Advancing Data Interoperability Standards for Animal Welfare and Production Systems

Confirmation of Candidature

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Focus on:

- Livestock production and welfare
- Extensive livestock systems
- Interoperability standards
- Technical outcome
Precision livestock farming

advanced technologies
production indicators
welfare indicators
individual animals

early disease detection
maximise production potential
Data interoperability

exchange between systems
interaction across domains
federation with other data
data re-use

achieve common goals
maximise data utility
Review of international literature

1. Issues and problems
2. Emerging responses and solutions
3. Technology review
4. Data collection and management
Challenges for PLF in extensive livestock production systems

- System complexity
- Economics
- Social
- Technical
- Data limitations
Emerging responses and solutions

Comprehensive and specific solutions, such as:

- Farm Management Information Systems
- Decision support tools
- Spatial tools with farm decision support
- Automated compliance systems
- Fodder production measurement
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Technology review

• Animal identification
• Animal sensors & measurements
• Other farm sensors
• Networks and protocols
• Computation & analysis
• Geospatial tools, e.g. GIS
• Models & visualisation
Data collection and management

- Data storage and web services
- Metadata standards
- Interoperability and open data
- International standards – particularly: Open Geospatial Consortium (OGC)
- Public vs. private data
- Technical challenges
Conclusions & Gaps

• Smart farming adoption in extensive systems is limited
• Information needs are increasing
• Information should be shown in meaningful, geospatial context
• Public vs private data issues
• High degree of complexity
• New technologies, e.g. IoT, wearable sensors

• Lack of livestock farming models and applications that show model output
• Need for decision support for extensive livestock production
• Lack of interoperable standards for data, metadata, models

Capalbo et al., 2016
Ferrández-Pastor et al., 2016
Wolfert et al., 2017

Antle et al., 2016
Ehrlich & Harte, 2015
Jones et al., 2016
Research Questions
Research Question 1

Can standards be used to benchmark or measure livestock production and welfare “performance”? 
Research Question 2

What livestock production and welfare data can be federated with geospatial data from different domains and how can this enhance production models and decision-useful information at different scales?
Research Question 3

How can such livestock production models be visualised within a spatial decision support system and could they help answer questions about trade-offs between different agricultural uses of land?
Research contribution & significance

Why do we need this research?

- Contribution to standards applicable to livestock farming
- Benefits for multiple users groups and a variety of use cases
- Increased use and re-use of data collected by research and industry
- Early adoption of interoperable data standards will benefit industry
Anticipated outcomes

Use case examples:
- compare running sheep vs cattle on a farm
- decision support: do we need to treat for XX this season?
- information request: what is the average stocking rate for this area?
- strategic: identify problem areas to assist with resource allocation

Potential real world application

Decision support at different geographical scales

Detection and mitigation of risks to livestock welfare and production

Calculation of trade-offs between different land uses including livestock

Assist benchmarking and raise local/regional performance alerts
Progress to date

- Literature review
- Developed research questions
- Investigated datasets
- Became versed with GIS software
- Experimented with sensor hardware and IoT applications
- Conference, expo attendance
UNE data set

- Armidale NSW
- 1 year
- 10 Merino wethers
- GPS collars
- SensorNet data
- GreenSeeker & Crop Circle for pasture data
Murdeduke data set

- Winchelsea, Victoria
- 4 weeks
- 80 Angus heifers
- weekly weight records
- accelerometers on cattle
- proximity sensors in paddock
- pasture quantity and quality: dry matter and feed tests
Research Plan

### Research Questions

1. Can standards be used to benchmark or measure livestock production and welfare “performance”?

2. What livestock production and welfare data can be federated with geospatial data from different domains and how can this enhance production models and decision-useful information at different scales?

3. How can such livestock production models be visualised within a spatial decision support system and could they help answer questions about trade-offs between different agricultural uses of land?

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**Review Paper**

- Case Studies Papers
- Methods Paper
- Discussion Paper
- Thesis