

July Update from the Field

Good morning,

I hope you all had a wonderful 4th of July weekend. Our summer seasonal campaign was on technology in agriculture. We rounded up a list of top mobile apps for agricultural safety and health and we encourage you to check that out here:

<https://icash.public-health.uiowa.edu/programs/seasonal-campaigns/summer-2020-agricultural-safety-and-health-apps/>. Our Update from the Field is geared toward some of the literature surrounding this new wave of technology in agriculture. If you'd like full articles, let me know at smcmilln@uiowa.edu. Please reach out with questions or comments.

Best regards,

Stephanie McMillan

State of Apps Targeting Management for Sustainability of Agricultural Landscapes

Inwood, Sarah E. Eichler, and Virginia H. Dale. "State of apps targeting management for sustainability of agricultural landscapes. A review." *Agronomy for sustainable development* 39, no. 1 (2019): 8.

The triple-bottom-line approach to sustainability in agriculture requires multi- and inter-disciplinary expertise and remains a major design and implementation challenge. Tools are needed to link extension agents, development workers, farmers, and other agriculture decision-makers to information related to practices that improve sustainability across agricultural landscapes. The digital age has brought many new cloud-based and mobile device-accessible software applications (apps) targeted at farmers and others in the agriculture sector; however, the effectiveness of these tools for advancing sustainability goals is unknown. Here, we review apps for agriculture in order to identify gaps in information provisioning and sharing for tools that connect decisionmakers to knowledge in support of sustainable agricultural landscapes. The major findings are (1) Agricultural apps can be categorized as supporting regulatory compliance, equipment optimization, farming simulator games, information management, agronomic reference information, product tracking, pest identification, emissions accounting, or benchmarks for marketing claims. (2) Many apps are developed to link specific products for single solutions, such as GPS-guided crop implementation or sensors within Internet-of-things connectivity. (3) While pilots, prototypes, and case studies are available in both Apple and Android digital markets, public mobile apps to improve multidirectional agriculture knowledge exchange are limited and poorly documented. (4) There remains a need for apps emphasizing knowledge exchange and resource discovery, rather than simply information delivery, to help farmers identify evidence-based practices that improve indicators of sustainability. (5) Development of a digital decision support tool requires early and ongoing interactions with targeted end users to clarify app performance objectives and social networking preferences, ensure reliability of scientific input and business management plans, and optimize the user experience.

Global Trends in Apps for Agriculture

Barbosa, Julierme Zimmer, Stephen A. Prior, Guilherme Quaresma Pedreira, Antonio Carlos Vargas Motta, Giovana Clarice Poggere, and Gabriel Democh Goularte. "Global trends in apps for agriculture." *Multi-Science Journal* 3, no. 1 (2020): 16-20.

Although applications (apps) for mobile devices show increasing popularity in the agricultural sector, studies regarding their availability are still incipient. In the present study, a survey was conducted to assess global trends of app availability for agriculture. This survey was conducted in 2015 and 2018 in two app stores with free access (Google Play and Windows Phone); searches for the following keywords were included in the survey: agriculture, agri, and farming. In 2015 and 2018, these searches found 244 and 599 apps from 33 and 61 countries, respectively. Countries with the largest number of apps (i.e., USA, Brazil, and India) accounted for ~64% of all surveyed apps. However, diversity and availability of paid apps was greater in USA and Brazil compared to India. Although many apps were related to magazines and market information, numerous other apps were available on farm management, pests and diseases, precision agriculture, and technical assistance. Related apps that used photographic input and citizen science data were also found. Our study indicates that the global development of apps for agriculture is growing rapidly, with most serving informative purposes at no cost to users.

Exploring the role of smartphone technology for citizen science in agriculture

Dehnen-Schmutz, Katharina, Gemma L. Foster, Luke Owen, and Séverine Persello. "Exploring the role of smartphone technology for citizen science in agriculture." *Agronomy for sustainable development* 36, no. 2 (2016): 25.

Citizen science is the involvement of citizens, such as farmers, in the research process. Citizen science has become increasingly popular recently, supported by the proliferation of mobile communication technologies such as smartphones. However, citizen science methodologies have not yet been widely adopted in agricultural research. Here, we conducted an online survey with 57 British and French farmers in 2014. We investigated (1) farmer ownership and use of smartphone technologies, (2) farmer use of farmspecific management apps, and (3) farmer interest and willingness to participate in agricultural citizen science projects. Our results show that 89 % respondents owned a smartphone, 84 % used it for farm management, and 72 % used it on a daily basis. Fifty-nine percent engaged with farm-specific apps, using on average four apps. Ninety-three percent respondents agreed that citizen science was a useful methodology for data collection, 93 % for real-time monitoring, 83 % for identification of research questions, 72 % for experimental work, and 72 % for wildlife recording. Farmers also showed strong interest to participate in citizen science projects, often willing to commit substantial amounts of time. For example, 54 % of British respondents were willing to participate in farmland wildlife recording once a week or monthly. Although financial support was not always regarded as necessary, experimental work was the most likely activity for which respondents thought financial support would be essential. Overall, this is the first study to quantify and explore farmers' use of smartphones for farm management, and document strong support for farm-based citizen science projects.

Smartphone Applications Targeting Precision Agriculture Practices—A systematic review

Mendes, Jorge, Tatiana M. Pinho, Filipe Neves dos Santos, Joaquim J. Sousa, Emanuel Peres, José Boaventura-Cunha, Mário Cunha, and Raul Morais. "Smartphone Applications Targeting Precision Agriculture Practices—A Systematic Review." *Agronomy* 10, no. 6 (2020): 855.

Traditionally farmers have used their perceptual sensorial systems to diagnose and monitor their crops health and needs. However, humans possess five basic perceptual systems with accuracy levels that can change from human to human which are largely dependent on the stress, experience, health and age. To overcome this problem, in the last decade, with the help of the emergence of smartphone technology, new agronomic applications were developed to reach better, cost-effective, more accurate and portable diagnosis systems. Conventional smartphones are equipped with several sensors that could be useful to support near real-time usual and advanced farming activities at a very low cost. Therefore, the development of agricultural applications based on smartphone devices has increased exponentially in the last years. However, the great potential offered by smartphone applications is still yet to be fully realized. Thus, this paper presents a literature review and an analysis of the characteristics of several mobile applications for use in smart/precision agriculture available on the market or developed at research level. This will contribute to provide to farmers an overview of the applications type that exist, what features they provide and a comparison between them. Also, this paper is an important resource to help researchers and applications developers to understand the limitations of existing tools and where new contributions can be performed.

Social Media—a disruptive opportunity for science and extension in agriculture?

Casey, M. J., A. Meikle, G. A. Kerr, and D. R. Stevens. "Social media—a disruptive opportunity for science and extension in agriculture." In *Hill Country Symposium. Grassland Research and Practice Series*, vol. 16, pp. 53-60. 2016.

The use of social media is increasing and provides an opportunity compared to 'traditional' media. Advances in cloud computing and smartphones have increased the ability to utilise different forms of social interaction. Are farmers and rural businesses realising this opportunity? The engagement of the agricultural community in social media was investigated using an online survey of email recipients of the New Zealand Grassland Association and Beef + Lamb New Zealand to understand their use of computing hardware and social media use. Case studies of recent social media use by Beef + Lamb New Zealand, NZ Agriseeds Ltd and a Deer Industry research uptake project are documented. Responses of 209 survey respondents identified 82% of users with two or more devices, while 100% used email regularly and approximately 95% accessed websites on a daily or weekly basis. Regular Facebook use averaged approximately 50% in the agribusiness and research communities, though this was only 30% in the farming community. Other social media platform use, such as Twitter, YouTube and LinkedIn, was lower. Regular mobile apps use was highest in the agribusiness (60%) while

this was lower in farming and research communities (30%). The case studies highlighted the development of new social networks using Facebook and Twitter as the underlying opportunity for future engagement in agriculture, while websites, mobile apps and YouTube have the capacity to house resources for interrogative learning and support. Resources need to be allocated to ensure the power of these platforms can be harnessed for commerce and practice change.