TraNSIT - Unlocking options for efficient logistics infrastructure in Australia
Andrew Higgins – CSIRO Land and Water

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Transport Network Strategic Investment Tool - TraNSIT

➢ Funded by the Australian Government
➢ Inform investment and regulatory changes in transport and supply chains
➢ A modular transport network analysis tool
  • Maps and optimises the route and cost of every vehicle and rail movement
  • Across the supply chain - farm – storage - processing – market
➢ Provides the most comprehensive mapping of Australia’s agriculture and forestry freight ever achieved
  • 98% of Australian agriculture transport
  • Provided new insights into freight task, including bottlenecks and inefficiencies
**TraNSIT features**

**Network**
- Roads and features
- Rail lines and load points

**Vehicle and trains**
- Costs model
- Optimal vehicle selection

**Commodities**
- Enterprise locations
- Demands or supplies

**Calculation**
- Vehicle route optimisation

<table>
<thead>
<tr>
<th>Type</th>
<th>100 km/h</th>
<th>60 km/h</th>
<th>20 km/h</th>
<th>Good Unsealed</th>
<th>Poor Unsealed</th>
<th>Idle cost ($/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semitrailer</td>
<td>1.91</td>
<td>2.58</td>
<td>6.11</td>
<td>0.09</td>
<td>0.26</td>
<td>119</td>
</tr>
<tr>
<td>B-Double</td>
<td>2.35</td>
<td>3.13</td>
<td>7.36</td>
<td>0.13</td>
<td>0.39</td>
<td>141</td>
</tr>
<tr>
<td>Type 1</td>
<td>2.71</td>
<td>3.54</td>
<td>6.81</td>
<td>0.16</td>
<td>0.49</td>
<td>169</td>
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<tr>
<td>Type 2</td>
<td>3.43</td>
<td>4.36</td>
<td>8.22</td>
<td>0.24</td>
<td>0.72</td>
<td>177</td>
</tr>
</tbody>
</table>

*Modelled cost ($/km) per travel speed and Additional maintenance costs ($/km).*
TraNSIT route optimisation
Impacts and achievements

➢ Most extensive agricultural transport data set and modelling ever assembled
  • Over 80 government agencies, associations and industry groups involved
  • 235,000 enterprises from farming to processing and markets
    – Plus 180,000 for forestry and other commodities
  • Over 5 million vehicle trips and 10,000 rail trips routed

➢ Inform government investment in roads
  • $100 million Northern Australia Beef Roads programme
    – Picked the best projects to fund and increased transport cost savings by 72%

➢ Changed regulation in transported related biosecurity
  • Reduced transport costs of cattle by $1.5 million per year

➢ Improved access to processing and markets
  • Last mile, high productivity vehicles, inter-modal

➢ Identified and prioritised bottlenecks across Australia
Average vehicles per year

Beef, Grains, Dairy, Rice, Sugar, Cotton, Horticulture, Pigs, Poultry, Sheep, Goats, Stock feed, Buffalo
Average vehicles per year – south west WA
Average vehicles per year - Grains

Grains - Number of trailers

- 1 - 1,000
- 1,001 - 3,000
- 3,001 - 5,500
- 5,501 - 9,000
- 9,001 - 13,000
- 13,001 - 18,000
- 18,001 - 27,000
- 27,001 - 40,000
- 40,001 - 60,000
- 60,001 - 110,000

Map of Australia showing traffic flow and number of trailers.
## Modelled annual transport costs

<table>
<thead>
<tr>
<th></th>
<th>Road ($m)</th>
<th>Rail ($m)</th>
<th>Road CO₂ (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beef</strong></td>
<td>$572.4</td>
<td>$31.6</td>
<td>244,082</td>
</tr>
<tr>
<td><strong>Grain</strong></td>
<td>$2,149.7</td>
<td>$487.3</td>
<td>862,184</td>
</tr>
<tr>
<td><strong>Pigs</strong></td>
<td>$29.0</td>
<td></td>
<td>11,156</td>
</tr>
<tr>
<td><strong>Rice</strong></td>
<td>$134.2</td>
<td></td>
<td>55,437</td>
</tr>
<tr>
<td><strong>Dairy</strong></td>
<td>$881.7</td>
<td></td>
<td>337,294</td>
</tr>
<tr>
<td><strong>Sugar</strong></td>
<td>$52.2</td>
<td>$9.9</td>
<td>16,174</td>
</tr>
<tr>
<td><strong>Sheep/Goats</strong></td>
<td>$221.8</td>
<td></td>
<td>85,883</td>
</tr>
<tr>
<td><strong>Cotton</strong></td>
<td>$76.9</td>
<td>$13.2</td>
<td>36,385</td>
</tr>
<tr>
<td><strong>Horticulture</strong></td>
<td>$617.8</td>
<td></td>
<td>256,295</td>
</tr>
<tr>
<td><strong>Post Processing</strong></td>
<td>$249.7</td>
<td></td>
<td>98,080</td>
</tr>
<tr>
<td><strong>Mixed (DC to Market)</strong></td>
<td>$284.5</td>
<td></td>
<td>109,157</td>
</tr>
<tr>
<td><strong>Poultry</strong></td>
<td>$28.2</td>
<td></td>
<td>8,766</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$5,298.3</td>
<td>$542.1</td>
<td>2,120,893</td>
</tr>
</tbody>
</table>

*including a small number (20,000 head) of Buffalo

*includes boxed beef, chicken, lamb, pork to domestic markets and port

^mixture of horticulture and post processed commodities between DC’s and supermarkets

These represent the total transport costs across the supply chain from paddock to domestic market (except grain) or port.
Applications over last 18 months

- Northern Australia Beef Roads Programme
- Various road upgrade and last mile bottlenecks
  - Road sealing, volumetric loading, road flood proofing, HPV
- Impact of processor disruption – Kingaroy pork abattoir
- Providing baseline to state and local government
- Local government applications
  - Temora, Hall Creek, Flinders and Toowoomba councils
- MLA – bottlenecks and inefficiencies of livestock export
- ARTC - freight hubs – with several local governments
Case study: Toowoomba Second Range Crossing - Change in freight volumes after construction

Total Savings: $5,402,976
Total Semi-Trailer Equivalents (full loads): 130,645
Savings per Trailer (one way): $20.68
## NSW floods – Impact on transport
### Forbes Shire

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Trailers Sept-Oct</th>
<th>Additional transport costs</th>
<th>Additional cost per tonne or head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>612</td>
<td>$0.2 m</td>
<td>$6.90</td>
</tr>
<tr>
<td>Grains</td>
<td>331</td>
<td>$0.1 m</td>
<td>$12.81</td>
</tr>
<tr>
<td>Horticulture</td>
<td>2,420</td>
<td>$0.4 m</td>
<td>$6.33</td>
</tr>
<tr>
<td>Processed</td>
<td>3,852</td>
<td>$0.8 m</td>
<td>$9.20</td>
</tr>
<tr>
<td>Rice</td>
<td>2</td>
<td>$0.0002m</td>
<td>$4.48</td>
</tr>
<tr>
<td>Sheep &amp; Goat</td>
<td>1,542</td>
<td>$0.4 m</td>
<td>$1.43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,147</strong></td>
<td><strong>$2 m</strong></td>
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</tbody>
</table>
Case study – two sheep feedlots – 70,000 head/yr
Selecting sites to minimise transport costs

<table>
<thead>
<tr>
<th>Supply chain segment</th>
<th>Scenario 1: Baseline – no feedlots</th>
<th>Scenario 2: Jerramungup, Mayanup</th>
<th>Scenario 3: Mt Barker, Cranbrook</th>
<th>Scenario 4: Mt Barker, Kojonup</th>
<th>Scenario 5: Mt Barker, Narrikup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property to Feedlot</td>
<td>$265,239</td>
<td>$228,398</td>
<td>$272,346</td>
<td>$226,810</td>
<td></td>
</tr>
<tr>
<td>Property to Silo</td>
<td>$235,716</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property to Abattoir</td>
<td>$345,309</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property to Feedlot</td>
<td>$478,526</td>
<td>$309,521</td>
<td>$384,550</td>
<td>$336,457</td>
<td></td>
</tr>
<tr>
<td>Feedlot to Abattoir</td>
<td>$420,195</td>
<td>$301,035</td>
<td>$430,392</td>
<td>$189,056</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$581,026</td>
<td>$1,163,961</td>
<td>$838,956</td>
<td>$1,087,289</td>
<td>$752,324</td>
</tr>
</tbody>
</table>

Feedlot base

Number of trailers

0 - 20
21 - 50
51 - 100
101 - 150
151 - 200
201 - 300
301 - 400
401 - 700
701 - 1,000

Mt Baker - Narrikup
Forestry supply chain – WA case study
Current/Future developments of TraNSIT

➢ Adding sea and air transport
  • Supply chains from point of production in country A to markets in country B
  • Facilitate logistics around trade and planning

➢ TraNSIT Web
  • Enable agencies to produce and test scenarios

➢ Link with rainfall and flood hazards

➢ Add a predictive capability
  • e.g. Freight task for future grain and livestock forecasts

➢ Extension to broader freight transport

➢ South East Asia – ACIAR, DFAT
  • Indonesia, Vietnam, Laos
For further information contact

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