Australian Biomass for Bioenergy Assessment

Julie Bird-RIRDC
Ana Belgun-DATA61
Rebecca Dengate DATA61
Session outline

1. Overview
2. Demonstration of AREMI
3. State presentations
4. Analytics presentation
5. Workshop
   • what data is needed to drive bioenergy
   • are we delivering this?
Project purpose

To catalyse investment in the renewable energy sector through the provision of detailed information to support the development of bioenergy projects.

Australian Renewable Energy Mapping Infrastructure (AREMI) platform
Data layers will include:-
• Biomass location, type & volume
• Existing bioenergy providers, location & volume
• Existing infrastructure-e.g. gas, electricity
• Information tools relating to biomass availability, economics and sustainability

Funded by ARENA

Collaboration of States, QUT & SCU, industry, and Data61/CSIRO, project managed by RIRDC.

Building on current regionally based data, and filling the gaps, for a national approach with public accessibility.
Data Collection

Stakeholder Feedback

State Based GIS Service

Project Management

Analytics

AREMI
Analytic tools

- QUT & USC post docs and supervisors
  - users will be able to interact with the platform & select scenarios, based on policy and economic drivers, such as carbon and oil price.
  - Similar examples already in AREMI for other energy types.
AREMI Demonstration
Australian Biomass for Bioenergy Assessment-
Western Australia Report

David Rogers & Ron Master
Team Western Australia

Kim Brooksbank
Project Manager

Ron Master
Project Officer

David Rogers
Project Officer
State Priorities

- Cereal Straw (Leading national approach)
- Forestry (Public and Private)
- Also leading the national approach for feedlots.
Western Australia data sets so far

- Cereal Straw
- Oil Mallee plantings
- Grape Marc
- Cattle Feedlots
Cereal Straw Residues

Feature Information
Cereal straw - Kent (S) tonnes

Kent (S)
Straw Yield /Ha Cereal Crop Average over 5 years: 1.46
Average Shire Yield of Cereal Residue in Tonnes: 191,401.98
Grape Marc Estimate
Feedlot Waste
What next

- Horticulture Layers
- Private Forestry
- Processors
- Municipal Waste
- Seaweed Wrack
- Other Intensive livestock industries.
  - Piggeries
  - Poultry
  - Dairies
Australian Biomass for Bioenergy Assessment
South Australia Report

Mary Lewitzka
Team South Australia

Project Manager
Temporarily Vacant

Project/GIS Officer
Mary Lewitzka
State Priorities

First Focus is on major Hotspot Region – SE of SA

Plantation Forestry & Timber Processing – Hotspot Region
Cropping/Cereal Straw - Statewide
Bioenergy Roadmap Data – Statewide
  • Working in Hotspots
  • Existing Waste Streams and Energy
Piggeries (Leading National Approach)
Meat and Livestock – Statewide/National
Wastewater/Sewerage/Bio-solids - Statewide
Municipal Waste – Statewide (Leading National Approach)
Grape and Wine (Leading National Approach with WA)
South Australia
Data sets so far

• Green Triangle Forestry
  • SE of SA SW of Victoria

• Existing Waste Streams
  • Horticulture, Straw Production, Processing Plants

• Crop Estimates

• Intensive Animal Husbandry and Production
Hotspot Mapping from Bioenergy Roadmap for SA Report

Existing Waste Streams

Existing feedstock hot spots
Existing solid biomass hot spots
Existing mixed slurries hot spots
Existing Waste Streams

Existing waste streams
Horticulture
- Glasshouses
- Glasshouses (hydroponic)
- Irrigated fruits tree
- Irrigated nut tree (including almonds)
- Irrigated vegetables and herbs

Existing waste streams
Processing Plants
- Land based aquaculture
- Wineries and Breweries

Existing waste streams
Straw production
- Hay and silage
- Irrigated hay and silage

Feature Information
horticulture-waste-stream.kmz - Irrigated vegetables and herbs

Feature Information
straw-production-waste-stream.kmz - Irrigated hay and silage

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<tr>
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<tr>
<td>HHV</td>
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### Crop Estimates by District - Yorke Peninsula

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<td>Lupins_Ha</td>
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# Intensive Animal Husbandry & Production

![Map of Murray Darling Basin](#)

## Feature Information

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<td>Desc_Sec</td>
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<td>Poultry farms</td>
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### Animal Husbandry/Production Type

- **Aquaculture**
- **Cattle feedlots**
- **Dairy sheds and yards**
- **Horse studs**
- **Intensive animal husbandry**
- **Piggeries**
- **Poultry farms**
- **Sheep feedlots**
- **Stockyards/saleyards**
Updates to datasets with relevant information:

- Forestry Residues
- Crop Residues – Agriculture, Horticulture, Timber Processing

Municipal/Regional Organic Waste
- MSW, C&I, C&D, Grease Trap Waste – ready to upload for Limestone Coast

Animal Wastes
- Pigs, Cows (Meat & Dairy), Poultry, Sheep, Other livestock, Stockyards & Feedlots

Grape & Wine Industry
- Grape Marc, harvest and vineyard residues

What next???
SA has strong Renewable Energy Targets & Policy Framework

SA’s Economic Priorities
Unlocking our potential resources, energy and renewables

Low Carbon Investment Plan: $10B by 2025

SA Climate Change Strategy 2015-2050

ABBA project sits in Low Carbon Economy Unit in the Dept for the Premier & Cabinet

Integration with broader Renewable Energy and Low Carbon Economy policy framework

High profile within State Govt
Bioenergy Roadmap for SA

Stage 1 - Identified hotspot areas – matched feedstocks with energy demand and overlaid with transport and energy info

Stage 2 - Working with industry and feedstock providers in hotspot areas to explore the feasibility of projects

- Bioenergy Roadmap Forums providing awareness around potential for bioenergy projects and ABBA project
- $50k in LC Region for pre-feasibility studies
- Up to $100k statewide matched funding for full feasibility studies

Stage 3 – Build Projects
Australian Biomass for Bioenergy Assessment - Victoria Report

Kelly Wickham
Victorian Team
State Priorities

- Learn from 2011 experience
- Focus on our diversified economic base
- Focus on clusters and obtain data where greatest opportunities exist
- Model data from agriculture
- Collaborate with other states throughout program
  - National survey to provide consistency
  - Guidance on Dairy Industry sector
- Ongoing industry engagement
Current datasets
Current datasets
Current datasets
Agriculture Victoria sector-specific industry profiles

Figure 1 – Breakdown of the value of agricultural production in Victoria in 2012-13

- Total crops: 48%
- Livestock products: 26%
- Livestock slaughtered & disposed of: 26%
- Pasture and crops cut for hay: 4%
- Nurseries, cut flowers and cultivated turf: 4%
- Vegetables for human consumption: 8%
- Broadacre crops: 20%
- Fruit and nuts (excluding grapes): 9%
- Grapes: 3%
Datasets: Cattle
Datasets: Dairy cattle
Datasets: Cereal & other crops
Datasets: Fruit production
What next

- Target industry specific events to obtain buy-in
- Refine existing datasets through survey responses
- Work with other states on analytics and other strategic approaches
- Integrate into Sustainability Victoria’s website
- Collaborate with CSIRO and their ASPIRE project
Australian Biomass for Bioenergy Assessment - Tasmania Report

Presenter
Martin Moroni
Private Forests Tasmania
Team Tasmania

- David Hurburgh: Senior consultant, resources and energy, Department of State Growth, Tasmanian Government
- Martin Moroni: Manager business development Private Forests Tasmania
- Jeremy Wilson: Director, System Development, Esk Mapping & GIS
- Alison Holmstrom: Environmental Officer Dulverton Waste Management
State Priorities

- Develop bioenergy (consistent with State Energy Strategy)
- Emphasis on heat
- Utilize low quality logs and processing waste
- Support food and agricultural industries
- Reduce pressure on Tas Water
Tasmanian leadership

- Description of forest residues
- Point wood supply calculator
- Meander Valley concept
  - First in Australia
  - Supported by ABBA initiative
    - (data collected is informing the feasibility study)
Tasmanian data sets so far

- Forest Harvest Residues
  - (low quality logs, stump, tip)
Forest Harvest Residues

• Low quality logs, stumps, tips. Supply modelled for 30 years encompassing all tenures and forest types
• Review of post TFA volumes (and availability) would improve data
• There are a number of bioenergy projects in Tasmania that are supported by the forest residue dataset. PFT promotes the dataset on PFT web-site
What next

Data

- Forest processing residues (sawdust and offcuts)
- Agricultural and food processing residues (not field waste)
- Municipal waste
- Waste water and biosolids (Tas Water?)

Data largely under control and must now be kept current beyond ABBA funds

Availability of residues? Much of what is listed is currently used

Analytical tool application development?
Australian Biomass for Bioenergy Assessment (ABBA)
Queensland Report
Team Queensland

Phil Norman  
Project manager

Kelly Bryant  
GIS officer

Jim Payne  
Spatial modeller

Michael Ngugi  
Forest modeller
Queensland data sets so far

• Sugarcane (state priority)
• Forestry
  • native forests and plantation softwoods

Data upcoming (early 2017)

• Waste
• Cereal crops
Method

- Feedstocks are identified
- Data collated and calculated (includes spatial, quantitative and qualitative data)
- Review – data review by industry groups, other ABBA state teams and other stakeholders (e.g. state government departments)
- Data published to AREMI
- Data is updated - incorporating feedback
Information published

- Infrastructure (specific to a feedstock)
- Land use footprint (outlines the spatial extent of that feedstock)
- Residues (where possible published in dry tonnes)
Issues

• Environmental sustainability
• Confidentiality
• Policy arrangements
What next?

Land suitability and production potential for dedicated bioenergy crops in Queensland

We are using a multifunction land evaluation approach to estimate the areas across Queensland which have the potential for bioenergy crop production.

E.g. Pongamia, fibrous cane varieties, sweet sorghum, fibre crops, oilseeds, agave, grasses etc
Australian Biomass for Bioenergy Assessment – New South Wales Report
New South Wales Team

Fabiano Ximenes
Project manager

Catherine Carney
Project/GIS officer
State Priorities

1. NSW priorities:
   - Forestry – harvest and wood processing residues
   - Cropping – cereal, oilseed and pulse crops residues
   - Organic waste – MSW, C&I and C&D
   - Livestock – cattle, dairy, poultry and piggery residues
   - Horticultural – vineyard, orchard and vegetable residues

2. NSW is leading the national approach for forestry.
1. Planted Softwood Harvest Residues
   • Bathurst, Monaro & Tumut
2. Native Hardwood Harvest Residues
   • Batemans Bay, Eden & Tumut
3. NSW State Forests
4. NSW Wood Processing Facilities
Planted Softwood Harvest Residues

These datasets estimate annual DM harvest residues (t) to determine availability for bioenergy, locations and quantities. They were calculated using FCNSW data and based on research by NSW Forest Science unit.
Native Hardwood Harvest Residues

These datasets estimate annual DM harvest residues (t) to determine availability for bioenergy, locations and quantities. They were calculated using FCNSW data and based on research by NSW Forest Science unit.
This dataset represents the State Forests of NSW and is included to assist in the interpretation of the forestry datasets. It is based on FCNSW spatial layers with forest names, and also includes forest type and wood type.
This dataset shows the location of wood processing facilities in NSW. Attributes include the business name, address by town, state and postcode and the wood type processed.
What next

1. Remaining forest regions - harvest residues
2. Sawmill residues
3. Agricultural cropping residues
4. Organic waste from MSW, C&I and C&D
5. Later: Livestock and Horticultural residues
Get involved

Come and visit us at the RIRDC stand to ask questions, make suggestions for improving and adding to the data, to supply feedback as to the usefulness and usability of these data sets and to see the software in action.

AREMI interface – visit:
Australian Biomass for Bioenergy Assessment - Analytics Report

Dr Phil Hobson and Dr Mohammad R. Ghaffariyan
Analytics team
Queensland University of Technology
Implementation of analytical tools
  Prof Ian O’Hara (Project Manager)
  Dr Phil Hobson
  Dr Mahmoud Masoud
  PhD student (currently being appointed)

University of the Sunshine Coast
Biomass supply chain management
  Prof Mark Brown (Project Manager)
  Dr Mohammad Ghaffariyan
  PhD student (currently being appointed)
Priorities

• Develop and implement (within AREMI) tools that provide regionally specific information to assist potential bioenergy investors

• Develop biomass supply chain technical and cost models
Development of analytical tools – progress so far

• Define proposed analytics
  - Basic tools (simple constraints)
    - Availability
    - Cost
    - Quality
    - Variability
    - Bioenergy (electricity, transport fuels) production potential
  - Extended analytical capabilities (scenarios)
    - Forecasting
    - Optimisation

• Demonstration of basic tools
Basic analytical tools

• Based on NREL Biofuels Atlas

• Aggregated outputs for defined regions
  – Tabular, graphical outputs
  – Historical data

• Spatial distribution of bioenergy resources and potential for defined regions
  – Spatial availability defined by state, municipality or user defined boundaries
  – Heat maps’ to define quantity

• Outputs at a specified location within a defined region
Extended analytical capabilities

• Two PhD studies – one each at USC and QUT

• Proposed topics:
  – The potential for expansion in biomass production
  – The impact of climate change on future biomass production
  – Optimal positioning of bioenergy plants
  – Optimal recovery of biomass at a given biorefinery site
Biomass availability within defined regions around Brisbane

#Prepared by Phil Norman, Department of Science, Information Technology and Innovation, Queensland Government
Demonstration outputs

Variability in biomass (sugarcane field residues) within defined regions around Ayr
Demonstration outputs

Biomass ‘hotspots’ in Far North Queensland (all biomass types)
What next
Implementation of analytical tools - the next 12 months

• Potential stakeholder input to and feedback on proposed analytics
  - Bioenergy Australia Workshop (next!)
  - State teams’ requirements

• Alpha testing of analytics – single state, single crop (May 2017)

• Beta testing – all states, single crop (October 2017)
Biomass supply chain management
Yield and recovery

- Yield (GMt/ha) and Growth (GMt/ha/year)
- Technical recovery rate (%)
- Sustainable recovery rate (%)
Potential products

- Potential product types (chips, pellets, logs, ...)

- Quality evaluation of products (low, medium...)

- Predicting dry mass and calorific values (e.g. using drying rates to get GJ/ha)
Biomass operations

- Selecting sustainable supply chain
- Selecting suitable and efficient machines/work methods
Productivity and cost

• Predict machine/system productivity

• Evaluating the operating costs

• Estimating transportation cost

• Identifying maximum transport distance (to locate future bioenergy plants)
Thank you!

Dr Phil Hobson
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Dr Mohammad R. Ghaffariyan
Email: mghaffar@usc.edu.au