LAND AND LIVESTOCK DATA INTERCHANGE STANDARDS AS AN ENABLER FOR MODELS AND MANAGEMENT

Andrew Cooke, D Lineham, K Saunders, G Ogle

Rezare Systems Limited, Waikato Innovation Park, PO Box 9466, Hamilton
Email: andrew.cooke@rezare.co.nz

Introduction

Farming is becoming a data-rich activity. Most biophysical processes, from soil nutrient management to cow performance, have both paper-based and organised databases recording status, productivity, and intentions. There are a significant number of tools covering livestock, nutrition, and financial management, including over 127 that have been developed for rural professionals (Allen & Wolfert, 2011).

In the future there will be an evolving demand for information about areas such as environmental compliance and improving system productivity and profitability rather than raw production. Approaches to address these will ultimately draw together disparate data such as location, soils, climate, livestock feeding, animal genetics and fertiliser applications.

Farmers will benefit from a highly innovative technology sector that delivers applications that are simple to use and access, which source the information they need without impedance and deliver value. From the farmers' perspective, any data collected about their land or herd should be kept with due custodianship and be available for a variety of uses as and when required, all with minimal overhead.

In order to encourage appropriate data sharing with minimal overhead, DairyNZ, Rezare Systems, and Farm IQ Systems are coordinating an industry programme to develop technical standards for interchange of livestock and land data relevant to the pastoral industry, and to facilitate discussions about a code of practice for organisations that manage farm data.

Any work on standards needs to take into account existing New Zealand projects and international work in this area, including pan-industry initiatives such as the Open Geospatial Consortium spatial data standards.

Methods

We are developing a voluntary Code of Practice that will enhance the ability for primary producers and service providers to do business by improving ease of access to information without duplication, and by encouraging adoption of technology. Organisations that choose to comply with the Code of Practice will give primary producers confidence that their information is secure and being handled in an appropriate manner. The Code of Practice itself does not define standards for data interchange, but rather requires that data is interchanged using appropriate standards so that it may be used effectively.

In parallel, the development of robust technical standards will make data sharing between participating organisations easier and reduce rework and hence costs. There is already considerable interest from a number of industry parties in agreeing data interchange standards

for these very reasons. All that has stood in the way of this effort is time and funding to facilitate the appropriate technical dialogue between parties.

Our work is focusing initially upon two key areas:

1. Developing technical standards to support the interchange of animal data, particularly information about individual animals. This focuses on data dictionaries, unique identifiers, and some logical messages rather than reinvention of transport protocols.

2. Developing technical standards to support the interchange of land data, particularly related to pastoral agriculture. Again, the focus will be on data dictionaries for agriculture and appropriate meta-data rather than reinventing the existing robust standards such as those published by the Open Geospatial Consortium (www.ogc.org, Open Geospatial Consortium 2007, 2009).

Results

Animal Data Standards
An initial meeting to establish the level of industry interest in the interchange of animal data was held in Hamilton, New Zealand during January 2013. It was attended by 24 people from farmer, service provider, research, and technology vendor organisations. A further 32 people sent their apologies and asked to remain involved with the process.

Following the meeting, a report was produced and published at http://www.rezare.co.nz/data-standards/animal-data-interchange-standards (Cooke et al, 2013a). The report summarised outcomes from the workshop, which included the following recommendations:

- The process should maintain industry engagement, eschew purely commercial outcomes, and insist on genuine commitment of participants.
- The process should focus on data (raw or collected data) rather than processed information.
- Standards should be as simple as possible (limit overheads to implementation and operation), and focus on modular pieces rather than an all-encompassing framework.
- There should be consideration of levels of accuracy (fit for purposes), and standard identifiers (animals, farms, herds).

The group identified three main areas of work:

1. Animal identification – agreeing upon unique identifiers for animals, land, and enterprises, and how they would work in a New Zealand context. This included both radio frequency identification (RFID) and traditional visual identifiers.
2. Life data – the set of mostly static information that defines an animal, such as sex, birth date, and breed, and the management of lists of valid values for these items.
3. Observations and actions – an approach to recording and transferring measurements such as weight, body condition score, yield, and milk test results, and management information such as movements, health treatments and diagnoses.

Following the workshop, a working group was set up using the World Wide Web Consortium (W3C) community process at http://www.w3.org/community/livestockdata/ and participants and other parties were invited to join.

Land Data Standards

A short meeting for interested people was held after presentation of a poster on this topic at the Fertilizer and Lime Research Centre Annual FLRC Workshop in February 2012. This meeting was attended by 15 people and a further 24 people sent apologies and asked to be kept involved in the process.

Participants at the meeting discussed areas that would benefit from data standards, and a broad range of responses was received. These included:

- Connections between spreading control equipment and fertiliser company databases (using placement technologies such as those discussed in Grafton et al, 2011);
- Similar proof of placement for spray and effluent;
- Accessibility of existing environmental databases, especially those operating at regional and national scales but which are applicable at farm scale;
- Farm scale mapping and the interchange of such maps;
- Sensors and observations, particularly water quality, soil moisture and profile available water, and weather, irrigation and water metering;
- Soil samples for different purposes and soil characteristics;
- Stock movements and grazing;
- Feed, crops, forages, feed movements between farms, and feeding-out of supplementary feeds.

A number of participants noted the importance of being able to collect data and have it feed into tools such as Overseer Nutrient Budgets (Ledgard et al. 1999a, Wheeler et al 2003, 2006) without manual re-entry. Participants recommended:

- Looking for low-hanging fruit – the biggest barriers and areas that will bring the largest gains;
- Providing the ability to select levels of standards adopted, from basics to "all the bells and whistles";
- Allowing for "citizen observations" as well as scientific equipment;
- Considering appropriate data quality methods and the use of meta-data to identify sources and represent data quality and fit for purpose.
- Reference to work being carried out by the National Land Resource Centre (www.nlrc.org.nz), and existing standards such as those published by the Open Geospatial Consortium (www.ogc.org, Open Geospatial Consortium 2007, 2009).

The full report from the meeting can be found at http://www.rezare.co.nz/data-standards/land-data-interchange-standards (Cooke et al, 2013b).

Conclusions

The development of data interchange standards can be a long and fruitless process, as standards development processes in other arenas have shown. However, New Zealand agricultural businesses are at an inflection point where effective access to data is becoming essential for a wide range of business activities, with the result that a number of organisations are committed to finding appropriate solutions. We believe that by focusing on the "low hanging fruit" of relatively simple standards that meet the needs of these organisations, we will make progress. We fully expect that this will not be a final solution, and that standards will evolve further over time as new measurements, technologies, and approaches appear.

Future areas of work may include the exchange of data relating to feeds, grazing, and cropping (especially fodder crops), as well as developing agreed standards for the interchange of farm financial and "farm model" data (for example, interchanging stock reconciliations or a record of planned or actual farm practices such as may be used by Overseer).

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