Data – Simple answer but what's the question?

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Precision Agriculture: What is it?

Precision agriculture can be defined as "the application of modern information technologies to provide, process and analyze multisource data of high spatial and temporal resolution for decision making and operations in the management of crop production" (National Research Council, 1997).

Farmers are continuously having to adapt and adjust their practices to increase efficiency and produce more with fewer resources. The simplest way to improve production is to analyze current practices and look for areas that could use improvement. This is true for every industry. This is where data and data management come in. Data is simply information that we use to make decisions. The more informed you are, the better decision you can make. There is nothing inherently new to this idea of using information to make decisions. What has changed in modern times is the amount of data available to us has exploded. Data analysis in modern times has focused on understanding patterns in these vast data pools using advances in information technologies and analytical tools. These insights are helping producers manage their farms, such as the use of precision ag technologies for fertilizer applications or detecting disease using automated milking systems (robots), improving carcass performance through genetic evaluation, or early disease detection within greenhouses and in the field.

Why it matters to the Ontario Livestock industry:

Agri-food is a complex ecosystem of people, businesses, technologies, and governmental organizations. It is increasingly impacted by disruptors such as pandemics, geopolitical instability, and climate change. Resiliency requires transparency and better usage of the data generated by all participants in the ecosystem.

Farmers are increasingly driven to compete in both the physical and digital economy. The physical economy is comprised of readily tangible assets and "things" such as plants, animals, land, inputs, emissions, people, markets, and financial transactions. The digital economy is comprised of less tangible bits and bytes, and complex technologies.

Many confuse data with information. Data is merely bits and bytes. Critical to farmers' success is knowing how specific data can be used to provide the explicit information required to make distinct decisions within a defined context, then monitor the effectiveness of those decisions over time. Farmers make informed decisions about which technology is best suited to meeting their needs. The challenge facing farmers is further complicated by the legalese of data ownership, consent, security, and access.

"*Farmers are the managers of the carbon, nitrogen and phosphorous cycles - with the water cycle to produce starch, oil and protein while improving soil quality, water quality and air quality while enhancing biodiversity - and just want to get paid for something - we buy retail and sell at wholesale and pay trucking both ways*"

-Don McCabe

Producers are often encouraged to adopt technologies without understanding how a specific technology solution best matches their operation's objectives within the context of their farm. Farmers are often required to provide access to farm data - for regulatory purposes or proof of practice to meet consumer demands. Security practices and use of on-farm data is often not understood, not transparent and even questionable. The data burden on producers is challenging, inefficient (e.g., the same data provided to multiple end users), and provides no direct benefit to the farmer to engage in the digital economy (e.g., carbon markets, niche markets).

The Risk Landscape

The agricultural industry is lagging in the use of innovative technologies or data driven systems to drive efficiencies and resiliency. Technology is often used as an objective (e.g., the use of blockchain and AI to solve every challenge) as opposed to understanding commercial objectives, then identifying technologies that would best meet those objectives. Without producers first possessing a clear understanding of a their commercial objectives, the context in which they farm (e.g., soil type, location, crop, equipment) and the decisions needed to farm profitably, it is impossible to make good decisions regarding on-farm technologies best suit their requirements.

Data must also be governed (e.g., security, access, usage, integrity). In the Canadian agri-food ecosystem there is very limited data governance activity. Agriculture and Livestock is a high-risk industry.

It is a complex, interconnected, and dynamic ecosystem encompassing a wide range of stakeholders and regulatory agencies. Using data and technologies to share important information with everyone involved will not only allow farmers to optimize their operations but provide for greater efficiencies across the supply chain.

For livestock this could be feed producers, technology manufacturers, scientific researchers, insurance companies, banks, your customers, and consumers. This is not a simple task and will require working together and trust.

What can livestock farmers do?

- Document their current operation and processes and identify data they can easily capture.

- Write down what your objectives are for your operations, both short and long term. Short term objectives might include enhancing or implementing biosecurity measures or improving herd genetics to achieve specific market objectives. Long term objectives might be succession planning and building a new barn for future generations. Talk with your trusted

advisors and experts to explore potential technologies that will meet your short- and long-term goals.

- Talk with other farmers who have used technologies you are interested in; ask questions such as, was there a return on investment, is there support available, what does maintenance require, was it easy to implement and simple to use and integrate into your workflow?

- Robots milk cows, clean barns, feed animals, pick fruit and cut and package meat in the final stages. An article written in Forbes recognizes that robotics in farming represents a global market of over $5 billion and is projected to double in the next five years (Connolly, 2022). This is an example of potential opportunity for farmers who successfully adopt these technologies.

- There are many free tools available regarding new technology and data usage which can be used to your advantage. For example, you can find hundreds of videos of farmers working with their technology, reviewing it, and walking you through their systems. It is easier to learn from a friend, thus the internet of things can be that friend.

- Encourage your associations to engage in discussions concerning the use of technologies to support your commodity, how greater strategic collaboration between producers and technology developers might be achieved, as well as the important topics of data governance and cybersecurity.

- Engage in research opportunities and encourage new research.

Market Change

The opportunity facing Ontario's meat industry is to determine how to use data and technology to best measure and monitor the inputs and processes that occur along the value chain. This can result in greater ability to improve the predictability and consistency with which farmers can produce animals that meet processors' demands, and the predictability and consistency with which retailers/foodservice can meet consumers' demands. The market will continue to shift as well as the financial rewards and penalties that are associated with information and data collected (or not) at the farm level.

Research Gaps

- Automated data collection on farm that turn data into valuable information for decision making

- Best practice data systems for enabling the continual improvement of farming systems from economic and environmental perspectives

- How to determine and replicate best practice systems

- Cybersecurity of on-farm technologies and farm management systems

Innovation Gaps

- Bridging the farm level (data collection) with industry data in an equitable manner to ensure commodity resiliency and sustainability

- Data governance practices (e.g., security, use and access) led by commodity leaders – with everyone at the table

- Clearly communicating the technology needs on the farm to innovative entrepreneurs and research institutions

- Enabling and supporting (e.g, specific government funding streams) for best practice data-driven innovation on the farm

- Learning from other jurisdictions and industries

For more information

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References

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