The Digital Divide and How it Matters for Canadian Food System Equity

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ABSTRACT
Policy discussions have raised concerns about how big data are used and who has knowledge about the ways in which they are used. These discussions, however, have largely ignored the role that digitization plays in agriculture. Consequently, the digitization of agriculture is unfolding with very little regulatory intervention. Drawing on ongoing research, this article argues that this omission may be critical, and suggests how it can be considered in current policy endeavours.

Keywords Big data; Digital agriculture; Data divide; Precision agriculture

RÉSUMÉ
Jusqu'à présent, les discussions sur les politiques ont porté sur comment on utilise les mégadonnées et sur qui détient le savoir sur comment on les utilise. Ces discussions, cependant, ont généralement ignorié le rôle de la numérisation en agriculture. En conséquence, la numérisation de l'agriculture se déroule avec très peu de suivis réglementaires. Cet article se fonde sur des recherches en cours pour soutenir que cette omission pourrait s'avérer critique et suggère comment des initiatives actuelles en matière de politique pourraient remédier à la situation.

Mots clés Mégadonnées; Agriculture numérique; Fossé numérique; Agriculture de précision
Introduction
A digital and data strategy for Canada must include considerations of agriculture, where digitization can have far-reaching consequences. Offering some context and drawing on empirical work, this commentary points to a topic that has been largely absent from digital and data strategy discussions. It argues that only careful governance interventions can ensure digitization will not further entrench already existing inequities associated with agricultural technologies.

A wealth of critical communication and data science research reveals the consequences of decisions about how big data are used (Crawford & boyd, 2012) and decisions about who has access to these data (or knowledge about the ways they are used, see O’Neil, 2016). Agricultural big data receive relatively little policy or critical social science attention (Carolan, 2016; cf. Bronson & Knezevic, 2016; Carbonell, 2016). This commentary’s empirically grounded claim is that the majority of big data developments are currently serving a few, already powerful, food system actors. It closes with specific recommendations about how to include considerations of this “digital divide” into the Canadian digital and data strategy.

Digital agriculture
The use of digital technologies in agriculture is variously discussed as big data in agriculture, digital agriculture, “smart” farming, or farming 4.0 (Weersink, Fraser, Pannell, Duncan, & Rotz, 2018). Regardless of the term used, these developments fall under “precision” agriculture—an approach using technology to respond to soil, crop, and climate variability in precise ways (Mulla, 2012). Information and communication technologies have been used in agriculture for years, but digital agriculture is distinguished by: 1) the reliance on sophisticated tools for collecting and aggregating agricultural data, and 2) the use of algorithms for sorting through and drawing information from large datasets.

While proponents argue for the environmental and economic possibilities of digital agriculture (e.g., Rossel & Bouma, 2016), there are potential negative implications, including the reproduction of inequity and unethical uses of farm-level data, such as the sale of data to third parties and the use of machinery sensors to “spy” on farmers (Bronson & Knezevic, 2016). Since 2016, the authors have been tracing industry trends and examining the discourse surrounding digital agriculture in media, policy, and corporate communication, and interviewing designers, funders, and users of digital agricultural tools (publications forthcoming). This commentary relies on the observation that little to no attention has been given to agriculture in discussions of digital and data policies. As eaters, people are all connected to agriculture, and the sector has enormous social, environmental, and economic impact in Canada. Yet, digital technologies have made inroads into the sector with very little regulatory oversight.

Technological inequity in agriculture
The majority of agricultural big data and infrastructures are currently servicing only those farmers working within a “productivist” strategy—maximizing the output of commodity export crops (Buttel, 2003). Interviews with Canadian farmers support a finding elsewhere: while many farmers use public satellite-derived information (on
weather, say) and global positioning system technologies, large-scale and low-value crop farmers are adopting tools for collecting and “mining” big agricultural data (see Paustian & Theuvsen, 2017). These end users are adopting tools for economic and environmental gain. Interviews conducted for this study show that many social actors interpret the value of big data in agriculture as a “win-win,” because reducing harmful chemicals also reduces expenses.

Unfortunately, the majority of commercially developed big data for agriculture are not useful to a diverse array of farmers. Corporate digital tools focus data selection methods on major agronomic commodity crops, such as corn and soy, versus horticultural crops, such as vegetables and fruits. Because of their relative value, agronomic crops are typically planted on large acreages; and for a host of reasons (land cost, environmental variation), there is an east-west split fragmenting land size across North America. The west is dominated by commodity farms averaging roughly 1,700 acres (Saskatchewan); in the east, horticulturalists manage farms averaging 261 acres (Nova Scotia). Variations in land size and strategy map translate into differences in technological needs. Expensive pieces of new equipment suit large holdings of over 1,000 acres for various reasons, including the fact that there is more capital available for investment in equipment to relatively large farmers.

Agribusinesses investing in digital agriculture are making little attempt to overcome these historic patterns of variation. The micro-feeds of data that build commercial data platforms come from sensing machinery or telematic sensors that plug into farm machines, which are both expensive and only used by large-scale industrial farms. Furthermore, in order to make good on the advice generated from the commercial big data platforms, one also needs machinery allowing for a “variable rate” application of inputs, such as chemical pesticides (otherwise knowing that a particular area of one’s farm needs a particular application load would be of little use).

This research reveals not only the furthering of inequity among farmers but also a furthering of inequity between farmers and agribusinesses. Commercially collected agricultural data are predominantly housed “in” the cloud, on servers owned or controlled by input or machinery companies. These farm-level data are used to “teach” predictive algorithms, but the full extent of their use is obfuscated from farmers and the public, as the corporation’s own privacy and access agreements currently govern them. A careful reading of these agreements shows that none specify the particular uses of agricultural data by corporations or third parties. Until recently, Monsanto received those data passively collected from every new John Deere tractor—called “precision” tractors—and it can be inferred that they are used for corporate gain such as profile development for targeted marketing. Such data uses, structured by legal arrangements between John Deere and seed/chemical companies (of which there have been 13), “give Monsanto a privileged position with unique insights into what farmers are doing around the clock, on a field-by-field, crop-by-crop basis into what is currently a third or more of the US farmland” (Carbonell, 2016, p. 2), and those same companies dominate the sector in Canada as well. This analysis of corporate documents and the interviews conducted for this study highlight that agricultural data in and of themselves are a valuable resource for corporations. In 2018, the global precision agriculture
market had an estimated value of U.S.$5.09 billion, and is expected to reach U.S.$9.53 billion by 2023 (Markets and Markets, 2018).

At the same time that corporations can capitalize on agricultural big data, those farmers who help collect data do not always have free access to it, even to aggregated and anonymized datasets. For instance, owners of John Deere precision tractors cannot access data easily, as these data are protected by international agreements (e.g., Anti-Counterfeiting Trade Agreement), which privilege software protections over farmers’ access to data.

Preventing the “big data divide”: Careful governance now
Many communications scholars have revealed how digital innovations create new social exclusions and aggravate old divisions, such as gender and socio-economic status (Gorski, 2003; Wong, Yat Chu Fung, Kwong Law, Chi Lam, & Wan Ping Lee, 2009). This “digital divide” between those with access and skill and those without has been well traced and analyzed, including in this country (Haight, Quan-Haase, & Corbett, 2014; Sciadas, 2002). Big data may similarly become a site for the reproduction of technological inequities (Andrejevic, 2014) and consequently inequities in the food system. Two governance recommendations are made here for counteracting the emerging data divide vis-à-vis agriculture in Canada.

Incentives
Governments ought to incentivize digitization for a variety of food system actors. There is a built-in disincentive for for-profit scientists to explore the problems that occupy unconventional farms (e.g., organic). As one representative for a large agribusiness put it: “There’s not that much regard for smaller family farms. … it’s not that [big businesses] don’t care. … Smaller farmers aren’t as profitable.” This becomes a democratic issue in light of Government of Canada funding, which so far has supported this trajectory for big agricultural data (e.g., Canadian Agricultural Partnership’s $3 billion commitment/investment). An equitably realized digital agriculture demands social innovation among corporations and public-sector scientists. Public-private partnerships in the agri-food sector have trended toward government funding and research in the service of the few over the many and diverse. But there are alternatives. The Ontario Centres of Excellence is supporting a partnership among the provincial body Ontario Agri-Food Technologies, Farm Credit Canada, and several corporate entities to develop AgBox. AgBox will allow farmers to decide how much data to share and for what purposes. While AgBox is still in development, it offers a model for technological governance that does not shy away from innovating but ensures there is space for using innovation to rebalance power in the sector.

Reparation
Regulators should seek redress for the considerable power that agribusinesses are able to wield via their access to granular data on individual farms, which potentially furthers historic power asymmetry between primary producers and conglomerates. The emerging research in this area (Bronson & Knezevic, 2016; Fraser, 2018; Mooney 2018) suggests that big data are becoming important parts of agri-food conglomerates’ portfolios. A handful of agribusinesses dominate the sector in seeds and chemicals, machinery, and
agricultural commodity trading; these companies have been merging to further concentrate markets (ETC Group, 2016; Howard, 2016). Mergers and acquisitions secure big data as a significant future revenue stream for agribusiness (ETC Group, 2016; Mooney, 2018), all with little regulatory oversight or intervention (e.g., to prevent monopolization, or to ensure a more even distribution of profits along the production chain).

A big data divide is appearing in agriculture, a sector of social and economic importance to Canada. The insights from this sector have implications for all Canadians, and they are not immaterial. The data divide disadvantages those farmers who are already abandoning agriculture in high numbers, with consequences on entire rural communities, community, and national food security, as well as the farmers’ livelihoods. The inclusion of digital agriculture in the Canadian digital and data strategy is both urgent and consequential.

**Websites**

- Farm Credit Canada, https://wwwfcc-fac.ca/en.html
- Ontario Centres of Excellence, https://www.oce-ontario.org/

**References**


