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# Sensitivity Analysis of Wood Fibre Potentially Available for Wood Energy

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# *Sensitivity Analysis of Wood Fibre Potentially Available for Wood Energy*

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Front cover Image foreground courtesy of Dr. Eugene Hendrick.
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# Table of Contents

# List of Tables and Figures

## Tables



## Figures

# *Background*

The All Ireland Roundwood Production Forecast 2021-2040 provides a separate annual forecast of wood fibre potentially available for wood energy in the Republic of Ireland up to 2040. This forecast is based upon a number of assumptions the most significant of which are:

**a)** The wood based panels (WBP) demand increases by 1% per annum. The WBP demand is met from a combination of Coillte small roundwood, private sector small roundwood and processing residues from the sawmilling sector. This supply is ring fenced and is assumed not to be available for other uses. In compiling the forecast this WBP demand is met first and then the remaining balance of material is potentially available for energy. This assumption is an artificial construct and while in practice and in accordance with the cascade principle almost all of the Coillte small roundwood will be directed to WBP, the private sector volumes and processing residues not being used for WBP will go to the highest paying end user unless there are supply contracts in place.

**b)** The balance of the processing residues after the WBP demand has been met is potentially available for wood energy. In practice however sawmills will retain part of this material for their own use, mainly for process heat and in a small number of cases for combined heat and power generation (cogeneration).Based on more recent evidence, a sawmill conversion rate of 52% was used as opposed to 49% in the All Ireland forecast.

**c)** Harvesting residues of an estimated 80 green tonnes per net ha will potentially be available from clearfell of sites of yield class 18 or higher with a minimum area of 4 ha. This material was subject to a distance constraint from an existing end user.

**Table 1.** Forecast of Wood Fibre and Potential for Energy ROI[1] ('000 $m^3$)[2] as estimated using the methodology in the 2021-2040 roundwood production forecast

| Year | Roundwood 7 - 13cm | Downgrade + Wood Residues | Harvesting Residues | Total |
|---|---|---|---|---|
| **2021** | 184 | 589 | 113 | **886** |
| **2022** | 258 | 708 | 93 | **1,059** |
| **2023** | 348 | 1,005 | 112 | **1,465** |
| **2024** | 325 | 1,002 | 86 | **1,413** |
| **2025** | 357 | 1,013 | 95 | **1,464** |
| **2026** | 394 | 982 | 145 | **1,522** |
| **2027** | 396 | 1,052 | 164 | **1,612** |
| **2028** | 363 | 1,037 | 153 | **1,553** |
| **2029** | 405 | 1,129 | 145 | **1,679** |
| **2030** | 467 | 1,280 | 146 | **1,893** |
| **2031** | 505 | 1,416 | 91 | **2,011** |
| **2032** | 591 | 1,538 | 98 | **2,226** |
| **2033** | 496 | 1,492 | 86 | **2,074** |
| **2034** | 593 | 1,432 | 96 | **2,121** |
| **2035** | 528 | 1,683 | 96 | **2,307** |
| **2036** | 394 | 1,550 | 55 | **1,999** |
| **2037** | 371 | 1,540 | 47 | **1,958** |
| **2038** | 327 | 1,512 | 32 | **1,871** |
| **2039** | 310 | 1,497 | 35 | **1,842** |
| **2040** | 301 | 1,472 | 45 | **1,819** |
| **Totals** | **7,914** | **24,928** | **1,933** | **34,775** |

[1] COFORD 2021. All Ireland Roundwood Production Forecast 2021-2040. COFORD, Kildare St., Dublin 2.

[2] Harvesting Residues are expressed in '000 green tonnes

The remit of the Climate Change group of the COFORD council included the development of a statement on the potential contribution of modern bioenergy[3] to the achievement of national climate change, energy and forest policies. A key element of the statement will be the level of current and future sustainable forest-based biomass supply. While the estimates provided are well founded, they are based on a set of assumptions around the level of thinning, methods of thinning and the recovery of forest biomass at final felling.

It was decided to revisit the assumptions behind Table 1 and determine the potential effects on sustainable forest biomass supply of:

1. Levels of first thinning
2. Recovery rates of biomass at thinning – including the level of use of systems that harvest most of the above ground biomass (excluding foliage)
3. Recovery rates following specified biomass harvesting at final felling (this refers to planned harvesting of separately piled tops and branches on clear-felling sites in accordance with good practice (Gavigan and Hendrick 2023).

This forest-based biomass forecast is not intended to replace the All Ireland forecast, but is viewed as supplementary information that can be used to make an informed assessment of the current and future production based on policy and market demand.

[3] Modern bioenergy refers to efficient and clean combustion of sustainably sourced forest-based biomass, and other forms of bioenergy.

# Methodology and Approach

## Wood Fibre Elements

**Tip to 7 cm Assortment**: This is the stem roundwood volume overbark from 7 cm diameter to the tip of the tree arising from the harvesting of thinnings and clearfells. The volumes per hectare are relatively small but represent a largely untapped source of biomass. The harvesting of this material is not always possible or indeed always desirable due to site conditions and / or site limitations.

**7 cm to 13 cm Assortment:** This is the assortment that is typically referred to as *pulpwood*. The end uses for this category are stake, pulpwood, and forest-based biomass for energy, (including woodchip and firewood). The proportion of a crop that forms this assortment varies with site productivity (yield class) and thinning treatment and the timing of clearfells (rotation length). Typically, a significant proportion of this assortment comes from first and second thinnings. While most harvest contractors harvest pulpwood down to a minimum of 7 cm top diameter overbark, some harvest material down to 5 cm top diameter in order to increase the volume per hectare harvested.

**Roundwood Downgrade:** Pulpwood is typically harvested as 3 m lengths and small sawlog as 3.4 m or 3.7 m lengths. The quality (straightness) requirements for small sawlog together with the small end diameter (SED) requirement of 14 cm means that a proportion of the 14-19 cm category will be harvested and marketed as pulpwood or fuelwood. As with the pulpwood, while the majority of harvest contactors operate to a minimum SED of 14 cm some will harvest material down to 12 cm depending on the mill and future end use.

**Harvesting Residues:** This is the material comprising the tips of trees and branches remaining on site following clearfell. There are currently no regulations in Ireland regarding the minimum site requirement for harvesting.

This process is now referred to as **specified biomass harvesting** (SBH) and is defined as: planned and specified biomass harvesting (SBH), comprising tops and branches removed during roundwood harvest and piled in situ on the forest floor adjacent to extraction racks (Figure 1), and left for a sufficient time to allow needle and leaf fall before collection. It excludes the material used to make brash mats, or their removal off the site[4]. SBH also specifies the productivity range for sites suitable for residue collection, of deadwood to be retrained on the site following biomass harvesting, and good practice in laying out brash mats. The All Ireland forecast required a minimum harvest area of 4 ha and a yield class of 18 or greater. Only spruce crops were considered. The recommendations in SBH can be extended to a wider range of sites and species.

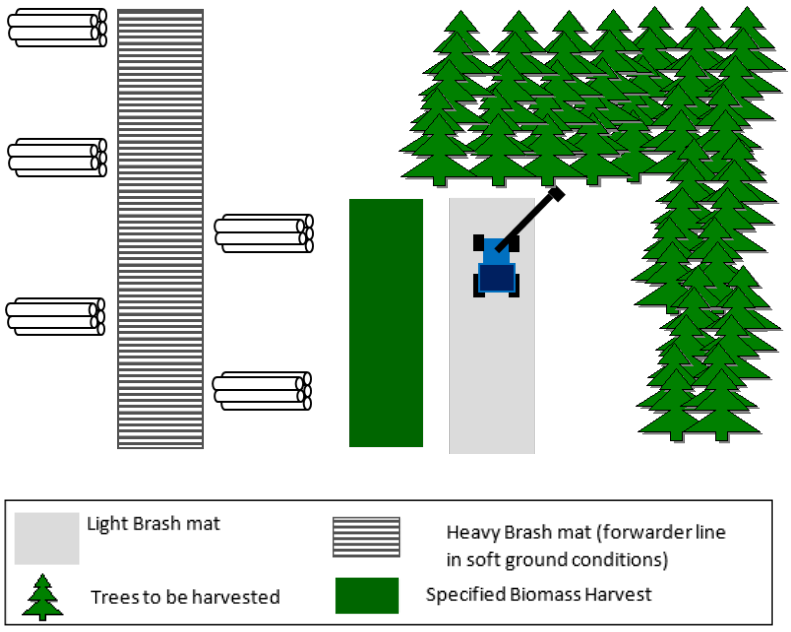


**Figure 1.** SBH on Clearfell Site (Gavigan & Hendrick (2023))

[4] Gavigan N, Hendrick E. 2023. Specified Biomass Harvesting: Good practice guidance for energy assortment harvesting at clearfell. Irish Bioenergy Association, Dublin.

## Approach

The starting point was the All-Ireland Roundwood Production Forecast 2021-2040 (the Forecast). The spreadsheet tables behind the Forecast were rearranged and reformatted to allow for their detailed analysis. Wherever possible, tables were maintained at county level to facilitate any future more detailed query at a regional or county level similar for example to that undertaken on behalf of IrBEA for the midlands development region (MDR)[5].

Additional material from the Forecast data set was extracted to allow for analysis of the impact of varying the levels of thinning and whole tree harvesting of first thinnings. Coillte and Silvalytics, which compiled the Forecast, provided an additional forecast for harvesting residues from clearfell sites. Coillte provided an estimate of the potential availability of Coillte small roundwood (volume 7-13 cm plus the downgrade of material from the 14-19 assortment) for the wood energy / biomass market over the period 2022 to 2040.

## Assessment of Woody Biomass from Private Sector

In order to allow for the ready comparison of the impact of varying thinning areas, types of thinning and levels of SBH recovery on overall woody biomass supply the current situation as of 2023 was evaluated and is provided in Table 2. Unlike the previous forecast, this does not assume any private sector volume or wood residues going to meet the WBP demand.

**a)** The harvestable element of the tip-7 cm assortment is estimated to be 10% of the assortment volume.

**b)** The downgrade from 14-19 cm to small roundwood due to quality and length consideration is estimated at 20% of net realisable volume in this assortment.

**c)** The wood residues exclude the residues retained by sawmills for their own use and assumes an average conversion rate of 52%. The Forecast assumed 49%.

**d)** The SBH values are those in the Forecast.

The total volume is 35.76 million $m^3$ with processing residues being the main contributor (53.4%) followed by 7-13 cm assortment (26.7%), downgrade (18.6%), SBH (1%) and tip-7 cm (0.5%). The volumes include circa 9% broadleaves. The dataset for the private sector Forecast relies on a Forest Inventory and Planning System (FIPS)[6] classification for crops planted before the mid-1980s for circa 68,000 ha. There are broad forest crop classes e.g. young other broadleaves (BYO) and each of the fifteen FIPS classes was assigned a species, age, yield class and management regime in the Forecast. The greater proportion of the FIPS area comprises mature broadleaves and mature mixed forests. The BYO element is responsible for the spike in supply in 2034 while the mixed young forest (MYF) is largely responsible for the spike in 2032. The broadleaf volumes should be treated with caution.

**Table 2.** Current Assessment of Woody Biomass Supply from the Private Sector ('000 $m^3$) Excluding private sector WBP demand (SBH data are '000 Green Tonnes)

| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tip to 7cm** | 9 | 8 | 9 | 10 | 11 | 10 | 10 | 11 | 12 | 13 | 12 | 13 | 12 | 9 | 9 | 8 | 8 | 8 | **185** |
| **7 - 13cm** | 420 | 387 | 433 | 498 | 502 | 455 | 514 | 603 | 665 | 788 | 653 | 791 | 698 | 491 | 464 | 409 | 393 | 381 | **9,548** |
| **Downgrade 14-19cm** | 210 | 225 | 216 | 230 | 254 | 276 | 292 | 304 | 339 | 343 | 364 | 376 | 437 | 466 | 478 | 564 | 574 | 619 | **6,568** |
| **Residues Processing** | 684 | 707 | 709 | 780 | 841 | 865 | 924 | 1,006 | 1,074 | 1,131 | 1,153 | 1,119 | 1,314 | 1,230 | 1,272 | 1,386 | 1,420 | 1,489 | **19,104** |
| **SBH** | 44 | 18 | 27 | 17 | 36 | 25 | 17 | 18 | 16 | 23 | 11 | 21 | 21 | 25 | 17 | 2 | 5 | 15 | **358** |
| **Total** | **1,367** | **1,346** | **1,394** | **1,535** | **1,644** | **1,630** | **1,757** | **1,943** | **2,107** | **2,298** | **2,193** | **2,320** | **2,483** | **2,222** | **2,241** | **2,370** | **2,400** | **2,513** | **35,762** |
| **Broadleaves** | 346 | 187 | 53 | 67 | 39 | 46 | 106 | 83 | 148 | 552 | 127 | 599 | 203 | 202 | 109 | 117 | 52 | 69 | **3,107** |

[5] Potential bioenergy supply in the Midlands Development Region 2022-2040. A report prepared for the Irish Bioenergy Association Hendrick, E., Phillips, H. Hickey, T. November 2022.

[6] Fogarty G., Coggins K. and Gallagher G. 2000. Forest Inventory and Planning System (FIPS) ITGA Forestry Year Book 2000.

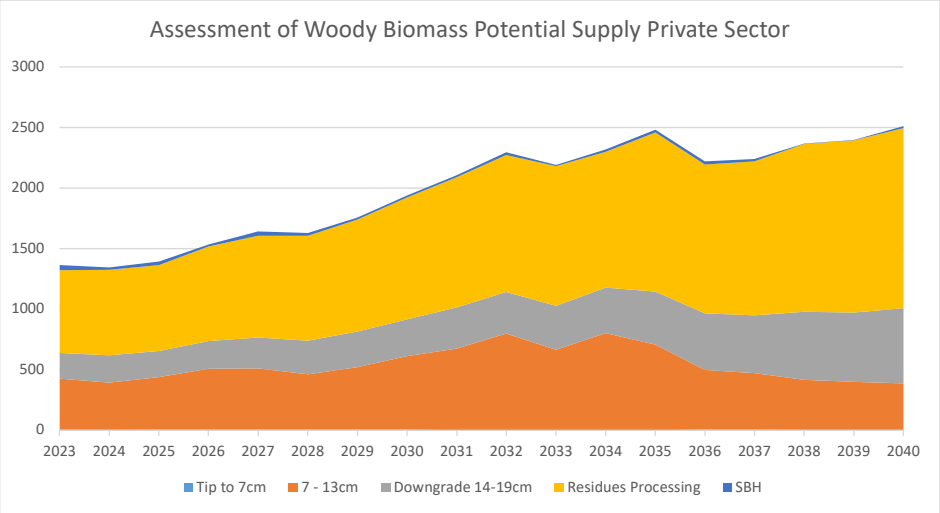


**Figure 2.** Private Sector Potential Woody Biomass (‘000 Green Tonnes)

# Results

## Updated Estimate of Wood Fibre Market Availability

The Forecast estimates were updated to take account of the following:

**a)** Increased sawlog conversion factor of 52%

**b)** Static WBP demand based on the demand estimate for 2021 and

**c)** An estimate of the demand for stakewood was subtracted from the 7-14 cm assortment.

The results are shown in Table 3. The total volume decreases marginally from over 34.77 million $m^3$ to 34.48 million $m^3$. The decrease in the 7-13 cm assortment of 3 million $m^3$ is due to the removal of stake material from this category. This decrease is more or less counter-balanced by an increase in wood residues due to the static WBP demand over the forecast period despite the improvement in sawlog conversion which would reduce the residue slightly. The harvesting residues (SBH) remain unchanged.

**Table 3.** Updated Estimate of Wood Fibre Market Potential Availability for Energy and other uses ('000 $m^3$)[7]

| Year | Roundwood 7 - 13cm | Downgrade + Wood Residues | Harvesting Residues | Total |
|---|---|---|---|---|
| 2021 | 34 | 557 | 113 | **704** |
| 2022 | 108 | 693 | 93 | **894** |
| 2023 | 198 | 1,003 | 112 | **1,313** |
| 2024 | 175 | 1,018 | 86 | **1,279** |
| 2025 | 207 | 1,047 | 95 | **1,349** |
| 2026 | 244 | 1,035 | 145 | **1,424** |
| 2027 | 246 | 1,122 | 164 | **1,532** |
| 2028 | 213 | 1,125 | 153 | **1,491** |
| 2029 | 255 | 1,235 | 145 | **1,635** |
| 2030 | 317 | 1,404 | 146 | **1,867** |
| 2031 | 355 | 1,555 | 91 | **2,001** |
| 2032 | 441 | 1,695 | 98 | **2,234** |
| 2033 | 346 | 1,669 | 86 | **2,102** |
| 2034 | 443 | 1,631 | 96 | **2,170** |
| 2035 | 378 | 1,897 | 96 | **2,371** |
| 2036 | 244 | 1,785 | 55 | **2,084** |
| 2037 | 221 | 1,796 | 47 | **2,064** |
| 2038 | 177 | 1,788 | 32 | **1,997** |
| 2039 | 160 | 1,794 | 35 | **1,990** |
| 2040 | 151 | 1,790 | 45 | **1,987** |
| **Totals** | **4,914** | **27,639** | **1,933** | **34,485** |

[7] SBH values are expressed in '000 green tonnes

Based on SEAI biomass data the material in Table 3 was converted to green tonnes and then allocated in varying proportions across the following sectors (Table 4):

a) ***Power only generation*** – 35% up to 2030 with a moisture content of 45%. No supply post 2030 as Edenderry is set to cease operating.

b) **Industry** – 49% up to 2030 with a moisture content of 50%. From 2031 onwards 75% of material with a moisture content of 45% (to include applications such as high temperature heating and cogeneration).

c) ***Residential*** – 16% up to 2030 with a moisture content of 30%. From 2031 onwards 25% with a moisture content of 30% (to include applications such as commercial and district heating).

**Table 4.** Forest-based Biomass Estimated Energy Content and End User

| | Green Tonnes ('000) | | | | Energy ('000 GJ) | | |
|---|---|---|---|---|---|---|---|
| Year | Roundwood 7 - 13cm | Downgrade + Wood Residues | SBH | Total | Power Generation | Industry | Residential |
| **2023** | 198 | 1,003 | 112 | **1,313** | 2,925 | 3,989 | 1,411 |
| **2024** | 175 | 1,018 | 86 | **1,279** | 2,850 | 3,887 | 1,375 |
| **2025** | 207 | 1,047 | 95 | **1,349** | 3,005 | 4,098 | 1,450 |
| **2026** | 244 | 1,035 | 145 | **1,424** | 3,172 | 4,326 | 1,530 |
| **2027** | 246 | 1,122 | 164 | **1,532** | 3,413 | 4,654 | 1,646 |
| **2028** | 213 | 1,125 | 153 | **1,491** | 3,322 | 4,531 | 1,603 |
| **2029** | 255 | 1,235 | 145 | **1,635** | 3,642 | 4,968 | 1,757 |
| **2030** | 317 | 1,404 | 146 | **1,867** | 4,159 | 5,672 | 2,006 |
| **2031** | 355 | 1,555 | 91 | **2,001** | 0 | 9,551 | 3,360 |
| **2032** | 441 | 1,695 | 98 | **2,234** | 0 | 10,664 | 3,751 |
| **2033** | 346 | 1,669 | 86 | **2,102** | 0 | 10,033 | 3,529 |
| **2034** | 443 | 1,631 | 96 | **2,170** | 0 | 10,359 | 3,644 |
| **2035** | 378 | 1,897 | 96 | **2,371** | 0 | 11,320 | 3,982 |
| **2036** | 244 | 1,785 | 55 | **2,084** | 0 | 9,948 | 3,499 |
| **2037** | 221 | 1,796 | 47 | **2,064** | 0 | 9,855 | 3,466 |
| **2038** | 177 | 1,788 | 32 | **1,997** | 0 | 9,533 | 3,353 |
| **2039** | 160 | 1,794 | 35 | **1,990** | 0 | 9,498 | 3,341 |
| **2040** | 151 | 1,790 | 45 | **1,987** | 0 | 9,487 | 3,337 |
| **Totals** | **4,772** | **26,389** | **1,727** | **32,888** | **26,488** | **136,375** | **48,041** |

The analysis in Table 4 represents the best estimate of current use and the baseline for the sensitivity analysis undertaken. It does not include the residues from the import of round logs by some sawmills nor does it take account of the export of round logs to Northern Ireland or the export of pulpwood to the UK. It also excludes imports from EU and other non EU countries.

Based on COFORD Woodflow reports[8] and on statistics from DAFM[9], there are likely to be net exports within the range -250,000 $m^3$ to -130,000 $m^3$. It is unclear whether round sawlogs will continue to be imported against a backdrop of increasing supply from the private sector. The export of pulpwood has in the past been sporadic and dependant on price. Whether the price advantage of pulp export will continue in the medium term is uncertain. There is also the added difficulty of sourcing certified pulp supplies from the private sector which would act to curtail any expansion of exports in the short term.

[8] COFORD 2019. Woodflow and forest-based biomass energy use on the island of Ireland (2018). COFORD Connects Processing/ Products no. 51

[9] DAFM 2024. Forest Statistics Ireland 2024. DAFM, Johnstown Castle Estate Co. Wexford

# Sensitivity Analysis

## Thinning

The Forecast for the private sector has a set of rules to determine whether crops will be thinned or remain unthinned. These include rules around minimum harvestable area, minimum yield class (productivity), wind speed, soil type and distance from a county road. The rules are based on a combination of a survey of forest companies and forestry consultants[10]. The area designated as no thin by the Forecast was obtained for each county together with the area in each county receiving a first thin for each year of the Forecast (Table 5). The percentage thinned area averaged 56% across all counties and varies from 75% in Laois to 25% in Dublin.

**Table 5.** Forecast Thin and No Thin Areas

| | Forecast Area (ha) | Forecast No Thin Area (ha) | Forecast Thin Area (ha) | % No Thin | % Thin |
|---|---|---|---|---|---|
| Carlow | 2,886 | 1,174 | 1,712 | 41% | 59% |
| Cavan | 12,101 | 4,776 | 7,325 | 39% | 61% |
| Clare | 30,825 | 15,537 | 15,288 | 50% | 50% |
| Cork | 43,497 | 20,553 | 22,944 | 47% | 53% |
| Donegal | 21,776 | 12,181 | 9,595 | 56% | 44% |
| Dublin | 1,896 | 1,414 | 482 | 75% | 25% |
| Galway | 22,792 | 10,739 | 12,053 | 47% | 53% |
| Kerry | 37,391 | 19,540 | 17,851 | 52% | 48% |
| Kildare | 5,940 | 2,826 | 3,114 | 48% | 52% |
| Kilkenny | 11,993 | 3,398 | 8,595 | 28% | 72% |
| Laois | 9,698 | 2,419 | 7,279 | 25% | 75% |
| Leitrim | 15,017 | 4,624 | 10,393 | 31% | 69% |
| Limerick | 15,947 | 6,882 | 9,065 | 43% | 57% |
| Longford | 7,724 | 2,995 | 4,729 | 39% | 61% |
| Louth | 2,049 | 1,239 | 810 | 60% | 40% |
| Mayo | 24,614 | 12,188 | 12,426 | 50% | 50% |
| Meath | 7,096 | 3,232 | 3,864 | 46% | 54% |
| Monaghan | 3,691 | 1,929 | 1,762 | 52% | 48% |
| Offaly | 12,311 | 4,771 | 7,540 | 39% | 61% |
| Roscommon | 15,840 | 5,344 | 10,496 | 34% | 66% |
| Sligo | 10,950 | 4,470 | 6,480 | 41% | 59% |
| Tipperary | 23,612 | 8,456 | 15,156 | 36% | 64% |
| Waterford | 11,175 | 4,558 | 6,617 | 41% | 59% |
| Westmeath | 10,883 | 3,754 | 7,129 | 34% | 66% |
| Wexford | 8,295 | 3,646 | 4,649 | 44% | 56% |
| Wicklow | 13,845 | 6,246 | 7,599 | 45% | 55% |
| **Totals** | **383,844** | **168,890** | **214,954** | **44%** | **56%** |

To rerun the Forecast with a new set of thinning rules was considered but the preferred approach was to increase the area of first thin by a given percentage as this avoided interaction between the various parameters in the thinning rules which could confuse the overall result. If the area of first thinning is increased then the area of second thinning is also increased and the allocation of volume across the four size assortments (tip-7 cm, 7 cm - 13 cm, 14 cm -19 cm and >+20 cm top diameter) is impacted with a greater proportion of the total crop volume ending up in the >=-14 cm assortment categories. The additional volume (7-13 cm) plus

[10] DAFM are currently undertaking an assessment of thinning operations in plantation forests, which will provide accurate information on the characteristics of thinnings that are currently taking place. The results from this ongoing work may necessitate a change in approach to the thinning assumptions adopted in future roundwood forecasts, in terms of the timing of thinning operations and level of volume being removed during thinning interventions.

the downgrade from 14-19 cm for first and subsequent thinning was assessed to be 45 $m^3$ per ha. Increases of 10%, 20% and 30% in first thinning area were analysed and the results are shown in Table 6. While it should be possible to have some increase in the overall thinning area, increases of the order of 20% and 30% would require some form of relaxation of the regulatory requirements, a timber price incentive and/or a growing forest-based biomass demand, and a positive promotional campaign to encourage thinning.

**Table 6.** Additional volume of small roundwood ('000 Green Tonnes) from increased thinning

| Increase | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **10%** | 22.9 | 24.4 | 24.3 | 25.6 | 21.3 | 17.6 | 15.8 | 13.7 | 14.1 | 13.7 | 11.4 | 11.9 | 12.2 | 13.1 | 14.3 | 12.2 | 13.7 | 16.3 | **298.5** |
| **20%** | 45.8 | 48.9 | 48.6 | 51.1 | 42.6 | 35.2 | 31.6 | 27.3 | 28.2 | 27.5 | 22.9 | 23.8 | 24.3 | 26.1 | 28.5 | 24.5 | 27.5 | 32.6 | **597.0** |
| **30%** | 68.7 | 73.3 | 72.9 | 76.7 | 63.9 | 52.8 | 47.4 | 41.0 | 42.2 | 41.2 | 34.3 | 35.7 | 36.5 | 39.2 | 42.8 | 36.7 | 41.2 | 48.9 | **895.4** |

For every 10% increase in first thinning there is an additional 0.298 million green tonnes of small roundwood made available over the period 2023 to 2040 (Table 6). However, this additional volume should be assessed against the estimated total of 12.65 million $m^3$ small roundwood for the same period (Table 2). A 30% increase in thinning area would account for only a 7.1% increase in small roundwood supply.

The increase in small roundwood volume is temporary in nature and would need to be offset against the reduced small roundwood recovery from thinned as opposed to unthinned crops at the time of clearfell. As a general rule, thinned crops will produce more large sawlog (>=20 cm) and less small sawlog (14-19 cm) per hectare than unthinned crops. A further point to note is that unthinned crops of Sitka spruce will on average produce slightly greater volume per hectare than thinned crops based on current rotation ages. Overall, there is likely to be a small reduction in the total woody biomass (small roundwood plus processing residues) from thinned crops of the order of circa 30 $m^3$ per ha over a rotation.

## *Whole Tree Thinning*

Whole tree thinning is where the whole stem and branches are harvested and extracted to the roadside typically during first thinning. When the needles have dried and fallen off, the trees are then chipped. Although not a widespread practice in Ireland, it is undertaken in a number of countries e.g. Denmark. The additional biomass yield from first thinnings is of the order of 30-60%[11].

Three scenarios were considered where the percentage of whole tree harvesting in first thinning was 10%, 20% and 30%. Whole tree harvesting was assessed to yield an additional 35$m^3$ per ha of biomass. The results are shown in Table 7.

**Table 7.** Additional biomass from increased whole tree thinning ('000 Green Tonnes)

| Increase | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **10%** | 20.0 | 21.4 | 21.3 | 22.4 | 18.6 | 15.4 | 13.8 | 12.0 | 12.3 | 12.0 | 10.0 | 10.4 | 10.6 | 11.4 | 12.5 | 10.7 | 12.0 | 14.3 | **261.2** |
| **20%** | 40.1 | 42.8 | 42.5 | 44.7 | 37.2 | 30.8 | 27.7 | 23.9 | 24.6 | 24.0 | 20.0 | 20.9 | 21.3 | 22.9 | 24.9 | 21.4 | 24.0 | 28.5 | **522.3** |
| **30%** | 60.1 | 64.2 | 63.8 | 67.1 | 55.9 | 46.2 | 41.5 | 35.9 | 37.0 | 36.0 | 30.0 | 31.3 | 31.9 | 34.3 | 37.4 | 32.1 | 36.1 | 42.8 | **783.5** |

For each 10% increase in whole tree harvesting there is a corresponding additional 0.261 million green tonnes of woody biomass potentially available over the period 2023 to 2040. This additional biomass should be assessed against the estimated total of 12.65 million green tonnes small roundwood (Table 2) for the same period. A 30% increase in whole tree thinning would account for only a 6.2% increase in volume.

[11] Kofman, P.D. (2010) A synthesis and comparison of forest energy harvesting methods in conifer plantations. COFORD Connects Harvesting/Transportation No. 26. COFORD

## Specified Biomass Harvesting (SBH)

Two additional forecasts, one for the private sector and one for Coillte, were run where the distance and market constraints for SBH were removed. The additional biomass potentially available is 4.065 million tonnes of which 2.5 million comes from the private sector (Table 8).

**Table 8.** Additional Biomass SBH 80t/ha ('000 Green Tonnes)

| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Private** | 128 | 129 | 144 | 143 | 120 | 154 | 129 | 90 | 144 | 133 | 127 | 158 | 120 | 248 | 253 | 81 | 96 | 104 | **2,500** |
| **Coillte** | 73 | 76 | 61 | 70 | 93 | 69 | 75 | 79 | 104 | 102 | 93 | 103 | 116 | 87 | 94 | 86 | 105 | 79 | **1,564** |
| **Totals** | **202** | **205** | **205** | **212** | **212** | **222** | **205** | **169** | **248** | **234** | **220** | **262** | **236** | **335** | **347** | **167** | **200** | **183** | **4,065** |

If the harvest recovery is reduced to 60 t per ha and the distance and market constraints remain removed then the additional biomass is reduced to 3.05 million tonnes (Table 9).

**Table 9.** Additional Biomass SBH 60t / ha ('000 Green Tonnes)

| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Private** | 96 | 97 | 108 | 107 | 90 | 115 | 97 | 67 | 108 | 99 | 95 | 119 | 90 | 186 | 190 | 61 | 72 | 78 | **1,875** |
| **Coillte** | 55 | 57 | 46 | 52 | 69 | 51 | 56 | 59 | 78 | 76 | 70 | 77 | 87 | 65 | 70 | 64 | 79 | 60 | **1,173** |
| **Totals** | **151** | **154** | **154** | **159** | **159** | **167** | **153** | **126** | **186** | **176** | **165** | **196** | **177** | **251** | **260** | **125** | **150** | **137** | **3,048** |

## Tip to 7 cm

The Tip to 7 cm category contributes relatively little to the overall volume of potentially available woody biomass (Table 2). To increase the percentage available would in effect constitute a form of double counting as this material is already encompassed in increased levels of whole tree thinning and in the relaxing of rules around SBH on clearfell residues.

## Most Likely Scenario

The most likely scenario based on the analysis above and assuming there will be some relaxation of the regulations on thinning, an increasing demand for wood energy and increased wood paying capability is:-

**a)** No harvesting of the tip-7 cm assortment

**b)** 20% increase in thinning area in the private sector

**c)** 20% whole tree harvesting of first thinnings in the private sector

**d)** 50% of the SBH at a yield of 60 t per net ha.

This would yield an additional 3,017 green tonnes (Table 10) with SBH being the main contributor at 55% followed by increased first thin (24%) and whole tree harvesting (21%).

**Table 10.** Increase in Woody Biomass - Likely Scenario ('000 Green Tonnes)

| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Harvest 50% SBH (60t/ha)** | 75.6 | 77.1 | 76.9 | 79.7 | 79.6 | 83.4 | 76.7 | 63.2 | 93.1 | 87.8 | 82.4 | 98.1 | 88.6 | 125.6 | 130.0 | 62.6 | 75.1 | 68.6 | **1,524** |
| **20% Thinning Increase** | 45.8 | 48.9 | 48.6 | 51.1 | 42.6 | 35.2 | 31.6 | 27.3 | 28.2 | 27.5 | 22.9 | 23.8 | 24.3 | 26.1 | 28.5 | 24.5 | 27.5 | 32.6 | **597** |
| **20% Whole Tree Thinning** | 68.7 | 73.3 | 72.9 | 76.7 | 63.9 | 52.8 | 47.4 | 41.0 | 42.2 | 41.2 | 34.3 | 35.7 | 36.5 | 39.2 | 42.8 | 36.7 | 41.2 | 48.9 | **895** |
| **Totals** | **190.1** | **199.3** | **198.3** | **207.5** | **186.0** | **171.4** | **155.8** | **131.6** | **163.5** | **156.4** | **139.6** | **157.7** | **149.4** | **190.9** | **201.3** | **123.9** | **143.8** | **150.2** | **3,017** |

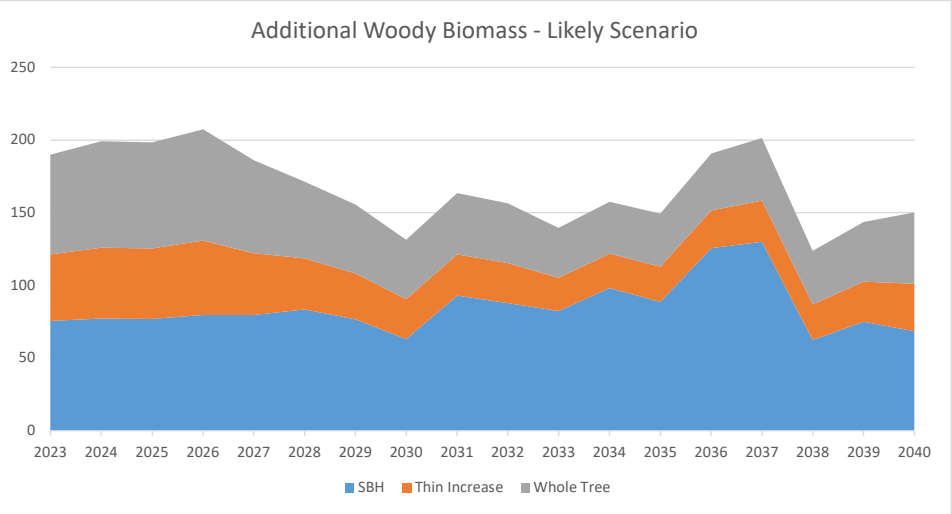


**Figure 3.** Additional Woody Biomass ('000 Green Tonnes)

Using the same assumptions as for Table 4, the additional biomass was allocated across the three main end use sectors and the results are shown in Table 11.

**Table 11.** Additional Woody Biomass Allocation and Energy Potential

| | Green Tonnes ('000) | | | | Energy ('000 GJ) | | |
|---|---|---|---|---|---|---|---|
| **Year** | **Harvest 50% SBH (60t/ha)** | **20% Thinning Increase** | **20% Whole Tree Thinning** | **Total** | **Power Generation** | **Industry** | **Residential** |
| **2023** | 76 | 51 | 77 | **204** | 454 | 619 | 219 |
| **2024** | 77 | 55 | 82 | **214** | 477 | 650 | 230 |
| **2025** | 77 | 54 | 82 | **213** | 474 | 647 | 229 |
| **2026** | 80 | 57 | 86 | **223** | 496 | 677 | 239 |
| **2027** | 80 | 48 | 72 | **199** | 443 | 604 | 214 |
| **2028** | 83 | 39 | 59 | **182** | 405 | 553 | 196 |
| **2029** | 77 | 35 | 53 | **165** | 368 | 502 | 178 |
| **2030** | 63 | 31 | 46 | **140** | 311 | 425 | 150 |
| **2031** | 93 | 32 | 47 | **172** | 0 | 821 | 289 |
| **2032** | 88 | 31 | 46 | **165** | 0 | 786 | 277 |
| **2033** | 82 | 26 | 38 | **146** | 0 | 699 | 246 |
| **2034** | 98 | 27 | 40 | **165** | 0 | 787 | 277 |
| **2035** | 89 | 27 | 41 | **157** | 0 | 748 | 263 |
| **2036** | 126 | 29 | 44 | **199** | 0 | 949 | 334 |
| **2037** | 130 | 32 | 48 | **210** | 0 | 1,002 | 352 |
| **2038** | 63 | 27 | 41 | **131** | 0 | 626 | 220 |
| **2039** | 75 | 31 | 46 | **152** | 0 | 726 | 255 |
| **2040** | 69 | 37 | 55 | **160** | 0 | 764 | 269 |
| **Totals** | **1,524** | **669** | **1,003** | **3,196** | **3,429** | **12,585** | **4,436** |

# *Conclusion*

Reassessing the assumptions and the underlying parameters behind the Forecast of Wood Fibre has the potential to yield significant sustainable increases in woody biomass over the period from 2023 to 2040 (Figure 4 and Table 12).

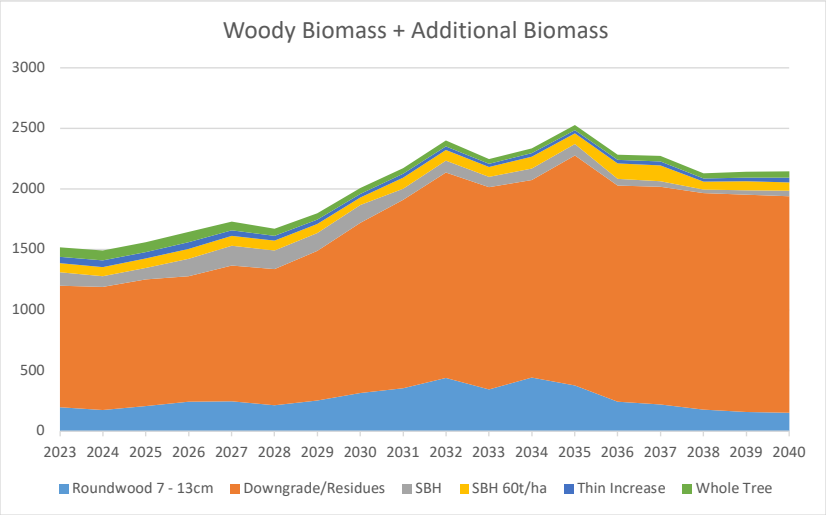


**Figure 4.** Woody Biomass Including Additional ('000 Green Tonnes)

The identified potential increases will only happen if there is a growing market for wood energy with a paying capacity that will lever supplies from the private sector. A growing demand and paying capability is not sufficient in the absence of some relaxation of the regulatory framework around road construction and harvesting. There is evidence that currently the level of thinning in the private sector has decreased and this will need to be reversed if the potential woody biomass is to be realised.

**Table 12.** Summary of Biomass and Energy Potential

| | Green Tonnes ('000) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Roundwood 7 - 13cm** | **Downgrade + Wood Residues** | **SBH** | **Harvest 50% SBH (60t/ha)** | **20% Thinning Increase** | **20% Whole Tree Thinning** | **Total** | **Energy (PJ) Table 4 + Table 11** |
| **2023** | 198 | 1,003 | 112 | 76 | 51 | 77 | **1,517** | 9.6 |
| **2024** | 175 | 1,018 | 86 | 77 | 55 | 82 | **1,493** | 9.5 |
| **2025** | 207 | 1,047 | 95 | 77 | 54 | 82 | **1,562** | 9.9 |
| **2026** | 244 | 1,035 | 145 | 80 | 57 | 86 | **1,647** | 10.4 |
| **2027** | 246 | 1,122 | 164 | 80 | 48 | 72 | **1,731** | 11.0 |
| **2028** | 213 | 1,125 | 153 | 83 | 39 | 59 | **1,673** | 10.6 |
| **2029** | 255 | 1,235 | 145 | 77 | 35 | 53 | **1,800** | 11.4 |
| **2030** | 317 | 1,404 | 146 | 63 | 31 | 46 | **2,007** | 12.7 |
| **2031** | 355 | 1,555 | 91 | 93 | 32 | 47 | **2,173** | 14.0 |
| **2032** | 441 | 1,695 | 98 | 88 | 31 | 46 | **2,399** | 15.5 |
| **2033** | 346 | 1,669 | 86 | 82 | 26 | 38 | **2,248** | 14.5 |
| **2034** | 443 | 1,631 | 96 | 98 | 27 | 40 | **2,335** | 15.1 |
| **2035** | 378 | 1,897 | 96 | 89 | 27 | 41 | **2,528** | 16.3 |
| **2036** | 244 | 1,785 | 55 | 126 | 29 | 44 | **2,283** | 14.7 |
| **2037** | 221 | 1,796 | 47 | 130 | 32 | 48 | **2,274** | 14.7 |
| **2038** | 177 | 1,788 | 32 | 63 | 27 | 41 | **2,128** | 13.7 |
| **2039** | 160 | 1,794 | 35 | 75 | 31 | 46 | **2,142** | 13.8 |
| **2040** | 151 | 1,790 | 45 | 69 | 37 | 55 | **2,147** | 13.9 |
| **Totals** | **4,772** | **26,389** | **1,727** | **1,524** | **669** | **1,003** | **36,084** | **231.4** |

# *Appendix 1 Increased Thinning Area – County Analysis*

| Increase 1st Thin area 10% >=7 cm ('000 $m^3$) | 10% 40 $m^3$/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| Carlow | 0.11 | 0.13 | 0.25 | 0.17 | 0.10 | 0.16 | 0.20 | 0.10 | 0.12 | 0.05 | 0.13 | 0.12 | 0.16 | 0.19 | 0.10 | 0.16 | 0.09 | 0.07 | **2.4** |
| Cavan | 0.93 | 0.96 | 0.72 | 0.73 | 0.87 | 0.76 | 0.96 | 0.61 | 1.01 | 0.81 | 0.44 | 0.55 | 0.45 | 0.84 | 0.75 | 0.68 | 0.82 | 0.67 | **13.6** |
| Clare | 1.78 | 1.60 | 1.66 | 2.01 | 1.40 | 1.30 | 1.67 | 0.87 | 0.82 | 0.87 | 0.58 | 0.62 | 1.01 | 0.57 | 0.96 | 0.75 | 0.81 | 1.30 | **20.6** |
| Cork | 2.55 | 3.32 | 3.02 | 3.62 | 2.76 | 2.64 | 2.14 | 2.04 | 2.34 | 2.33 | 1.60 | 1.73 | 1.99 | 2.10 | 1.78 | 1.71 | 1.64 | 1.96 | **41.3** |
| Donegal | 0.97 | 1.00 | 1.77 | 1.66 | 1.21 | 0.78 | 0.30 | 0.37 | 0.46 | 0.48 | 0.33 | 0.20 | 0.15 | 0.28 | 0.19 | 0.06 | 0.17 | 0.25 | **10.6** |
| Dublin | 0.03 | 0.03 | 0.04 | 0.02 | 0.01 | 0.02 | 0.00 | 0.02 | 0.00 | 0.04 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.05 | 0.00 | **0.3** |
| Galway | 1.40 | 1.16 | 1.04 | 1.18 | 1.04 | 0.77 | 0.80 | 0.56 | 0.77 | 0.76 | 0.66 | 0.74 | 0.86 | 0.59 | 0.55 | 0.77 | 0.70 | 1.03 | **15.4** |
| Kerry | 2.30 | 2.81 | 3.13 | 2.74 | 2.91 | 1.56 | 1.53 | 1.25 | 0.94 | 1.09 | 0.86 | 1.04 | 0.92 | 0.89 | 1.29 | 0.92 | 1.07 | 1.10 | **28.3** |
| Kildare | 0.33 | 0.66 | 0.48 | 0.53 | 0.28 | 0.16 | 0.31 | 0.12 | 0.42 | 0.42 | 0.11 | 0.16 | 0.18 | 0.13 | 0.28 | 0.17 | 0.15 | 0.19 | **5.1** |
| Kilkenny | 0.86 | 0.74 | 0.93 | 0.93 | 0.70 | 0.65 | 0.82 | 0.62 | 0.87 | 0.66 | 0.33 | 0.40 | 0.52 | 0.71 | 0.82 | 0.50 | 0.54 | 0.90 | **12.5** |
| Laois | 1.21 | 1.04 | 0.89 | 0.82 | 0.80 | 0.67 | 0.42 | 0.34 | 0.45 | 0.31 | 0.33 | 0.25 | 0.29 | 0.58 | 0.37 | 0.55 | 0.51 | 0.65 | **10.5** |
| Leitrim | 1.15 | 1.77 | 1.17 | 1.07 | 1.09 | 1.23 | 0.68 | 0.55 | 0.66 | 0.67 | 0.53 | 0.71 | 0.66 | 0.67 | 0.90 | 0.95 | 1.50 | 1.83 | **17.8** |
| Limerick | 1.38 | 1.77 | 1.42 | 2.18 | 1.49 | 1.15 | 0.91 | 0.94 | 0.94 | 0.93 | 0.90 | 0.84 | 0.57 | 0.52 | 0.65 | 0.47 | 0.39 | 0.81 | **18.3** |
| Longford | 0.55 | 0.54 | 0.77 | 0.46 | 0.40 | 0.75 | 0.66 | 0.47 | 0.35 | 0.36 | 0.53 | 0.32 | 0.41 | 0.59 | 0.44 | 0.41 | 0.35 | 0.44 | **8.8** |
| Louth | 0.05 | 0.01 | 0.03 | 0.16 | 0.02 | 0.14 | 0.03 | 0.13 | 0.04 | 0.12 | 0.09 | 0.10 | 0.12 | 0.11 | 0.19 | 0.05 | 0.05 | 0.03 | **1.4** |
| Mayo | 1.39 | 1.07 | 1.34 | 1.42 | 1.17 | 1.27 | 0.93 | 0.81 | 0.66 | 0.41 | 0.53 | 0.59 | 0.65 | 0.78 | 0.72 | 0.93 | 1.03 | 0.61 | **16.3** |
| Meath | 0.60 | 0.56 | 0.43 | 0.65 | 0.62 | 0.23 | 0.36 | 0.31 | 0.44 | 0.46 | 0.40 | 0.22 | 0.35 | 0.35 | 0.40 | 0.26 | 0.35 | 0.35 | **7.3** |
| Monaghan | 0.21 | 0.08 | 0.15 | 0.13 | 0.11 | 0.14 | 0.09 | 0.07 | 0.14 | 0.17 | 0.26 | 0.20 | 0.21 | 0.16 | 0.25 | 0.24 | 0.19 | 0.26 | **3.0** |
| Offaly | 0.76 | 0.88 | 1.28 | 1.25 | 1.15 | 0.77 | 0.94 | 0.97 | 0.60 | 0.42 | 0.40 | 0.46 | 0.45 | 0.49 | 0.55 | 0.63 | 0.59 | 0.66 | **13.2** |
| Roscommon | 1.21 | 1.71 | 1.39 | 1.39 | 1.21 | 1.04 | 0.85 | 0.62 | 0.71 | 0.87 | 0.94 | 0.94 | 0.86 | 0.92 | 0.66 | 0.62 | 1.21 | 1.10 | **18.3** |
| Sligo | 1.04 | 0.73 | 0.76 | 1.00 | 0.79 | 0.43 | 0.34 | 0.46 | 0.24 | 0.27 | 0.26 | 0.34 | 0.34 | 0.47 | 0.74 | 0.56 | 0.53 | 0.52 | **9.8** |
| Tipperary | 1.97 | 1.99 | 1.87 | 2.02 | 1.32 | 1.37 | 0.97 | 1.34 | 1.09 | 0.95 | 0.98 | 1.07 | 0.97 | 1.00 | 1.33 | 0.55 | 0.70 | 0.95 | **22.5** |
| Waterford | 0.60 | 0.64 | 0.64 | 0.60 | 0.63 | 0.32 | 0.50 | 0.58 | 0.50 | 0.53 | 0.25 | 0.37 | 0.25 | 0.42 | 0.60 | 0.51 | 0.49 | 0.68 | **9.1** |
| Westmeath | 1.33 | 0.92 | 0.94 | 0.69 | 0.74 | 0.48 | 0.84 | 0.47 | 0.48 | 0.65 | 0.47 | 0.38 | 0.43 | 0.37 | 0.72 | 0.70 | 0.56 | 0.85 | **12.0** |
| Wexford | 0.43 | 0.56 | 0.59 | 0.71 | 0.48 | 0.41 | 0.23 | 0.40 | 0.53 | 0.62 | 0.53 | 0.46 | 0.32 | 0.44 | 0.45 | 0.25 | 0.41 | 0.65 | **8.5** |
| Wicklow | 0.51 | 0.69 | 0.50 | 0.49 | 0.56 | 0.50 | 0.25 | 0.31 | 0.17 | 0.15 | 0.35 | 0.54 | 0.49 | 0.45 | 0.28 | 0.29 | 0.50 | 0.42 | **7.4** |
| **Totals** | **26** | **27** | **27** | **29** | **24** | **20** | **18** | **15** | **16** | **15** | **13** | **13** | **14** | **15** | **16** | **14** | **15** | **18** | **334.3** |

| Increase 1st Thin area 20% >=7 cm ('000 $m^3$) | 20% 40 $m^3$/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| **Carlow** | 0.22 | 0.27 | 0.50 | 0.34 | 0.20 | 0.31 | 0.40 | 0.19 | 0.25 | 0.09 | 0.25 | 0.24 | 0.33 | 0.38 | 0.19 | 0.31 | 0.17 | 0.14 | **4.8** |
| **Cavan** | 1.85 | 1.93 | 1.43 | 1.47 | 1.75 | 1.52 | 1.93 | 1.22 | 2.02 | 1.62 | 0.88 | 1.10 | 0.90 | 1.69 | 1.49 | 1.36 | 1.64 | 1.35 | **27.1** |
| **Clare** | 3.56 | 3.20 | 3.32 | 4.03 | 2.80 | 2.60 | 3.34 | 1.74 | 1.63 | 1.75 | 1.17 | 1.25 | 2.03 | 1.14 | 1.93 | 1.50 | 1.62 | 2.60 | **41.2** |
| **Cork** | 5.10 | 6.63 | 6.05 | 7.24 | 5.53 | 5.28 | 4.27 | 4.07 | 4.67 | 4.67 | 3.20 | 3.45 | 3.99 | 4.20 | 3.56 | 3.43 | 3.29 | 3.93 | **82.6** |
| **Donegal** | 1.95 | 2.00 | 3.54 | 3.32 | 2.41 | 1.57 | 0.59 | 0.74 | 0.93 | 0.96 | 0.65 | 0.41 | 0.30 | 0.55 | 0.38 | 0.12 | 0.34 | 0.51 | **21.3** |
| **Dublin** | 0.05 | 0.05 | 0.08 | 0.04 | 0.01 | 0.03 | 0.01 | 0.03 | 0.00 | 0.07 | 0.03 | 0.00 | 0.02 | 0.00 | 0.02 | 0.04 | 0.11 | 0.01 | **0.6** |
| **Galway** | 2.79 | 2.33 | 2.08 | 2.37 | 2.07 | 1.54 | 1.60 | 1.12 | 1.55 | 1.52 | 1.31 | 1.47 | 1.72 | 1.19 | 1.09 | 1.53 | 1.39 | 2.06 | **30.7** |
| **Kerry** | 4.60 | 5.62 | 6.26 | 5.49 | 5.81 | 3.12 | 3.07 | 2.50 | 1.88 | 2.18 | 1.73 | 2.08 | 1.84 | 1.78 | 2.57 | 1.84 | 2.14 | 2.20 | **56.7** |
| **Kildare** | 0.66 | 1.32 | 0.97 | 1.06 | 0.56 | 0.32 | 0.61 | 0.25 | 0.85 | 0.83 | 0.22 | 0.32 | 0.35 | 0.26 | 0.56 | 0.34 | 0.30 | 0.37 | **10.2** |
| **Kilkenny** | 1.71 | 1.47 | 1.86 | 1.86 | 1.40 | 1.30 | 1.63 | 1.24 | 1.74 | 1.33 | 0.66 | 0.81 | 1.05 | 1.41 | 1.64 | 1.00 | 1.08 | 1.80 | **25.0** |
| **Laois** | 2.43 | 2.08 | 1.77 | 1.63 | 1.60 | 1.35 | 0.83 | 0.68 | 0.90 | 0.61 | 0.66 | 0.49 | 0.58 | 1.16 | 0.73 | 1.10 | 1.02 | 1.29 | **20.9** |
| **Leitrim** | 2.30 | 3.54 | 2.34 | 2.14 | 2.18 | 2.47 | 1.37 | 1.11 | 1.33 | 1.34 | 1.06 | 1.43 | 1.31 | 1.33 | 1.79 | 1.91 | 2.99 | 3.65 | **35.6** |
| **Limerick** | 2.77 | 3.54 | 2.85 | 4.35 | 2.98 | 2.31 | 1.82 | 1.87 | 1.88 | 1.86 | 1.81 | 1.68 | 1.14 | 1.04 | 1.29 | 0.94 | 0.77 | 1.61 | **36.5** |
| **Longford** | 1.09 | 1.09 | 1.53 | 0.92 | 0.79 | 1.51 | 1.32 | 0.93 | 0.70 | 0.72 | 1.05 | 0.64 | 0.82 | 1.17 | 0.88 | 0.82 | 0.69 | 0.87 | **17.6** |
| **Louth** | 0.10 | 0.01 | 0.06 | 0.31 | 0.05 | 0.28 | 0.06 | 0.26 | 0.08 | 0.23 | 0.18 | 0.20 | 0.25 | 0.21 | 0.37 | 0.09 | 0.11 | 0.06 | **2.9** |
| **Mayo** | 2.77 | 2.14 | 2.68 | 2.84 | 2.33 | 2.55 | 1.85 | 1.61 | 1.32 | 0.82 | 1.06 | 1.18 | 1.30 | 1.56 | 1.44 | 1.87 | 2.05 | 1.22 | **32.6** |
| **Meath** | 1.20 | 1.12 | 0.85 | 1.30 | 1.23 | 0.46 | 0.72 | 0.61 | 0.88 | 0.91 | 0.81 | 0.44 | 0.69 | 0.70 | 0.80 | 0.51 | 0.71 | 0.69 | **14.6** |
| **Monaghan** | 0.42 | 0.17 | 0.30 | 0.25 | 0.23 | 0.28 | 0.17 | 0.14 | 0.29 | 0.33 | 0.52 | 0.39 | 0.41 | 0.32 | 0.50 | 0.48 | 0.38 | 0.52 | **6.1** |
| **Offaly** | 1.52 | 1.75 | 2.56 | 2.50 | 2.29 | 1.54 | 1.89 | 1.93 | 1.21 | 0.84 | 0.80 | 0.92 | 0.89 | 0.98 | 1.10 | 1.26 | 1.18 | 1.32 | **26.5** |
| **Roscommon** | 2.42 | 3.43 | 2.77 | 2.77 | 2.43 | 2.07 | 1.69 | 1.25 | 1.42 | 1.74 | 1.89 | 1.88 | 1.72 | 1.84 | 1.32 | 1.25 | 2.41 | 2.20 | **36.5** |
| **Sligo** | 2.08 | 1.47 | 1.52 | 2.01 | 1.58 | 0.86 | 0.68 | 0.92 | 0.48 | 0.54 | 0.52 | 0.68 | 0.68 | 0.95 | 1.48 | 1.12 | 1.07 | 1.04 | **19.7** |
| **Tipperary** | 3.94 | 3.99 | 3.74 | 4.03 | 2.64 | 2.75 | 1.94 | 2.69 | 2.18 | 1.90 | 1.97 | 2.13 | 1.93 | 2.00 | 2.67 | 1.11 | 1.39 | 1.90 | **44.9** |
| **Waterford** | 1.20 | 1.27 | 1.29 | 1.20 | 1.26 | 0.64 | 1.00 | 1.15 | 1.00 | 1.05 | 0.50 | 0.74 | 0.50 | 0.84 | 1.21 | 1.02 | 0.97 | 1.35 | **18.2** |
| **Westmeath** | 2.65 | 1.84 | 1.89 | 1.38 | 1.47 | 0.97 | 1.69 | 0.95 | 0.97 | 1.30 | 0.94 | 0.76 | 0.85 | 0.75 | 1.44 | 1.40 | 1.11 | 1.70 | **24.1** |
| **Wexford** | 0.86 | 1.12 | 1.18 | 1.41 | 0.95 | 0.81 | 0.46 | 0.81 | 1.06 | 1.24 | 1.05 | 0.92 | 0.64 | 0.89 | 0.90 | 0.49 | 0.83 | 1.29 | **16.9** |
| **Wicklow** | 1.03 | 1.37 | 1.00 | 0.98 | 1.11 | 1.00 | 0.50 | 0.61 | 0.34 | 0.30 | 0.69 | 1.08 | 0.98 | 0.90 | 0.56 | 0.59 | 1.01 | 0.84 | **14.9** |
| **Totals** | **51** | **55** | **54** | **57** | **48** | **39** | **35** | **31** | **32** | **31** | **26** | **27** | **27** | **29** | **32** | **27** | **31** | **37** | **668.6** |

| Increase 1st Thin area 30% >=7 cm ('000 $m^3$) | 30% 40 $m^3$/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| **Carlow** | 0.34 | 0.40 | 0.74 | 0.50 | 0.30 | 0.47 | 0.59 | 0.29 | 0.37 | 0.14 | 0.38 | 0.36 | 0.49 | 0.58 | 0.29 | 0.47 | 0.26 | 0.21 | **7.2** |
| **Cavan** | 2.78 | 2.89 | 2.15 | 2.20 | 2.62 | 2.27 | 2.89 | 1.84 | 3.03 | 2.43 | 1.32 | 1.65 | 1.35 | 2.53 | 2.24 | 2.05 | 2.46 | 2.02 | **40.7** |
| **Clare** | 5.34 | 4.79 | 4.97 | 6.04 | 4.20 | 3.89 | 5.01 | 2.61 | 2.45 | 2.62 | 1.75 | 1.87 | 3.04 | 1.71 | 2.89 | 2.25 | 2.43 | 3.91 | **61.8** |
| **Cork** | 7.65 | 9.95 | 9.07 | 10.86 | 8.29 | 7.93 | 6.41 | 6.11 | 7.01 | 7.00 | 4.79 | 5.18 | 5.98 | 6.31 | 5.34 | 5.14 | 4.93 | 5.89 | **123.8** |
| **Donegal** | 2.92 | 3.00 | 5.32 | 4.98 | 3.62 | 2.35 | 0.89 | 1.10 | 1.39 | 1.43 | 0.98 | 0.61 | 0.45 | 0.83 | 0.58 | 0.18 | 0.51 | 0.76 | **31.9** |
| **Dublin** | 0.08 | 0.08 | 0.12 | 0.05 | 0.02 | 0.05 | 0.01 | 0.05 | 0.00 | 0.11 | 0.04 | 0.00 | 0.03 | 0.00 | 0.03 | 0.06 | 0.16 | 0.01 | **0.9** |
| **Galway** | 4.19 | 3.49 | 3.12 | 3.55 | 3.11 | 2.30 | 2.40 | 1.68 | 2.32 | 2.28 | 1.97 | 2.21 | 2.59 | 1.78 | 1.64 | 2.30 | 2.09 | 3.09 | **46.1** |
| **Kerry** | 6.90 | 8.42 | 9.39 | 8.23 | 8.72 | 4.69 | 4.60 | 3.75 | 2.82 | 3.28 | 2.59 | 3.12 | 2.76 | 2.68 | 3.86 | 2.75 | 3.20 | 3.30 | **85.0** |
| **Kildare** | 0.99 | 1.99 | 1.45 | 1.59 | 0.84 | 0.48 | 0.92 | 0.37 | 1.27 | 1.25 | 0.33 | 0.49 | 0.53 | 0.39 | 0.84 | 0.51 | 0.45 | 0.56 | **15.2** |
| **Kilkenny** | 2.57 | 2.21 | 2.80 | 2.79 | 2.09 | 1.95 | 2.45 | 1.85 | 2.62 | 1.99 | 1.00 | 1.21 | 1.57 | 2.12 | 2.46 | 1.49 | 1.63 | 2.70 | **37.5** |
| **Laois** | 3.64 | 3.12 | 2.66 | 2.45 | 2.40 | 2.02 | 1.25 | 1.01 | 1.35 | 0.92 | 0.99 | 0.74 | 0.87 | 1.74 | 1.10 | 1.65 | 1.53 | 1.94 | **31.4** |
| **Leitrim** | 3.46 | 5.30 | 3.52 | 3.21 | 3.28 | 3.70 | 2.05 | 1.66 | 1.99 | 2.01 | 1.59 | 2.14 | 1.97 | 2.00 | 2.69 | 2.86 | 4.49 | 5.48 | **53.4** |
| **Limerick** | 4.15 | 5.31 | 4.27 | 6.53 | 4.47 | 3.46 | 2.74 | 2.81 | 2.82 | 2.78 | 2.71 | 2.52 | 1.72 | 1.56 | 1.94 | 1.41 | 1.16 | 2.42 | **54.8** |
| **Longford** | 1.64 | 1.63 | 2.30 | 1.39 | 1.19 | 2.26 | 1.99 | 1.40 | 1.05 | 1.08 | 1.58 | 0.97 | 1.23 | 1.76 | 1.32 | 1.23 | 1.04 | 1.31 | **26.3** |
| **Louth** | 0.14 | 0.02 | 0.08 | 0.47 | 0.07 | 0.42 | 0.09 | 0.39 | 0.12 | 0.35 | 0.26 | 0.30 | 0.37 | 0.32 | 0.56 | 0.14 | 0.16 | 0.08 | **4.3** |
| **Mayo** | 4.16 | 3.21 | 4.02 | 4.26 | 3.50 | 3.82 | 2.78 | 2.42 | 1.98 | 1.23 | 1.60 | 1.77 | 1.95 | 2.35 | 2.15 | 2.80 | 3.08 | 1.83 | **48.9** |
| **Meath** | 1.80 | 1.69 | 1.28 | 1.96 | 1.85 | 0.69 | 1.08 | 0.92 | 1.33 | 1.37 | 1.21 | 0.65 | 1.04 | 1.05 | 1.19 | 0.77 | 1.06 | 1.04 | **22.0** |
| **Monaghan** | 0.63 | 0.25 | 0.45 | 0.38 | 0.34 | 0.42 | 0.26 | 0.21 | 0.43 | 0.50 | 0.78 | 0.59 | 0.62 | 0.47 | 0.75 | 0.72 | 0.56 | 0.78 | **9.1** |
| **Offaly** | 2.28 | 2.63 | 3.85 | 3.74 | 3.44 | 2.31 | 2.83 | 2.90 | 1.81 | 1.25 | 1.20 | 1.39 | 1.34 | 1.47 | 1.65 | 1.89 | 1.77 | 1.98 | **39.7** |
| **Roscommon** | 3.63 | 5.14 | 4.16 | 4.16 | 3.64 | 3.11 | 2.54 | 1.87 | 2.13 | 2.61 | 2.83 | 2.82 | 2.58 | 2.76 | 1.99 | 1.87 | 3.62 | 3.30 | **54.8** |
| **Sligo** | 3.13 | 2.20 | 2.27 | 3.01 | 2.37 | 1.29 | 1.01 | 1.38 | 0.72 | 0.81 | 0.78 | 1.02 | 1.01 | 1.42 | 2.22 | 1.68 | 1.60 | 1.55 | **29.5** |
| **Tipperary** | 5.91 | 5.98 | 5.61 | 6.05 | 3.96 | 4.12 | 2.92 | 4.03 | 3.26 | 2.84 | 2.95 | 3.20 | 2.90 | 3.01 | 4.00 | 1.66 | 2.09 | 2.85 | **67.4** |
| **Waterford** | 1.80 | 1.91 | 1.93 | 1.81 | 1.88 | 0.96 | 1.49 | 1.73 | 1.49 | 1.58 | 0.74 | 1.11 | 0.75 | 1.26 | 1.81 | 1.53 | 1.46 | 2.03 | **27.3** |
| **Westmeath** | 3.98 | 2.77 | 2.83 | 2.07 | 2.21 | 1.45 | 2.53 | 1.42 | 1.45 | 1.95 | 1.41 | 1.13 | 1.28 | 1.12 | 2.17 | 2.10 | 1.67 | 2.56 | **36.1** |
| **Wexford** | 1.29 | 1.68 | 1.76 | 2.12 | 1.43 | 1.22 | 0.68 | 1.21 | 1.59 | 1.86 | 1.58 | 1.37 | 0.96 | 1.33 | 1.35 | 0.74 | 1.24 | 1.94 | **25.4** |
| **Wicklow** | 1.54 | 2.06 | 1.50 | 1.47 | 1.67 | 1.49 | 0.75 | 0.92 | 0.51 | 0.45 | 1.04 | 1.62 | 1.47 | 1.35 | 0.84 | 0.88 | 1.51 | 1.26 | **22.3** |
| **Totals** | **77** | **82** | **82** | **86** | **72** | **59** | **53** | **46** | **47** | **46** | **38** | **40** | **41** | **44** | **48** | **41** | **46** | **55** | **1,002.9** |

# Appendix 2 Increased Whole Tree Thinning – County Analysis

| Increase the % Whole Tree Harvest ('000 $m^3$) | 10% 35 $m^3$/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| Carlow | 0.10 | 0.12 | 0.22 | 0.15 | 0.09 | 0.14 | 0.17 | 0.09 | 0.11 | 0.04 | 0.11 | 0.11 | 0.14 | 0.17 | 0.09 | 0.14 | 0.08 | 0.06 | **2.1** |
| Cavan | 0.81 | 0.84 | 0.63 | 0.64 | 0.76 | 0.66 | 0.84 | 0.54 | 0.88 | 0.71 | 0.39 | 0.48 | 0.39 | 0.74 | 0.65 | 0.60 | 0.72 | 0.59 | **11.9** |
| Clare | 1.56 | 1.40 | 1.45 | 1.76 | 1.22 | 1.14 | 1.46 | 0.76 | 0.71 | 0.76 | 0.51 | 0.55 | 0.89 | 0.50 | 0.84 | 0.66 | 0.71 | 1.14 | **18.0** |
| Cork | 2.23 | 2.90 | 2.65 | 3.17 | 2.42 | 2.31 | 1.87 | 1.78 | 2.04 | 2.04 | 1.40 | 1.51 | 1.74 | 1.84 | 1.56 | 1.50 | 1.44 | 1.72 | **36.1** |
| Donegal | 0.85 | 0.88 | 1.55 | 1.45 | 1.06 | 0.69 | 0.26 | 0.32 | 0.41 | 0.42 | 0.28 | 0.18 | 0.13 | 0.24 | 0.17 | 0.05 | 0.15 | 0.22 | **9.3** |
| Dublin | 0.02 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.03 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.05 | 0.00 | **0.3** |
| Galway | 1.22 | 1.02 | 0.91 | 1.04 | 0.91 | 0.67 | 0.70 | 0.49 | 0.68 | 0.67 | 0.57 | 0.65 | 0.75 | 0.52 | 0.48 | 0.67 | 0.61 | 0.90 | **13.5** |
| Kerry | 2.01 | 2.46 | 2.74 | 2.40 | 2.54 | 1.37 | 1.34 | 1.09 | 0.82 | 0.96 | 0.76 | 0.91 | 0.80 | 0.78 | 1.13 | 0.80 | 0.93 | 0.96 | **24.8** |
| Kildare | 0.29 | 0.58 | 0.42 | 0.46 | 0.24 | 0.14 | 0.27 | 0.11 | 0.37 | 0.37 | 0.09 | 0.14 | 0.15 | 0.11 | 0.25 | 0.15 | 0.13 | 0.16 | **4.4** |
| Kilkenny | 0.75 | 0.64 | 0.82 | 0.81 | 0.61 | 0.57 | 0.71 | 0.54 | 0.76 | 0.58 | 0.29 | 0.35 | 0.46 | 0.62 | 0.72 | 0.44 | 0.47 | 0.79 | **10.9** |
| Laois | 1.06 | 0.91 | 0.77 | 0.71 | 0.70 | 0.59 | 0.36 | 0.30 | 0.39 | 0.27 | 0.29 | 0.22 | 0.25 | 0.51 | 0.32 | 0.48 | 0.45 | 0.57 | **9.2** |
| Leitrim | 1.01 | 1.55 | 1.03 | 0.94 | 0.96 | 1.08 | 0.60 | 0.48 | 0.58 | 0.59 | 0.46 | 0.62 | 0.57 | 0.58 | 0.78 | 0.83 | 1.31 | 1.60 | **15.6** |
| Limerick | 1.21 | 1.55 | 1.25 | 1.90 | 1.30 | 1.01 | 0.80 | 0.82 | 0.82 | 0.81 | 0.79 | 0.73 | 0.50 | 0.46 | 0.56 | 0.41 | 0.34 | 0.70 | **16.0** |
| Longford | 0.48 | 0.48 | 0.67 | 0.40 | 0.35 | 0.66 | 0.58 | 0.41 | 0.31 | 0.32 | 0.46 | 0.28 | 0.36 | 0.51 | 0.38 | 0.36 | 0.30 | 0.38 | **7.7** |
| Louth | 0.04 | 0.01 | 0.02 | 0.14 | 0.02 | 0.12 | 0.03 | 0.11 | 0.03 | 0.10 | 0.08 | 0.09 | 0.11 | 0.09 | 0.16 | 0.04 | 0.05 | 0.02 | **1.3** |
| Mayo | 1.21 | 0.94 | 1.17 | 1.24 | 1.02 | 1.11 | 0.81 | 0.71 | 0.58 | 0.36 | 0.47 | 0.52 | 0.57 | 0.68 | 0.63 | 0.82 | 0.90 | 0.53 | **14.3** |
| Meath | 0.52 | 0.49 | 0.37 | 0.57 | 0.54 | 0.20 | 0.32 | 0.27 | 0.39 | 0.40 | 0.35 | 0.19 | 0.30 | 0.31 | 0.35 | 0.22 | 0.31 | 0.30 | **6.4** |
| Monaghan | 0.18 | 0.07 | 0.13 | 0.11 | 0.10 | 0.12 | 0.08 | 0.06 | 0.13 | 0.15 | 0.23 | 0.17 | 0.18 | 0.14 | 0.22 | 0.21 | 0.16 | 0.23 | **2.7** |
| Offaly | 0.66 | 0.77 | 1.12 | 1.09 | 1.00 | 0.67 | 0.83 | 0.85 | 0.53 | 0.37 | 0.35 | 0.40 | 0.39 | 0.43 | 0.48 | 0.55 | 0.52 | 0.58 | **11.6** |
| Roscommon | 1.06 | 1.50 | 1.21 | 1.21 | 1.06 | 0.91 | 0.74 | 0.55 | 0.62 | 0.76 | 0.83 | 0.82 | 0.75 | 0.80 | 0.58 | 0.55 | 1.05 | 0.96 | **16.0** |
| Sligo | 0.91 | 0.64 | 0.66 | 0.88 | 0.69 | 0.38 | 0.30 | 0.40 | 0.21 | 0.24 | 0.23 | 0.30 | 0.30 | 0.42 | 0.65 | 0.49 | 0.47 | 0.45 | **8.6** |
| Tipperary | 1.72 | 1.74 | 1.64 | 1.77 | 1.16 | 1.20 | 0.85 | 1.18 | 0.95 | 0.83 | 0.86 | 0.93 | 0.85 | 0.88 | 1.17 | 0.49 | 0.61 | 0.83 | **19.6** |
| Waterford | 0.52 | 0.56 | 0.56 | 0.53 | 0.55 | 0.28 | 0.44 | 0.50 | 0.44 | 0.46 | 0.22 | 0.32 | 0.22 | 0.37 | 0.53 | 0.45 | 0.43 | 0.59 | **8.0** |
| Westmeath | 1.16 | 0.81 | 0.83 | 0.60 | 0.65 | 0.42 | 0.74 | 0.41 | 0.42 | 0.57 | 0.41 | 0.33 | 0.37 | 0.33 | 0.63 | 0.61 | 0.49 | 0.75 | **10.5** |
| Wexford | 0.38 | 0.49 | 0.51 | 0.62 | 0.42 | 0.36 | 0.20 | 0.35 | 0.46 | 0.54 | 0.46 | 0.40 | 0.28 | 0.39 | 0.39 | 0.22 | 0.36 | 0.57 | **7.4** |
| Wicklow | 0.45 | 0.60 | 0.44 | 0.43 | 0.49 | 0.44 | 0.22 | 0.27 | 0.15 | 0.13 | 0.30 | 0.47 | 0.43 | 0.39 | 0.25 | 0.26 | 0.44 | 0.37 | **6.5** |
| **Totals** | **22** | **24** | **24** | **25** | **21** | **17** | **15** | **13** | **14** | **13** | **11** | **12** | **12** | **13** | **14** | **12** | **13** | **16** | **292.5** |

| Increase the % Whole Tree Harvest ('000 $m^3$) | 20% 35 $m^3$/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| **Carlow** | 0.20 | 0.23 | 0.43 | 0.29 | 0.17 | 0.27 | 0.35 | 0.17 | 0.22 | 0.08 | 0.22 | 0.21 | 0.28 | 0.34 | 0.17 | 0.27 | 0.15 | 0.12 | **4.2** |
| **Cavan** | 1.62 | 1.69 | 1.25 | 1.28 | 1.53 | 1.33 | 1.69 | 1.07 | 1.77 | 1.42 | 0.77 | 0.96 | 0.79 | 1.48 | 1.31 | 1.19 | 1.44 | 1.18 | **23.8** |
| **Clare** | 3.11 | 2.80 | 2.90 | 3.52 | 2.45 | 2.27 | 2.92 | 1.52 | 1.43 | 1.53 | 1.02 | 1.09 | 1.77 | 1.00 | 1.69 | 1.31 | 1.42 | 2.28 | **36.0** |
| **Cork** | 4.46 | 5.81 | 5.29 | 6.33 | 4.84 | 4.62 | 3.74 | 3.56 | 4.09 | 4.08 | 2.80 | 3.02 | 3.49 | 3.68 | 3.11 | 3.00 | 2.88 | 3.44 | **72.2** |
| **Donegal** | 1.70 | 1.75 | 3.10 | 2.91 | 2.11 | 1.37 | 0.52 | 0.64 | 0.81 | 0.84 | 0.57 | 0.35 | 0.26 | 0.49 | 0.34 | 0.10 | 0.30 | 0.45 | **18.6** |
| **Dublin** | 0.05 | 0.05 | 0.07 | 0.03 | 0.01 | 0.03 | 0.01 | 0.03 | 0.00 | 0.06 | 0.03 | 0.00 | 0.02 | 0.00 | 0.02 | 0.03 | 0.10 | 0.01 | **0.5** |
| **Galway** | 2.44 | 2.04 | 1.82 | 2.07 | 1.82 | 1.34 | 1.40 | 0.98 | 1.35 | 1.33 | 1.15 | 1.29 | 1.51 | 1.04 | 0.96 | 1.34 | 1.22 | 1.80 | **26.9** |
| **Kerry** | 4.03 | 4.91 | 5.48 | 4.80 | 5.09 | 2.73 | 2.68 | 2.19 | 1.64 | 1.91 | 1.51 | 1.82 | 1.61 | 1.56 | 2.25 | 1.61 | 1.87 | 1.92 | **49.6** |
| **Kildare** | 0.58 | 1.16 | 0.85 | 0.93 | 0.49 | 0.28 | 0.54 | 0.21 | 0.74 | 0.73 | 0.19 | 0.28 | 0.31 | 0.23 | 0.49 | 0.30 | 0.26 | 0.33 | **8.9** |
| **Kilkenny** | 1.50 | 1.29 | 1.63 | 1.63 | 1.22 | 1.14 | 1.43 | 1.08 | 1.53 | 1.16 | 0.58 | 0.71 | 0.92 | 1.24 | 1.43 | 0.87 | 0.95 | 1.57 | **21.9** |
| **Laois** | 2.12 | 1.82 | 1.55 | 1.43 | 1.40 | 1.18 | 0.73 | 0.59 | 0.79 | 0.54 | 0.58 | 0.43 | 0.51 | 1.01 | 0.64 | 0.96 | 0.89 | 1.13 | **18.3** |
| **Leitrim** | 2.02 | 3.09 | 2.05 | 1.87 | 1.91 | 2.16 | 1.19 | 0.97 | 1.16 | 1.17 | 0.93 | 1.25 | 1.15 | 1.17 | 1.57 | 1.67 | 2.62 | 3.20 | **31.1** |
| **Limerick** | 2.42 | 3.10 | 2.49 | 3.81 | 2.61 | 2.02 | 1.60 | 1.64 | 1.64 | 1.62 | 1.58 | 1.47 | 1.00 | 0.91 | 1.13 | 0.82 | 0.68 | 1.41 | **31.9** |
| **Longford** | 0.95 | 0.95 | 1.34 | 0.81 | 0.70 | 1.32 | 1.16 | 0.82 | 0.61 | 0.63 | 0.92 | 0.56 | 0.71 | 1.03 | 0.77 | 0.72 | 0.61 | 0.76 | **15.4** |
| **Louth** | 0.08 | 0.01 | 0.05 | 0.27 | 0.04 | 0.25 | 0.05 | 0.23 | 0.07 | 0.20 | 0.15 | 0.17 | 0.22 | 0.18 | 0.33 | 0.08 | 0.09 | 0.05 | **2.5** |
| **Mayo** | 2.43 | 1.87 | 2.35 | 2.48 | 2.04 | 2.23 | 1.62 | 1.41 | 1.16 | 0.72 | 0.93 | 1.03 | 1.14 | 1.37 | 1.26 | 1.63 | 1.79 | 1.07 | **28.5** |
| **Meath** | 1.05 | 0.98 | 0.75 | 1.14 | 1.08 | 0.41 | 0.63 | 0.53 | 0.77 | 0.80 | 0.71 | 0.38 | 0.61 | 0.61 | 0.70 | 0.45 | 0.62 | 0.61 | **12.8** |
| **Monaghan** | 0.36 | 0.15 | 0.26 | 0.22 | 0.20 | 0.25 | 0.15 | 0.12 | 0.25 | 0.29 | 0.46 | 0.34 | 0.36 | 0.28 | 0.44 | 0.42 | 0.33 | 0.46 | **5.3** |
| **Offaly** | 1.33 | 1.53 | 2.24 | 2.18 | 2.00 | 1.35 | 1.65 | 1.69 | 1.06 | 0.73 | 0.70 | 0.81 | 0.78 | 0.86 | 0.96 | 1.11 | 1.03 | 1.15 | **23.2** |
| **Roscommon** | 2.12 | 3.00 | 2.43 | 2.42 | 2.13 | 1.81 | 1.48 | 1.09 | 1.24 | 1.52 | 1.65 | 1.65 | 1.50 | 1.61 | 1.16 | 1.09 | 2.11 | 1.93 | **31.9** |
| **Sligo** | 1.82 | 1.29 | 1.33 | 1.75 | 1.38 | 0.75 | 0.59 | 0.81 | 0.42 | 0.48 | 0.46 | 0.60 | 0.59 | 0.83 | 1.29 | 0.98 | 0.93 | 0.91 | **17.2** |
| **Tipperary** | 3.45 | 3.49 | 3.27 | 3.53 | 2.31 | 2.40 | 1.70 | 2.35 | 1.90 | 1.66 | 1.72 | 1.87 | 1.69 | 1.75 | 2.33 | 0.97 | 1.22 | 1.66 | **39.3** |
| **Waterford** | 1.05 | 1.11 | 1.13 | 1.05 | 1.10 | 0.56 | 0.87 | 1.01 | 0.87 | 0.92 | 0.43 | 0.65 | 0.44 | 0.74 | 1.06 | 0.89 | 0.85 | 1.18 | **15.9** |
| **Westmeath** | 2.32 | 1.61 | 1.65 | 1.21 | 1.29 | 0.85 | 1.48 | 0.83 | 0.85 | 1.14 | 0.82 | 0.66 | 0.75 | 0.66 | 1.26 | 1.23 | 0.97 | 1.49 | **21.1** |
| **Wexford** | 0.75 | 0.98 | 1.03 | 1.24 | 0.83 | 0.71 | 0.40 | 0.71 | 0.93 | 1.08 | 0.92 | 0.80 | 0.56 | 0.78 | 0.79 | 0.43 | 0.73 | 1.13 | **14.8** |
| **Wicklow** | 0.90 | 1.20 | 0.87 | 0.86 | 0.97 | 0.87 | 0.43 | 0.54 | 0.30 | 0.26 | 0.61 | 0.94 | 0.86 | 0.79 | 0.49 | 0.51 | 0.88 | 0.73 | **13.0** |
| **Totals** | **45** | **48** | **48** | **50** | **42** | **34** | **31** | **27** | **28** | **27** | **22** | **23** | **24** | **26** | **28** | **24** | **27** | **32** | **585.0** |

| Increase the % Whole Tree Harvest ('000 $m^3$) | 30% 35 $m^3$/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| **Carlow** | 0.29 | 0.35 | 0.65 | 0.44 | 0.26 | 0.41 | 0.52 | 0.26 | 0.33 | 0.12 | 0.33 | 0.32 | 0.43 | 0.50 | 0.26 | 0.41 | 0.23 | 0.18 | **6.3** |
| **Cavan** | 2.43 | 2.53 | 1.88 | 1.93 | 2.29 | 1.99 | 2.53 | 1.61 | 2.65 | 2.12 | 1.16 | 1.44 | 1.18 | 2.22 | 1.96 | 1.79 | 2.15 | 1.77 | **35.6** |
| **Clare** | 4.67 | 4.20 | 4.35 | 5.28 | 3.67 | 3.41 | 4.38 | 2.28 | 2.14 | 2.29 | 1.53 | 1.64 | 2.66 | 1.50 | 2.53 | 1.97 | 2.12 | 3.42 | **54.1** |
| **Cork** | 6.69 | 8.71 | 7.94 | 9.50 | 7.26 | 6.93 | 5.61 | 5.34 | 6.13 | 6.12 | 4.19 | 4.53 | 5.23 | 5.52 | 4.67 | 4.50 | 4.32 | 5.16 | **108.4** |
| **Donegal** | 2.55 | 2.63 | 4.65 | 4.36 | 3.17 | 2.06 | 0.78 | 0.97 | 1.22 | 1.26 | 0.85 | 0.53 | 0.39 | 0.73 | 0.51 | 0.16 | 0.45 | 0.67 | **27.9** |
| **Dublin** | 0.07 | 0.07 | 0.10 | 0.05 | 0.02 | 0.04 | 0.01 | 0.04 | 0.00 | 0.10 | 0.04 | 0.00 | 0.03 | 0.00 | 0.03 | 0.05 | 0.14 | 0.01 | **0.8** |
| **Galway** | 3.67 | 3.06 | 2.73 | 3.11 | 2.72 | 2.02 | 2.10 | 1.47 | 2.03 | 2.00 | 1.72 | 1.94 | 2.26 | 1.56 | 1.43 | 2.01 | 1.83 | 2.70 | **40.4** |
| **Kerry** | 6.04 | 7.37 | 8.22 | 7.20 | 7.63 | 4.10 | 4.02 | 3.28 | 2.46 | 2.87 | 2.27 | 2.73 | 2.41 | 2.34 | 3.38 | 2.41 | 2.80 | 2.89 | **74.4** |
| **Kildare** | 0.86 | 1.74 | 1.27 | 1.39 | 0.73 | 0.42 | 0.81 | 0.32 | 1.11 | 1.10 | 0.28 | 0.42 | 0.46 | 0.34 | 0.74 | 0.45 | 0.39 | 0.49 | **13.3** |
| **Kilkenny** | 2.25 | 1.93 | 2.45 | 2.44 | 1.83 | 1.71 | 2.14 | 1.62 | 2.29 | 1.74 | 0.87 | 1.06 | 1.37 | 1.86 | 2.15 | 1.31 | 1.42 | 2.36 | **32.8** |
| **Laois** | 3.19 | 2.73 | 2.32 | 2.14 | 2.10 | 1.77 | 1.09 | 0.89 | 1.18 | 0.81 | 0.86 | 0.65 | 0.76 | 1.52 | 0.96 | 1.44 | 1.34 | 1.70 | **27.5** |
| **Leitrim** | 3.02 | 4.64 | 3.08 | 2.81 | 2.87 | 3.24 | 1.79 | 1.45 | 1.74 | 1.76 | 1.39 | 1.87 | 1.72 | 1.75 | 2.35 | 2.50 | 3.93 | 4.80 | **46.7** |
| **Limerick** | 3.63 | 4.64 | 3.74 | 5.71 | 3.91 | 3.03 | 2.39 | 2.46 | 2.47 | 2.44 | 2.38 | 2.20 | 1.50 | 1.37 | 1.69 | 1.23 | 1.01 | 2.11 | **47.9** |
| **Longford** | 1.43 | 1.43 | 2.01 | 1.21 | 1.04 | 1.98 | 1.74 | 1.23 | 0.92 | 0.95 | 1.38 | 0.85 | 1.07 | 1.54 | 1.15 | 1.08 | 0.91 | 1.15 | **23.1** |
| **Louth** | 0.13 | 0.02 | 0.07 | 0.41 | 0.07 | 0.37 | 0.08 | 0.34 | 0.10 | 0.31 | 0.23 | 0.26 | 0.33 | 0.28 | 0.49 | 0.12 | 0.14 | 0.07 | **3.8** |
| **Mayo** | 3.64 | 2.81 | 3.52 | 3.73 | 3.06 | 3.34 | 2.43 | 2.12 | 1.73 | 1.08 | 1.40 | 1.55 | 1.71 | 2.05 | 1.88 | 2.45 | 2.69 | 1.60 | **42.8** |
| **Meath** | 1.57 | 1.47 | 1.12 | 1.71 | 1.62 | 0.61 | 0.95 | 0.80 | 1.16 | 1.19 | 1.06 | 0.57 | 0.91 | 0.92 | 1.04 | 0.67 | 0.93 | 0.91 | **19.2** |
| **Monaghan** | 0.55 | 0.22 | 0.39 | 0.33 | 0.30 | 0.37 | 0.23 | 0.19 | 0.38 | 0.44 | 0.68 | 0.51 | 0.54 | 0.41 | 0.66 | 0.63 | 0.49 | 0.68 | **8.0** |
| **Offaly** | 1.99 | 2.30 | 3.37 | 3.28 | 3.01 | 2.02 | 2.48 | 2.54 | 1.58 | 1.10 | 1.05 | 1.21 | 1.17 | 1.29 | 1.44 | 1.66 | 1.55 | 1.73 | **34.7** |
| **Roscommon** | 3.18 | 4.50 | 3.64 | 3.64 | 3.19 | 2.72 | 2.22 | 1.64 | 1.86 | 2.29 | 2.48 | 2.47 | 2.25 | 2.41 | 1.74 | 1.64 | 3.16 | 2.89 | **47.9** |
| **Sligo** | 2.73 | 1.93 | 1.99 | 2.63 | 2.07 | 1.13 | 0.89 | 1.21 | 0.63 | 0.71 | 0.69 | 0.89 | 0.89 | 1.25 | 1.94 | 1.47 | 1.40 | 1.36 | **25.8** |
| **Tipperary** | 5.17 | 5.23 | 4.91 | 5.30 | 3.47 | 3.61 | 2.55 | 3.53 | 2.86 | 2.49 | 2.58 | 2.80 | 2.54 | 2.63 | 3.50 | 1.46 | 1.83 | 2.49 | **58.9** |
| **Waterford** | 1.57 | 1.67 | 1.69 | 1.58 | 1.65 | 0.84 | 1.31 | 1.51 | 1.31 | 1.38 | 0.65 | 0.97 | 0.65 | 1.10 | 1.59 | 1.34 | 1.28 | 1.78 | **23.9** |
| **Westmeath** | 3.48 | 2.42 | 2.48 | 1.81 | 1.94 | 1.27 | 2.22 | 1.24 | 1.27 | 1.71 | 1.23 | 0.99 | 1.12 | 0.98 | 1.90 | 1.84 | 1.46 | 2.24 | **31.6** |
| **Wexford** | 1.13 | 1.47 | 1.54 | 1.85 | 1.25 | 1.07 | 0.60 | 1.06 | 1.39 | 1.63 | 1.38 | 1.20 | 0.84 | 1.17 | 1.18 | 0.65 | 1.09 | 1.70 | **22.2** |
| **Wicklow** | 1.35 | 1.80 | 1.31 | 1.29 | 1.46 | 1.31 | 0.65 | 0.81 | 0.45 | 0.39 | 0.91 | 1.42 | 1.28 | 1.18 | 0.74 | 0.77 | 1.32 | 1.10 | **19.5** |
| **Totals** | **67** | **72** | **71** | **75** | **63** | **52** | **46** | **40** | **41** | **40** | **34** | **35** | **36** | **38** | **42** | **36** | **40** | **48** | **877.5** |

# Appendix 3 SBH – County Analysis

| Private Specified Biomass Harvesting ('000 tonnes) | 80 t/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| Carlow | 1.55 | 1.77 | 2.97 | 1.72 | 1.67 | 0.80 | 0.00 | 0.24 | 1.95 | 0.21 | 0.31 | 1.79 | 0.25 | 1.64 | 1.45 | 0.48 | 1.64 | 1.14 | **21.6** |
| Cavan | 5.95 | 5.93 | 8.44 | 4.39 | 4.16 | 4.88 | 5.08 | 2.39 | 10.12 | 7.91 | 7.71 | 6.75 | 5.13 | 14.12 | 16.62 | 3.53 | 2.62 | 6.43 | **122.2** |
| Clare | 19.11 | 16.18 | 13.39 | 14.95 | 14.20 | 12.12 | 12.14 | 14.02 | 9.13 | 15.40 | 10.18 | 13.47 | 11.84 | 15.76 | 20.44 | 16.02 | 6.27 | 6.10 | **240.7** |
| Cork | 10.50 | 13.94 | 18.95 | 15.93 | 15.63 | 34.04 | 19.03 | 7.54 | 21.03 | 22.92 | 16.95 | 23.14 | 22.18 | 37.91 | 33.11 | 5.90 | 8.57 | 4.00 | **331.3** |
| Donegal | 4.92 | 2.56 | 4.52 | 2.54 | 3.87 | 12.31 | 6.87 | 6.41 | 4.03 | 5.46 | 3.35 | 3.52 | 2.11 | 6.64 | 3.91 | 4.54 | 1.35 | 1.79 | **80.7** |
| Dublin | 0.00 | 0.27 | 0.00 | 0.00 | 0.17 | 0.00 | 0.88 | 1.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.05 | **2.7** |
| Galway | 5.12 | 4.38 | 4.37 | 3.84 | 4.26 | 3.91 | 3.50 | 1.39 | 3.19 | 4.17 | 7.37 | 5.21 | 5.18 | 8.53 | 7.83 | 1.62 | 1.97 | 5.21 | **81.0** |
| Kerry | 13.13 | 8.76 | 15.08 | 13.03 | 11.38 | 16.08 | 13.73 | 7.06 | 17.94 | 12.04 | 15.88 | 27.24 | 11.31 | 18.98 | 13.69 | 4.76 | 2.37 | 1.83 | **224.3** |
| Kildare | 1.16 | 3.69 | 0.25 | 1.14 | 0.13 | 0.37 | 0.04 | 0.28 | 0.03 | 0.00 | 1.11 | 0.04 | 0.10 | 1.00 | 0.64 | 0.00 | 0.67 | 0.26 | **10.9** |
| Kilkenny | 6.44 | 9.59 | 9.13 | 17.93 | 9.65 | 7.64 | 11.10 | 3.19 | 4.14 | 4.60 | 2.65 | 8.58 | 5.26 | 20.13 | 11.22 | 1.21 | 3.93 | 4.23 | **140.6** |
| Laois | 9.92 | 5.97 | 6.69 | 12.02 | 7.81 | 2.47 | 8.00 | 6.98 | 8.85 | 5.89 | 2.27 | 4.62 | 2.74 | 5.58 | 5.90 | 0.46 | 2.07 | 2.22 | **100.5** |
| Leitrim | 15.66 | 9.86 | 13.42 | 10.18 | 10.63 | 20.96 | 5.82 | 4.70 | 8.34 | 9.71 | 9.20 | 13.29 | 9.29 | 13.05 | 25.57 | 22.51 | 23.70 | 19.32 | **245.2** |
| Limerick | 5.48 | 5.64 | 7.67 | 5.03 | 8.69 | 7.94 | 9.57 | 10.58 | 18.69 | 22.73 | 13.90 | 12.21 | 11.53 | 26.14 | 28.29 | 2.10 | 1.40 | 1.69 | **199.3** |
| Longford | 1.15 | 1.50 | 1.21 | 2.43 | 0.86 | 0.69 | 0.20 | 0.67 | 2.34 | 2.12 | 2.28 | 3.69 | 2.25 | 3.98 | 2.70 | 0.19 | 6.65 | 2.43 | **37.3** |
| Louth | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.53 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.06 | 1.85 | 0.96 | 0.00 | 0.37 | 0.06 | **5.1** |
| Mayo | 5.21 | 7.81 | 7.82 | 7.66 | 6.87 | 7.97 | 9.91 | 8.79 | 7.66 | 9.99 | 6.38 | 4.84 | 6.38 | 10.29 | 12.36 | 5.45 | 5.47 | 9.03 | **139.9** |
| Meath | 1.11 | 0.45 | 1.45 | 0.42 | 1.71 | 1.26 | 7.67 | 1.89 | 2.24 | 3.50 | 0.76 | 1.25 | 0.74 | 8.58 | 3.18 | 0.36 | 0.96 | 0.94 | **38.4** |
| Monaghan | 0.46 | 0.87 | 0.79 | 0.36 | 0.80 | 0.11 | 1.02 | 0.83 | 0.99 | 1.09 | 1.23 | 1.01 | 2.64 | 2.55 | 3.00 | 0.84 | 0.77 | 0.76 | **20.1** |
| Offaly | 3.83 | 1.38 | 0.00 | 0.84 | 2.13 | 0.64 | 1.58 | 3.19 | 2.52 | 0.00 | 1.90 | 5.40 | 1.47 | 2.83 | 2.40 | 0.10 | 0.86 | 7.56 | **38.6** |
| Roscommon | 5.62 | 9.12 | 6.04 | 8.24 | 6.80 | 3.83 | 3.30 | 3.83 | 5.15 | 2.39 | 8.29 | 8.55 | 10.40 | 11.57 | 10.02 | 2.28 | 5.06 | 7.88 | **118.4** |
| Sligo | 11.58 | 6.02 | 4.81 | 5.94 | 4.05 | 5.87 | 5.70 | 2.19 | 6.22 | 3.04 | 3.85 | 5.79 | 3.00 | 5.75 | 9.34 | 4.48 | 1.99 | 5.90 | **95.5** |
| Tipperary | 22.01 | 9.00 | 23.49 | 12.30 | 22.84 | 15.15 | 12.52 | 13.08 | 13.57 | 10.58 | 11.04 | 13.18 | 10.33 | 27.67 | 26.39 | 2.13 | 9.68 | 12.76 | **267.7** |
| Waterford | 5.77 | 5.49 | 7.04 | 8.78 | 3.70 | 8.81 | 2.76 | 0.96 | 5.39 | 3.59 | 4.89 | 5.41 | 7.81 | 10.75 | 11.63 | 1.81 | 5.34 | 6.68 | **106.6** |
| Westmeath | 2.24 | 5.91 | 0.59 | 1.70 | 3.77 | 0.46 | 1.39 | 1.36 | 0.13 | 3.99 | 1.99 | 0.95 | 2.04 | 5.18 | 1.95 | 0.79 | 1.99 | 1.78 | **38.2** |
| Wexford | 6.38 | 7.60 | 7.31 | 4.21 | 6.19 | 3.80 | 0.82 | 2.93 | 3.03 | 3.37 | 3.22 | 6.27 | 5.97 | 7.16 | 12.92 | 0.77 | 3.00 | 5.11 | **90.1** |
| Wicklow | 7.48 | 3.40 | 4.94 | 4.32 | 3.75 | 6.39 | 2.04 | 2.05 | 3.76 | 0.41 | 1.23 | 3.17 | 1.38 | 5.84 | 4.52 | 1.12 | 1.41 | 3.88 | **61.1** |
| **Totals** | **172** | **147** | **170** | **160** | **156** | **179** | **146** | **108** | **160** | **155** | **138** | **179** | **141** | **273** | **270** | **83** | **100** | **119** | **2,858.1** |

| Private Specified Biomass Harvesting ('000 tonnes) | 60 t/ha | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | Totals |
| **Carlow** | 1.16 | 1.33 | 2.23 | 1.29 | 1.25 | 0.60 | 0.00 | 0.18 | 1.46 | 0.16 | 0.24 | 1.34 | 0.19 | 1.23 | 1.09 | 0.36 | 1.23 | 0.86 | **16.2** |
| **Cavan** | 4.46 | 4.45 | 6.33 | 3.29 | 3.12 | 3.66 | 3.81 | 1.79 | 7.59 | 5.93 | 5.78 | 5.06 | 3.85 | 10.59 | 12.47 | 2.65 | 1.97 | 4.82 | **91.6** |
| **Clare** | 14.33 | 12.13 | 10.04 | 11.21 | 10.65 | 9.09 | 9.11 | 10.52 | 6.85 | 11.55 | 7.63 | 10.11 | 8.88 | 11.82 | 15.33 | 12.02 | 4.70 | 4.57 | **180.5** |
| **Cork** | 7.87 | 10.45 | 14.21 | 11.95 | 11.72 | 25.53 | 14.27 | 5.65 | 15.77 | 17.19 | 12.71 | 17.36 | 16.64 | 28.44 | 24.83 | 4.42 | 6.43 | 3.00 | **248.5** |
| **Donegal** | 3.69 | 1.92 | 3.39 | 1.91 | 2.90 | 9.23 | 5.15 | 4.81 | 3.02 | 4.09 | 2.51 | 2.64 | 1.59 | 4.98 | 2.93 | 3.40 | 1.02 | 1.35 | **60.5** |
| **Dublin** | 0.00 | 0.20 | 0.00 | 0.00 | 0.13 | 0.00 | 0.66 | 0.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.04 | **2.0** |
| **Galway** | 3.84 | 3.29 | 3.28 | 2.88 | 3.20 | 2.93 | 2.62 | 1.04 | 2.40 | 3.13 | 5.52 | 3.91 | 3.88 | 6.39 | 5.88 | 1.21 | 1.48 | 3.90 | **60.8** |
| **Kerry** | 9.85 | 6.57 | 11.31 | 9.78 | 8.54 | 12.06 | 10.30 | 5.30 | 13.46 | 9.03 | 11.91 | 20.43 | 8.48 | 14.24 | 10.27 | 3.57 | 1.78 | 1.37 | **168.2** |
| **Kildare** | 0.87 | 2.77 | 0.19 | 0.85 | 0.10 | 0.27 | 0.03 | 0.21 | 0.02 | 0.00 | 0.83 | 0.03 | 0.08 | 0.75 | 0.48 | 0.00 | 0.51 | 0.20 | **8.2** |
| **Kilkenny** | 4.83 | 7.19 | 6.85 | 13.45 | 7.24 | 5.73 | 8.33 | 2.40 | 3.11 | 3.45 | 1.99 | 6.44 | 3.94 | 15.09 | 8.42 | 0.91 | 2.94 | 3.17 | **105.5** |
| **Laois** | 7.44 | 4.48 | 5.02 | 9.02 | 5.86 | 1.85 | 6.00 | 5.23 | 6.64 | 4.41 | 1.70 | 3.46 | 2.05 | 4.18 | 4.42 | 0.35 | 1.56 | 1.67 | **75.3** |
| **Leitrim** | 11.75 | 7.39 | 10.06 | 7.64 | 7.97 | 15.72 | 4.36 | 3.53 | 6.26 | 7.28 | 6.90 | 9.97 | 6.97 | 9.79 | 19.18 | 16.88 | 17.77 | 14.49 | **183.9** |
| **Limerick** | 4.11 | 4.23 | 5.75 | 3.77 | 6.51 | 5.96 | 7.18 | 7.94 | 14.02 | 17.05 | 10.42 | 9.15 | 8.65 | 19.60 | 21.22 | 1.57 | 1.05 | 1.27 | **149.4** |
| **Longford** | 0.86 | 1.13 | 0.91 | 1.82 | 0.64 | 0.52 | 0.15 | 0.50 | 1.75 | 1.59 | 1.71 | 2.77 | 1.69 | 2.99 | 2.02 | 0.14 | 4.99 | 1.82 | **28.0** |
| **Louth** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.15 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.05 | 1.39 | 0.72 | 0.00 | 0.27 | 0.04 | **3.8** |
| **Mayo** | 3.90 | 5.85 | 5.87 | 5.75 | 5.15 | 5.98 | 7.43 | 6.59 | 5.74 | 7.49 | 4.79 | 3.63 | 4.78 | 7.71 | 9.27 | 4.09 | 4.10 | 6.77 | **104.9** |
| **Meath** | 0.83 | 0.34 | 1.09 | 0.31 | 1.28 | 0.94 | 5.76 | 1.42 | 1.68 | 2.63 | 0.57 | 0.93 | 0.56 | 6.43 | 2.39 | 0.27 | 0.72 | 0.71 | **28.8** |
| **Monaghan** | 0.34 | 0.65 | 0.59 | 0.27 | 0.60 | 0.08 | 0.77 | 0.62 | 0.74 | 0.81 | 0.92 | 0.76 | 1.98 | 1.91 | 2.25 | 0.63 | 0.58 | 0.57 | **15.1** |
| **Offaly** | 2.87 | 1.03 | 0.00 | 0.63 | 1.60 | 0.48 | 1.19 | 2.39 | 1.89 | 0.00 | 1.43 | 4.05 | 1.10 | 2.12 | 1.80 | 0.07 | 0.64 | 5.67 | **29.0** |
| **Roscommon** | 4.21 | 6.84 | 4.53 | 6.18 | 5.10 | 2.87 | 2.48 | 2.87 | 3.86 | 1.79 | 6.21 | 6.41 | 7.80 | 8.68 | 7.52 | 1.71 | 3.80 | 5.91 | **88.8** |
| **Sligo** | 8.69 | 4.52 | 3.61 | 4.45 | 3.03 | 4.40 | 4.28 | 1.64 | 4.66 | 2.28 | 2.89 | 4.34 | 2.25 | 4.31 | 7.00 | 3.36 | 1.49 | 4.43 | **71.6** |
| **Tipperary** | 16.51 | 6.75 | 17.62 | 9.23 | 17.13 | 11.37 | 9.39 | 9.81 | 10.18 | 7.93 | 8.28 | 9.89 | 7.74 | 20.75 | 19.79 | 1.60 | 7.26 | 9.57 | **200.8** |
| **Waterford** | 4.33 | 4.12 | 5.28 | 6.58 | 2.78 | 6.61 | 2.07 | 0.72 | 4.04 | 2.70 | 3.67 | 4.06 | 5.86 | 8.06 | 8.72 | 1.36 | 4.01 | 5.01 | **80.0** |
| **Westmeath** | 1.68 | 4.43 | 0.44 | 1.28 | 2.82 | 0.34 | 1.05 | 1.02 | 0.10 | 2.99 | 1.49 | 0.71 | 1.53 | 3.89 | 1.46 | 0.59 | 1.49 | 1.34 | **28.7** |
| **Wexford** | 4.79 | 5.70 | 5.48 | 3.15 | 4.65 | 2.85 | 0.62 | 2.20 | 2.27 | 2.53 | 2.42 | 4.70 | 4.48 | 5.37 | 9.69 | 0.57 | 2.25 | 3.83 | **67.5** |
| **Wicklow** | 5.61 | 2.55 | 3.71 | 3.24 | 2.81 | 4.80 | 1.53 | 1.53 | 2.82 | 0.31 | 0.92 | 2.38 | 1.04 | 4.38 | 3.39 | 0.84 | 1.06 | 2.91 | **45.8** |
| **Totals** | **129** | **110** | **128** | **120** | **117** | **134** | **110** | **81** | **120** | **117** | **103** | **135** | **106** | **205** | **203** | **63** | **75** | **89** | **2,143.5** |

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