National Soil Data Project: Building a soils data community

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Overview

• National soil data project
• Community building & accessing private data for digital agriculture
• Towards a farmers data market
Australian Soil Resource Information System

- A platform for sharing soil and land resource data
- 20+ years Australian Collaborative Land Evaluation Program (ACLEP)
  - Nutrient Management
  - Crop Modelling
  - Atlas of Australian Soils
  - Physiographic Regions of Australia
  - National Soil Grids
  - Acid Sulfate Soils

But......

- Built and operated through projects
- Primarily public, government data
- Reduced government spending on data capture
- Valuable ‘private’ sources of data exist
- Many barriers

National soil data project – a socio technical challenge

**Technical architecture**
A sustainable operational environment for accessible, interoperable and well managed soil information for Australia

**Social architecture**
a data sharing environment to benefit all providers and users across government, research, and private sectors
Soil data community project

- Agriculture focus
- Barriers and opportunities to public-private soil data sharing
- Social, institutional and economic aspects

Approach
- Explore issues and co-design solutions through workshops
- Economic and institutional analysis of issues identified in workshop

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User engagement - the workshop

• Stakeholders - different world views and perspectives
  – Farmer
  – Ag industry – machinery, software,
  – Agronomist
  – Researchers
  – Government

• Logic
  – Common vision soil community
  – Use case – soil moisture data
  – Enablers and constrains
  – Cost and benefits
  – Value proposition
  – Solutions

• Building trust
• Location
• Trusted intermediary Birchip Cropping Group
Soil moisture sensor data

Farmer owned sensor (FOS)  Sensor as a Service (SaaS)

**COSTS**
- Maintenance of:
  - Platform
  - Storage
  - Exchange mechanisms

**REVENUE**
- Potential revenue through selling access to data and services
- Potential to secure revenue stream through licensing access to data or selling services

**Different**
- Operational models
- Locus of costs and revenue
- Data ownership & rights – collection /downstream use

Supplying data to others

Potential issue around ownership and rights in data when on-sold

Sharing risks (e.g. with financial institutions).

Need clarify benefit outweighs costs/risk for individual and collective.

For FOS, data rights are clear. For SaaS rights about reuse are less clear.

Sensors costs:
- Mobile data
- Solar panels
- Site visits
- Batteries

FOS – farmer bears the cost of sensor purchase and operation

SAAS – service provider bears costs of sensor purchase and operation

FOS – farmers want to receive benefit for data sharing through e.g. Preferential service access or share in revenue of onsold data

SAAS - need to generate Revenue to cover sensor sunk and operational costs
**Mission statement**

To create a ‘farmers’ data-market’ for trusted, equitable, efficient rule based, exchange of data and information, at a range of scales and for multiple use cases for the benefit of community members (farmers) and third parties.

**Workshop outcomes**

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<th>Institutional</th>
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<td>Standardise <strong>contractual arrangements</strong> around data</td>
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<td>Clarify <strong>rights in data</strong></td>
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<td>Develop a <strong>governance</strong> framework</td>
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<td>Enable providers to opt into data aggregations</td>
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<td>Develop <strong>rules to minimise potential negative impacts</strong> of data sharing on farmers</td>
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<td>Develop <strong>public-private partnerships</strong> to progress data sharing</td>
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<td>Develop creative commons <strong>licensing</strong> for this data</td>
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<td>Need to develop <strong>trust</strong> within the community and around third party use of data</td>
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<td>Provide education on <strong>data rights</strong></td>
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<td><strong>Farmers benefit more</strong> than other users of data</td>
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<td>Key stakeholder in the community include:</td>
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<td>• Farmers</td>
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<td>• Agronomists</td>
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<td>• Farm machinery companies</td>
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<td>• Financial institutions</td>
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<td>• Researchers</td>
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<td>• Citizen scientists</td>
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<td>• Government</td>
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<td><strong>Harness standards and vocabularies from OGC and others to enable data exchange</strong></td>
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<td>Technology and infrastructure exist - need to harmonise</td>
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<td>Need agreements in place for system interoperability and exchange of data</td>
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<td>Need to provide education to build skills and capacity in data management, analysis and use</td>
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<td>Pre-competitive space can achieve standardisation of data early in the chain</td>
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<td>Determine a viable <strong>revenue stream/funding model</strong> for public private data exchange</td>
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<td>Consider a <strong>hybrid model</strong> of fee for service, subsidies from government and subscriptions to incentivise and cover costs of data sharing</td>
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<td>Design <strong>incentives</strong> (e.g. Government subsidies) to enable soil survey data sharing</td>
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Box et al. 2017 Soil Data Community Workshop, Report  
[https://doi.org/10.4225/08/59a468429042f](https://doi.org/10.4225/08/59a468429042f)
Data economics – incentives for sharing

Public, private or club goods - exclusivity and sharing dis-benefit

- Data can be made available as private, public or club goods
- Defined by combinations degree of **exclusivity** and **sharing disbenefit** (to provider)
- Providers determine level of exclusivity (who is excluded from its use) based on an assessment of the disbenefits of sharing the data.

- Institutions funding, policy, legislation, norms can be used to incentivize pro-sharing behaviour.

Examples of data representing different types of economic good

- **A** BoM weather observation data is produced by government and made available publicly at no disbenefit to anyone
- **B** Government-held public health records or Census data.
- **E** Here be dragons
- **F** Water trading within a cooperative water sharing network
- **C** Soil moisture data held by a single farmer and not shared
- **D** Crop planting choice data

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Sanderson T, Reeson A and Box P (2017) Cultivating trust: towards an Australian agricultural data market. CSIRO, Australia (forthcoming)
Data providers - data holders can choose whether they engage with a market and offer data as private, club or public goods. Their willingness to offer data into the market is influenced by benefits they receive and costs and risks they bear.

Data providers - make decisions about if, how and with whom to share their data. Potential data providers' attitudes towards excludability, rivalrousness (or disbenefit of sharing) determine under what conditions the data is offered and to whom. Privacy and commercial confidentiality are major factors that may cause disbenefit in sharing arrangements. Collectively these factors determine data providers' willingness to accept (WTA) – the minimum benefit they have to receive to share their data.

Types of economic goods - in data markets, three types of data goods co-exist, each of which exhibit different properties: private, public and club. Providers make a conscious (and institutionally conditioned) decision about how their data is treated in the market. In some cases, regulation may prevent data from being shared (e.g. privacy legislation) and in some cases data providers may not want to share data. Money or access to services may be offered as an incentive to share some private data with.

Incentives and institutions - institutions set the ‘rules of the game’ that incentivise and set the conditions for conducive behaviours for data sharing and use in the market. These rules provide the necessary trust underpinning the market.
The role of data co-operatives

**Agricultural cooperatives** - pool resources to gain economies of scale
- **supply** – supplying inputs for agricultural production
- **marketing** - collaborate to transport, package, distribute and market farm outputs

**Data co-operatives** - formed to achieve economies of scale (and reduced transaction costs) for members through pooling resources to share data
- create, maximise and ensure the flow of collective data value back to data providers

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**Individual**
- Farmer
- Farmer
- Farmer

**Cooperative**
- Grain
- Soil moisture data

**Third party service provider**
- Transportation
  - Farmer application

**Benefit to cooperative members**
- Reduced cost to market
- On farm productivity

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**Market Platform**

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What is the role of a data cooperatives in a data market?
Take aways

• Barriers are social, institutional & economic
• Trust is key – farmers are wary of information asymmetry
• Researchers are not necessarily trusted
• Framing as a data market a useful design and communication tool
• Academic commons or cooperatives and club goods?