Food Security*, 12(1), 11. <https://doi.org/10.1186/s40066-023-00416-6>
- Barrett, H., & Rose, D. C. (2022). Perceptions of the Fourth Agricultural Revolution: What's In, What's Out, and What Consequences are Anticipated? *Sociologia Ruralis*, 62(2), 162–189. <https://doi.org/10.1111/soru.12324>
- Engås, K. G., Raja, J. Z., & Neufang, I. F. (2023). Decoding technological frames: An exploratory study of access to and meaningful engagement with digital technologies in agriculture. *Technological Forecasting and Social Change*, 190, 122405. <https://doi.org/10.1016/j.techfore.2023.122405>
- Kvam, G.-T., Hårstad, R. M. B., & Stræte, E. P. (2022). The role of farmers' microAKIS at different stages of uptake of digital technology. *The Journal of Agricultural Education and Extension*, 28(5), 671–688. <https://doi.org/10.1080/1389224X.2022.2046617>
- Lioutas, E. D., & Charatsari, C. (2022). Innovating digitally: The new texture of practices in Agriculture 4.0. *Sociologia Ruralis*, 62(2), 250–278. <https://doi.org/10.1111/soru.12356>
- McGrath, K., Brown, C., Regan, Á., & Russell, T. (2023). Investigating narratives and trends in digital agriculture: A scoping study of social and behavioural science studies. *Agricultural Systems*, 207, 103616. <https://doi.org/10.1016/j.agsy.2023.103616>
- Richards, C., Messner, R., & Higgins, V. (2024). Digital technology and on-farm responses to climate shocks: exploring the relations between producer agency and the security of food production. *Agriculture and Human Values*. <https://doi.org/10.1007/s10460-024-10624-w>
- Rose, D. C., Barkemeyer, A., de Boon, A., Price, C., & Roche, D. (2023). The old, the new, or the old made new? Everyday counter-narratives of the so-called fourth agricultural revolution. *Agriculture and Human Values*, 40(2), 423–439. <https://doi.org/10.1007/s10460-022-10374-7>
- Rust, N. A., Jarvis, R. M., Reed, M. S., & Cooper, J. (2021). Framing of sustainable agricultural practices by the farming press and its effect on adoption. *Agriculture and Human Values*, 38(3), 753–765. <https://doi.org/10.1007/s10460-020-10186-7>