

# NZ's residual biomass resources

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# NZ Biomass resources 2021

Update of 2017 report – expanded coverage, latest forest data (NEFD).

Estimates of regional volumes of biomass residues suitable for heat fuel supply and potential feedstock for biofuel production.

Assessments are given for every 5-year period from 2021 out to 2051; for gross supply and estimates of realisable / recoverable supply (green tonnes and energy (GJ) per annum)

# NZ Biomass resources

Covers the following list of resources;

- In-forest harvest residues (from landings and cutover),
  - Thin to waste volumes from plantation forests, (new)
  - Pruning residues, (new)
  - Unutilised wood processing residues,
  - Municipal wood waste,
  - Horticultural wood residues
  - Agricultural (straw & stover) residues,
  - Bark from ports,
  - Shelterbelt turnover, (new)
- Volumes of pulp logs and K grade logs are also estimated.

# NZ Biomass resources

In-forest residues (one of the largest residual biomass resources) were split into categories by site type;

- landing / roadside,
- flat to rolling terrain (ground-based harvest) cutover,
- steep terrain (hauler harvest) cutover.

These have differing levels of accessibility, cost of recovery and levels of recoverability;

- environmental limits need to be applied to some resources
  - straw and stover
  - in-forest cutover residues,

to maintain soil fertility, biodiversity and potentially mitigate soil erosion

# NZ Biomass resources

- Estimates of currently surplus quantities available from wood processing facilities are included in the assessment.
  - Wood processing residue estimates do not include that calculated as already being used by the wood processing industry for the production of on-site heat and power.
- The availability of pulp logs is based on the amounts that are believed to be available after the demands of the pulp, paper, and fibre board industries are met.
- K grade logs are largely exported and are considered to be available at market prices (volatile over last 18 months)

# Biomass residue fuel properties

|                 | Moisture Content | Ash Content | GCV  | NCV  | NCV - 5% | NCV + 5% |
|-----------------|------------------|-------------|------|------|----------|----------|
| Landing stem    | 56.5             | 1.8         | 19.8 | 6.8  | 6.5      | 7.2      |
| Landing mixed   | 54.0             | 4.5         | 19.3 | 7.0  | 6.7      | 7.4      |
| CO GB stem      | 51.5             | 0.9         | 20.0 | 7.7  | 7.3      | 8.1      |
| CO GB mixed     | 51.5             | 4.8         | 19.2 | 7.4  | 7.0      | 7.8      |
| CO Hauler stem  | 51.5             | 0.9         | 20.0 | 7.7  | 7.3      | 8.1      |
| CO Hauler mixed | 51.5             | 4.8         | 19.2 | 7.4  | 7.0      | 7.8      |
| MWW             | 31.5             | 4.5         | 19.3 | 11.0 | 10.5     | 11.6     |
| Orchard*        | 51.5             | 1.5         | 19.9 | 7.9  | 7.5      | 8.3      |
| Straw           | 13.5             | 6.8         | 18.1 | 14.4 | 13.7     | 15.1     |
| Stover          | 20.0             | 5.6         | 17.8 | 13.8 | 13.1     | 14.5     |
| WPR Wood**      | 58.0             | 0.5         | 20.1 | 7.3  | 6.9      | 7.7      |
| WPR Bark debark | 53.0             | 3.0         | 19.6 | 7.4  | 7.0      | 7.8      |
| WPR Bark yard   | 58.0             | 7.5         | 18.7 | 6.1  | 5.7      | 6.4      |

\*mix of types, includes vineyards and kiwifruit

\*\*mix of residues; sawdust, dry shavings and off-cuts

| <b>Recovery factors for different Residue types</b> | <b>Gross volume estimate (100%)</b> | <b>Recoverability factor 1 (% of gross)</b> | <b>Recoverability factor 2 (% of gross)</b> |
|---|-------------------------------------|---|---|
| <b>In-forest residues - landings</b>                | 100                                 | 80  | 65  |
| <b>In-forest residues - cutover</b>                 | 100                                 | 70  | 55  |
| <b>Wood processing residues</b>                     | 100                                 | 95  | 90  |
| <b>Municipal wood waste</b>                         | 100                                 | 80  | 60  |
| <b>Port bark</b>                                    | 100                                 | 90  | 80  |
| <b>Horticultural residues</b>                       | 100                                 | 80  | 65  |
| <b>Straw and Stover*</b>                            | 100                                 | 80  | 60  |
| <b>Shelter belt residuals</b>                       | 100                                 | 80  | 60  |
| <b>Production thinnings residuals</b>               | 100                                 | 80  | 65  |
| <b>Waste thinnings</b>                              | 100                                 | 50  | 25  |
| <b>Prunings</b>                                     | 100                                 | 50  | 25  |
| <b>Pulp log</b>                                     | 100                                 | 95  | 90  |
| <b>Sawmill chip</b>                                 | 100                                 | 75  | 50  |
| <b>K grade logs</b>                                 | 100                                 | 75  | 50  |
| <b>Douglas-fir production thinnings</b>             | 100                                 | 80  | 50  |

## Tonnes per annum by resource type at a national level

|  | 2021 - 2025       | 2026 - 2030       | 2031 - 2035      | 2036 - 2040      | 2041 - 2045      | 2046 - 2050      |
|--|-------------------|-------------------|------------------|------------------|------------------|------------------|
| <b>In-forest post-harvest</b>                | 3,281,411         | 2,657,097         | 2,057,579        | 2,042,674        | 2,274,610        | 2,360,950        |
| <b>MWW</b>                                   | 171,730           | 184,827           | 199,156          | 214,848          | 232,047          | 250,917          |
| <b>Orchard</b>                               | 98,728            | 100,703           | 102,717          | 104,771          | 106,866          | 109,004          |
| <b>Straw and stover</b>                      | 480,073           | 489,675           | 499,468          | 509,458          | 519,647          | 530,040          |
| <b>Shelter belt</b>                          | 61,440            | 61,440            | 61,440           | 61,440           | 61,440           | 61,440           |
| <b>Thin to waste</b>                         | 71,240            | 131,830           | 95,764           | 63,452           | 90,374           | 77,777           |
| <b>Production thin residues</b>              | 23,067            | 18,650            | 123,912          | 212,587          | 155,894          | 71,635           |
| <b>Port bark</b>                             | 200,719           | 220,791           | 230,827          | 210,755          | 200,719          | 200,719          |
| <b>Prunings</b>                              | 3,523             | 14,520            | 12,381           | 6,078            | 3,927            | 3,523            |
| <b>Douglas fir production thinnings</b>      | 356,031           | 382,291           | 82,667           | 88,154           | -                | -                |
| <b>Sawmill chip</b>                          | 1,125,398         | 1,125,398         | 1,125,398        | 1,125,398        | 1,125,398        | 1,125,398        |
| <b>Pulp log (surplus to domestic demand)</b> | 2,127,887         | 1,856,618         | 817,321          | 397,061          | 843,400          | 344,871          |
| <b>K grade log</b>                           | 4,579,022         | 4,405,647         | 3,030,689        | 2,728,893        | 3,072,889        | 3,548,060        |
| <b>Total</b>                                 | <b>12,580,270</b> | <b>11,649,488</b> | <b>8,439,319</b> | <b>7,765,568</b> | <b>8,687,210</b> | <b>8,684,333</b> |



| <b>PJ per annum; national level</b>          | <b>2021 - 2025</b> | <b>2026 - 2030</b> | <b>2031 - 2035</b> | <b>2036 - 2040</b> | <b>2041 - 2045</b> | <b>2046 - 2050</b> |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>In-forest post-harvest</b>                | 22.64              | 18.33              | 14.20              | 14.09              | 15.69              | 16.29              |
| <b>MWW</b>                                   | 1.41               | 1.52               | 1.63               | 1.76               | 1.90               | 2.06               |
| <b>Orchard</b>                               | 0.68               | 0.69               | 0.71               | 0.72               | 0.74               | 0.75               |
| <b>Straw and stover</b>                      | 7.44               | 7.59               | 7.74               | 7.90               | 8.05               | 8.22               |
| <b>Shelter belt</b>                          | 0.42               | 0.42               | 0.42               | 0.42               | 0.42               | 0.42               |
| <b>Thin to waste</b>                         | 0.49               | 0.91               | 0.66               | 0.44               | 0.62               | 0.54               |
| <b>Production thin residues</b>              | 0.16               | 0.13               | 0.85               | 1.47               | 1.08               | 0.49               |
| <b>Port bark</b>                             | 1.38               | 1.52               | 1.59               | 1.45               | 1.38               | 1.38               |
| <b>Prunings</b>                              | 0.02               | 0.10               | 0.09               | 0.04               | 0.03               | 0.02               |
| <b>Douglas fir production thinnings</b>      | 2.46               | 2.64               | 0.57               | 0.61               | -                  | -                  |
| <b>Sawmill chip</b>                          | 7.77               | 7.77               | 7.77               | 7.77               | 7.77               | 7.77               |
| <b>Pulp log (surplus to domestic demand)</b> | 14.68              | 12.81              | 5.64               | 2.74               | 5.82               | 2.38               |
| <b>K grade log</b>                           | 31.60              | 30.40              | 20.91              | 18.83              | 21.20              | 24.48              |
| <b>Total</b>                                 | <b>91.16</b>       | <b>84.83</b>       | <b>62.79</b>       | <b>58.24</b>       | <b>64.71</b>       | <b>64.81</b>       |

## All residues (recovery level 1) by region

| PJ / p. a.               | 2021 - 2025  | 2026 - 2030  | 2031 - 2035  | 2036 - 2040  | 2041 - 2045  | 2046 - 2050  |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Northland; Rec 1         | 2.16         | 1.81         | 1.73         | 2.27         | 2.64         | 2.47         |
| Auckland; Rec 1          | 1.38         | 1.40         | 1.25         | 1.13         | 1.22         | 1.34         |
| Waikato; Rec 1           | 3.58         | 3.83         | 3.41         | 3.14         | 3.31         | 3.49         |
| Bay of Plenty; Rec 1     | 6.16         | 6.45         | 5.73         | 6.02         | 6.33         | 6.08         |
| Gisborne; Rec 1          | 3.00         | 2.29         | 1.72         | 1.75         | 2.05         | 2.12         |
| Hawkes Bay; Rec 1        | 2.66         | 2.44         | 2.01         | 1.73         | 1.79         | 1.90         |
| Taranaki; Rec 1          | 0.56         | 0.42         | 0.36         | 0.38         | 0.39         | 0.39         |
| Manawatu-Wanganui; Rec 1 | 1.76         | 1.32         | 1.02         | 1.09         | 1.14         | 1.10         |
| Wellington; Rec 1        | 1.15         | 0.91         | 0.65         | 0.59         | 0.67         | 0.72         |
| Wairarapa; Rec 1         | 2.63         | 1.56         | 0.85         | 0.86         | 1.17         | 1.32         |
| Tasman / Nelson; Rec 1   | 1.34         | 1.53         | 1.45         | 1.29         | 1.06         | 1.06         |
| Marlborough; Rec 1       | 1.35         | 1.14         | 1.04         | 1.18         | 1.20         | 1.16         |
| West Coast; Rec 1        | 0.45         | 0.40         | 0.41         | 0.37         | 0.31         | 0.32         |
| Canterbury; Rec 1        | 5.82         | 5.56         | 4.81         | 4.65         | 4.60         | 4.65         |
| Otago; Rec 1             | 3.48         | 3.56         | 2.31         | 2.23         | 2.00         | 2.02         |
| Southland; Rec 1         | 2.79         | 2.80         | 1.47         | 1.20         | 1.07         | 1.03         |
| <b>Total; Rec 1</b>      | <b>40.27</b> | <b>37.41</b> | <b>30.21</b> | <b>29.89</b> | <b>30.94</b> | <b>31.18</b> |

# Costs

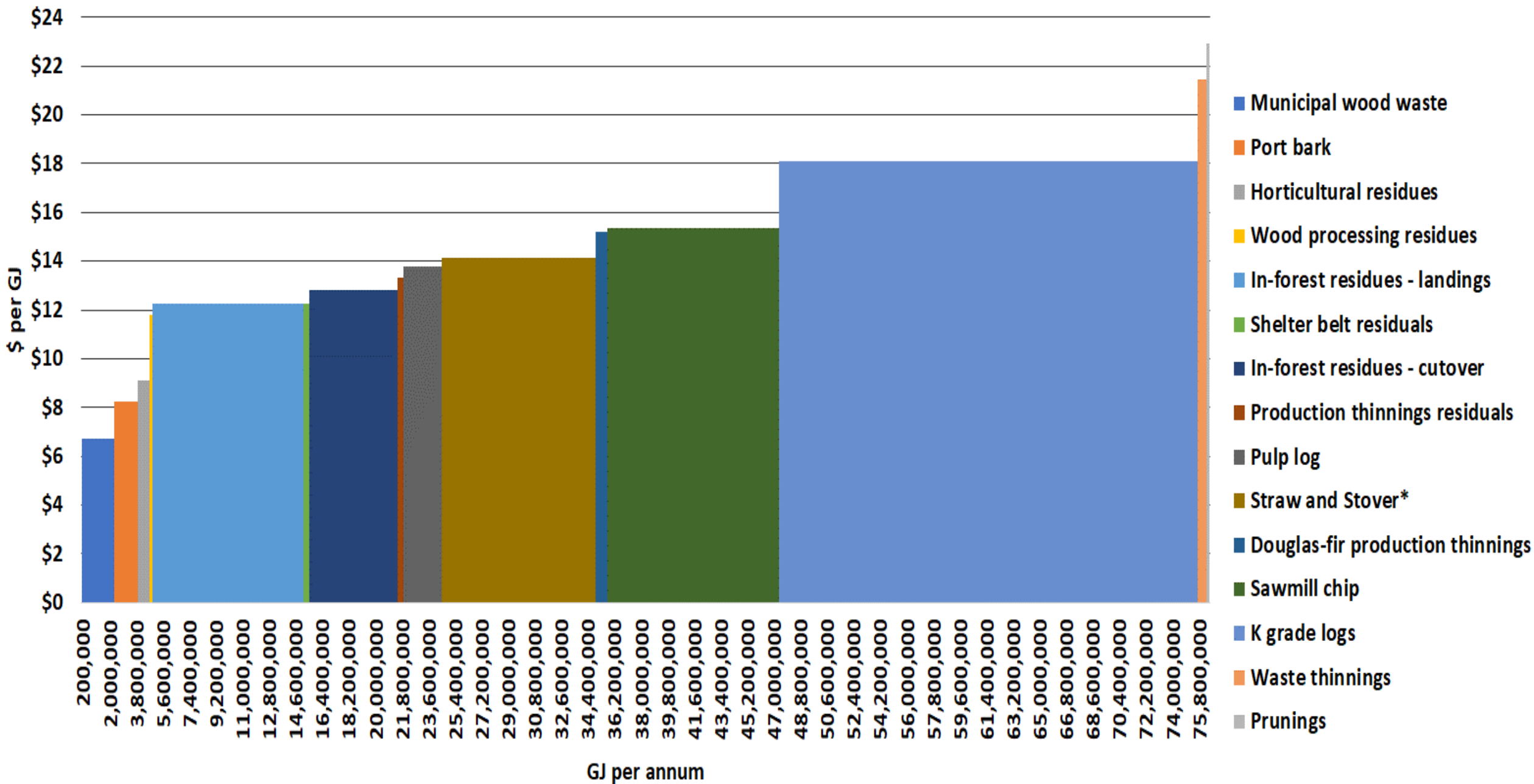
Indicative delivered costs (including profit margins of 10%) were derived using 2022 cost inputs for capital, fuel, labour and consumables etc.

Capital equipment costs were derived from the INFORME harvesting price guide (2020) and a range of sources for items such as fuel, oil, tyres, labour etc.

Forest residue transport distances are based on forest industry data for average log hauls (86km one way) and estimates of other distances derived from Google maps etc. Standard 44 tonne Gross Vehicle Mass (GVM) trucks were used in the transport cost analysis.

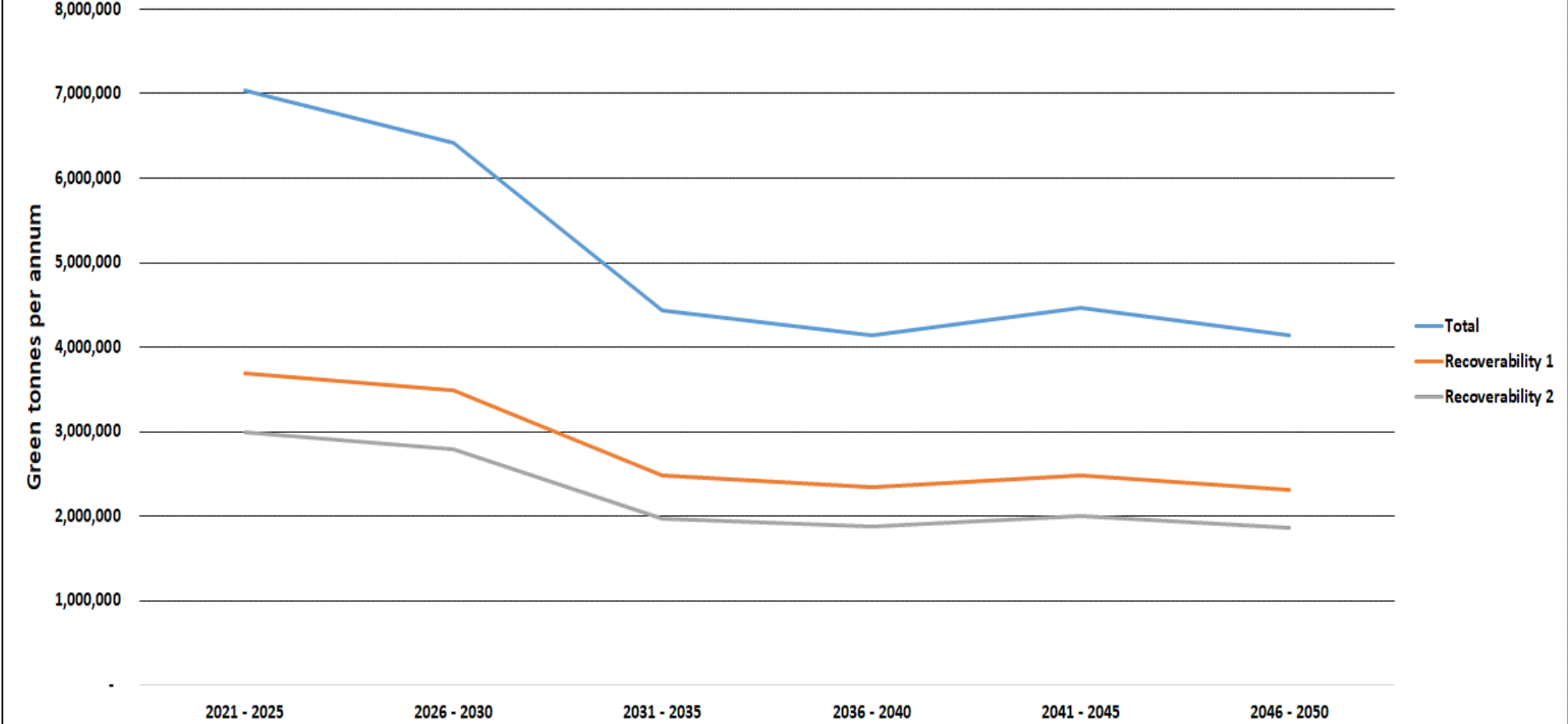
**These are indicative costs and do not necessarily reflect actual delivered prices as site specifics such as transport distance, limitations on truck size due to access restrictions and scale of demand can have a substantial influence. Costs were derived based on full utilisation of equipment, in reality some idle time will likely occur; increasing operation costs and risks which would be reflected in delivered prices.**

# Cost supply curves for biomass supply nationally, GJs available by \$ per GJ

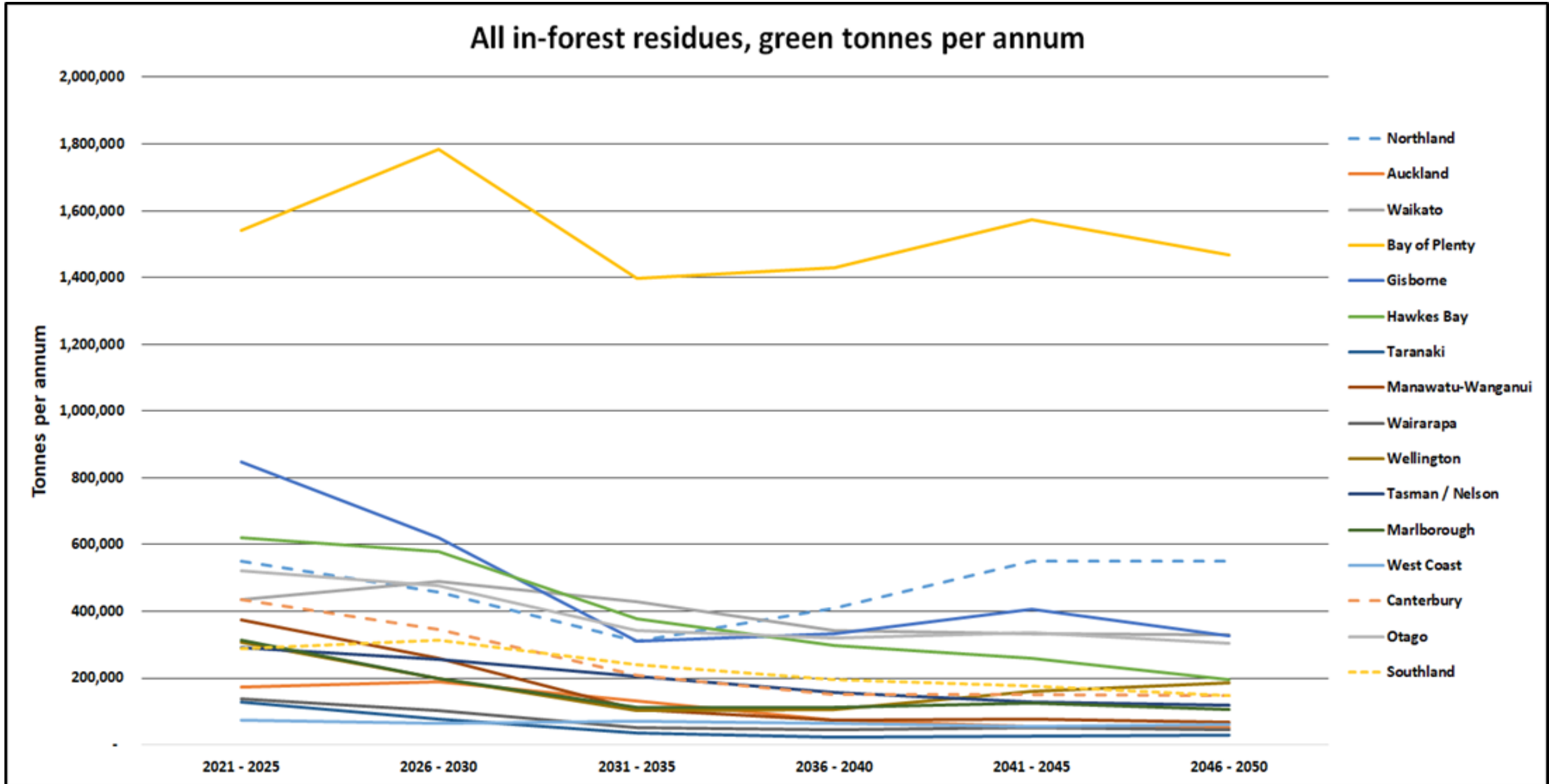


# Residue volumes over time at national level

In-forest residue biomass, green tonnes per annum ;  
gross and recoverability levels 1 and 2



# Residue volumes over time at regional level







If we don't use it as fuel some of it will burn anyway;

- Scion is aware of 13 landing pile fires in the South Island in the last 3 years.
- Spontaneous combustion

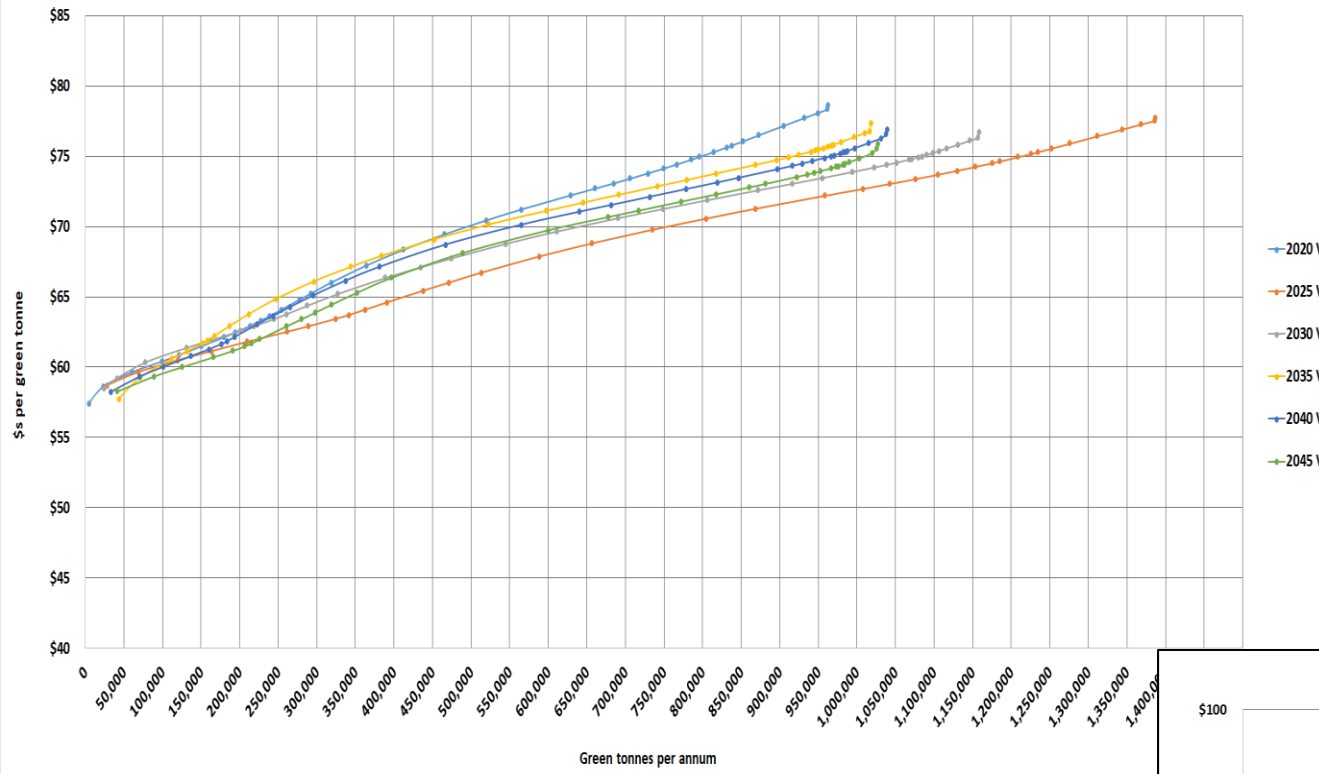






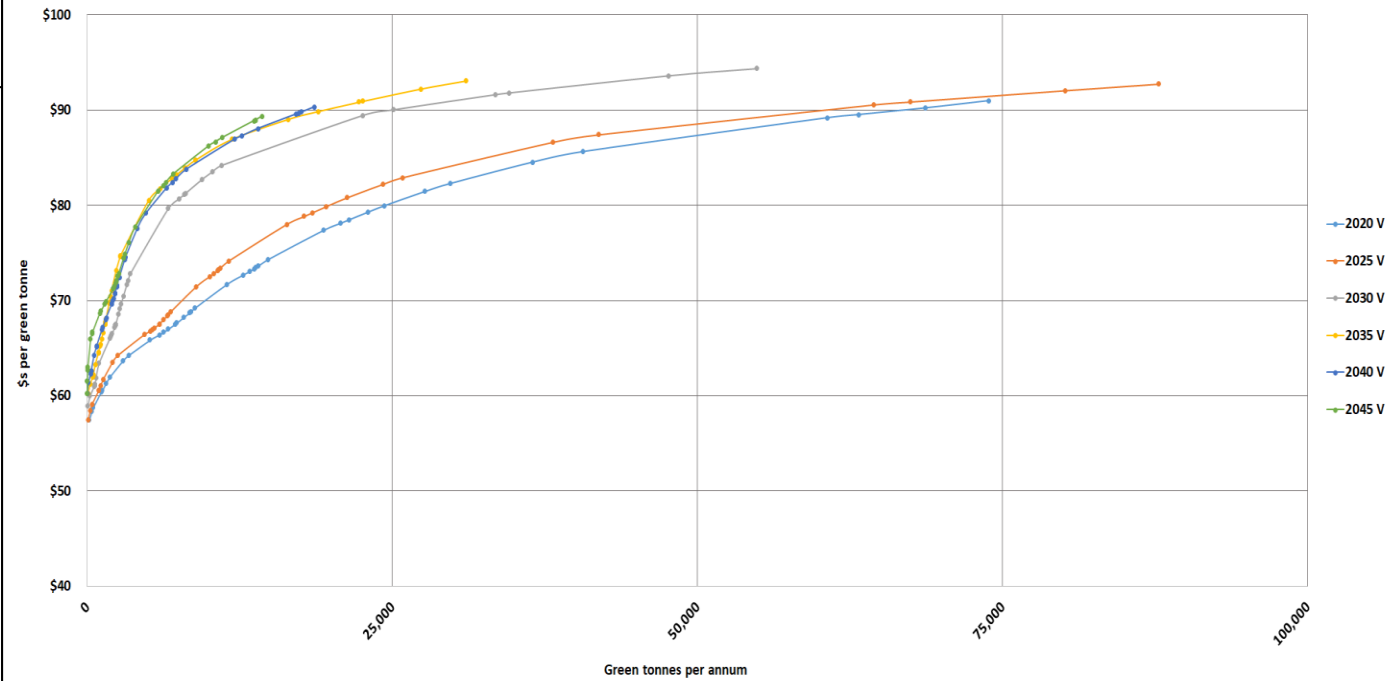


All in-forest residues to Kinleith; cost supply curves



**Cost supply curves derived from Scions Biomass Supply Model;**  
**- Kinleith, (Waikato) left**  
**- Bell Block (Taranaki), below**

All in-forest residues to Bell Block; cost supply curves



**A key point to remember;**

Residues are not the only resource or potential resource.

We can grow what we need,  
as much as we need,  
if we decide we want to.

Land, time, action.

- short rotation forests;
- short rotation coppice,
- miscanthus



## Need more resource?

GIS based models that help identify sites suitable for SRF

- Derived from GIS based modelling;
- Site productivity (soil, rainfall, temperature)
- Land costs
- Slope (harvesting costs)
- Road network
- Etc.



# Any Questions?



Presentation based on;

**Residual biomass fuel projections for New Zealand;  
2021** - Indicative availability by region and source

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Prosperity from trees *Mai i te ngahere oranga*

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