



Eucalyptus Short Rotation Forestry and harvesting methods

11/12/17

ecoates@wit.ie



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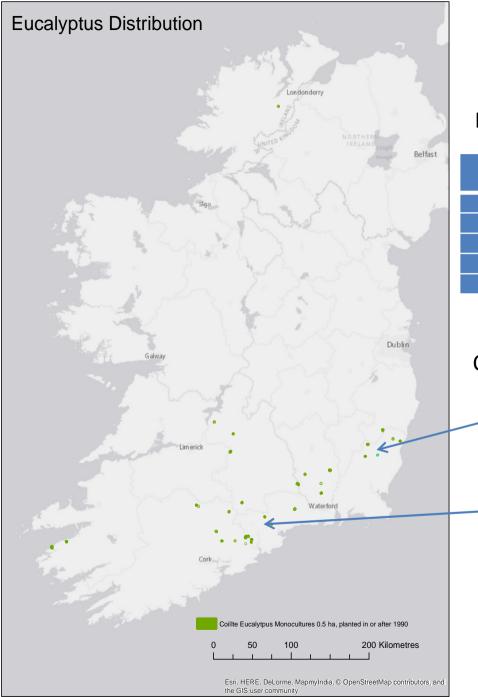
This presentation is in two parts:

- 1) A characterisation of eucalyptus short rotation forestry plantations in Ireland
- 2) A financial analysis of eucalyptus short rotation forestry supply chains





A characterisation of eucalyptus short rotation forestry plantations in Ireland



Planted since 2009

| | Coillte | Private | Total |
|-------------------|---------|---------|-------|
| No. Sites | 53 | 0 | 53 |
| Total Area (ha) | 333 | 0 | 333 |
| Average Area (ha) | 6.3 | 0.0 | |
| Min area (ha) | 0.6 | 0 | |
| Max area (ha) | 25.5 | 0 | |

Older Plantations

Kilbora, Co. Wexford. Planted 1992.

Glenshelane, Co. Waterford. Planted 1993.

Fieldwork

- Stratifying
- Assessing the canopy cover (DENSIOMETER)
- Setting out plots for an assessment of survival, stocking and dbh distribution
- Height measurements
- On a number of sample trees, upper stem measurements were taken to develop a local volume equation for each strata (CRITERION)
- Crown projection measurements (DENSIOMETER)
- Identification of soil type and soil nutrient regime (Soil pit + indicator species)





















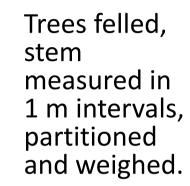








Destructive sampling on 3 sites



MC, density,
 oven dry
 mass, CV,
 ash, chemical
 analysis



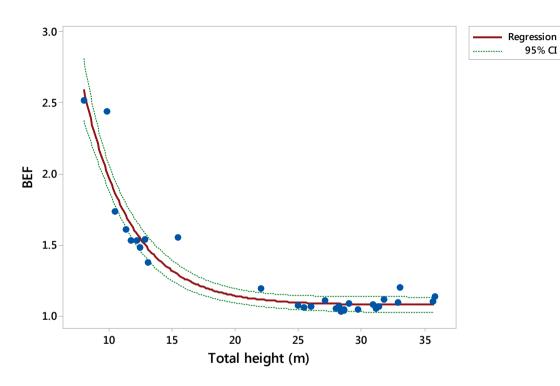




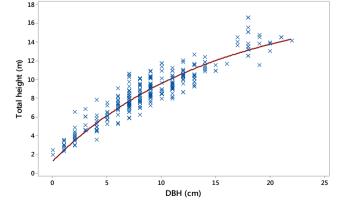
Aboveground Biomass Expansion Factor equation developed from the data

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DBH to total height equation parameterised from data to use with the BEF equation



Descriptions, survival, top height, and basal area of the study sites

| | | r | rr | | i | | | · | r | | | NIE | [/ | |
|------|------------------|--------------------|--|-------------------------|-------------------------|------------------|--|------------------|----------------------|---|--------------------------------------|----------------------------------|----------------------|-----------------------|
| Site | Species | Growing Seasons | Soil Type | Soil Nutrient Regime | Soil Moisture Regime | Elevation (m) | Surviving trees ha ^{.1} (incl. < 7 cm DBH) | Mortality (%) | Canopy Cover % | Standing dead trees ha ⁻¹ | Stocking (trees > 7 cm DBH) | No. Trees < 7 cm DBH ha | Top height (m) | Basal Area ha¹ (m² |
| 1 | E. <u>nitens</u> | 6 | Brown <u>Gley</u> / <u>Podzolic Gley</u> | Poor - Medium | Fresh - Moist | 189 | 1,600 | 36 | 43 | 0 | 1,330 | 270 | 10 | 9.9 |
| 2 | E. <u>nitens</u> | 7 | Loamy Brown Earth | Medium | Moist | 168 | 1,414 | 43 | 44 | 0 | 771 | 643 | 9 | 5.3 |
| 3 | E. <u>nitens</u> | 7 | Loamy Brown Earth | Medium | Moist | 173 | 1,863 | 25 | 66 | 0 | 1,250 | 613 | 13 | 11.3 |
| 4 | E. <u>nitens</u> | 7 | Brown <u>Gley</u> | Poor - Medium | Very Moist | 168 | 950 | 62 | 22 | 0 | 210 | 740 | 7 | 1.1 |
| 5 | E. <u>nitens</u> | 7 | Loamy Brown Earth | Medium | Moist | 169 | 1,400 | 44 | 48 | 0 | 1,213 | 187 | 13 | 14 |
| 6 | E. <u>nitens</u> | 7 | Loamy Brown Earth / Brown Gley | Medium | Moist | 172 | 1,467 | 41 | 42 | 0 | 417 | 1,050 | 12 | 4.3 |
| 7 | E. <u>nitens</u> | 7 | Loamy Brown Earth | Medium | Moist | 174 | 1,917 | 23 | 61 | 0 | 1,150 | 767 | 13 | 12.2 |
| 8 | E. <u>nitens</u> | 7 | Gravelly Iron Pan Soils | Poor | SI. Dry | 184 | 1,967 | 21 | 40 | 1 | 833 | 1,134 | 9 | 4.9 |
| 9 | E. <u>nitens</u> | 7 | Gravelly Brown Earth/ Podzol | Poor | SI. Dry | 151 | 2,217 | 11 | 53 | 0 | 1,100 | 1,117 | 9 | 6.1 |
| 10 | E. <u>nitens</u> | 7 | Gravelly, Sandy Brown Earth | Poor - Medium | SI. Dry | 171 | 2,100 | 16 | 52 | 0 | 1,138 | 962 | 10 | 7.7 |
| 11 | E. <u>nitens</u> | 6 | Podzolic Gley | Poor | Moist | 153 | 2,200 | 12 | 55 | 0 | 1,300 | 900 | 11 | 8.8 |
| 12 | E. delegatensis | 22 | Loamy Brown Earth | Very Poor | Mod. Dry | 92 | 436 | - | - | - | 436 | 0 | 28 | 34.8 |
| 13 | E. <u>nitens</u> | 23 | Podzolic Gley / Surface Water Gley | Medium | Very Moist | 180 | 842 | - | - | 400 | 842 | 0 | 33 | 49.8 |
| 14 | E. gynnii | 5 | Podzolic Gley | Very Poor | Moist | 223 | 2,200 | 12 | 25 | 0 | 0 | 2,200 | 5 | NA |
| 15 | E. gunnii | 5 | Podzolic Gley / Surface Water Gley | Poor - Medium | Very Moist | 243 | 1,783 | 29 | 36 | 0 | 67 | 1,716 | 6 | 0.28 |

Productivity estimates of the study sites

| Site | Species | No. of growing Seasons | QMDBH (cm) | Avg. merchantable <u>roundwood</u> volume per tree (m³) | Merchantable roundwood volume (m³ ha-1) | Stem Basic density (kg m-³) | Merch Stem Biomass per ha (odt)* | Residue biomass per ha (odt) | Wholetree biomass per ha (odt) | Productivity: whole tree biomass (odt ha ⁻¹ yr ⁻¹) |
|------|------------------------|------------------------------|---------------|---|--|--------------------------------------|--|---------------------------------------|---|--|
| 1 | E. <u>nitens</u> | 6 | 11 | 0.02 | 31 | | 13 | 15 | 28 | 4.7 |
| 2 | E. <u>nitens</u> | 7 | 10 | 0.02 | 15 | | 6 | 12 | 18 | 2.6 |
| 3 | E. <u>nitens</u> | 7 | 11 | 0.04 | 44 | 412 | 18 | 16 | 34 | 4.9 |
| 4 | E. <u>nitens</u> | 7 | 8 | 0.01 | 2 | | 1 | 4 | 5 | 0.7 |
| 5 | E. <u>nitens</u> | 7 | 13 | 0.05 | 65 | | 27 | 18 | 45 | 6.4 |
| 6 | E. <u>nitens</u> | 7 | 12 | 0.04 | 18 | | 7 | 9 | 16 | 2.3 |
| 7 | E. <u>nitens</u> | 7 | 12 | 0.04 | 50 | | 21 | 17 | 38 | 5.4 |
| 8 | E. <u>nitens</u> | 7 | 9 | 0.02 | 13 | | 5 | 13 | 18 | 2.6 |
| 9 | E. <u>nitens</u> | 7 | 9 | 0.01 | 16 | | 7 | 15 | 21 | 3 |
| 10 | E. <u>nitens</u> | 7 | 10 | 0.02 | 23 | | 9 | 15 | 25 | 3.6 |
| 11 | E. <u>nitens</u> | 6 | 10 | 0.02 | 30 | | 12 | 17 | 30 | 5 |
| 12 | E. <u>delegatensis</u> | 22 | 32 | 0.88 | 385 | 435 | 167 | 13 | 180 | 8.2 |
| 13 | E. <u>nitens</u> | 23 | 27 | 0.8 | 666 | 394 | 262 | 27 | 289 | 12.6 |
| 14 | E. <u>gunnii</u> | 5 | 0 | 0 | 0 | | 0 | 0 | 2 | 0.4 |
| 15 | E. gunnii | 5 | 8 | 0 | 1 | | 0 | 0 | 5 | 1 |

*estimated using a basic density of 412 kg m⁻³ for site no. 1-11, 14 and 15, 435 kg m⁻³ for site no. 12, and 394 kg m⁻³ for site no. 13.

Wood fuel parameters per tested partitions (standard deviations in parenthesis).

| | | | | | | | | | | | | Ash Defo | ormation | | |
|---------------|--------------------------|---|-----------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|-----------------------------|------------------------------|--------------------------|-----------------|---------------------------------------|--------------|--------|----------------------|
| Partition | Ash content (% db) | Gross calorific value (GJ/tonne) (db) | Carbon content (% db) | Hydrogen content (% db) | Nitrogen content (% db) | Chlorine content (% db) | Sulphur content (% db) | Oxygen content (% db) | NCV (GJ Tonne) (db) | Init. deform. (°C) | Soften. (°C) | Hemisph. (°C) | Flow (°C) | (°C) | Slaggin; potentia |
| Stem | 1.2 | 19.2 | 46.40 | 5.70 | 0.18 | 0.08 | 0.010 | 46.41 | 17.96 | >1,500 | >1,500 | >1,500 | >1,500 | >1,500 | Weal |
| Stem | (0.1) | (0.1) | (2.77) | (0.16) | (0.10) | (0.03) | (0.017) | (2.89) | | | | | | | |
| Bark | 5.7 | 17.7 | 46.09 | 5.38 | 0.40 | 0.34 | 0.017 | 42.04 | 16.56 | >1,500 | >1,500 | >1,500 | >1,500 | - | Wea |
| вагк | (4.7) | (1.4) | (5.92) | (0.46) | (0.13) | (0.05) | (0.015) | (2.03) | | | | | | | |
| | 0.5 | 19.4 | 48.64 | 6.12 | 0.19 | 0.07 | <0.01 | 44.48 | 18.05 | <850 | <850 | <850 | <850 | - | Sever |
| Wood | (0.3) | (0.3) | (2.54) | (0.23) | (0.04) | (0.03) | | (2.23) | | | | | | | |
| | 2.2 | 19.9 | 49.92 | 5.85 | 0.51 | 0.14 | 0.013 | 41.39 | 18.61 | <850 | <850 | <850 | <850 | - | Sever |
| Live Branches | (0.4) | (0.3) | (2.11) | (0.19) | (0.09) | (0.03) | (0.015) | (1.85) | | | | | | | |
| | 1.3 | 19.5 | 48.51 | 5.92 | 0.32 | 0.10 | 0.007 | 43.87 | 18.21 | >1,500 | >1,500 | >1,500 | >1,500 | - | Wea |
| Dead Branches | (0.5) | (0.1) | (2.77) | (0.31) | (0.07) | (0.10) | (0.006) | (3.18) | | | | | | | |
| | 2.4 | 20.1 | 48.68 | 5.97 | 0.55 | 0.13 | 0.017 | 42.25 | 18.81 | >1,500 | >1,500 | >1,500 | >1.500 | >1,500 | Wea |
| Tops | (0.6) | (0.2) | (3.66) | (0.06) | (0.40) | (0.05) | (0.029) | (4.65) | | | | | | | |
| - 1. | 3.6 | 22.4 | 54.12 | 5.92 | 1.49 | 0.22 | 0.113 | 34.54 | 21.15 | >1,500 | >1,500 | >1,500 | >1,500 | - | Wea |
| Foliage | (0.6) | (0.5) | (3.42) | (0.15) | (0.14) | (0.04 | (0.042) | (3.71) | | · · · · · | ·····* | · · · · · · · · · · · · · · · · · · · | • | | |

| | | Typical values EN | 1496-1:2009 | |
|----------|---------|---|---------------|--------------|
| | | Virgin Wood Materials (with of without insignificant amounts of bark and leaves | Virgin Bark | Residues |
| GCV | MJ/kg d | 19.4 - 20.4 | 18.0 - 22.7 | 19.5 - 20 |
| Ash | % d | 0.2 - 1.0 | 0.8 - 3.0 | 2.0 - 10.0 |
| Carbon | % d | 48 - 52 | 47 - 55 | 50 - 51 |
| Hydrogen | % d | 5.9 - 6.5 | 5.3 - 6.4 | 5.8 - 6.1 |
| Oxygen | % d | 41 - 45 | 32 - 42 | 40 - 43 |
| Nitrogen | % d | <0.1 - 0.5 | 0.1 - 0.8 | 0.3 - 0.8 |
| Sulphur | % d | <0.01 - 0.05 | <0.02 to 0.2 | 0.01 - 0.08 |
| Chlorine | % d | <0.01 - 0.03 | <0.01 to 0.05 | <0.01 - 0.02 |

Data available at www.forestenergy.ie

| iwfdb.forestenerg | y.ie/eucalyptus.php | |
|-------------------|--|---|
| COFORD.IE - Round | ASTGTM LP DAAC :: 🔣 www.geos.ed.ac.uk/h 👔 FOBIA - Home 斗 w | www.forestry.gov.uk/ 📷 🔰 Fuel consumption in 🖹 🗋 Climadapt Login 🗯 Sci-Hub: removing b |
| | Irish Wood Fuel Database Methodology User Guide Parameter Profile | s - Species Profiles - Forest Energy Shortfor |
| | Irish Wood Fuel Database | |
| | Species Profiles | |
| | Eucalyptus (E. nitens, E. delegatensis) | |
| | Moisture Content | Ash Content |
| | Expressed as a percentage of total weight. | Expressed as a percentage of dry weight. |
| | Stem Wood Top Branch Bark Foliage Wholetr. | Bark Branch Foliage Stem Top Whole Wood |
| | 57.2% 56.4% 45.6% 41.1% 57.1% 50.7% 59.0% | 6.0 % 1.7 % 3.8 % 1.2 % 2.3 % 2.4 % 0.4 % |
| | • • • • • | |
| | 20 25 30 35 40 45 50 55 60 65 Moisture content (% total weight basis) | 0.0 2.0 4.0 6.0 8.0 10.0 |
| | Stem Top Bark Wholetree Wood Branch Foliage | Ash content (% dry basis) Bark Foliage Top Wood Branch Stem Wholetree |
| | 상 + ableau 수 교 :=: | 🎂 + ableau 🗠 다. |
| | Energy Content | Basic Density |







A financial analysis of eucalyptus short rotation forestry supply chains



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Supply Chains studied

| No | Name | Description |
|----|---|---|
| | | |
| 1 | CTL SMALL SAWLOG + PULP | Roundwood production using a harvester and forwarder |
| 2 | CTL SMALL SAWLOG + PULP + RESIDUE BUNDLES | Roundwood logs & hogfuel biomass production using a harvester, forwarder, residue bundler, and a shredder. |
| 3 | CTL SMALL SAWLOG + PULP + LOOSE RESIDUES | Roundwood logs & biomass production using a harvester, forwarder, and a chipper. |
| 4 | CTL SMALL SAWLOG + PULPWOOD WOOD CHIP | Sawlog and pulpwood woodchip production using a harvester, forwarder, and a chipper. |
| 5 | CTL SMALL SAWLOG + PULPWOOD WOODCHIP + RESIDUE BUNDLES | Sawlog, pulpwood woodchip, and hogfuel biomass production using a harvester, forwarder, chipper, residue bundler, and shredder. |
| 6 | CTL SMALL SAWLOG + PULPWOOD WOODCHIP + LOOSE RESIDUES | Sawlog, pulpwood woodchip, and biomass production using a harvester, forwarder and a chipper. |
| 7 | CTL ROUNDWOOD WOODCHIP | Roundwood woodchip production using a harvester, forwarder and a chipper. |
| 8 | CTL ROUNDWOOD WOODCHIP + RESIDUE BUNDLES | Roundwood woodchip and hogfuel biomass production using a harvester, forwarder, chipper residue bundler and shredder. |
| 9 | CTL ROUNDWOOD WOODCHIP + LOOSE RESIDUES | Roundwood woodchip and hogfuel biomass production using a harvester, forwarder, chipper, and shredder. |
| 10 | INTEGRATED SMALL SAWLOG AND BIOMASS | Sawlog and biomass production using a harvester, forwarder and chipper. |
| 11 | WHOLE TREE BIOMASS | Wholetree biomass production using a harvester, forwarder and chipper. |



Machine Productivity

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Harvester:

 $y = 60.711 \times (x^{0.6545})$

Where: y = harvester productivity in m³ PMH (productive machine hour). x = mean tree volume in m³ (Jiroušek et al. 2007).

Forwarder:

 $y = 17.0068 \times (x^{13.2533/x})$

Where: $y = productivity in m^3 per PMH$. x = average extraction distance in metres (Jiroušek et al. 2007)

Residue bundler:

4.21 ODT PMH⁻¹ (29.2 bundles PMH⁻¹) which is 11.6 m³ solid PMH⁻¹ (Coates et al. 2014).

Roadside chipper:

19.8 ODT PMH⁻¹ (Coates et al. 2016)

Shredder:

15 ODT PMH⁻¹ (Coates et al. 2014)



Machine Rates

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| | | Harvester: 1070D E | Forwarder: 810D E | Chipper: Komptech Chippo 5010 CD | Bundler: John Deere Bundler (1490 Base Machine) | Shredder: Jenz AZ 660 | Front Loader (Generic) |
|---------------------------|-----------|-----------------------|----------------------|---|--|--------------------------|------------------------------|
| Rate | Unit | Amount | Amount | Amount | Amount | Amount | Amount |
| Initial Investment | Euro | 365000 | 235000 | 610000 | 425000 | 330000 | 100000 |
| Machine Power | kW | 136 | 86 | 397 | 134 | 357 | 65 |
| Salvage Value | Euro | 73000 | 47000 | 122000 | 85000 | 66000 | 20000 |
| Economic Life | years | 8 | 7 | 8 | 7 | 5 | 9 |
| Scheduled Operating hours | hrs/year | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 |
| Utilisation Percentage | % | 65 | 65 | 40 | 65 | 75 | 75 |
| Productive Machine Hours | hrs/year | 1300 | 1300 | 800 | 1300 | 1500 | 1500 |
| Depreciation | Euro/year | 37922 | 27246 | 61000 | 48571 | 52800 | 8889 |
| Interest | Euro/year | 20227 | 13143 | 33703 | 23739 | 19074 | 5478 |
| Insurance | Euro/year | 9518 | 6185 | 15860 | 11171 | 8976 | 2578 |
| Maintenance and Repair | Euro/PMH | 29.2 | 16.8 | 76.3 | 37.4 | 35.2 | 5.9 |
| Fuel | Euro/PMH | 8.6 | 5.6 | 26.0 | 8.8 | 23.4 | 4.3 |
| Lubrication | Euro/PMH | 3.0 | 2.0 | 9.1 | 3.1 | 8.2 | 1.5 |
| Labour incl. benefits | Euro/PMH | 32.2 | 32.2 | 52.3 | 32.2 | 27.9 | 0.0 |
| Overheads per SMH | Euro/SMH | 4.1 | 3.0 | 6.0 | 4.7 | 5.6 | 0.9 |
| Operating Profit Per SMH | Euro/SMH | 7.7 | 5.7 | 11.4 | 8.9 | 10.5 | 1.6 |
| Total Rate per SMH | Euro/SMH | 93.0 | 68.7 | 138.2 | 108.3 | 127.5 | 19.7 |
| Total Rate per PMH | Euro/SMH | 143.1 | 105.7 | 345.5 | 166.7 | 170.0 | 26.3 |



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Simulation

Establisment / Maintenance / Roading Costs Industry consultation Literature Harvest Volume / Biomass

BFC Yield Models (poplar) BEF Basic Density Calorific Values

Harvesting Costs

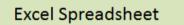
Machine Rates Productivity Models

Haulage Costs

DAFM

Price at millgate / biomass user for product Market Survey

Grants & Premiums



Value using each supply chain for each YC and a range of Harvest Years

Net Present



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Baseline:

| BASELINE SCENARIO | |
|--------------------------------|----------------------------|
| Ground Prep | Ripping |
| Initial Spacing | 2.7 m |
| Fencing | 126.5 m sheep fencing / ha |
| Glyphosate | 2 applications |
| Filling in | 10% |
| Roading | 20 m / ha |
| | |
| Discount rate | 5% |
| Productive area | 85% |
| Harvest losses | 15% |
| Average forwarder distance | 250 m |
| Haulage distance | 37.5 km |
| Moisture content | 50% |
| | |
| Small sawlog price at millgate | €52 / m3 |
| Pulp price at mill gate | €40 / m3 |
| Energy Price | 2.3 cent / kWh |
| | 30 % of establishment and |
| | maintenance costs, 15 % of |
| Management costs | roading costs, and 10 % of |
| | harvesting revenue |

Analysis done on 1 rotation. Reforestation costs included. Windrowing not applicable to supply chains that mobilise residues.



Results:

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NPV without grants and premiums

Supply chains which returned a positive NPV without grants and premiums (including reforestation costs).

| Harvest Year | YC4 | YC6 | YC8 | YC10 | YC12 | YC14 |
|-----------------|-----|-----|-----|---------|----------------|----------------|
| 11 | | | | | | |
| 12 | | | | | | |
| 13 | | | | | | |
| 14 | | | | | | |
| 15 | | | | | | 2,3,6 |
| 16 | | | | | 6 | 1,2,3,4,5,6,10 |
| 17 | | | | | 2,3,6,10 | 1,2,3,4,5,6,10 |
| 18 | | | | | 1,2,3,4,5,6,10 | 1,2,3,4,5,6,10 |
| 19 | | | | | 1,2,3,4,5,6,10 | 1,2,3,4,5,6,10 |
| 20 | | | | 2,3,4,6 | 1,2,3,4,5,6,10 | 1,2,3,4,5,6,10 |

The numbers in the cells indicate supply chains which returned a positive NPV

Orange = Whole tree volume of less than 150 m³ per ha, Green = whole tree volume of $150 - 300 \text{ m}^3$ ha, Blue = whole tree volume greater than 300 m^3 ha.



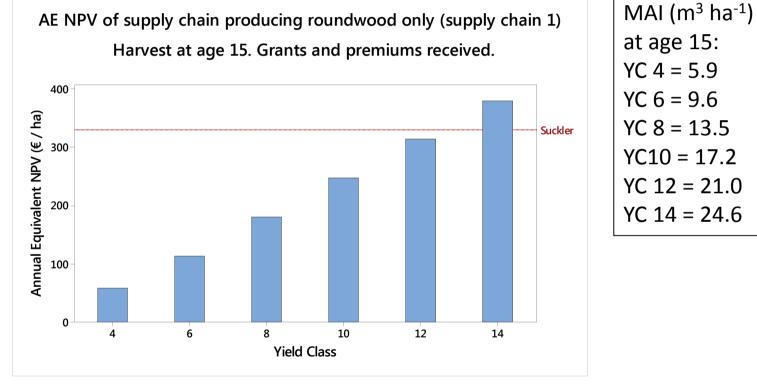
NPV with Grants and Premiums:

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All supply chains returned a positive NPV (except for a harvest in year 11 and 12 for YC 4).

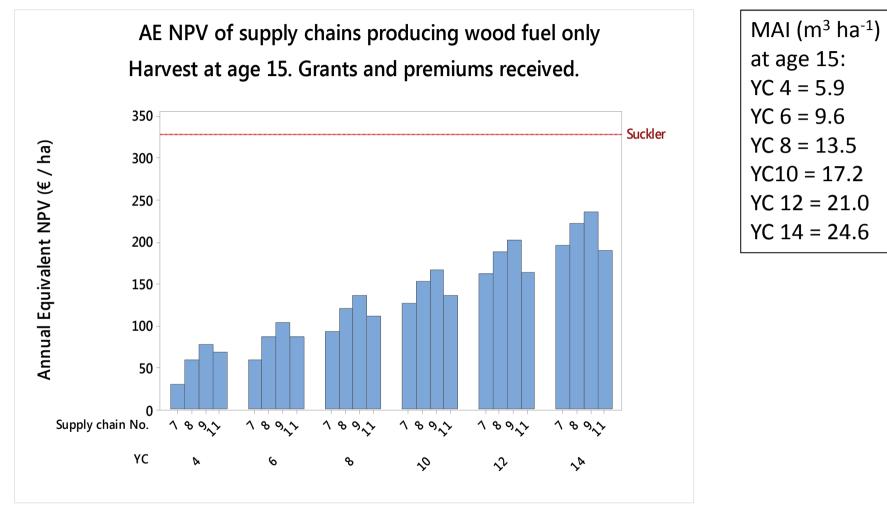
Roundwood Only :



Supply chain 1 returned a NPV of €3944 for YC 14 harvested at age 15, which is an Annual Equivalent NPV of €380 per year.

Suckler is the income from suckler farming in 2015, as described by Ryan et al. 2016

Wood Fuel Only:



Supply chain 9 (CTL roundwood woodchip and loose residues) returned an NPV of €2453 for YC 14 harvested at age 15, which is an AE NPV of €236 ha yr⁻¹

Suckler is the income from suckler farming in 2015, as described by Ryan et al. 2016

Integrated supply chains:



Supply chain 3 (CTL small sawlog + pulp + loose residues) returned a NPV of €4368 for YC 14 harvested at age 15, which is an Annual Equivalent NPV of €421 ha⁻¹ yr⁻¹

Suckler is the income from suckler farming in 2015, as described by Ryan et al. 2016



Conclusions:

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In the simulations, the highest NPV return was from:

Cut to length small sawlog and pulp with the mobilisation of the residues in loose form to the roadside where they were chipped.

The price of 2.3 cents per kWh means that the wood fuel supply chains did not perform as well as the roundwood or integrated supply chains.

Without grants and premiums, a positive NPV value was not returned within 14 years for any supply chains at the YC tested.

With the current grant and premium rates, all supply chains returned a positive NPV within a 10 – 15 year period at all YC tested.

At YC 14, the annual equivalent return from roundwood or integrated supply chains for a harvest at age 15 was estimated to be more than the income from suckler farming.

Possibility to include other species, data, and conventional forestry systems into the model.

| Cut Calibri • 11 • A A = | ^E ≡ ■ ≫·• 📑 Wrap Text | t General 👻 | S Normal 4 | Norma | l 5 Normal 6 | Normal 7 | | Σ Aur | toSum * A |
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| alyptus parameters running off a poplar yield is per the BFC modelling for EUC yield) Stocki 1372 stems per ha. (2.7 m spacing) | | t Years for Click here to Sin | | | | | | Forester Manage | ement Costs |
| Inputs | | | R | pading | | | | % of actualise | |
| YC | 14 | | Roading required / h | na 20 | m | | | Establishment & | & Main. |
| Rotation / Harvest Year | 20 | | Roading costs € / | | See roading tab fo | r indicative figure | es | | Roading |
| Discount rate % | | | Year of road construction | | yrs prior to harves | - | | % of harvesting r | 0 |
| Productive Area % | 85 | | Roading grant applicab | le YES | | - | | Harvesting & Tra | ansport |
| Select Supply Chain from dropdown | Description | | | | | | | | |
| CTL SAWLOG + PULPWOOD WOOD (| user in timber truck | pecific roundwood log assortmen ks. The pulpwood logs are chipped | | | | - | re hauled to t | ne ena- | |
| CTL SAWLOG + PULPWOOD WOOD (| user in timber truck | | | | | - | Price Input | | |
| CTL SAWLOG + PULPWOOD WOOD G | user in timber truck | ks. The pulpwood logs are chipped | d at the roadsie into trailer | | | s end-user. | Price Inpu Locati | its ion Price | |
| Forwarder Extraction Distance | HIP user in timber truck | ks. The pulpwood logs are chipped | d at the roadsie into trailer | | | s end-user. | Price Inpu | its ion Price NDUSER 52 | €/m3 |
| Forwarder Extraction Distance Haulage Distances One Way (costs cale | HIP user in timber truck | ks. The pulpwood logs are chipped Basic Density kg | d at the roadsie into trailer sic Density of wood g/m3 414 | | | s end-user. | Price Inpu Locati | its ion Price NDUSER 52 | |
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Thank You.

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