

The ethics of cybersecurity, data use and AI in agriculture

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Key words

integrity, data sovereignty, artificial intelligence, intellectual property, privacy, professionalism

Take home message

- Producers, growers, advisers, researchers, and all others in the agriculture sector should commit to professional development or accreditation with an ethics component, particularly in the context of the use, storage, and security of data
- Data and artificial intelligence are key to a productive and well-run agriculture sector, ethical behaviour is paramount to support this
- Industry lead initiatives such as accreditations with an ethics requirement and high-quality professional development opportunities such as masterclasses are the cornerstone of ensuring agriculture remains professional and ethical into the future.

The need for data use ethics in agriculture

In this paper we will explore the ethical dilemmas and implications of using and storing agriculture data, as well as some of the risks, specifically around the use of artificial intelligence (AI) and cybersecurity.

Data use and ownership

Digital agriculture, the collection of large amounts of agricultural data, and the use of that data to develop on farm solutions and tools for improved productivity has been a growing part of the agriculture industry (McKinnon *et al.*, 2022). Many agtech startups, all with different goals and purposes, have popped up across Australia and globally. These have resulted in some impressive and innovative methods to improve productivity in various ways. The research and data collection required for these innovative solutions to be available is often understated, and questions around the ownership and usage permissions of that data is often not explicitly discussed.

Similarly, the development and wider availability of out of the box technologies is also increasing, with technologies such as weather stations now competitively marketed with many options available. These commercial options offer advantages such as ease of use and competitive pricing. However, the licence agreements and data use and storage agreements are often ambiguous and may allow the vendor to access, store, use and share data.

There are ethical implications of failing to perform due diligence through discussing data use and storage agreements. Privacy laws in Australia state that a person or entity must be able to access their information on request, and that the agreement to share information can be withdrawn at any time. Such a request may have very significant impacts on a research project or technology trial. Thus, it is important to ensure that informed consent is provided and that the privacy of any data that is collected can be maintained.

Often, results and conclusions that can be drawn from data collected for research or technology trials will be published or shared in some way, particularly to demonstrate positive outcomes or benefits. However, if that data is not deidentified or the sample size is too small, this could lead to privacy concerns. The dilemma here is not whether the data should or should

not be collected, but rather what is the most ethical way of analysing and sharing the results and ensuring informed consent.

Data storage and (cyber)security

With the development of supercomputers and faster computing options, big data has become an important part of agricultural research and innovation. This involves the analysis of very large amounts of data, often from a large number of sources (Misra *et al.*, 2022). However, the analysis of such a large amount of data requires all that data to be stored somewhere and accessible by the relevant people or systems.

Similarly, the analysis of multiple on-farm data sources to estimate yields, input costs etc. requires the use of multiple stored data sources. Typically, this might have been done on a single computer system when on-farm data capture was still new. But it is more common to use a cloud-based system or external data storage source (Kharel *et al.*, 2020).

Where several different systems or software are used to collect on-farm data, those systems will also need to either export data in a common format or share data in a common format. The ability of one system to share and read data from another system or software is termed data interoperability. This concept and the development of basic standards for data interoperability is being considered by the Australian government for the purpose of traceability of produce (National Archives of Australia, 2023). For such a system to work 2 main risks need to be managed:

1. Storage and sharing of relevant data
2. Maintenance of security and privacy of that data.

The frequency and severity of cybersecurity incidents has increased significantly over the last decade and there have been several high-profile breaches. However, there are many more low-profile breaches to data storage by small companies that pose just as big a threat to privacy and data integrity. As data is shared more widely, this opens the door for more opportunities for cyberattacks (Cofone, 2023). Whilst privacy laws set out what types of data must be protected these laws cannot keep up with cybersecurity threats. Therefore, as part of an ethical data storage agreement, data owners should ask questions about the security protocols in place and what to expect when a breach occurs. No company will ever be able to fully guarantee the secure storage of accessible data. The ethical dilemma here is what happens when a breach does occur, and what does due diligence look like?

AI

The use of AI for complex (and sometimes simple) tasks has become a key part of many people's lives. AI has been researched for use in precision agriculture for some time, however, with the release of ChatGPT and other open source, user friendly AI models, its use has expanded to many other applications. However, there are a few aspects of creating and using AI that should be considered from an ethical standpoint.

1. The outputs of an AI system are only as good as the inputs. Inconsistent data, biased data, and incomplete data that is fed into an AI will result in inconsistent, incomplete, biased, and sometimes dangerous outputs.
2. Open-source AI systems use open-source data. That means that any data that is inputted into an open-source AI such-as ChatGPT, can and will be used for outputs for other users. This could result in privacy or confidentiality breaches.

3. Depending on the complexity, AI systems can use large amounts of computing resources which in turn uses large amounts of power to run complex analysis. Where is that carbon footprint attributed? The IT industry, or the agriculture industry that is using the AI?
4. Some AI systems are unsupervised, meaning it is unclear how the system is analysing data to create the conclusions or outputs. While this method has its uses, it can make it difficult to know how the system came to a conclusion and what effect different data sources have on the outcome. Consumers of results from an AI should be confident to ask questions about what and how data sources were used.
5. AI that is integrated into a connected device (smart watches etc.) can be exploited by hackers. This creates further data access and privacy issues. (Chen *et al.*, 2024).

How do we ensure agriculture data is used and handled ethically?

From the three examples above it is clear that whilst data has significantly improved the productivity and sustainability of agriculture, there are still ethical requirements for its use. As with all things in life, one of the best ways to ensure your data is used, treated, and stored ethically is through trust.

The Ag Institute Australia has developed an accreditation program which sets out standards expected of professionals working in the agriculture industry through its code of ethics (Ag Institute Australia, 2018; Guerin *et al.*, 2019). This is backed by an ethics committee which is responsible for investigating and responding to possible breaches of the code of ethics. The institute also runs regular ethics masterclasses, which includes an introduction to ethics, its importance for the agriculture industry, and a facilitated worked example of an ethical dilemma.

Other professional associations both within and outside of the agriculture industry have developed accreditation and training in ethics, including Soil Science Australia (2023) and the Australian Institute of Company Directors. There are also new guidelines and policies being developed to assist professionals to access, use, and share data ethically, such as the Australian Farm Data Code (National Farmers Federation, 2020) and the Data Interoperability Maturity Model (National Archives of Australia, 2023).

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