Bridging the Digital Divide:
Enhancing Science Communication in Precision and Digital Agriculture

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Introduction and Theoretical Framework

The need for agricultural production has increased due to population growth and globalization. The world's population is anticipated to reach between 9.4 and 10.2 billion people by 2050, necessitating a 70% increase in food production to avoid drastic global food insecurity (FAO, 2017). Digital agriculture is predicted to play a significant role in achieving sustainable agricultural production (Annosi et al., 2021). However, for digital agriculture to meet this need, farmers must adopt new practices to increase yield and improve crop efficiency. This raises the question of how international and domestic agricultural producers and stakeholders can integrate digital agriculture into existing and future practices to meet societal needs.

Guided by gadgets like remote sensors, robotic systems, and unmanned aerial systems (UAS), digital agriculture is rapidly expanding to meet global agricultural production demands (Fountas et al., 2020). The development of digital agriculture has transformed agricultural production, enhancing farming techniques, increasing output and yield, and reducing environmental externalities (Colussi et al., 2022). Despite these advancements, Odini (2014) found that most rural farming communities have a poor acceptance rate due to ineffective communication and exchange of agricultural information about technology. Colussi et al. (2022) also discovered that inadequate communication and education contribute to the lack of information and discomfort about adopting digital agricultural instruments among stakeholders throughout the agri-food production chain.

The biggest barrier to digital agriculture is the lack of skills required to use communication technologies among many farmers. On a global scale, farmers' inability to use digital technology is largely a communication and comprehension barrier (Gelb et al., 2009). Improving agricultural producers' understanding and perception of "digital agriculture" requires localized adoption of these technologies and practices. Scientific communicators must share messaging related to digital agriculture for stakeholders to comprehend its scope and value to the industry. Colussi et al. (2022) identified various ways to inform farmers about digital agriculture, including mass media (e.g., newspapers, magazines, radio, television, websites/blogs), social media (e.g., WhatsApp, Facebook, YouTube, Instagram, LinkedIn), and in-person interactions (e.g., field days, conferences, retailers, Extension agents, peer groups, neighborhood chats).

The theoretical framework for this innovative idea is Rogers and Adhikarya's (1979) diffusion of innovations theory. This framework discusses the impact on international audiences and the challenges of gaining community support for new technologies due to limiting factors in adopting new ideas. Increased communication improves knowledge and information among stakeholders, playing a major role in planning inputs, increasing the production of quality foods, and improving business decision-making (Boehlje et al., 2021). Gaining community support often depends on the success of messaging and communication strategies, which are vital for international outreach efforts.

Purpose and Objectives

The purpose of this teaching innovative idea is to equip science communicators with tools to teach communication strategies related to digital agriculture and the global adoption of emerging technologies. The objectives are to (1) identify communication needs related to digital agriculture, and (2) identify communication strategies to connect with varying audiences at different levels—macro, meso, and micro (Klerkx et al., 2019).

Method

For this innovative educational model, we adapted Klerkx et al.'s (2019) model for digitalization and adoption of emerging agricultural technologies and Rogers and Adhikarya's (1979) diffusion of innovations theory to teach science communicators in Science Communication class at New Mexico State University how to break down messaging for digital agriculture on macro, meso, and micro levels. We first shared key innovations in digital agriculture, such as drone technology, sensors, precision agriculture, satellites, and IoT devices. These technologies can optimize water usage, monitor crop health, detect weeds, identify plant diseases, and automate irrigation (Jayna Locke, 2025). Students were then asked to identify three examples of digital agriculture in the media.

Using their brainstormed list, students selected their favorite topic, and we shared Klerkx et al.'s (2019) model for digitalization and adoption of emerging agricultural technologies, which helps communicators break down messaging targeting audiences on macro, meso, and micro levels. Using a guided notes handout, students broke down messaging strategies they could incorporate at global, state, and local levels to teach approaches for targeted communication efforts.

Results

Following the educational activity, students shared their perspectives on the challenges communities, stakeholders, and farmers face related to digital agriculture. Some students were aware of the drastic need for digital agricultural innovations to address global challenges but had not considered the messaging required at varying levels—global to local—to invoke change in communities broad enough to encourage agriculturists to engage and policymakers to support. Students also noted that messaging efforts vary at different levels, requiring different communication strategies to connect with domestic and international audiences.

Recommendations, Implications, and Application

Providing tools for science communicators to engage global and domestic audiences on pivotal agricultural issues, such as digital agriculture, is vital for advancing the agricultural industry. Using Klerkx et al.'s (2019) and Rogers and Adhikarya's (1979) models for inspiring change, we recommend that educators create spaces for students to adapt their interests related to agricultural challenges. Engaging local stakeholders in brainstorming sessions can help students grasp the connection between communication efforts and international and domestic agricultural solutions. Additionally, involving local or international experts in the brainstorming phase can enhance students' understanding of targeted communication efforts.

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