ForestNavigator

D2.3 Report and collection of high frequency updates forest cover and disturbance layers

Report accompanying the data layers

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Abstract

This report describes the data delivered in D2.3, which consists of the second version of the forest geodatabase ("forest4model" datacube) and the updated EUFo database. This report provides a brief summary of the data layers included in D2.3 compared to D2.1 and D2.2, the methods applied, existing data sources used, and data curation efforts to date. Existing and planned validation steps of the data are also briefly described.

Keywords

Forest data layers, EU, Datacube, forest harvest data

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Public

Abbreviations

AGB	Aboveground biomass
CRF	Common reporting format
EFDA	European Forest Disturbance Atlas
EO	Earth Observation
ESA	European Space Agency
EU	European Union
EUFo	European Forest Database
FAO	Food and Agriculture Organization of the United Nations
GHG	Green House Gas
NIR	National inventory report
SBTN	Science Based Targets for Land
WP	Work Package
NFI	National Forest Inventory

1. Data fusion for forest monitoring

Work package (WP) 2 of the ForestNavigator project focuses on data fusion for monitoring and modelling of forest carbon and biodiversity. The general aim is to develop near-real-time monitoring of EU forests and forest bioeconomy to support Greenhouse Gas (GHG) Inventory development and policy pathway modelling at EU and national level. The specific purpose is to ensure that state-of-the-art and up-to-date, consistently integrated data streams are provided and used in data-driven analysis, GHG inventory estimation, and in certain forward-looking models to enable transparent monitoring of progress towards the national and EU climate change mitigation targets. With this, WP2 provides quality data and data-driven assessments towards the project objectives.

Key elements for this are (1) an EU wide forest database consistent with reporting, monitoring and modelling needs, (2) a reconciled database with National Forest Inventory (NFI) and other data sources for monitoring status of forest carbon stock, (3) a near-real-time geodatabase with yearly updates of forest cover and disturbances, and (4) enhanced quality and frequency of reporting in GHG inventories. To achieve this, two databases were created and published: (1) a forest geodatabase based on Earth Observation (EO) datasets which were combined in a harmonised and consistent "forest4model" datacube (D2.1, see section 1.1. and section 2) and (2) a database presenting key forest indicators based on NFI data at sub-national level, called the European Forest (EUFo) database (D2.2, see section 1.2 and section 3). Following this, we present in this deliverable the updates for both databases.

With this, WP2 presents a comprehensive and current picture of forests and forest characteristics in the EU, relying on EO and NFI data equally, which enables both large-scale and sub-national assessments.

We first introduce the forest geodatabase and its updates with EO data, and then focus on the main characteristics and updates of the EUFo database.

1.1. Introducing the forest geodatabase

The development of the ForestNavigator forest geodatabase was the first important project step for compiling key data sources in WP2 for downstream uptake in the various data analysis and modelling WPs ("forest4model" datacube v1, D2.1 (September 2023). The database includes an updated "picture" of the current and recent forest status and change. Generating the database combines different data streams from remote sensing, statistics, and inventories for a consistent and comprehensive dynamic representation of forests for a spatially explicit assessment of forest changes, aboveground biomass/carbon stocks, forest age, and structural diversity. The following criteria have been defined as important and guiding for the database development:

- Consistent: integrating remote sensing, field data and (where needed/possible) reconciling with national and (sub)national statistics.
- Spatially distributed and high-resolution: make best use of available remote sensing data and tools, able to bridge the different scales and obtain more punctual information on forest status and change.

- Comprehensive: includes key baseline forest information and, in particular, covers dimensions that have not been extensively covered in the past (e.g. climate, biodiversity).
- Transparent: data should be open source and easy to find, accessible, interoperable, and reusable - allowing reproducibility and stimulating understanding and sharing among many stakeholders.
- Timely: need to address rapid changes happening in European forests, i.e. all data should be 2020 for version 1, and for version 2, we curate more recent data.
- EU-wide: cover the entire region at the same level of detail and quality.

The first instalment of the forest geodatabase was a findable, accessible, interoperable, and reusable (FAIR) multi-layered harmonised geodatabase representing the near past (2000-2020) and containing 14 data layers that present the status of EU forests, usable for carbon and biodiversity monitoring and modelling.

Following version 1 of the forest database ("forest4model" datacube v1), we updated the forest geodatabase. Main updates to v2 include: (1) more recent data sets such as disturbance data extending to 2023 and forest biomass maps for 2010, 2015, 2022, to complement 2020 data in v1 and (2) new forest variables such as disturbance agent and forest timber volume. Section 2 outlines the updated data sets and methodology for the "forest4model" datacube v2.

1.2. Introducing the EUFo database

The establishment of a database of sub-national forest inventory data at the European level is a major achievement of WP2 in the ForestNavigator project. As described in D2.2, the EUFo database offers information on forestry area, harvest, biomass stocks and increment for the period 1990/2000-2023 at (mostly) sub-national level. It consists of two main components: the EUFo-reported dataset and the EUFo-harmonised dataset (Figure 1). The core of the EUFo-reported dataset consists of the collected primary data from National Forest Inventories (NFIs) and census statistics with additional national data from the State of Europe's Forests (SoEF) (FOREST EUROPE, 2020) and the Global Forest Resource Assessments (FRA) (FAO, 2020) for the available reporting periods/years in the timeframe 1990-2023. Data was converted to common units, and national specifics regarding definitions were documented. The EUFo-harmonised dataset, in contrast, was established based on common definitions and by applying necessary adjustments and harmonisation procedures on the reported values for the included indicators. Further, gap-filling was performed using appropriate methods for each indicator, like interpolation and modelling (with the CRAFT model), to establish a stock-flow consistent annual time series for forest harvest, area, biomass stocks and increment for the timeframe 2000-2023.

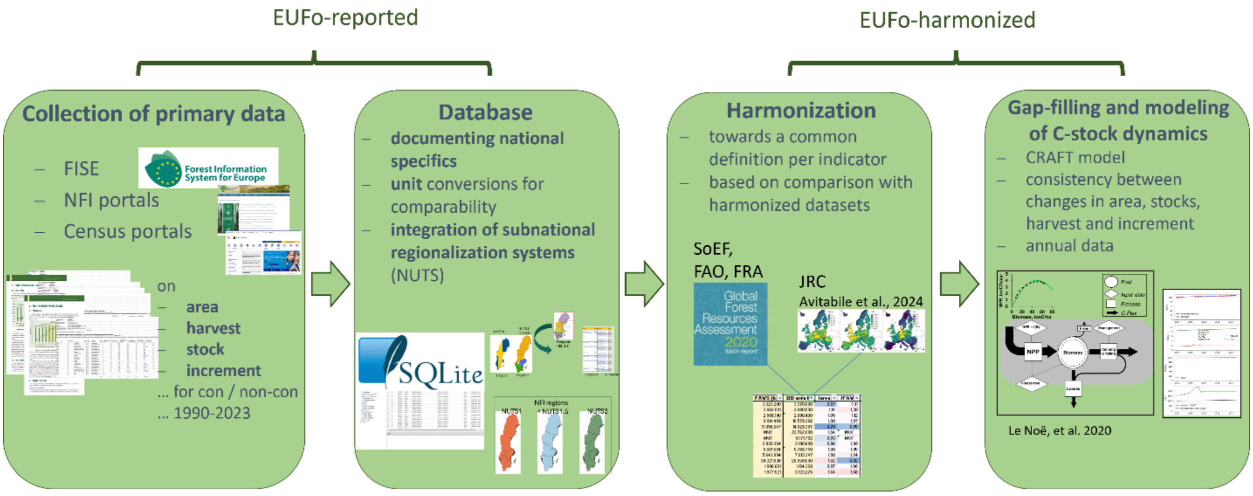

Figure 1: Overview of EUFo database collection, harmonisation and modelling efforts and the interlinkage of the two subparts of the database, EUFo-reported and EUFO-harmonised.

During the past year, the EUFo database was updated in the following ways: 1) integration of newly published data from NFI reports and census statistics; 2) continuous data cleaning and consistency checks; 3) adjustment of the harmonisation and gap-filling procedures to arrive at an annual time series. These updates are outlined in detail in Section 3.

2. The forest geodatabase

The first instalment of the forest geodatabase (September 2023) was a findable, accessible, interoperable, and reusable (FAIR) multi-layered harmonised geodatabase representing the near past (2000-2020) and present status of EU forests to be used for carbon and biodiversity monitoring and modelling. The resulting "forest4model" datacube v1 contains 14 high-resolution (100 m spatial resolution) data sets. This state-of-the-art and up-to-date, EU-wide forest geodatabase is consistent with reporting, transparent monitoring, and forward-looking modelling needs. The database's primary audience is the project modelling efforts, but it could be useful for other purposes as well, such as harmonised overviews (example by World Resources Institute in section 4. Discussion and Outlook). Since the first instalment of the forest database in September 2023, we have updated it to include more recent and updated data layers to achieve a near-real-time geodatabase.

The forest geodatabase was updated with the following Earth Observation-based (EO) datasets: disturbance year and fraction until 2023 (Viana-Soto and Senf, 2025; previously only 2020), forest aboveground biomass maps for 2010, 2015, 2020 and 2022 (Santoro and Cartus, 2025; previously only 2020), and lastly forest timber volume (Miettinen et al., 2024). In this document, we describe the EO and methodology that were used to generate the eight new high-resolution (100 m spatial resolution) data sets (i.e. datacube) that were prepared and are included in version 2 of the forest geodatabase and its corresponding data curation processes. As an important part of the data set description, consideration and datacube integration, we outline the validation steps and data quality assessments that were performed to demonstrate the quality of the input layers. All layers selected are underpinned by a scientific publication or reference and include an (individual) assessment of accuracy and/or uncertainties that are also summarised in this document.

For the already published EO input data sets, we outline their validation and data quality as described in the related publications. Most of the EO-derived data sets do not provide spatially explicit uncertainty or precision layers that could be applied in an error propagation framework for the datacube. Here, we rather describe the known accuracy information for each individual layer to inform the user about the potential and limitations when using the data. Overall, we maintained the data quality and consistency of the datacube by firstly applying a widely recognised forest definition, secondly by using the forest cover map (year 2020 from the datacube v1) as a mask for the following datacube layers and thirdly by not manipulating the input data sets but only upscaling and reprojecting the data to a common spatial resolution and projection. With this, we ensure consistency within the datacube version 1 and version 2 and a reliable input for the modelling studies.

The final results are the initial datacube (v1) and the updated version 2 with data layers that describe EU forest cover, disturbance history and biodiversity and structure parameters (Table 1).

Table 1: Overview of data sets curated for the forest geodatabase and the forest4model datacube v2 (top rows) and v1 (bottom rows, grey).

Data set	Definition	Description	Unit	Specification
Disturbance year	The identified disturbance and disturbance year	Identified areas of tree cover loss and the associated disturbance years from 1985-2023.	1985-2023; signed integers 16-bit	1985-2023, 100 m spatial resolution
Disturbance fraction	The fraction of identified disturbances	Identifies the fraction of identified tree cover loss at 30 m spatial resolution (original input) at 100 m spatial resolution from 1985-2023.	0-1; signed integers 16-bit	1985-2023, 100 m spatial resolution
Disturbance agent	The dominant disturbance agent for identified disturbances from 1985-2023	The identified dominant disturbance agent, as windfall/bark beetle, fire, harvest or mixed agent, following tree cover loss from 1985-2023.	1, 2, 3, 4; signed integers 16-bit	1985-2023, 100 m spatial resolution
Forest aboveground biomass	The estimated aboveground biomass (Mg/ha) in forest areas in 2010, 2015, 2020 and 2022	The estimated aboveground biomass (Mg/ha) in forest areas in 2010, 2015, 2020 and 2022.	0-421/414 Mg/ha; signed integers 16-bit	**2010, 2015, 2020, 2022**; 100 m spatial resolution
Forest timber volume	The estimated timber volume (m^3/ha) in forest areas in 2020	The estimated timber volume (m^3/ha) in forest areas in 2020.	0-757 m^3/ha; signed integers 16-bit	2020, 100 m spatial resolution
Forest cover	Forest cover in the year 2020	Forest cover is land with tree cover of more than 10 %, with trees reaching at least 5 m and an area of more than 0.5 ha in 2020.	binary: 1; signed integers 16-bit	2020, 100 m spatial resolution
Forest cover fraction	Forest cover fraction in 2020	Identifies the fraction of forest cover at 30 m spatial resolution (original input) at 100	0-1; signed integers 16-bit; scale factor 0.001	2020, 100 m spatial resolution

Data set	Definition	Description	Unit	Specification
		m spatial resolution.		
Forest extent stable	The identified stable forest area between 2000 and 2020	The forest extent (cover) that remained stable – no identified tree cover loss - between 2000 and 2020.	binary: 1; signed integers 16-bit	2000-2020, 100 m spatial resolution
Forest extent loss	The identified forest extent loss between 2000 and 2020	The forest extent (cover) that experienced tree cover loss between 2000 and 2020.	binary: 1; signed integers 16-bit	2000-2020, 100 m spatial resolution
Forest extent gain	The identified forest extent gained between 2000 and 2020	The forest extent (cover) that experienced tree cover gain between 2000 and 2020.	binary: 1; signed integers 16-bit	2000-2020, 100 m spatial resolution
Deadwood distribution	The estimated deadwood volume	The estimated deadwood volume in m^3/ha	m^3/ha	2006-2008, 1km spatial resolution
Forest age	The estimated forest age in 2020	The estimated forest age in 2020.	1-300; signed integers 16-bit	2020, 100 m spatial resolution
Forest canopy height	The estimated forest canopy height in 2020	The estimated forest canopy height (m) in 2020	0-50; signed integers 16-bit	2020, 100 m spatial resolution
Forest Type	Identified forest types as broadleaved, coniferous forests, mixed forest areas, and undefined	The identified forest type differentiating between broadleaved, coniferous, mixed forest, and undefined in 2018	1,2,3,4; signed integers 16-bit	2018, 100 m spatial resolution
Forest fragmentation	The identified forest fragmentation in 2020	The identified forest fragmentation based on a synthetic forest fragmentation index (FFI, 0-1) in 2020	0-1; signed integers 16-bit; scale factor 0.001	2020, 100 m spatial resolution
Forest fragmentation	The identified change in forest	The identified change in forest	0-1; signed integers 16-bit;	2000-2020, 100 m spatial

Data set	Definition	Description	Unit	Specification
change	fragmentation between 2000 and 2020	fragmentation based on a synthetic forest fragmentation index (FFI, 0-1) between 2000 and 2020	scale factor 0.001	resolution
Natural forests	Unmanaged or minimally managed natural forest	The identified natural forests as unmanaged or minimally managed natural forests	1,2; signed integers 16-bit	2020, 100 m spatial resolution

2.1. Forest datacube version 2

The "forest4model" datacube version 2 consists of 8 data layers[1], which complement or update the 14 layers in the "forest4model" datacube v1. The individual data layers and their processing steps are described below. For the second version of the datacube we curated newly published data sets on the state of EU forests and harmonised these to a common grid and scale.

We applied three general processing steps to all data layers included in the datacube. Firstly, all data sets were upscaled to 100 m spatial resolution as a uniform common output resolution. Secondly, all data layers were masked to the existing 2020 forest cover map, as this is the most recent forest cover map for Europe. This ensures consistency between datacube v1 and v2. For the general processing steps, we worked with the Lambert Azimuthal Equal Area Projection (EPSG: 3035, ETRS89 / LAEA Europe) as this is an equal area projection, and some of the data processing steps rely on an equal area. Thirdly, the output projection of the final products, however, is the World Geodetic System 1984 (EPSG: 4326, WGS84), as this is more commonly applied in modelling studies. In this last step, all data sets were reprojected to the geographic coordinates. The output projection was World Geodetic System 1984 (EPSG: 4326, WGS84). The forest4model datacube is provided in netCDF (CF-1.12) format.

The most recent forest cover map available is for 2020 and was created for the datacube v1. The forest cover map 2020 was based on ESA WorldCover 10 m 2020 v100 (Zanaga et al. 2021) and a tree height of 2020 map from Potapov et al. (2022) (see details D2.1 documentation). The forest cover map 2020 indicates areas with a forest cover of minimum 10 % tree cover, minimum of 5 m tree height and a minimum area of 0.5 ha, which follows the FAO definition of forests as closely as possible, except excludes areas that are by land use a forest but do not fulfill the physical parameters currently, e.g. areas currently harvested. The land cover and tree height maps from 2020 are still the most recent data available. On the one hand, using the same forest cover map as a mask for the datacubes (v1 and v2) maintains consistency between datacube versions, which has a substantial benefit. On the other hand, post-2020 changes in the forest cover are not accounted for directly (only when considering disturbances) and might introduce small uncertainties.

[1] Excludes deadwood and forest harvest, sub-national, 2000-2020, and GHG inventories forest estimates datasets

This highlights two important points when working with Earth Observation data: firstly, timely and near real-time monitoring is tangible and obtainable nowadays, but small temporal inconsistencies in updating all layers of the datacube can remain, especially when several data products are needed, such as forest height and a land cover map to obtain a forest cover map. Secondly, while EO products provide spatially explicit data, the common understanding is that large-scale EO products often lack certainty at local scales and their benefits are with larger scale aggregations to identify broader spatial patterns and trends. Following this, working with the 2020 forest cover map for the datacube update is acceptable as a) there is only a short temporal difference of 3 years between the forest cover map (2020) and the most recent disturbance data (2023) in version 2 and b) disturbance information until 2023 is provided and can be consolidated in case of uncertainties related to the forest masking. Only forested areas exceeding 5 meters of height post-2020 are potentially missed, as they would be included in a more recent forest cover map.

2.1.1. Forest disturbance history 1985-2023

As part of forest disturbance history, we created three layers related to disturbance (i.e., year, fraction, and agent). Next, we detail the primary data inputs, methodology, and validation efforts for each of these layers.

2.1.1.1. Data used

The three disturbance history products were derived from the European Forest Disturbance Atlas (EFDA) version 2.1.1. (Viana-Soto and Senf, 2025). The maps comprise annual forest disturbances across 38 European countries from 1985-2023 at 30 m spatial resolution. Further forest disturbance product specifications and methodology can be found in the accompanying publication.

We derived a disturbance year product that identifies the main disturbance year at 100 m spatial resolution. As the disturbances and the associated disturbance year were initially mapped at 30 m spatial resolution, we aggregated this information to a coarser resolution. Hence, the disturbance year product depicts the main disturbance year of that 100 m pixel and potentially also for a small area that was not identified as disturbed by Viana-Soto and Senf (2025). Following this, we provide a second disturbance product, the disturbance fraction 100 m, which indicates the fraction of 30 m spatial resolution identified as disturbed that is represented in the 100 m aggregated product. Thirdly, we used the available disturbance agent product from the EFDA and created a disturbance agent 100 m data layer that indicates the dominant disturbance agent, differentiating between wind/bark beetle, fire, harvest and a mix of the three.

2.1.1.2. Methodology

The individual processing steps that were applied to derive the disturbance year at 100 m data set, the underlying disturbance fraction at 100 m data set, and the disturbance agent at 100 m data set are described in *Table 2*, *Table 3*, and *Table 4*.

Table 2: List of the processing steps to derive the disturbance year 100 m data set.

Step	Description	Comment	Spatial resolution	Data set
1. Input	disturbance year 1985-2023	latest disturbance year layer is provided per country	30 m	Viana-Soto and Senf (2025)
2. Upscale	upscale to 100 m	upscale algorithm: mode	100 m	disturbance year 1985-2023 100 m
3. Mask	mask with forest cover 2020 map	eliminating small-scale disturbance patches and falsely identified disturbances in non-forest areas	100 m	disturbance year 1985-2023 100 m
4. Reproject	reproject to geographic coordinates	reproject to WGS 84	100 m	**disturbance year 1985-2023 100 m**

Table 3: List of the processing steps to derive the disturbance fraction 100 m data set.

Step	Description	Comment	Spatial resolution	Data set
1. Input	disturbance year 1985-2023	latest disturbance year layer is provided per country	30 m	Viana-Soto and Senf (2025)
2. Preprocessing	convert disturbance year to binary (0/1)	disturbance = 1, no disturbance = 0	30 m	disturbance year 1985-2023 binary
3. Upscale	upscale to 100 m	upscale algorithm: average	100 m	disturbance fraction 100 m
4. Mask	mask with forest cover 2020 map	eliminating small-scale disturbance patches and falsely identified disturbances in non-forest areas	100 m	disturbance fraction 100 m
5.Reproject	reproject to geographic coordinates	reproject to WGS 84	100 m	**disturbance fraction 100 m**

Table 4: List of the processing steps to derive the disturbance agent 100 m data set.

Step	Description	Comment	Spatial resolution	Data set
1. Input	disturbance agent aggregated	disturbance agent aggregated layer is provided per country	30 m	Viana-Soto and Senf (2025)
2. Upscale	upscale to 100 m	upscale algorithm: mode	100 m	disturbance agent 100 m
3. Mask	mask with forest cover 2020 map	eliminating small-scale disturbance patches and falsely identified disturbances in non-forest areas	100 m	disturbance agent 100 m
4. Reproject	reproject to geographic coordinates	reproject to WGS 84	100 m	**disturbance agent 100 m**

2.1.1.3. Datacube layer

- disturbance year
- disturbance fraction
- Disturbance agent

2.1.1.4. Validation and limitations

The forest disturbance layers in this geodatabase and datacube are based on one publicly available and peer-reviewed data set, the European Forest Disturbance Atlas (Viana-Soto and Senf, 2025).

The European Forest Disturbance Atlas was validated with 4,566 manually interpreted Landsat time-series reference pixels. The reference data set contains stratified samples of forest and non-forest pixels based on the forest proportion of a country. Overall, the disturbance classification has high F1 scores. 0.89 for the overall classification result, 0.99 for undisturbed pixels and 0.80 for disturbed pixels. While commission and omission errors for undisturbed pixels are negligible (< 1 %), they are slightly higher for disturbed pixels with 17.3 % and 22.5 %, respectively. About 17 % of the disturbed pixels are falsely classified as disturbed, and about 23 % of true disturbances were not mapped. There are some regional differences in the validation results, showing that in northern Europe, more pixels are falsely mapped as disturbed, whereas true disturbances are less likely to be missed. In central and southern Europe, the trends are contrary, with more true disturbances missed (omission) than false disturbances mapped (commission).

The validation of the identified disturbance year showed high fluctuations between years. Overall, disturbances before 2000 had a 19.5 % chance of being false, which decreased to 10.6 % after 2000. Despite this, there is a good fit between the mapped and manually interpreted disturbance year, with a mean absolute error of 1.91 years.

The disturbance agent prediction results show a similarly good model performance, with an overall error of 14.1 %. The commission error rates (false occurrences) per disturbance agent vary with 10.5 % for bark beetle-windstorm, 5.7 % for fire and 17.4 % for harvest.

The most recent forest cover map available is from 2020, which was already applied for the datacube v1 and again for datacube v2. On the one hand, using the same forest cover map as a mask for the datacubes (v1 and v2) leads to consistency between datacube versions, which is a benefit. On the other hand, changes in the forest cover post 2020 are not accounted for and might introduce a small level of uncertainty. However, this can be neglected for the disturbance history data sets, as they indicate the potential changes in forest cover for the most recent years.

2.1.2. Forest aboveground biomass 2010, 2015, 2020 and 2022

2.1.2.1. Data used

The ESA Biomass Climate Change Initiative provides global maps of aboveground biomass (Santoro and Cartus, 2025). The latest version 6 of the product provides several maps, including those for 2010, 2015, 2020 and 2022. We used these data sets to depict aboveground biomass in 2010, 2015, 2020 and 2022 for European forests. The year 2020 was already available from ESA CCI Biomass version 5 and was used for datacube v1 but we decided to also process 2020 v6 for datacube v2 for consistency across the biomass products. Further product specifications and methodology can be found in the accompanying publication and data documentation provided by the ESA Climate Change Initiative Biomass team.

2.1.2.2. Methodology

The individual processing steps that were applied to derive the forest biomass 2010, 2015, 2020 and 2022 at 100 m data sets are described in *Table 5*.

Table 5: List of the processing steps to derive the forest aboveground biomass 2010, 2015, 2020 and 2022 100 m data set.

Step	Description	Comment	Spatial resolution	Data set
1. Input	AGB 2010/2015/2020/2022	aboveground biomass maps are provided in WGS 84	100 m	Santoro and Cartus (2025)
2. Reproject	reproject to equal area projection (EPSG: 3035)	the layers have to be provided in an equal area projection for masking	100 m	AGB 100 m (EPSG: 3035)
3. Mask	mask with forest cover 2020 map	only depict aboveground biomass for forest area	100 m	forest AGB 100 m
4. Reproject	reproject to geographic coordinates	reproject to WGS 84	100 m	**Forest AGB 2010/2015/2020/2022 100 m**

Note: AGB = Aboveground biomass

2.1.2.3. Datacube layer

- Forest aboveground biomass 2010, 2015, 2020, 2022

2.1.2.4. Validation and limitations

The forest aboveground biomass layer in this geodatabase and datacube is based on the global ESA Climate Change Initiative aboveground biomass maps for 2010, 2015, 2020 and 2022 v6 (Santoro and Cartus, 2025). These data products consist of two global layers: the aboveground biomass (AGB) map itself and a per-pixel estimate of the AGB uncertainty.

The map was validated with forest field inventory and LiDAR reference data sets. The reference data set was increased from ESA CCI Biomass version 5 to version 6 by, e.g. obtaining new NFI data from Ireland and Italy and LiDAR-based maps; however, the LiDAR data was not from Europe.

Overall, the results indicate a reasonably good trend, but also an overestimation of low AGB and an underestimation of high AGB values between the CCI biomass maps and reference plots. Spatial aggregation of the plot-level data shows a decrease in the difference between maps and plots. Between 50 Mg/ha and 400 Mg/ha the mean difference between maps and reference data was found to be within 20%, which indicates a reasonable fit overall.

The 2010 map shows less consistency with the ESA plot data than the 2015, 2020, and 2022 maps. This could be the result of a lower number of reference data and slightly lower quality of the remote sensing data (ESA CCI Biomass, Product Validation and Intercomparison Report for version 6, coming out soon). The ESA CCI biomass AGB uncertainty layer can be addressed for further spatial details, but was not included in the datacube assessment, as for most other input layers, similar assessments are not available.

2.1.3. Forest timber volume 2020

2.1.3.1. Data used

High-resolution pan-European forest structure maps were published by Miettinen et al. (2024), containing a 2020 timber volume map at 10 m spatial resolution. The maps are based on Sentinel-2, Copernicus, and National Forest Inventory data and cover 40 European countries. Further product specifications and methodology can be found in the accompanying data publication.

2.1.3.2. Methodology

The individual processing steps that were applied to derive the forest timber volume at the 100 m data set are described in Table 6.

Table 6: List of the processing steps that were applied to derive the forest timber volume 2020 100 m data set.

Step	Description	Comment	Spatial resolution	Data set
1. Input	timber volume 2020	timber volume layer	10 m	Miettinen et al. (2024)
2. Upscale	upscale to 100 m	upscale algorithm: average	100 m	Timber volume 2020 100 m
3. Mask	mask with forest cover 2020 map	only depict forest age for forest area	100 m	forest timber volume 2020 100 m
4. Reproject	reproject to geographic coordinates	reproject to WGS 84	100 m	**Forest timber volume 2020 100 m**

2.1.3.3. Datacube layer

- Forest timber volume 2020

2.1.3.4. Validation and limitations

The high-resolution forest structure maps were derived from a Sentinel-2 2020 image mosaic, Copernicus layers, and about 151,000 sample plots from 14 NFIs across Europe (Miettinen et al. 2024). One third of the NFI plots, about 50,400 samples, were used for validation with error metrics such as the Root-Mean-Square-Error (RMSE) and bias. Both for processing and validation, Europe was divided into 13 multi-country processing areas. For the timber volume map, the RMSE varies from 55.38 % to 83.92 % and the bias from 0.12 % to 4.56 % for the 13 processing areas. Overall, the validation showed that the mapped results and ground data are aligned well, with a tendency for high timber volume values to be underestimated and low volume values to be overestimated.

2.2. Changes between datacube v1 and v2

Datacube v1 was published as deliverable D2.1 in 2023, and datacube v2 follows as deliverable D2.3 in 2025 to update and complement the forest geodatabase. Main updates and additions include: 1) more recent data sets such as disturbance data extending to 2023 and forest biomass maps for 2010, 2015 and 2022 and 2) new forest variables such as disturbance agent and timber volume (Table 7). Section 2.1 outlines the updated data sets and methodology for D2.3.

Table 7: Overview of data sets that are updated or new in the forest geodatabase and the forest4model datacube v2.

Data set	Definition	Description
Disturbance year	The identified disturbance and disturbance year	Identified areas of tree cover loss and the associated disturbance year from 1985-2023.
Disturbance fraction	The fraction of identified disturbances	Identifies the fraction of identified tree cover loss at 30 m spatial resolution (original input) at 100 m spatial resolution from 1985-2023.
Disturbance agent	The dominant disturbance agent for identified disturbances from 1985-2023	The identified dominant disturbance agent, as in windfall/bark beetle, fire, harvest or mixed agent following tree cover loss from 1985-2023.
Forest aboveground biomass	The estimated aboveground biomass (Mg/ha) in forest areas in 2010, 2015, 2020 and 2022	The estimated aboveground biomass (Mg/ha) in forest areas in 2010, 2015, 2020 and 2022.
Forest timber volume	The estimated timber volume (m^3/ha) in forest areas in 2020	The estimated timber volume (m^3/ha) in forest areas in 2020.

The updated disturbance history data sets and the newly available disturbance agent layer are key components for forest assessments in Europe. They do not just highlight changes and the recent disturbance dynamics but also indicate the most likely source of the disturbance, which helps us understand forest dynamics in Europe to a greater extent. Similarly, the newly added forest aboveground biomass maps for 2010, 2015 and 2022, together with the already provided data set for 2020 (updated in D2.3 with the more recent ESA CCI Biomass v6), allow us to assess the temporal dynamics of forest biomass and changes in the last decade. Lastly, the forest timber volume data set enables us to address forest management and use of timber in European forests which is a new assessment component and now also possible with the datacube v2.

The most recent available forest cover map is from 2020 and was used for both the datacube v1 and v2. On the one hand, using the same forest cover map as a mask for the datacubes (v1 and v2) leads to consistency between datacube versions, which is a benefit. On the other hand, changes in the forest cover post-2020 are not accounted for and might introduce a small level of uncertainty.

3. The updated EUFo database

3.1. Database of reported forest indicators (EUFO-reported): main characteristics and updates

Key forestry indicators forest area, harvest, biomass stocks and increment were collected for 38 European countries (26 EU members, 8 EU candidates, 4 non-EU) from various sources: nationally produced data from NFIs and census and data from national reporting from the State of Europe's Forest (SoEF) report (FOREST EUROPE, 2020) and FAOSTAT (FAO, 2025).

We have revised and searched for new data in all countries where we have already collected NFI and census data in version 1 (D2.2) of the EUFo-Reported. New data has been added for the period 1990–2000 and for the years 2023 and 2024 in some countries. The dataset now also includes subnational NFI and census data for two non-EU countries: Norway and Great Britain and Northern Ireland. Additionally, some faulty datasets have been replaced. A complete list of updates and changes can be found below.

The database now covers 93% of the forest area in the EU-27 with NFI and census data from 20 countries. Other European countries were supplemented by SoEF data at the national level. In the SoEF database area, stock and increment are usually available for the years 1990, 2000, 2005, 2010, 2015 and 2020, and harvest is available annually from 1988 to 2017. Subnational data is available for 17 EU-27 states (89% of EU-27 forest area) and 2 non-EU ones. A more comprehensive overview is available in Figure 2. Small to medium-sized regions in Europe not included because of lack of data (microstates and regions without reported data) includes Andorra, Liechtenstein, Malta, Monaco, San Marino, Vatican City Kosovo, the Warsaw metropolitan area and the Kaliningrad Oblast. Table 14 in the Annex section 6.1 provides a comprehensive overview of all data sources and indicators covered per country.

The EUFo-reported database now covers 383, 311, 227, and 285 regions for area, stock, increment, and harvest, respectively. These correspond to 45.408, 29.172, 21.012, and 39.828 data points. Information on the keys (columns) is listed in Table 8.

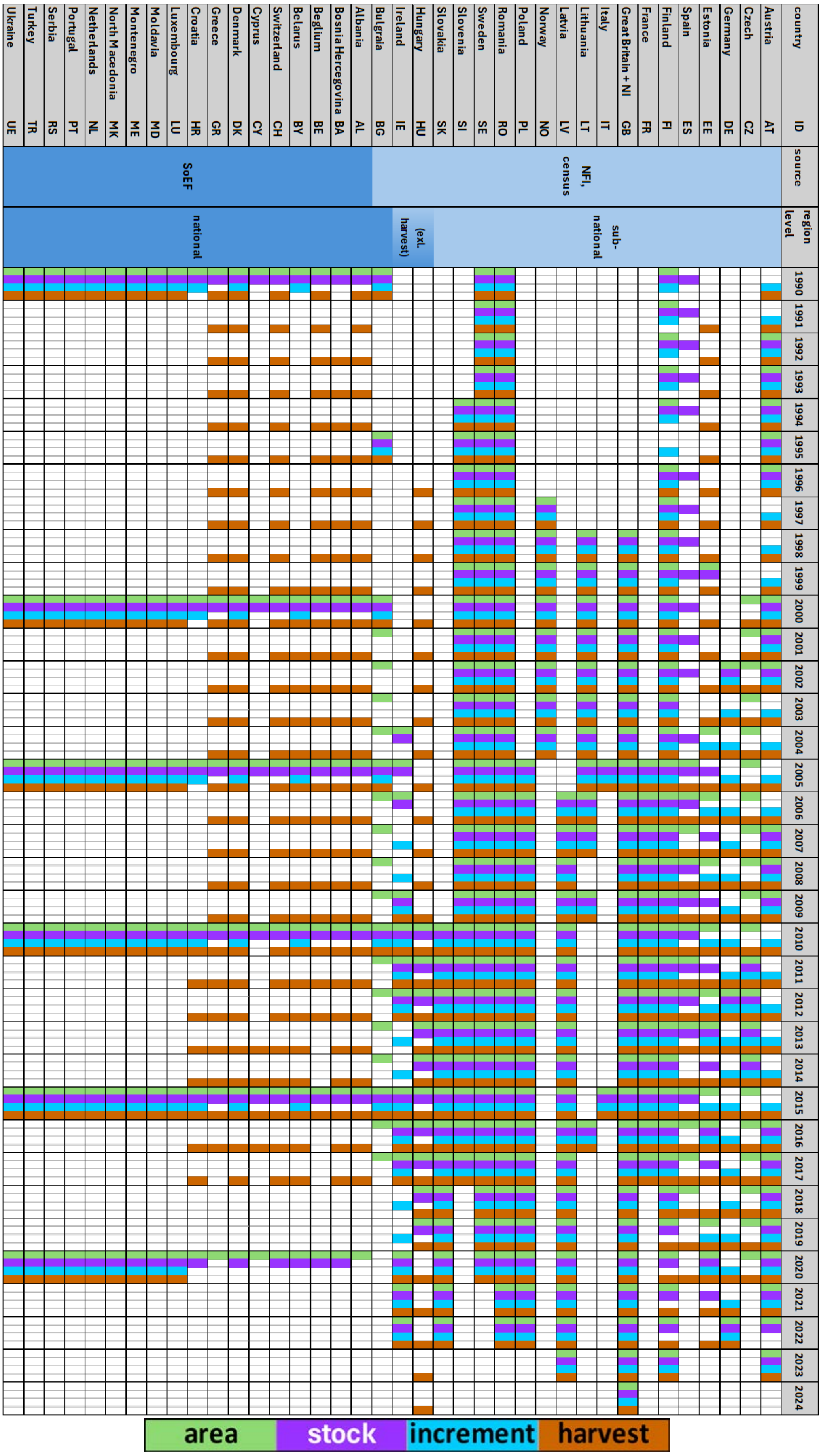

Figure 2: Updated overview of forest indicators (area, stock, increment, harvest) included in EUFo-reported per year for countries where NFIs and census data were collected.

Table 8: Description of keys used in the EUFo-reported database illustrated with an example entry.

key	Description	example
cntry_ID	ISO-2 Country identifier	AT
cntry_group	Is either: EU, EUcandidate, nonEU	
NUTS_ID	NUTS2021 with added NUTS_IDs for country-specific region systems that lie between the original NUTS levels = NUTS+.	AT11
NUTS_level	NUTS+ level: 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5	2
forest_area_orig	Original term/definition for reported forest area	
forest_area_engl	English translation of forest area term/definition from original source	forest area under use
harvest_cat_orig	Original term/definition for reported harvest	
harvest_cat _engl	English translation of forestry harvest term/definition from original source	
indicator	Is either: **area**, **stock**, **increment** or **harvest**	area
species_engl	English translation of reported species type	spruce
species_class	<u>Added species class information:</u> **con:** coniferous tree species **noncon:** non-coniferous tree species **unstocked:** unstocked forest area **unknown:** unknown tree species <u>Added totals within a category/region:</u> **con-total:** sum of con at unique NUTS_ID, year, forest_area, (harvest_cat) **noncon-total:** sum of noncon at unique NUTS_ID, year, forest_area, (harvest_cat) **total-con_ncon:** sum of con-total and noncon-total at unique NUTS_ID, year, forest_area, (harvest_cat) **total-allclass:** sum of con-total, noncon-total, unknown and unstocked.	con
year	Reference year	2000
source	Is either: NFI, census or SoEF.	NFI
unit	1000 ha for area 1000 m3 for stock, increment, harvest	1000ha
value	value entry	20
NUTS0	Functional NUTS+ mapping. It can be used to aggregate from this entry to larger spatial NUTS units. In this case, from NUTS2 to NUTS1 and NUT0.	AT
NUTS0.5		
NUTS1		AT1
NUTS1.5		
NUTS2		AT11
NUTS2.5		
NUTS3		
NUTS3.5		

Updates and changes from version 1:

- Updates:
  - AT: added 2018-2023 data from NFI interim evaluation
  - EE: added full subnational harvest time-series for 1991-2023
  - FI: added NFI13 data for area, stock & increment and harvest data for 2023
  - LV: added 2016-2023 data for area, stock & harvest

- SE: exchanged time-series with a longer one (1990-2020) for area, added 2021 stock data and 2020 harvest data.
- HU: exchanged harvest data (was a categorically incorrect entry), unfortunately, now only at the national level.
- DE: exchanged harvest entries from category "loss" to "timber harvesting", as loss also included natural mortality.

- New subnational data for countries:
  - Norway (NO)
  - Great Britain (GB)

While searching for new data, we found information about new forest data for some countries. However, we were unable to integrate this data because it was not available in an easily accessible machine-readable form, and it would be time-intensive to integrate this data. The information can be used for future work that may update the database (e.g. when data becomes more accessible), after the ForestNavigator project.

Found but not included new data because not readily accessible and/or due to time constraints:

- CZ: NFI 3, as PDF in the Czech language
- ES: yearbooks 2019-2022 available as PDFs in the Spanish language
- FR: new raw data up to 2023
- LT: yearbooks up to 2022, but only at the national level
- PL: NFI4 available in the Polish language
- SI: forest reports 2017-2023 available

Country and indicator-wise information about performed updates and information about found, but not included data, is also shown in the data source overview table in the Annex section 6.1.

3.2. Database of consistent annual forest indicators (EUFo-harmonised): main characteristics and updates

The second subpart of the EUFo database, EUFo-harmonised, presents a stock-flow consistent, annual database for forest carbon stocks in Europe from 2000 to 2023. In this database, consistent definitions of the included forest indicators (area, harvest, biomass stock and the derivative indicator of increment) across all countries (Table 9) are used.

Table 9: Specifications of forest indicators included in the EUFo-harmonised database.

Indicator	Definition	Unit
Forest biomass stock	Biomass of all living trees, including the stump, stem, branches, foliage (aboveground), and roots (belowground)	MtC
Forest biomass increment	Year-to-year difference in biomass stocks plus harvest.	MtC/yr
Forest area	"Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use." (FAO et al., 2024)	Mha
Forest harvest incl. residues	Removed roundwood over bark and harvest/logging residues (above- and belowground, i.e., tree tops, branches, stumps, and roots)	MtC/yr

For consistency, all indicators need to refer to the same spatial unit, which is not always the case in EUFo-reported. The necessary aggregation steps result in 211 individual regions, of which 190 are subnational, and 21 are on the national level. We updated our regional classification system, which was generated from NUTS and country-specific regions (= “NUTS+”), as shown in the Annex in section 6.2.

Harmonisation and gap filling

The EUFo-harmonised dataset aims to present information on forest area, harvest, and biomass stock for the total forest. However, for most countries, values for total forest are not directly included in the EUFo-reported. Instead, countries typically report various sub-categories (such as used and unused forest area, or industrial roundwood and wood fuel for harvest).

In version 1 of the EUFo-harmonised, when no total value was available for a given region, we first aggregated by species and then selected the category closest in definition and/or value to the total forest per indicator. For example, we selected the ‘used’ forest over the ‘unused’ forest area, and industrial roundwood over wood fuel. This approach assumed that the key information lies in the subnational distribution, as any differences in total forest would be resolved in the subsequent harmonisation process, which relies on sources explicitly reporting total forest values. The modification of this approach in version 2 of the EUFo-harmonised database is described next.

Initial aggregation steps

As in version 1, the first step was to calculate the highest possible aggregates from the EUFo-reported database. Coniferous and non-coniferous species were aggregated, and for stock, increment, and harvest, these were summed to create a total species aggregate. For the area, we followed the same procedure but also included other forest areas (e.g. unstocked) to calculate the highest possible forest area aggregate based on the available data.

When the NUTS+ reporting level differed between indicators (area, stock, and harvest) within one country, indicator values were aggregated to the highest common NUTS+ level. For example, if area and stock were reported at NUTS1 but harvest at NUTS2, the harvest data were aggregated to NUTS1. Where values were already present at the higher aggregate level (e.g.: when coniferous totals were available beside coniferous species entries), those entries were used directly.

To improve transparency regarding the initial aggregation steps conducted (i.e. to document which values originate directly from EUFo-reported and which were, for example, aggregated across regions or species) , a ‘calculation flag’ column (flag_calc) was introduced in this version. This column stores sequential flags that represent the calculation steps, with the initial aggregation steps described in Table 10.

Table 10: Calculation flags of initial aggregation steps.

Calculation flag: flag_calc	Description
Original data	Data entered directly from EUFo-reported
species([NUTS_level])	Identifies from which NUTS-level the species aggregate (e.g. coniferous total) was formed
tree_stock([NUTS_level])	Identifies from which NUTS-level the total (e.g. coniferous total + broadleaved total + unstocked) was formed.
regions([NUTS_level])	Identifies from which lower NUTS level this aggregate was formed (e.g. entry is at NUTS1 and was calculated from NUTS2)

Calculation flag: flag_calc	Description
Removals (industrial roundwood (under/over bark), wood fuel (under/over bark))	Indicates that roundwood removals were calculated from industrial roundwood and wood fuel entry when both entries are either under or over bark.

For harvest, we performed country-specific data processing steps to be able to calculate aggregates at the necessary level for further harmonisation processes:

- We included wood fuel harvest estimates for NO and LT from national SoEF data and allocated them according to subnational industrial roundwood removals. A calculation flag "wood_fuel_of_indr_rdwd()" was added to the flag_calc column in this case.
- The total species aggregation in ES was not directly possible, as there are temporal mismatches between subnational harvest reporting, e.g. region A reports in the year 2000 and region B in 2001. We therefore first gap-filled ES harvest estimates before calculating species totals. We used the same interpolation method we used in the harvest harmonisation process (point 2 in "Forest harvest" below) and added calculation flags to the flag_calc column accordingly from Table 12.

Forest harvest

The harmonisation of forestry harvest relied on various sources with varying spatial, temporal, and definitional characteristics (Table 11). After conducting the initial aggregation steps described above, harvest values were selected or calculated that can be categorically compared with data from other sources, referring to 'roundwood removals under bark' at the total species level.

Table 11: Description of data sources for forest harvest.

Source	Spatial unit	Temporal characteristics	Definition: included biomass compartments
EUFo-reported (NFI and national census) with aggregation and data-cleaning	Sub-national/ national	Periodic	Originally varies from "roundwood under bark" to "fellings", but was aggregated/selected to also refer to "roundwood under bark"
SoEF	National	Annually 1988-2017	Roundwood under bark
FAOSTAT	National	Annually 1961-2023	Roundwood under bark

The harmonisation process from version 1 of the EUFo-harmonised database was adapted using the following procedure, which combines different data sources for harvest:

Harvest estimates from EUFo-reported, adjusted using expansion factors:

1. We converted the EUFo-reported data (after the initial aggregation and data cleaning steps) to represent removals under bark, applying national factors for the proportion of bark (derived from the Global Forest Resources Assessment 2000) and factors for harvest losses or residues ("recovery factor") (derived from the ratio of removals to fellings from the SoEF database). Recovery factors were calculated directly from NFIs for CZ, HU, and SE.

2. We linearly interpolated between NFI or census harvest data points and kept values constant at an average of the nearest available three years before the first and after the last data point to arrive at an annual timeseries.

Harvest estimate from interpolated EUFo-reported, adjusted using national SoEF and subnational harvest shares:

3. We used the relative annual development of the FAOSTAT harvest to (i.) extend the SoEF time series beyond 2017 to 2023 (2023 was added in this update) (ii.) gap-fill when no SoEF value existed. If neither SoEF nor FAOSTAT harvest data were available, we filled the gaps by linear interpolation and extended the time series backward by holding values constant, using the average of the three years closest to the first available data point. We also corrected harvest data in Bosnia and Herzegovina (BA) for the years 1992-1996 from (the very implausible value) 40 to 4000 to match with harvest levels of later years, as we assume that this is a decimal point error in SoEF.
4. We used the full time series of NFI and census data from step 2. to calculate subnational harvest shares. Then, we applied these shares to the gap-filled national SoEF harvest levels to derive subnational harvest levels.

EUFo-harmonised harvest estimate:

5. We calculated the annual average between the harvest (referring to roundwood under bark) time series derived in step 2 (NFI/census-based) and step 4 (SoEF-based).
6. Finally, using the same set of recovery factors as in point 1 and conversion factors (IPCC, 2003) to convert harvest volume into biomass dry matter and applying a carbon factor of 0.5, the total forest harvest of above and belowground (estimated based on expansion factors) biomass carbon, including harvest losses [MtC/yr] was calculated.

For the calculations described above, calculation flags were added to the flag_calc column in the database as described in Table 12.

Table 12: Calculation flags of forest harvest harmonisation and gap filling.

Calculation flag - flag_calc	Description
inter([year0]-[year1])	Indicates the years from which the interpolation was performed. E.g. for an entry with year =2010 it could be: year0=2008, year1=2012
extra([yearN])	Indicates the value has been kept constant from yearN
harm(SoEF)	Indicates that harvest is harmonised by averaging of EUFo-reported (with expansion factors) and SoEF-derived estimates.

At the EU-27 (excl. Malta) (“EU-26”) level, we achieved good alignments between the SoEF, the adapted EUFo-reported values (i.e. application of expansion factors to arrive at removals under bark), as well as the harvest estimate from EUFo-harmonised, shown in Figure 3. However, looking at the country level we find that discrepancies between the various sources can be quite large. As an example, we included a harvest level comparison for Germany in Figure 4. The alignment of harvest levels at the EU-26 levels shows that there is no systematic bias of EU-harmonised values, but rather an offset between higher and lower estimates compared to SoEF, as it is the case in Germany.

The newly introduced flags allow us to distinguish between interpolated values, original input years, and applied harmonisation procedures (see Figure 4), providing additional information on possible sources of uncertainty.
This information on the discrepancy between sources gives valuable insights into uncertainties associated with harvest reports. We have included comparison figures for all 38 countries of the EUFo database in the Annex section 6.3.

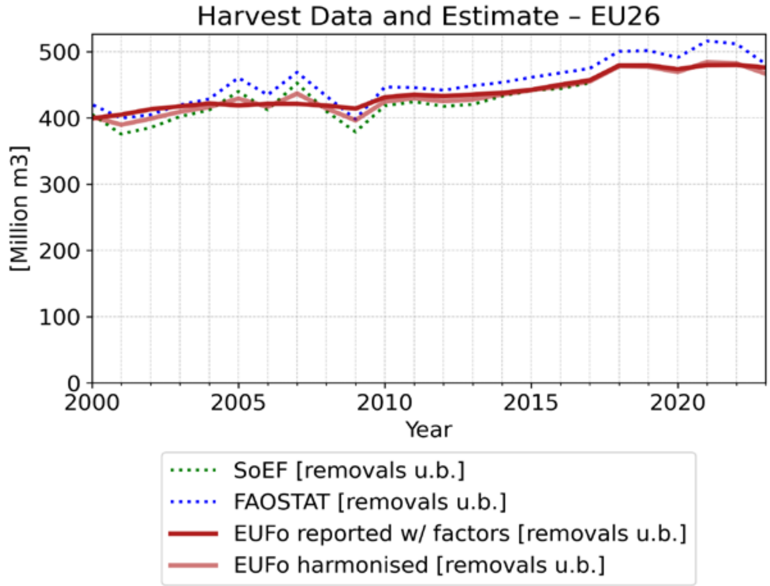

Figure 3: Comparison of harvest data (as removals under bark) between national reporting (SoEF, FAOSTAT) with derived roundwood under bark values from EUFo-reported and the harvest estimate from EUFo-harmonised for EU-27 excl. Malta.

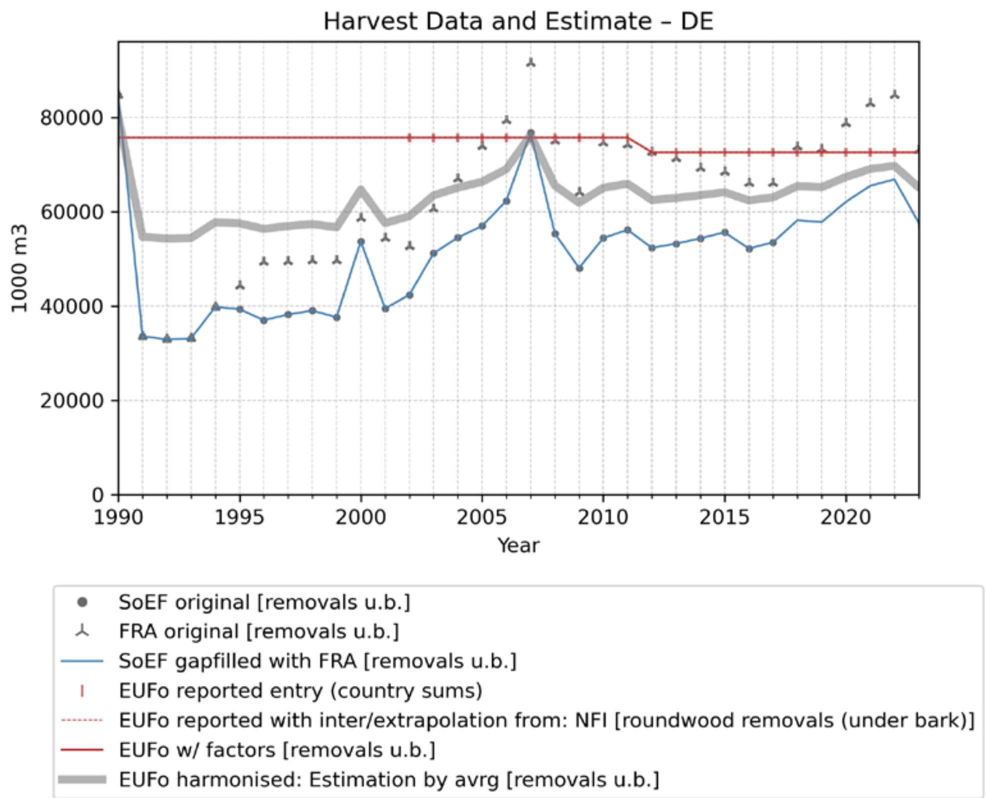

Figure 4: Comparison and adaptation of different sources of harvest data for Germany.

Figure 5 shows harvest estimates at the subnational level for Germany as an example of the EUFo-harmonised harvest estimates.

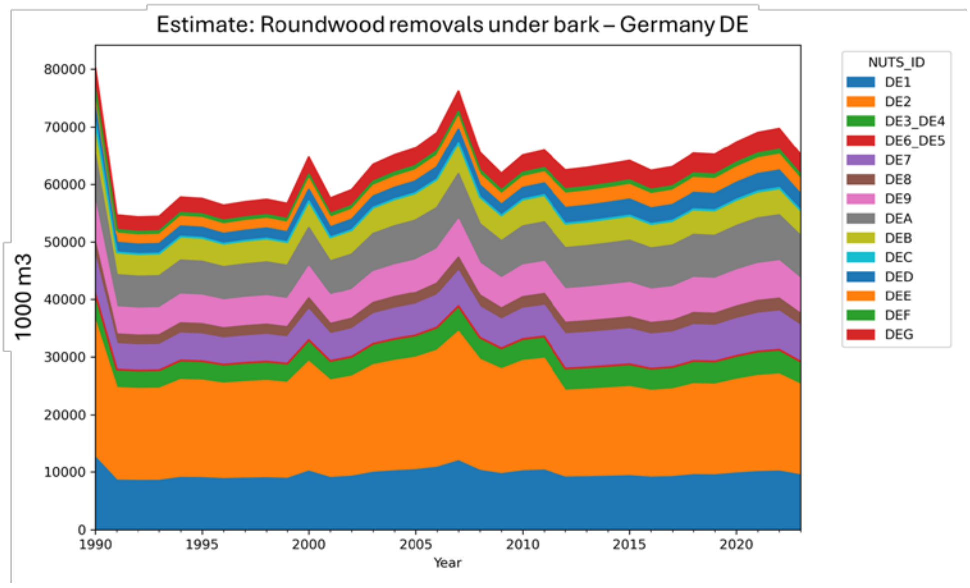

Figure 5: EUFo-harmonised harvest estimates, in 1000m3 roundwood removals under bark, by subnational regions at NUTS1 in Germany.

Forest area

For the cross-country harmonisation of forest area, the definitions applied in Avitabile et al. (2024) were followed. The dataset presented by Avitabile et al. (2024), hereafter called 'JRC dataset', resulted from a collaboration of several European NFIs to produce harmonised data across Europe using a common definition for forest area, biomass stocks, and increment. It includes sub-national data for at least one NFI period between 1997 and 2015 and then uses an empirical forest model (Carbon Budget Model) to calculate biomass densities in 2020. These data points are highly relevant for our harmonisation effort as they allow us to derive adjustment factors between the data collected in EUFo-reported and the harmonised values supplied in the JRC dataset.

In version 1 (D2.2) we calculated harmonisation factors for forest area by comparing values from EUFo-reported with the best categorical match in the JRC dataset (e.g. "used forest" from NFI with "Forest Available for Wood Supply" from JRC). In this updated version, we improved consistency between definitions by using the highest calculated/available aggregate instead and calculated harmonisation factors by comparing with the total forest area from the JRC dataset. While this update reduced the divergence between the two dataset slightly, we still find high harmonisation factors for countries where we did not have complete forest area information in the EUFo-reported (this is especially visible in Scandinavia, where unused forest areas are large and only used areas are reported); and small harmonisation factors, especially for AT, DE, CH and PT, indicating that these countries have a more inclusive forest area definition in their reporting than the one adapted for the JRC dataset. It should be noted, however, that the harmonisation factors shown in Figure 6 should not be seen as a direct comparison of NFI/census data with JRC values. Rather, it shows the definitional differences as forest area categories often don't match up (as discussed in D2.2). For countries included in EUFo but not in the JRC dataset (AL, BA, BY, CY, LU, MD, ME, MK, TR, GB, UA) SoEF values were used.

We also revised the spatial and temporal match-up between data pofints from EUFo and the JRC dataset. For the spatial match we were able to match subnational regions for the countries FI, ES, LT, LV, NO and EE, which were previously only matched nationally, resulting in a total of 179 matched regions (85% of the total 211 regions in EUFo-harmonised). The temporal match-up was also improved by matching JRC data with the gap-filled EUFo-reported values (described below) rather than the closest reported year.

The area data from EUFo-reported was gap-filled by linear interpolation between available data points and by keeping values constant before the first and after the last data point to arrive at an annual time series of total forest area.

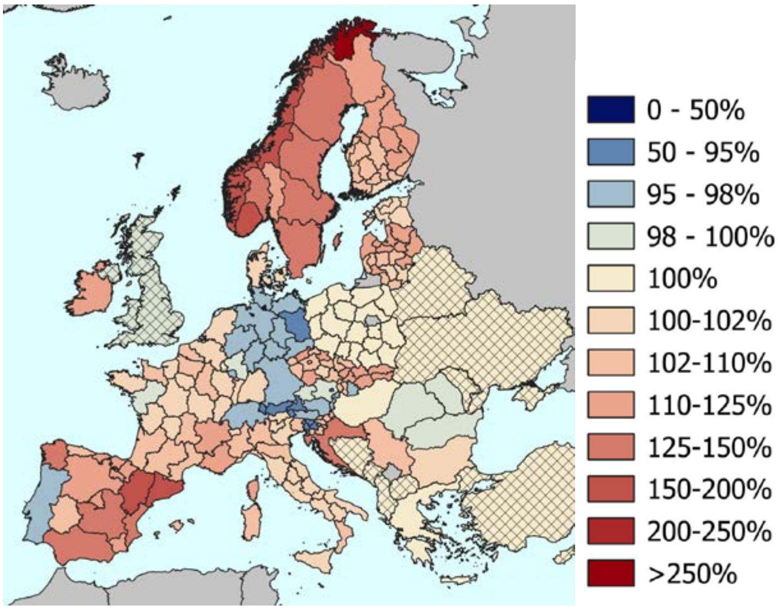

Figure 6: Area harmonisation factors calculated by division of total forest area from Avitabile et al. (2024) and highest aggregate of forest area from EUFo-reported: blue = EUFo is higher, red = Avitabile is higher. Hashed lines indicated the use of SoEF values

For the calculations described above, calculation flags were added to the flag_calc column in the database as described in Table 13.

Table 13: Calculation flags of forest area harmonisation and gap filling.

Calculation flag - flag_calc	Description
inter([year0]-[year1])	Identifies the years from which the interpolation was performed. E.g. for an entry for year =2010 it could be: year0=2008, year1=2012
extra([yearN])	Indicates that the value has been kept constant from yearN.
harm(JRC/SoEF)	Identifies the source (Avitabile et al., 2024 or SoEF) used for the harmonisation.

Forest biomass stock

In our previous version, we calculated aboveground biomass (AGB) carbon from growing stock volumes from the EUFo-reported database using the same expansion and conversion factors as were used for harvest. Region-specific harmonisation factors were derived from a comparison of those calculated ABG values with the AGB values from the JRC dataset, based on the closest temporal match, as these factors were not given in Avitabile et al. (2024). These factors were then applied to all reported data points for growing stock. We updated this procedure and now use general country-specific growing stock volume correction factors (to get from country-specific growing stock volume definitions that can include different woody biomass components to derive pure stem volumes) and biomass expansion and conversion factors (BCEFs) applied to the corrected growing stock to derive at total forest AGB, both factor sets presented in Pilli et al. (2024). This avoids the problem of temporal mismatches, which biased the results of the previous procedure. A comparison of data from various sources for growing stocks and ABG is presented in the Annex (sections 6.4 and 6.5).

Reconstructing annual biomass stocks with CRAFT

The CaRbon Accumulation in ForesT (CRAFT) model (Le Noë et al., 2021, 2020) was used to reconstruct the annual development of carbon stocks and flows in forest ecosystems. It establishes place and time-specific relationships between biomass C stocks and Net Primary Production (NPP). Required input data are annual forest area and harvest plus factors on other losses (e.g. mortality, fire), as well as some data points on forest biomass within the modelling period for calibration (see D2.2 for details).

Although the EUFo-harmonised database consists of data from 2000 to 2023, we extended the modelling time frame back to 1990, using the period 1990 to 2000 as a spin-up for calibrating the growth parameters. We also adapted the constraints for modelling the biomass density development before the first and last datapoint derived from EUFo-reported: the annual change in biomass density for these periods is now constrained to two times the annual change between the first and last datapoint, creating conservative estimates of biomass dynamics. The updated results are shown in Figure 7.

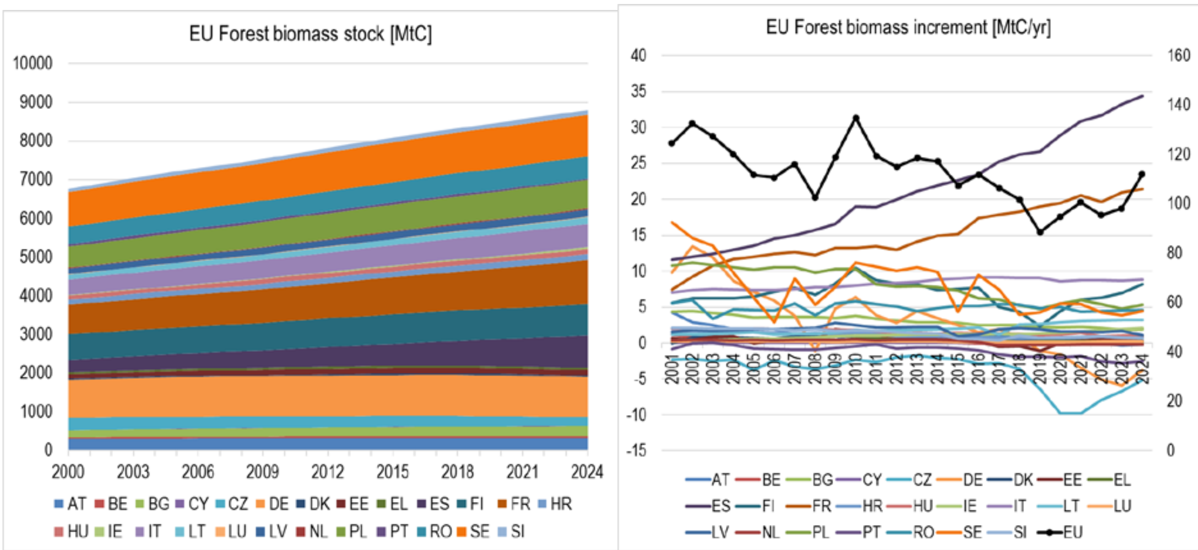

Figure 7: Forest biomass stocks (left) and annual increment (right) for the EU.

4. Discussion and Outlook

The focus of WP2 has been on compiling "available" data. The "forest4model" datacube versions 1 and 2 presented here include the currently curated existing and published Earth Observation data sets describing the state of European forests. For this, the available data sets were harmonised to the same spatial resolution, projection and data set extent. The datacube is made progressively available to ForestNavigator project partners and stakeholders via the ForestNavigator data portal and via the ForestNavigator WP2 public Git repository.

We describe the validation and uncertainties of the individual input data sets; however, a full validation and error propagation of the datacube was not possible, as spatially explicit uncertainty layers are not available for all data layers, which is a limitation.

Copernicus, as the Earth Observation component of the European Union, provides important datasets with the Copernicus Land Monitoring Service and the Sentinel satellites. We integrated their high-resolution forest type product in the datacube v1. Additionally, Sentinel-2 data is the foundation of the forest timber volume product which is integrated in the datacube v2. While in the past, Landsat data was used extensively, we see that with the ongoing availability and the ever-increasing Sentinel data time series, more data products relying on Sentinel data are being prepared. One example is the RADD Forest Disturbance Alert system for Europe, which is a Sentinel-1-based near-real-time disturbance mapping product (concept Reiche et al. 2021).

We anticipate more forest-related EO products to be available for update of this datacube. A new forest species map and a forest structure product (Foliage Height Density), both available for 2020, are already prepared by partner projects, but the data sets are still under embargo and not publicly available yet.

The EUFo database compiles currently available reports on forest area, harvest, biomass stocks and increment at the subnational level for the timeframe 1990-2023 (EUFo-reported). Taking into account the various inconsistencies between data sources it also contains the EUFo-harmonised dataset, which presents one approach for reconciling the various data sources to create a stock-flow consistent, annual time series of forest dynamics for the period 2000-2023. Other data sources or harmonisation approaches can and should, in the future, be integrated to better understand uncertainties. The EUFo-database will be published in a scientific journal and will then be made openly available.

Next steps include the integration of the Earth Observation data and NFI data for more timely and qualitative Greenhouse Gas reporting (D2.4). For this, we focus on three country case studies, namely Ireland, Italy and Czechia.

Additionally, the datacube and EUFo data have been and will be taken up by other projects and initiatives. The datacube version 1 was the foundation for an Application for European forest monitoring, which was developed by the World Resources Institute (WRI, 2025). The app (https://landandcarbon.projects.earthengine.app/view/european-forests) showcases the datacube layers to highlight the state of European forests at different NUTS levels and blends data layers for meaningful monitoring of results. Furthermore, the project FORWARDS develops a comprehensive observatory for the resilience of European forests (FORWARDS, 2025). The datacube v1 and v2 will be part of the observatory to represent Earth Observation data.

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6. Annex

6.1. EUFo-reported: overview of data entries and sources

Table 14: Overview of data entries, including sources, performed updates for version 2 of EUFo-reported and available but not included data.

ID	indicators	source type	authorities responsible for original data	name of original dataset	link to original data	accessed	v2 update	availabvle but not included
AT	area, stock, increment, harvest	NFIs 2-4	Bundes Forschungs Zentrum für Wald (BFW)	Waldinventur	https://www.waldinventur.at/	23.08.2023	2018-2023 Zwischenauswertung	
BG	area, stock, increment, harvest	census *	Executive Forest Agency (EFA)	Sredni_pokazateli_do_2015	http://www.iag.bg/data/docs/Sredni_pokazateli_do_2015.doc	23.08.2023		
CZ	area	NFIs 1&2, census	Forest Management Institute (FMI), Ministry of Agriculture of the Czech Republic	Národní inventarizace lesů, český statistický úřad	https://nil.uhul.cz/en/, https://csu.gov.cz/home	03.08.2023		NFI 3, only as PDF in czech language
	stock, increment	NFI 2	Forest Management Institute (FMI)	Národní inventarizace lesů	https://nil.uhul.cz/en/	03.08.2023		NFI 3, only as PDF in czech language
	harvest	NFI2, census	Forest Management Institute (FMI), Ministry of Agriculture of the Czech Republic	Národní inventarizace lesů, český statistický úřad	https://nil.uhul.cz/en/, https://csu.gov.cz/home	03.08.2023		NFI 3, only as PDF in czech language
DE	area, stock, increment, harvest	NFIs 3&4	Thünen-Institut	Bundeswaldinventur	https://bwi.info/	20.11.2024	exchanged harvest data set from "loss" to "timber harvest"	
EE	area, stock, increment	census (based on NFIs)	Statistics Estonia	Environment / Natural resources and their use/Forest resources	https://andmed.stat.ee/en	24.07.2024		
	harvest	census (based on NFIs)	Statistics Estonia	Economy / Forestry	https://andmed.stat.ee/en	24.07.2024	census harvest data added that has a full time-series from 1991-2023 at subnational level, aligns to NFI harvest data	
ES	area, stock	NFIs 3&4	Ministerio para la Transición Ecológica y el Reto Demográfico	Inventario Forestal Nacional	https://www.miteco.gob.es/en/biodiversidad/temas/inventarios-nacionales/inventario-forestal-nacional.html	29.08.2023		yearbooks 2019-2022 available, but data extraction hard, as in spanish
	harvest	census	Ministerio para la Transición Ecológica y el Reto Demográfico	Anuarios de Estadística Forestal	https://www.miteco.gob.es/es/biodiversidad/estadisticas/forestal_anuarios_todos.html	29.08.2023		yearbooks 2019-2022 availabls in spanish

FI	area, stock, increment	NFIs 9-12 & intermediate to 13	Luke - Natural Resources Institute Finland	Forest statistics / Forest resources	https://www.luke.fi/en/statistics	04.07.2023	NFI 13	
	harvest	census	Luke - Natural Resources Institute Finland	Forest statistics / Structure and production	https://www.luke.fi/en/statistics	04.07.2023	added 2023	
FR	area, stock, increment, harvest	NFIs 2005-2009, 2009-2014 & 2013-2017	Institut national de l'information géographique et forestière	IGN – Inventaire forestier	https://inventaire-forestier.ign.fr/dataifn/?lang=en	28.03.2023		new raw data till 2023
GB	area, harvest	NFI	Forest Research (FR), Forestry Commission (FC)	Time Series, Woodland area	https://www.forestresearch.gov.uk/	03.04.2025	new entry	
	stock	NFI*	Forest Research (FR), Forestry Commission (FC) & FAO	Forest Statistics 2017 & FRA 2015 for UK and N. Ireland	https://www.forestresearch.gov.uk/, https://cdn.forestresearch.gov.uk/2022/03/fra2015ukfinaldraft.pdf	13.04.2023	new entry	
HU	area, stock	NFIs* 1&2	NFK Forestry Department	Hungarian NFI-1/ NFI-2 Results tables	https://portal.nebih.gov.hu/	20.09.2023		
	harvest	census	Hungarien Ministry of Agriculture	Environment, public utilities	https://www.ksh.hu/stadat_files/kor/en/kor0006.html	31.07.2025	exchanged harvest data, now only at national level	
IE	area, stock, increment, harvest	NFIs 1, 2, 3*, 4	Department of Agriculture, Food and the Marine	Ireland's National Forest Inventory	https://www.gov.ie/en/publication/823b8-irelands-national-forest-inventory/	22.08.2023		
IT	area, stock, increment, harvest	NFIs 2 & 3	Inventario Nazionale delle Foreste e dei serbatoi forestali di Carbonio – INFC	Inventario forestale nazionale italioano	https://www.inventarioforestale.org/en/	23.08.2023		
LT	area, stock, increment, harvest	NFIs* 1 & 2, census *	Valstybinė miškų tarnyba	Lithuanian National Forest Inventory, Lithuanian Statistical Yearbook of Forestry	https://amvmt.lrv.lt/lt/	08.08.2024		annual forest statistic yearbooks available till 2022 at national level. Sometimes also for "state forest enterprise", aggragation mabye possible but tedious.
NO	area, stock, increment, harvest	census	Statistics Norway	The National Forest Inventory	https://www.ssb.no	03.04.2025	new entry	
LV	area, stock, harvest	census (based on NFIs 1-3)*	Latvijas Valsts mežzinātnes institūts "Silava"	I, II un III cikla kopsavilkumi pa tekošajām piecgadēm (2018. gads) / Summaries of cycles I, II and III running 5 years (2018)	https://www.silava.lv/	13.04.2023	added subnational data for 2016-2023	

PL	area, stock, increment, harvest	NFIs 1-3 & intermediate to 4	Biuro Urządzania Lasu i Geodezji Leśnej	Wielkoobszarowa Inwentaryzacja Stanu Lasów	https://www.bdl.lasy.gov.pl/portal/wisl-en	17.10.2023		fourth NFI 2019-2023 available as pdf in Polish
RO	area	NFIs 1&2, census *	Centrala Institutului Național de Cercetare-Dezvoltare în Silvicultură (INCDS), Institutul Național de Statistică	Inventarul forestier național (IFN), TEMPO_AGR	https://roifn.ro/site/, https://insse.ro/cms/en/search/node/Statistica%20activit%C4%83%C5%A3ilor%20din%20silvicultur%C4%83	13.04.2023		
	stock, increment	NFIs 1&2	Centrala Institutului Național de Cercetare-Dezvoltare în Silvicultură (INCDS)	Inventarul forestier național (IFN)	https://roifn.ro/site/	13.07.2023		
	harvest	census *	Institutul Național de Statistică	TEMPO_AGR	https://insse.ro/cms/en/search/node/Statistica%20activit%C4%83%C5%A3ilor%20din%20silvicultur%C4%83	13.04.2023		
SE	area	NFI annually 2000-2016	Riksskogstaxeringen, SLU	Riksskogstaxeringen Officiell statistik om de svenska skogarna	https://skogsstatistik.slu.se/pxweb/en/OffStat/	23.08.2023	exchange of time series to one that includes data from 1990-2020	
	stock	NFI annually 2005-2020	Riksskogstaxeringen, SLU	Riksskogstaxeringen Officiell statistik om de svenska skogarna	https://skogsstatistik.slu.se/pxweb/en/OffStat/	23.08.2023	added 2021	
	increment	NFI annually 2000-2016	Riksskogstaxeringen, SLU	Riksskogstaxeringen Officiell statistik om de svenska skogarna	https://skogsstatistik.slu.se/pxweb/en/OffStat/	23.08.2023		other time series available that begins 2002 and has data till 2018. Current time series has full coverage from 1990-2016.
	harvest	NFI annually 2000-2022	Riksskogstaxeringen, SLU	Riksskogstaxeringen Officiell statistik om de svenska skogarna	https://skogsstatistik.slu.se/pxweb/en/OffStat/	23.08.2023	added 2020 subnational	
SI	area, stock, increment, harvest	NFIs* annually 2004-2017 (without 2010), census *	Zavod za gozdove Slovenije, Republic of Slovenia Statistical Office (SiStat)	Annual Report of the Slovenian Forest Service, Environment/Environmental accounts/ Forest accounts	http://www.zgs.si/zavod/publikacije/letna_porocila/index.html, https://pxweb.stat.si/SiStat/sl	13.04.2023		2017-2023 annual forest reports online.
SK	area, stock, harvest	census	Národné lesnicke centrum (NLCSK)	Údaje o lesnom hospodárstve	https://gis.nlcsk.org/ibulh/	24.07.2024	added 2023 for area	

* data comes from Forest Information System for Europe (FISE) Data catalogue https://datacatalogue-fise.eea.europa.eu/

6.2. Updated NUTS+ region classification

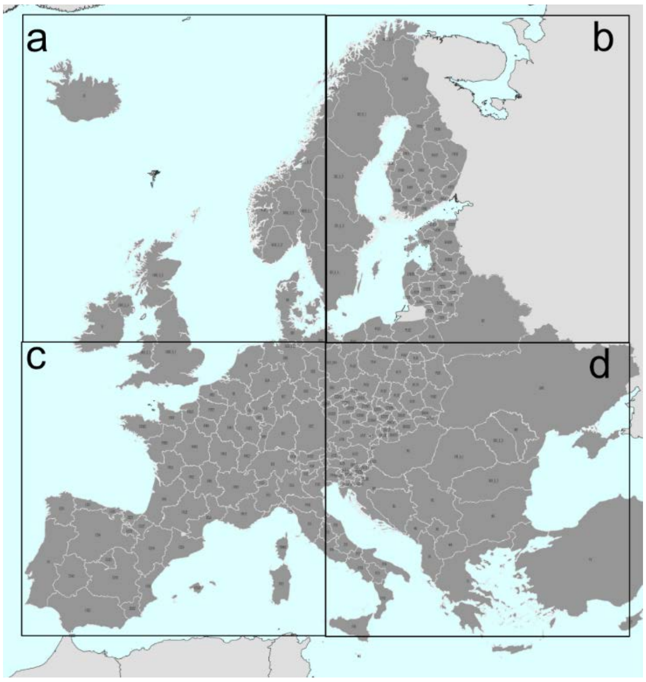


Figure 8: EUFo region classification from NUTS+ showing cutouts.

Figure 9: EUFo region classification from NUTS+, cutout a.

Figure 10: EUFo region classification from NUTS+, cutout b.

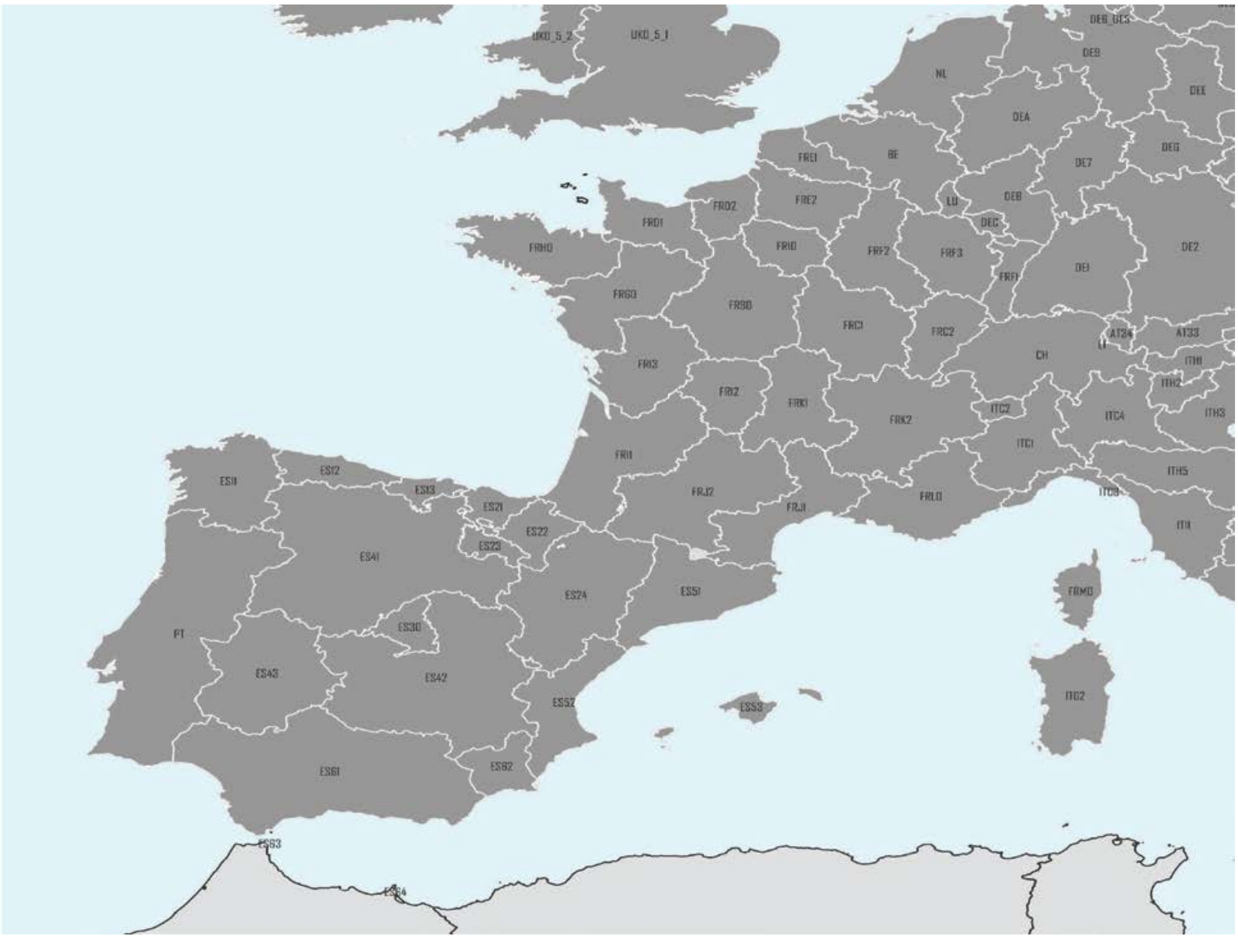


Figure 11: EUFo region classification from NUTS+, cutout c.

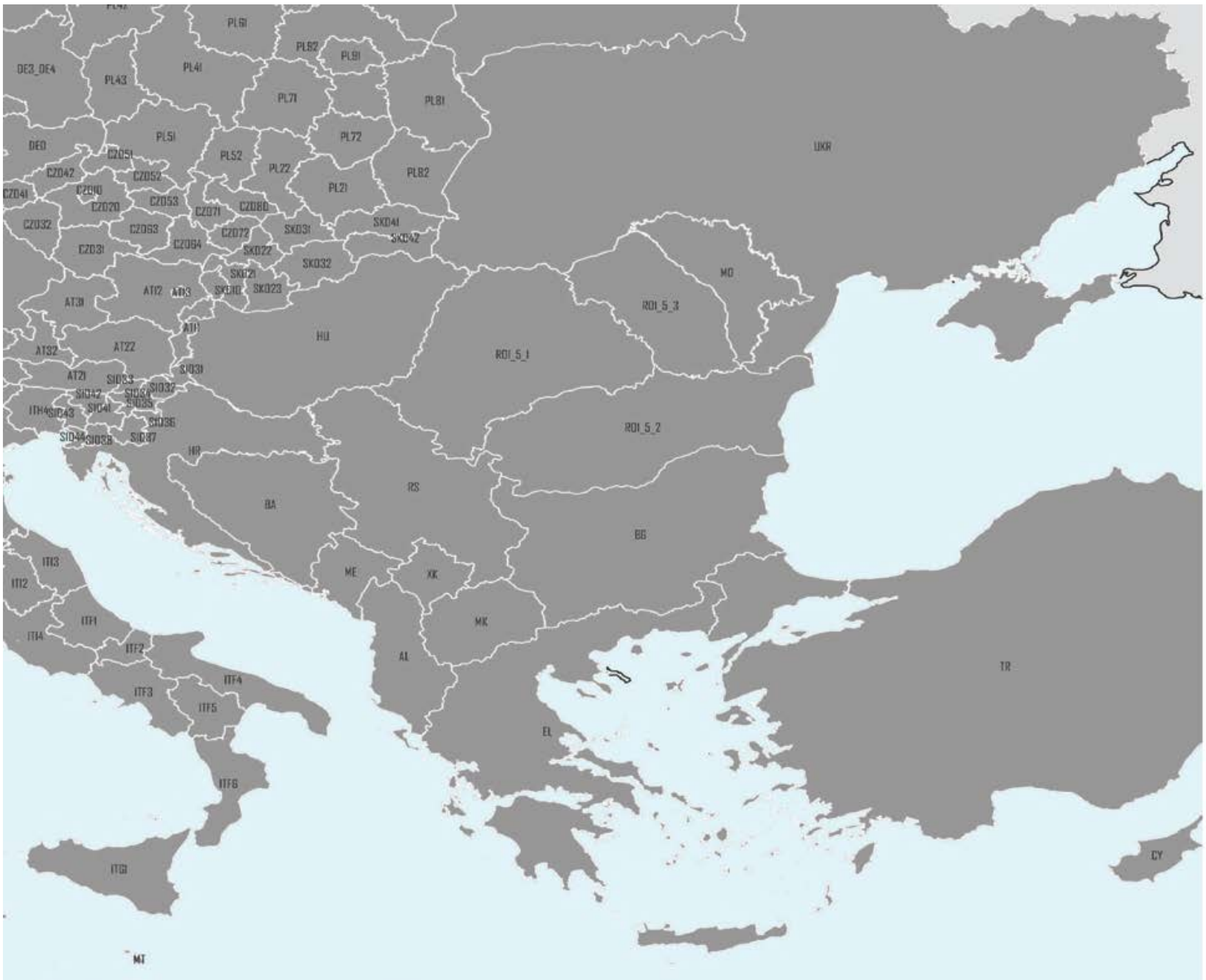
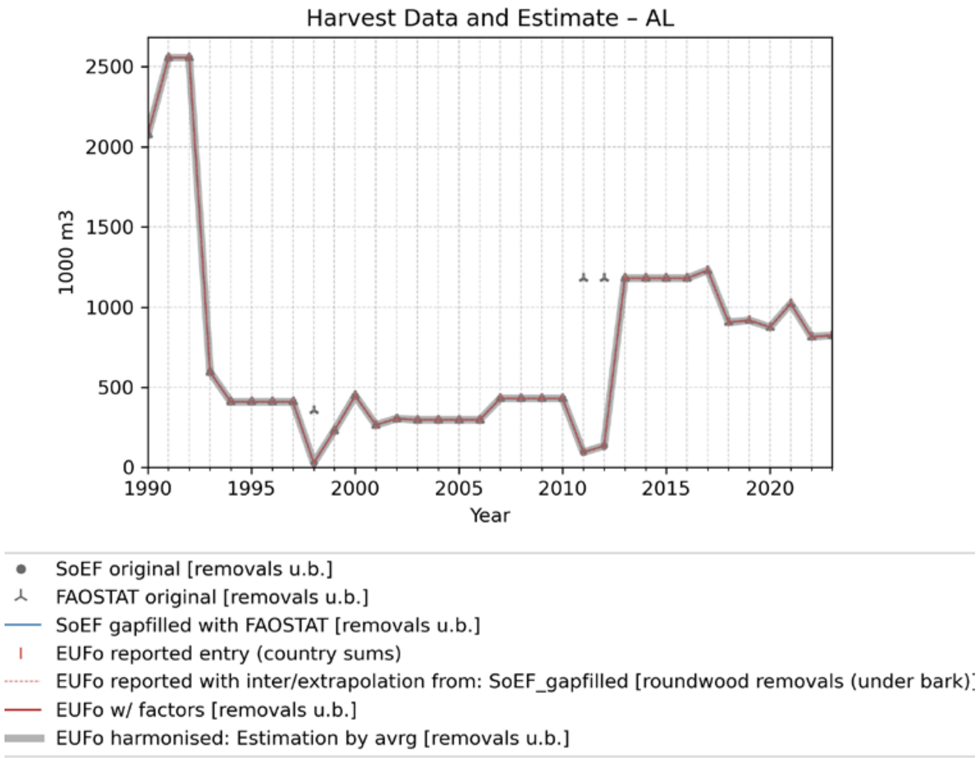
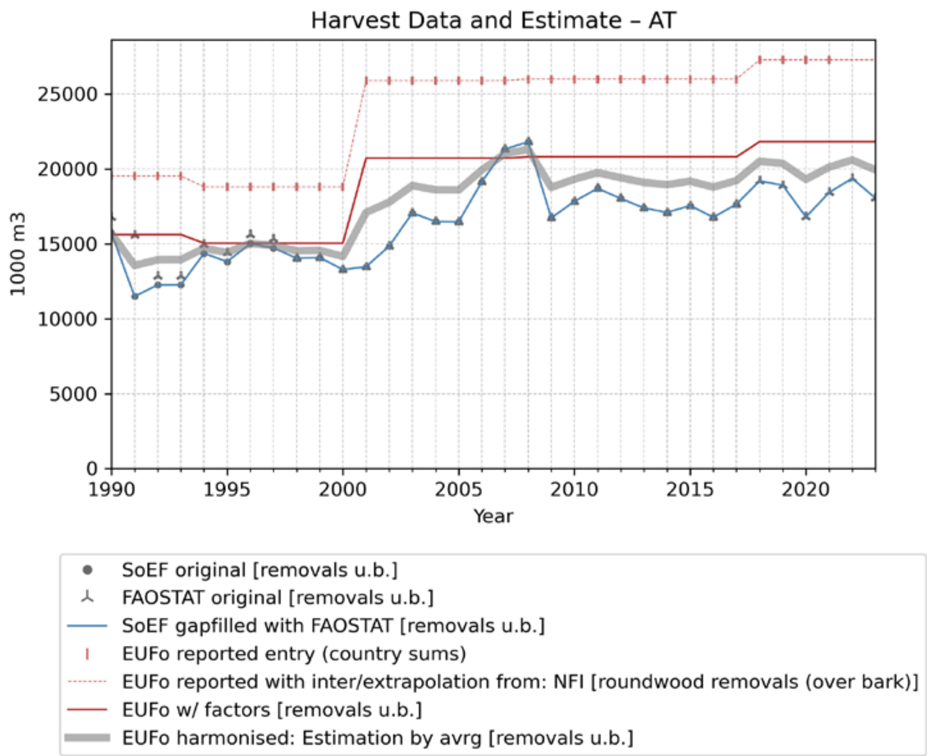
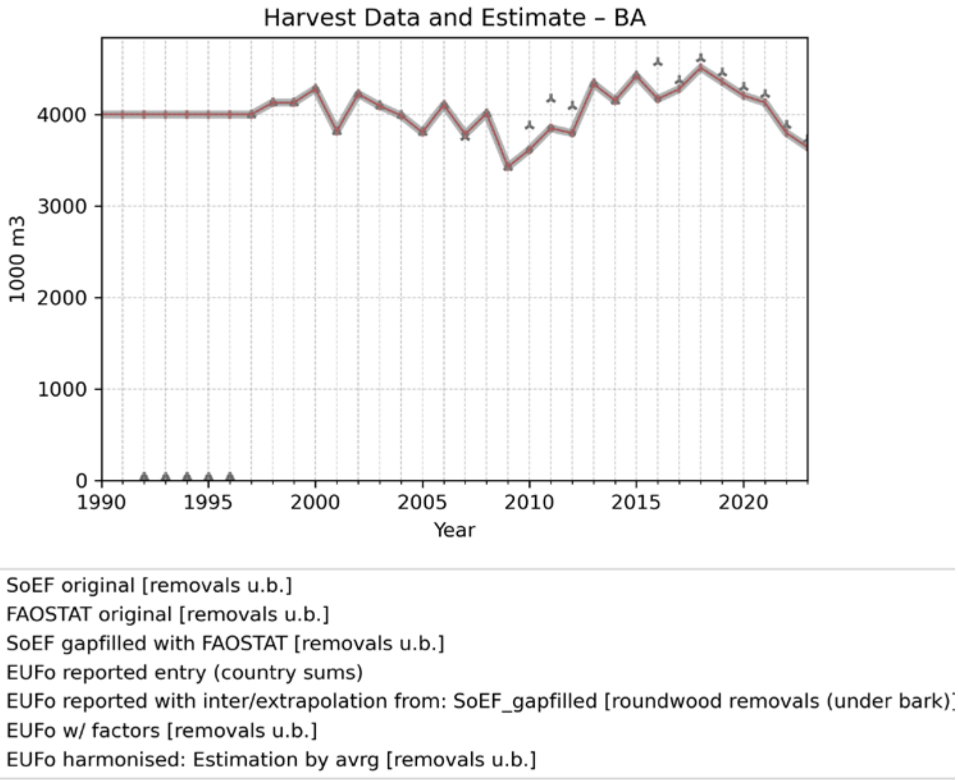


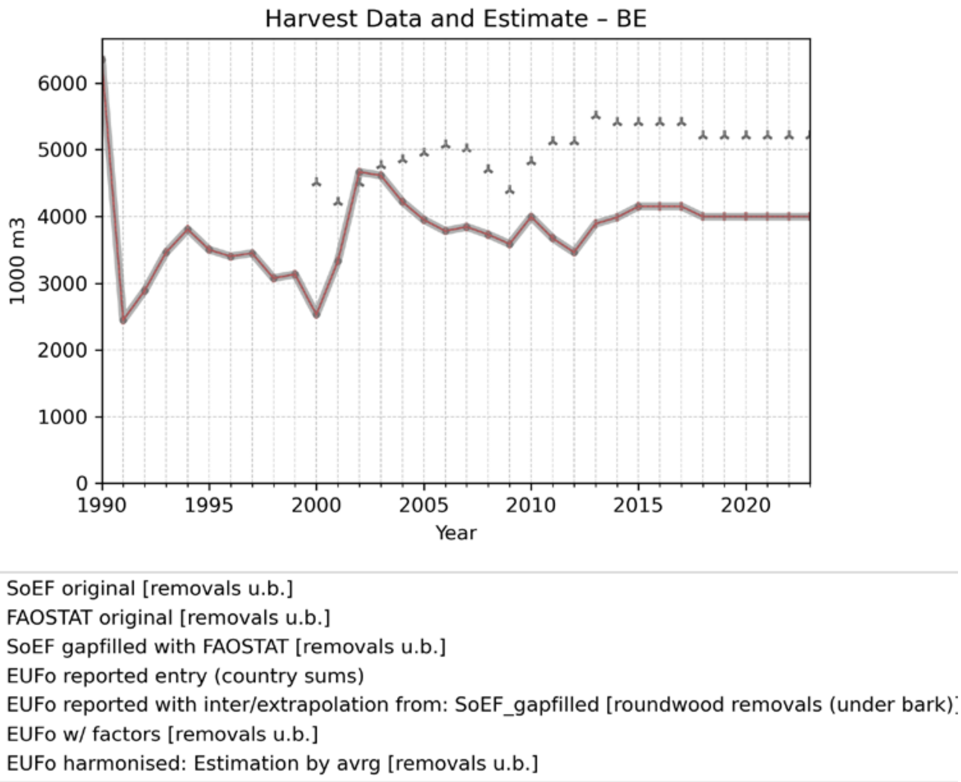
Figure 12: EUFo region classification from NUTS+, cutout d.

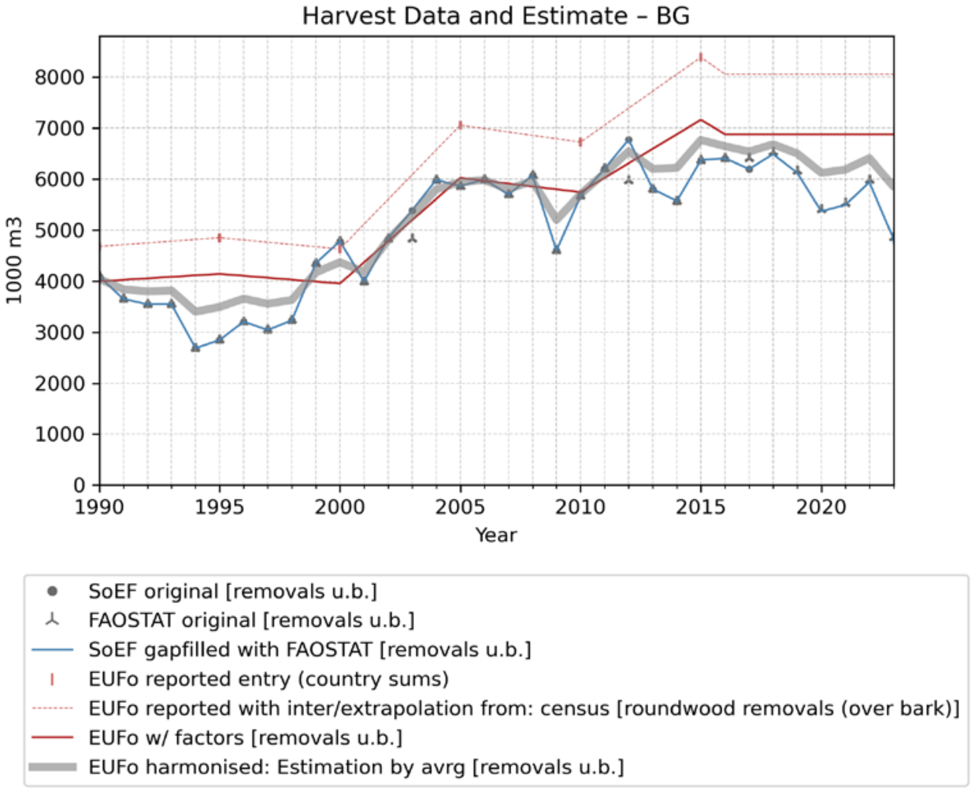
6.3. Comparison of forest harvest data sources between SoEF, FRA, and EUFo ordered by two digit country code

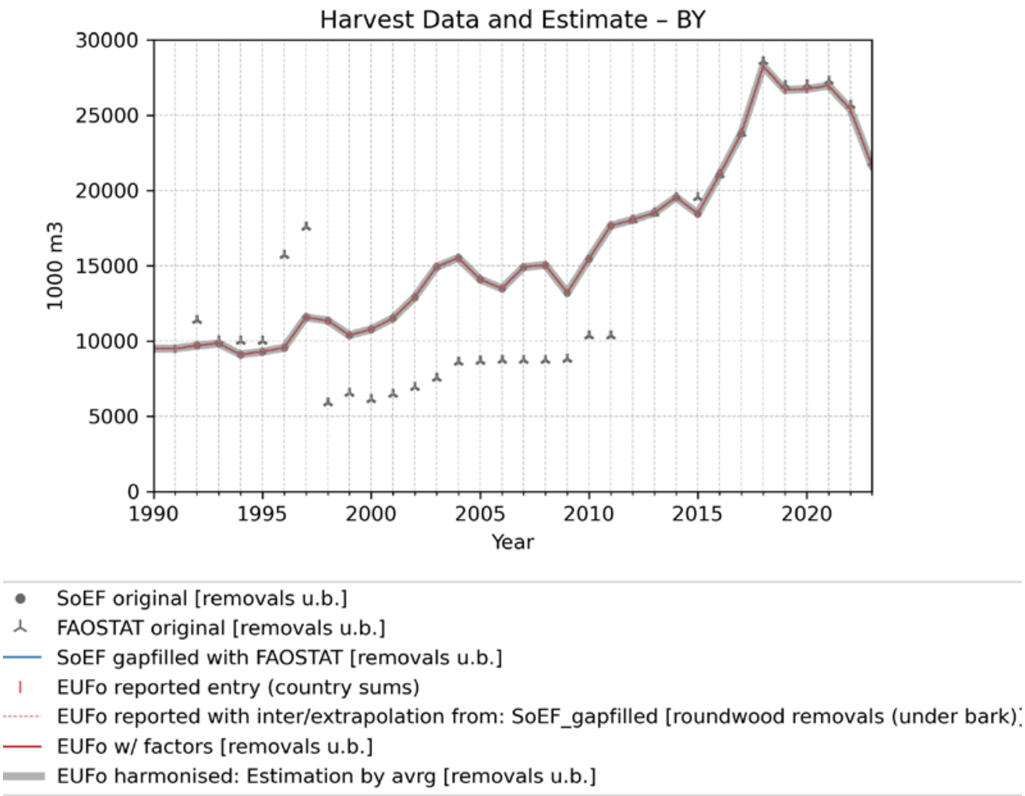


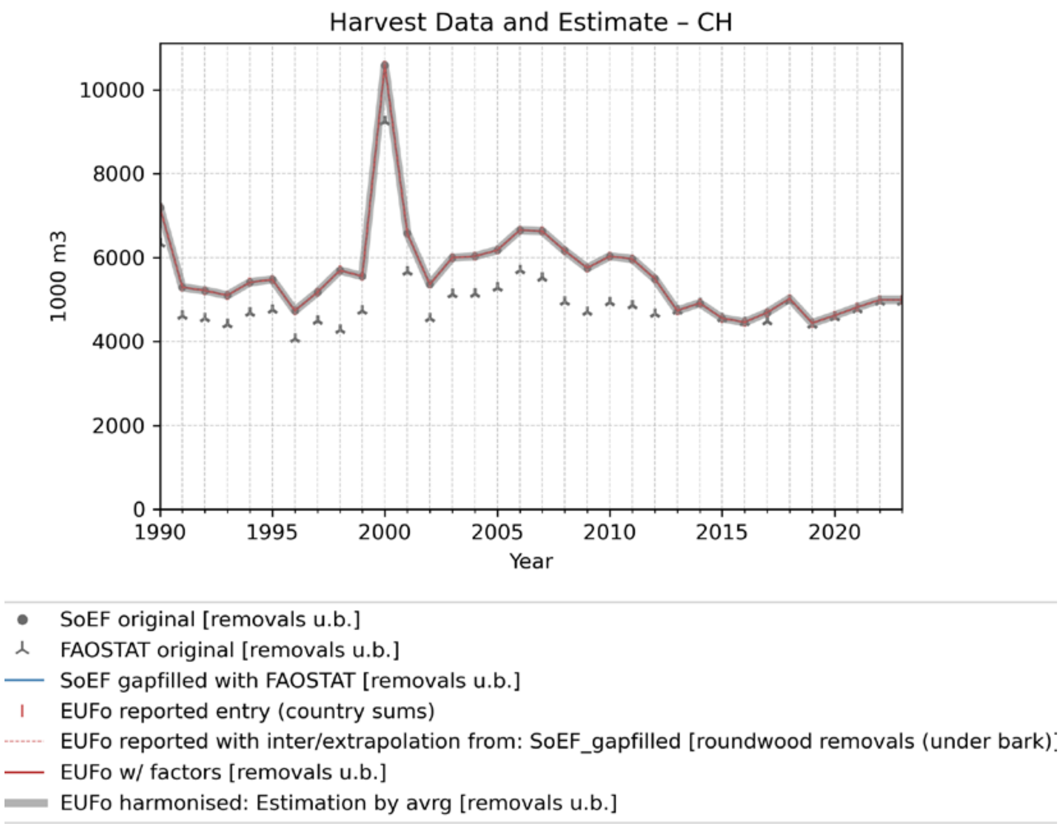


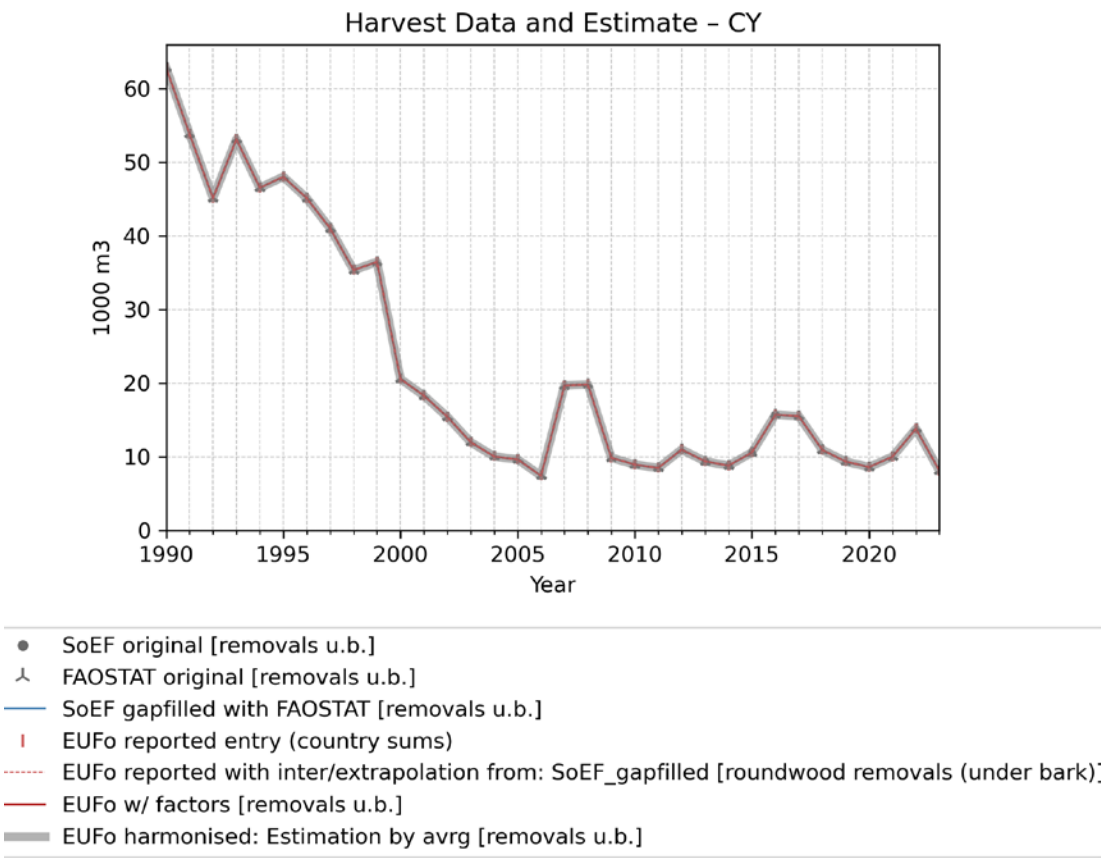

Harvest Data and Estimate – BA
1000 m3
0
1000
2000
3000
4000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

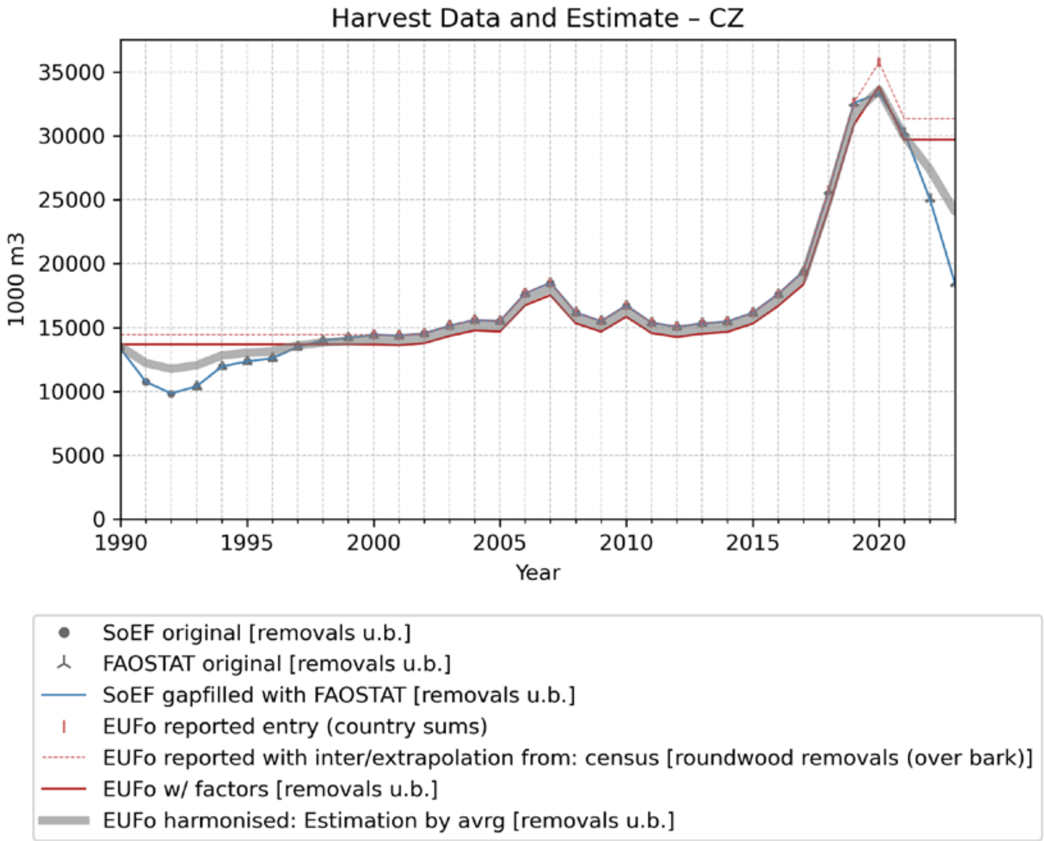

Harvest Data and Estimate – BE
1000 m3
0
1000
2000
3000
4000
5000
6000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

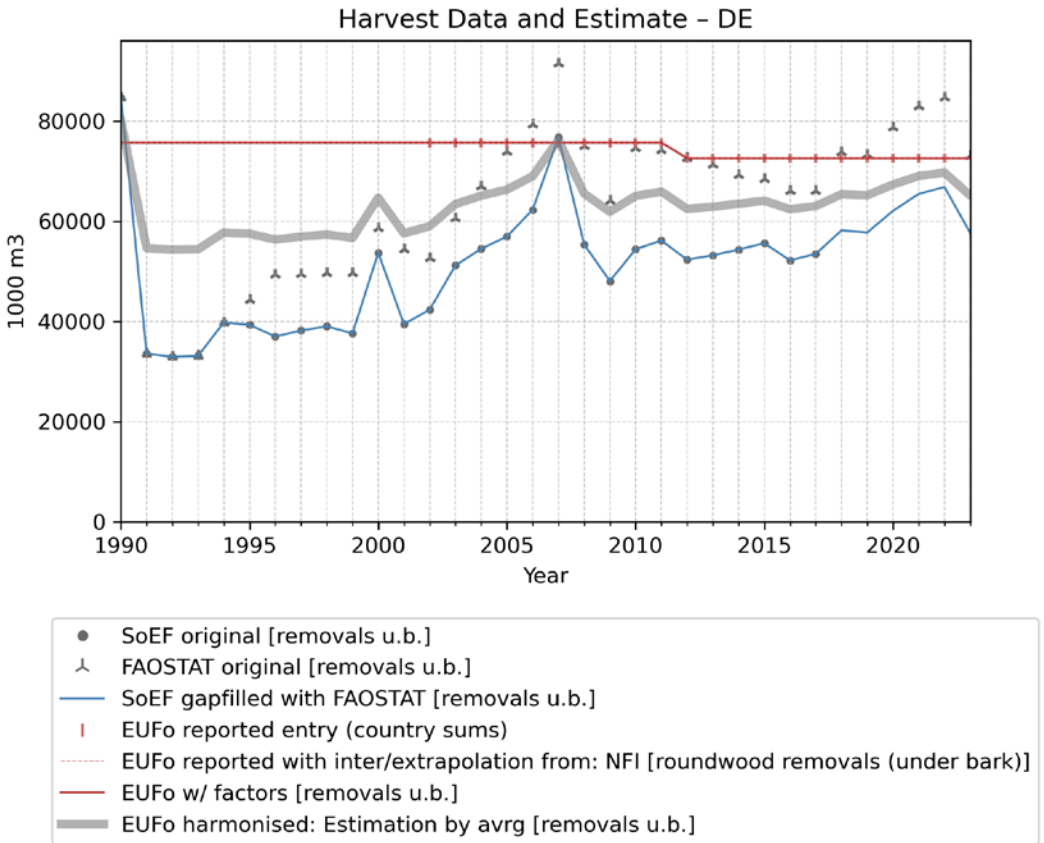

Harvest Data and Estimate – BG
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

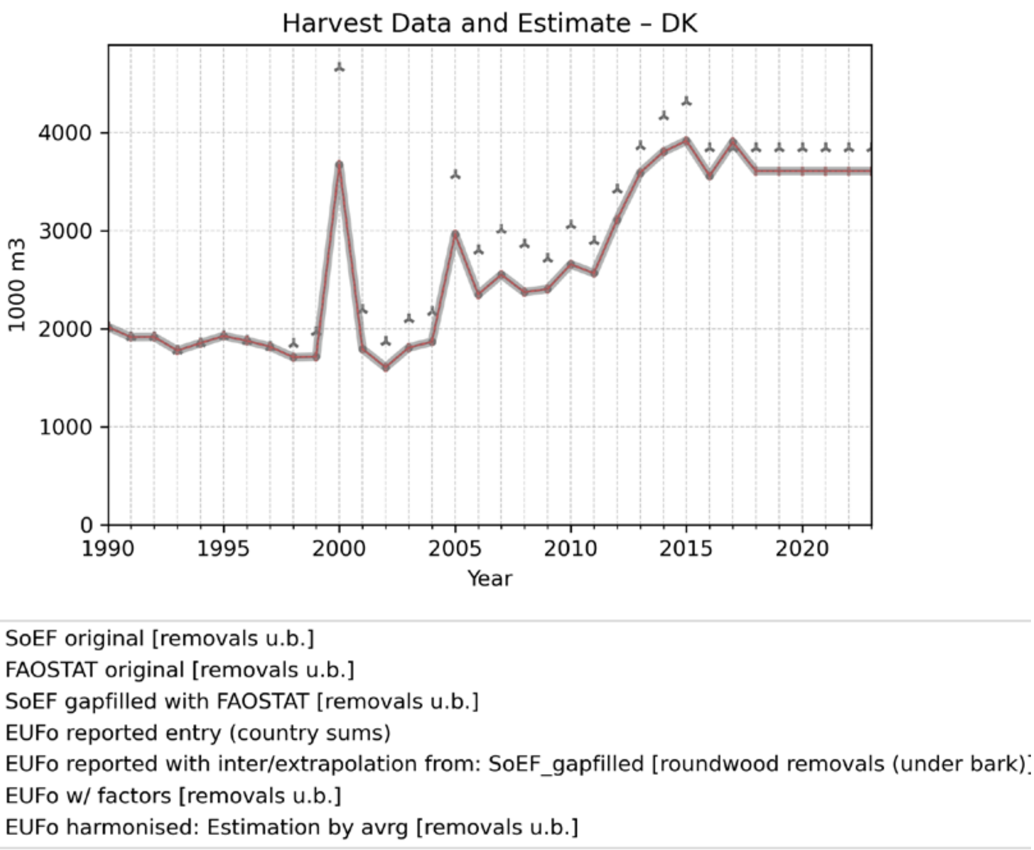

Harvest Data and Estimate – BY
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

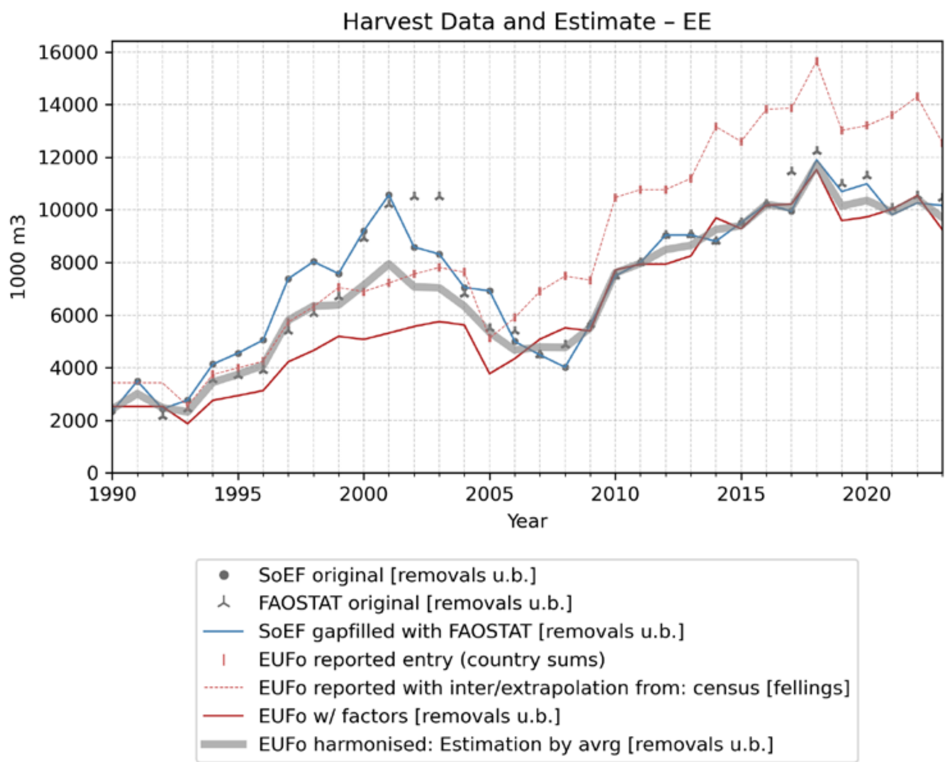

Harvest Data and Estimate – CH
1000 m3
0
2000
4000
6000
8000
10000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

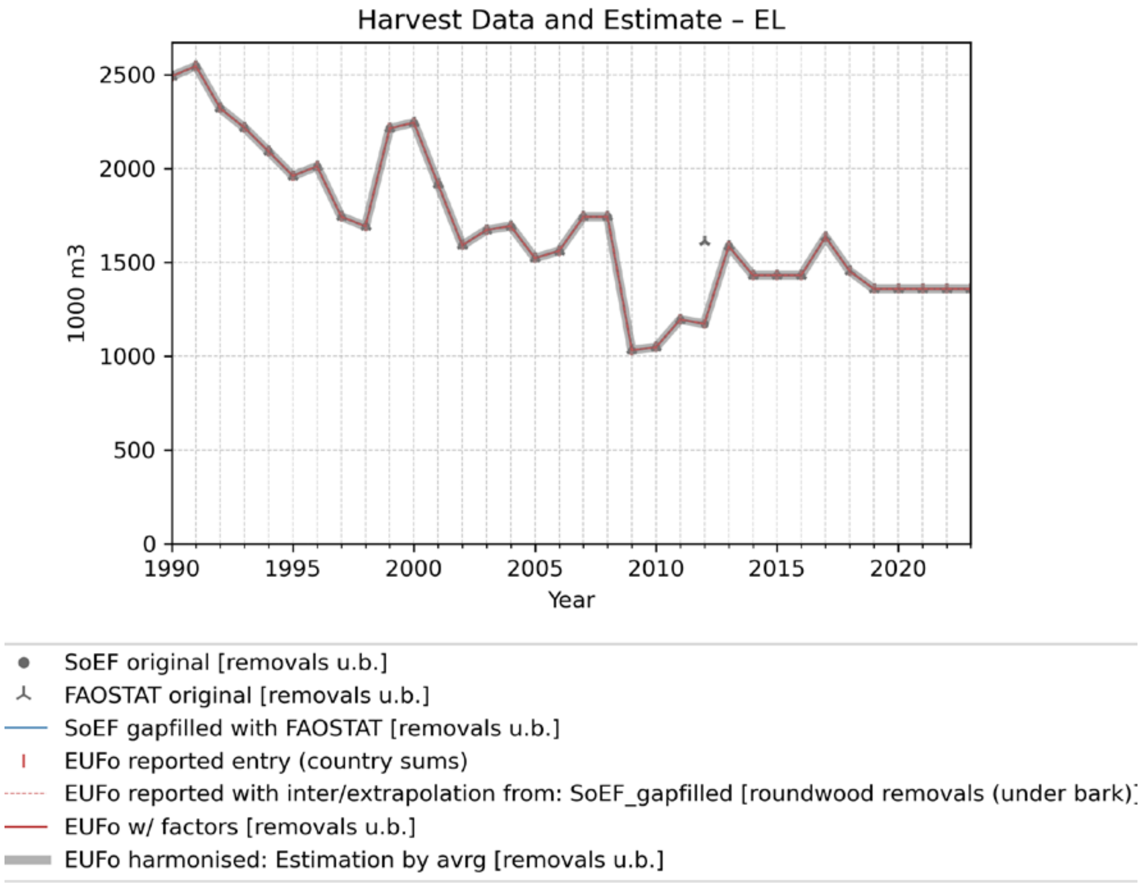

Harvest Data and Estimate – CY
1000 m3
0
10
20
30
40
50
60
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

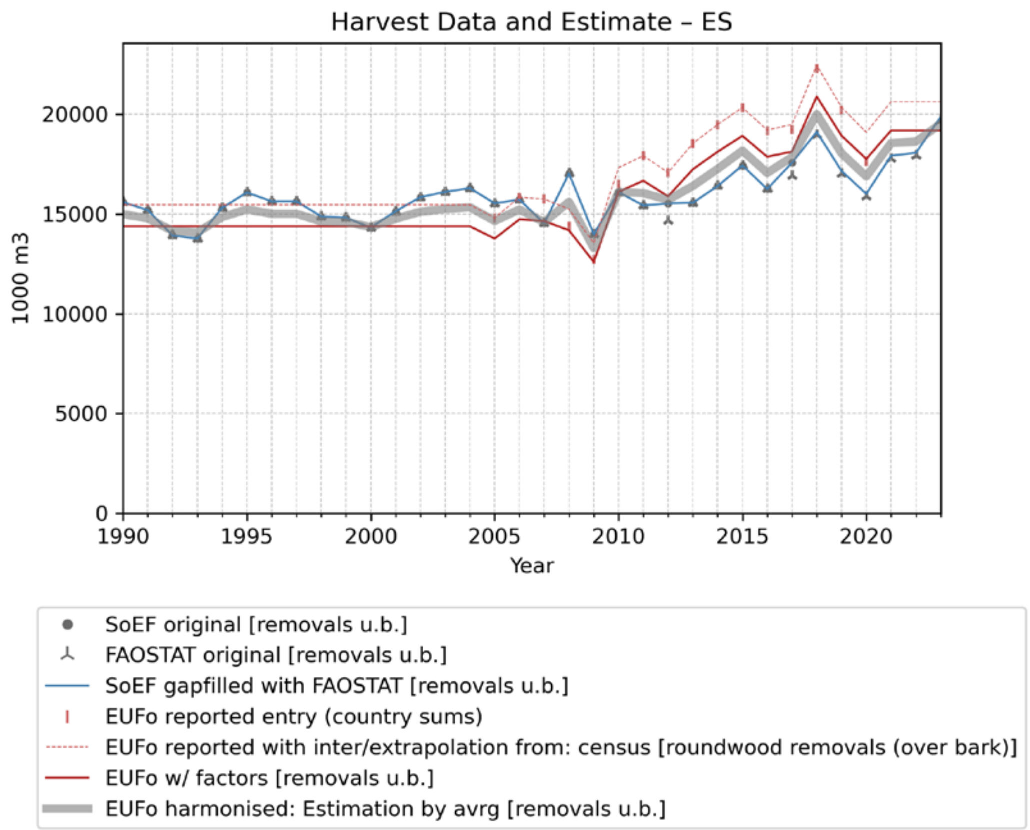

Harvest Data and Estimate – CZ
35000
30000
25000
20000
15000
10000
5000
0
1000 m3
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

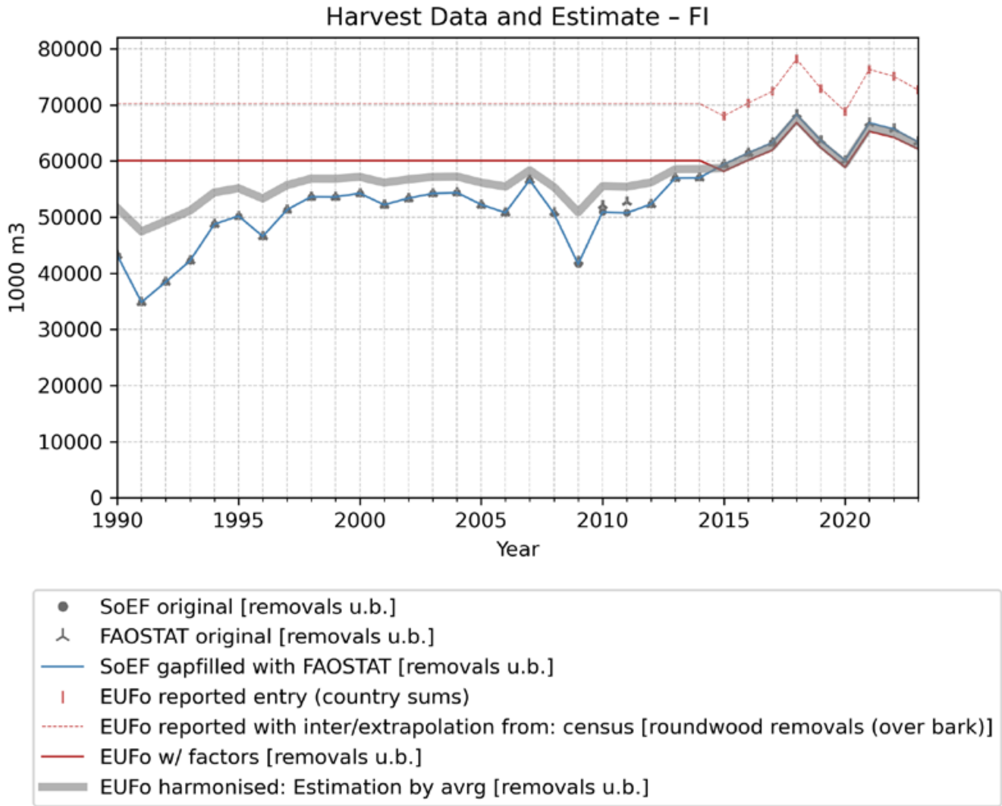

Harvest Data and Estimate – DE
80000
60000
40000
20000
0
1000 m3
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

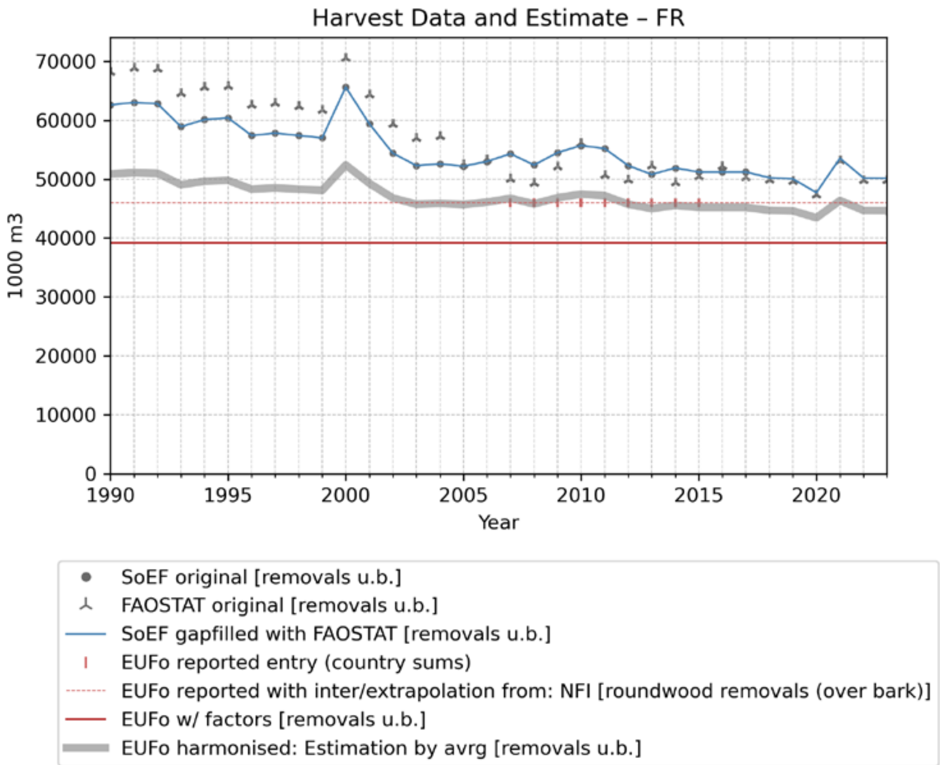

Harvest Data and Estimate – DK
1000 m3
Year
0
1000
2000
3000
4000
1990
1995
2000
2005
2010
2015
2020
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

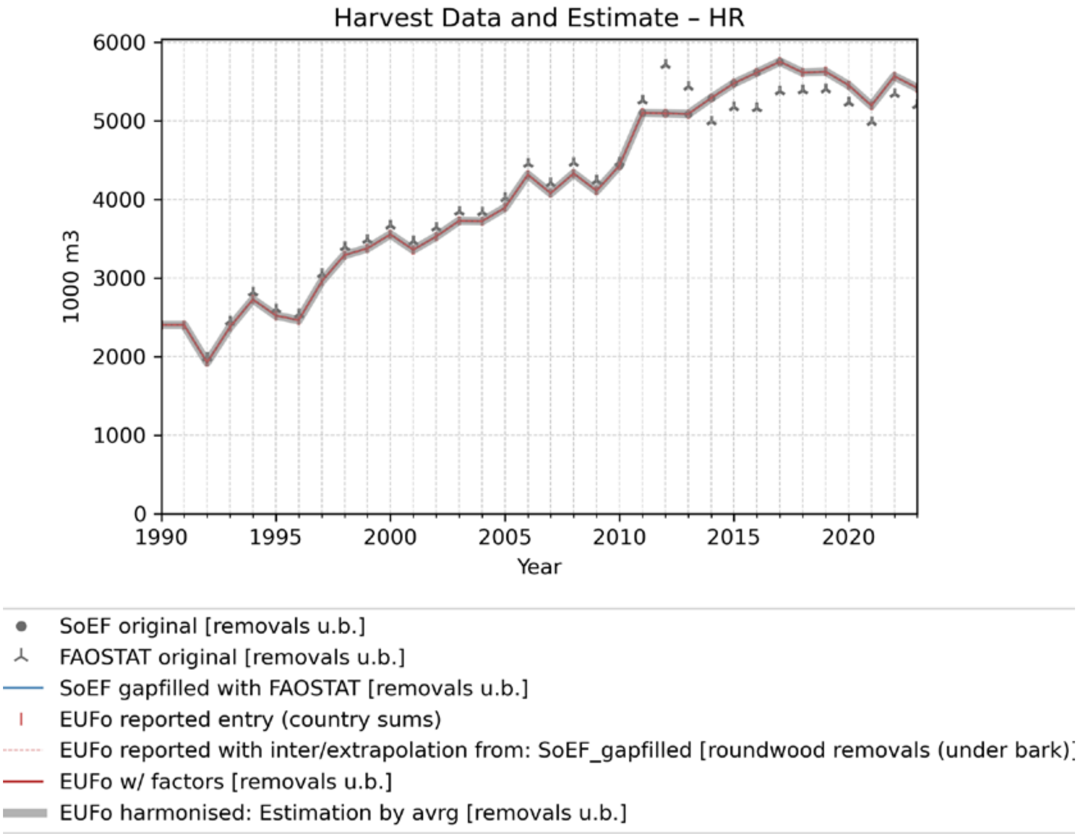

Harvest Data and Estimate – EE
1000 m3
Year
0
2000
4000
6000
8000
10000
12000
14000
16000
1990
1995
2000
2005
2010
2015
2020
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [fellings]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

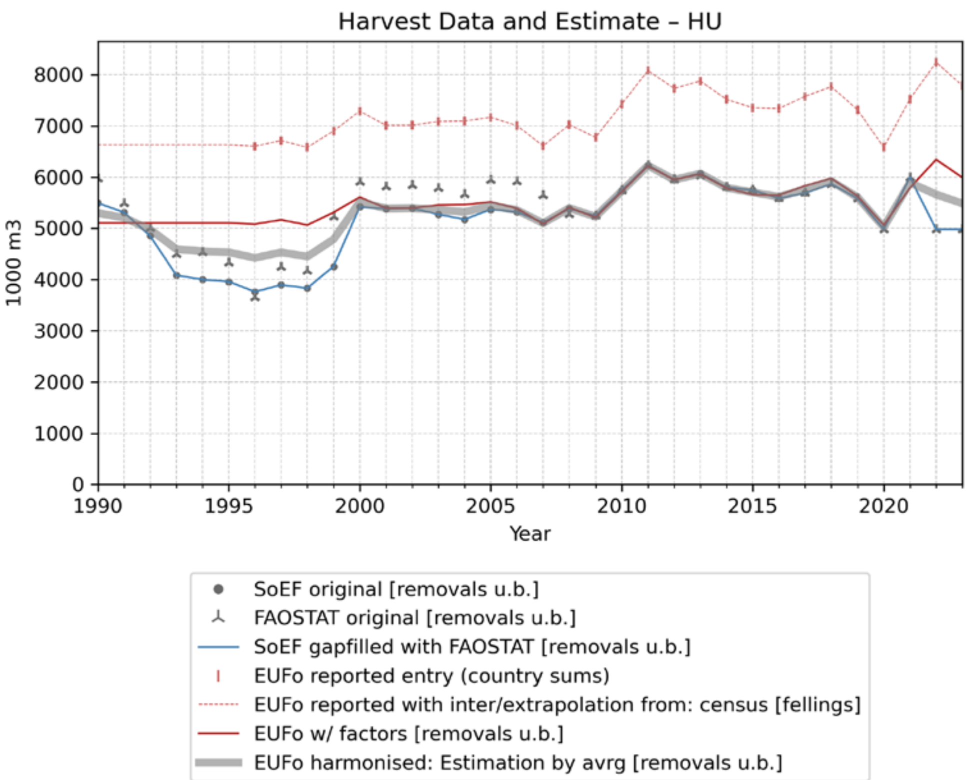

Harvest Data and Estimate – EL
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

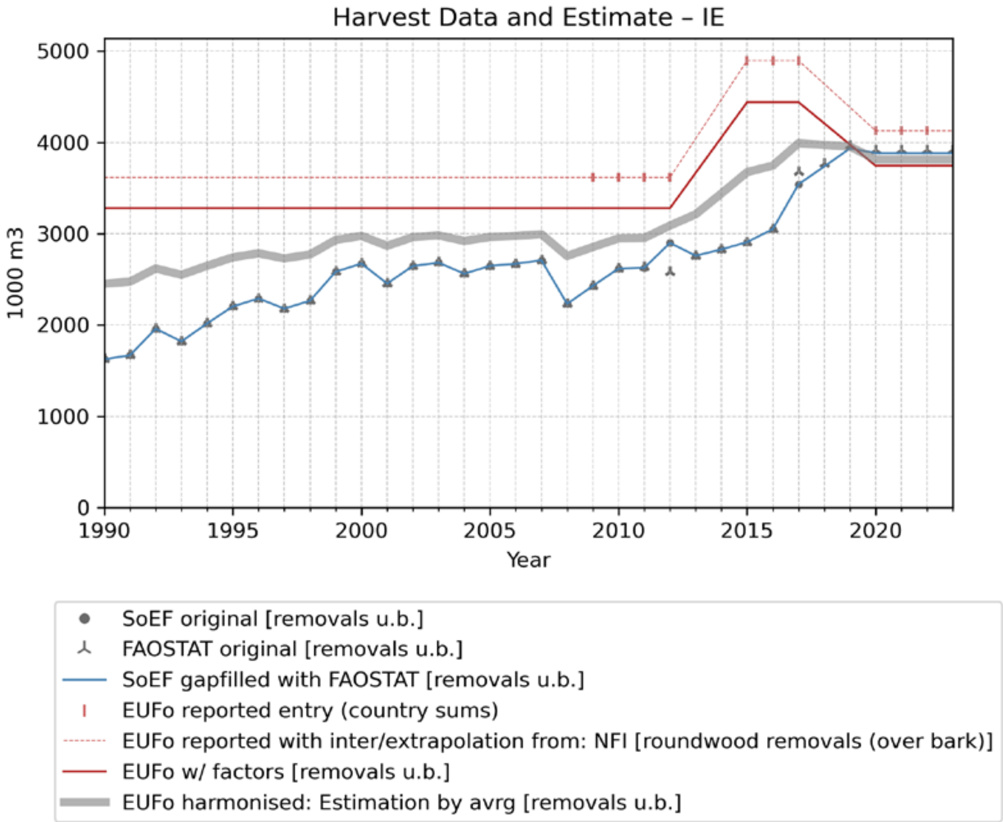

Harvest Data and Estimate – ES
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]


Harvest Data and Estimate – FI
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

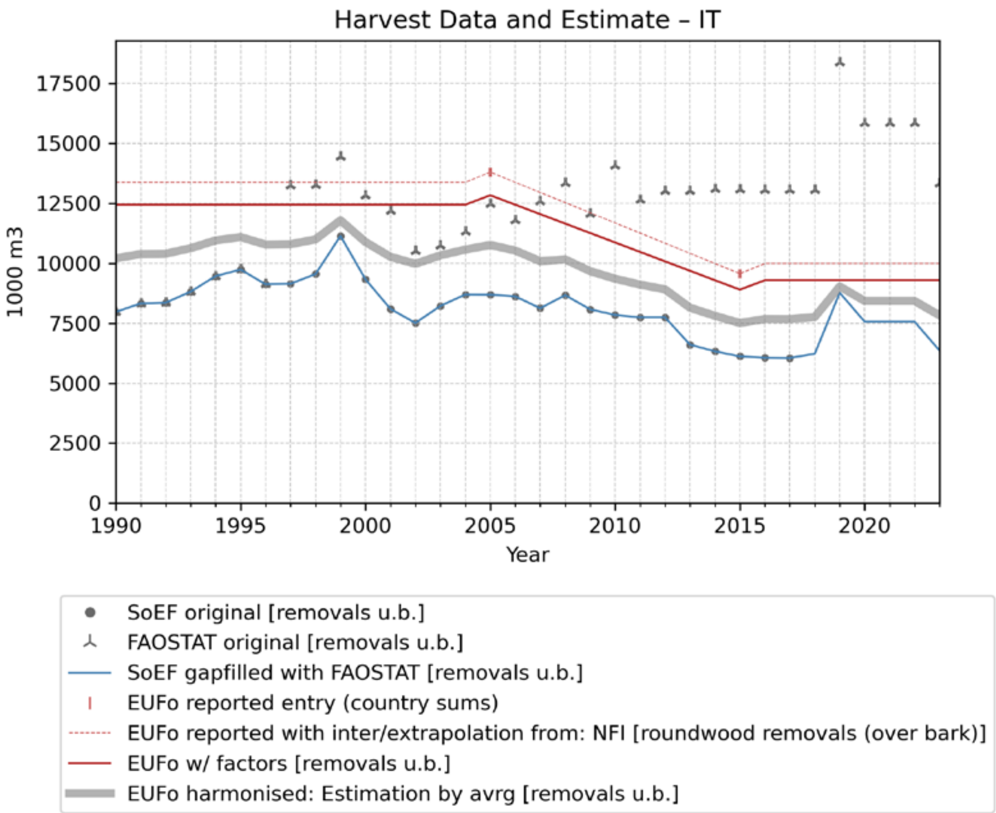

Harvest Data and Estimate – FR
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]


Harvest Data and Estimate – HR
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

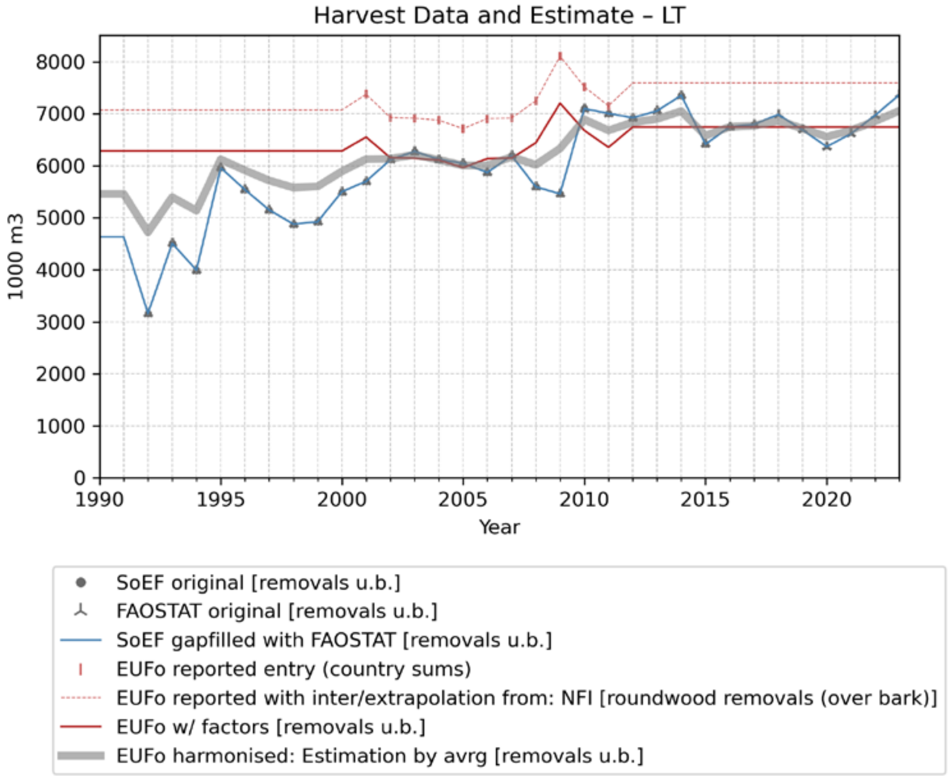

Harvest Data and Estimate – HU
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [fellings]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

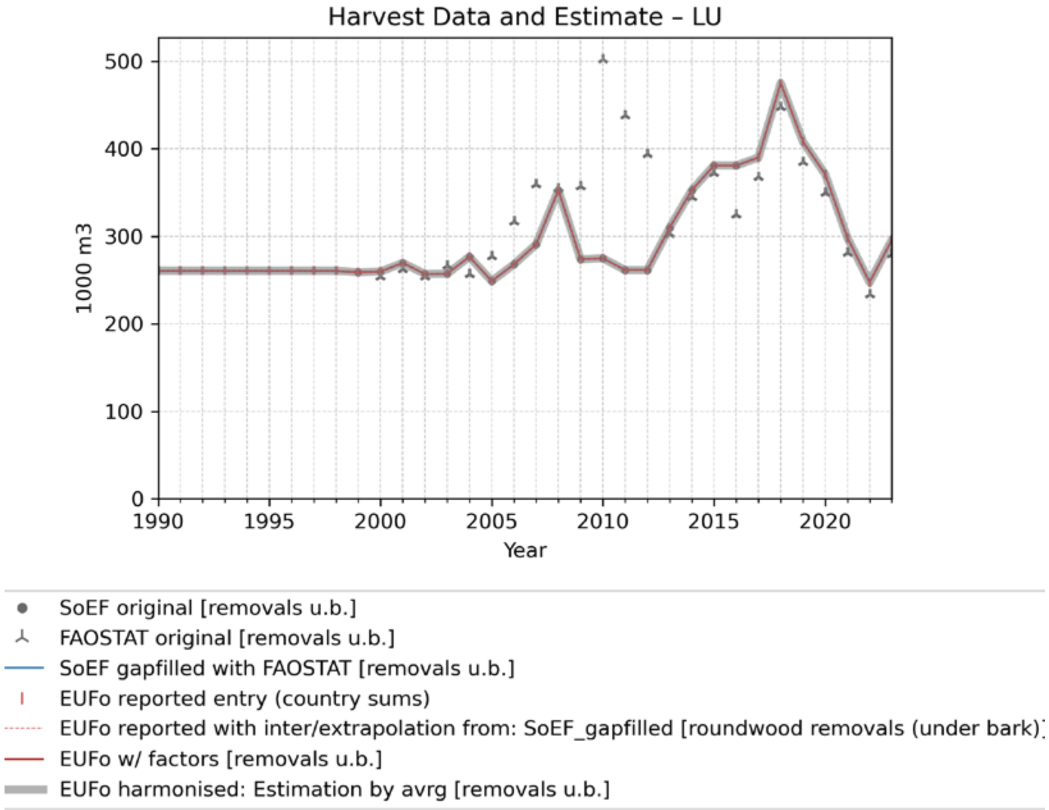


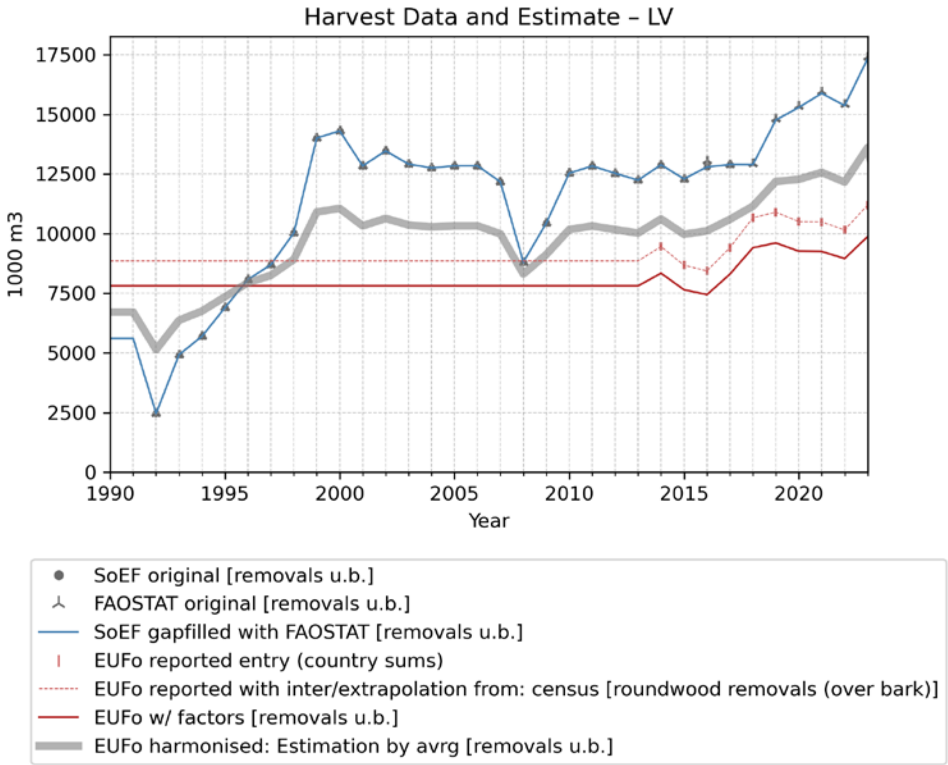
Harvest Data and Estimate – IE
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

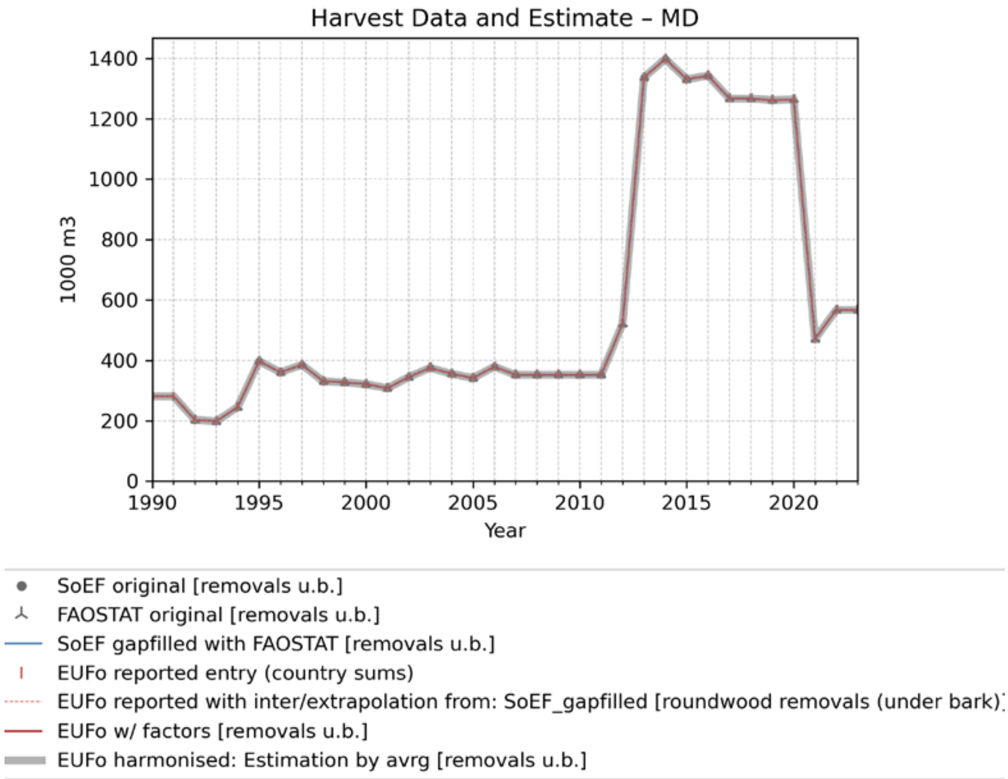


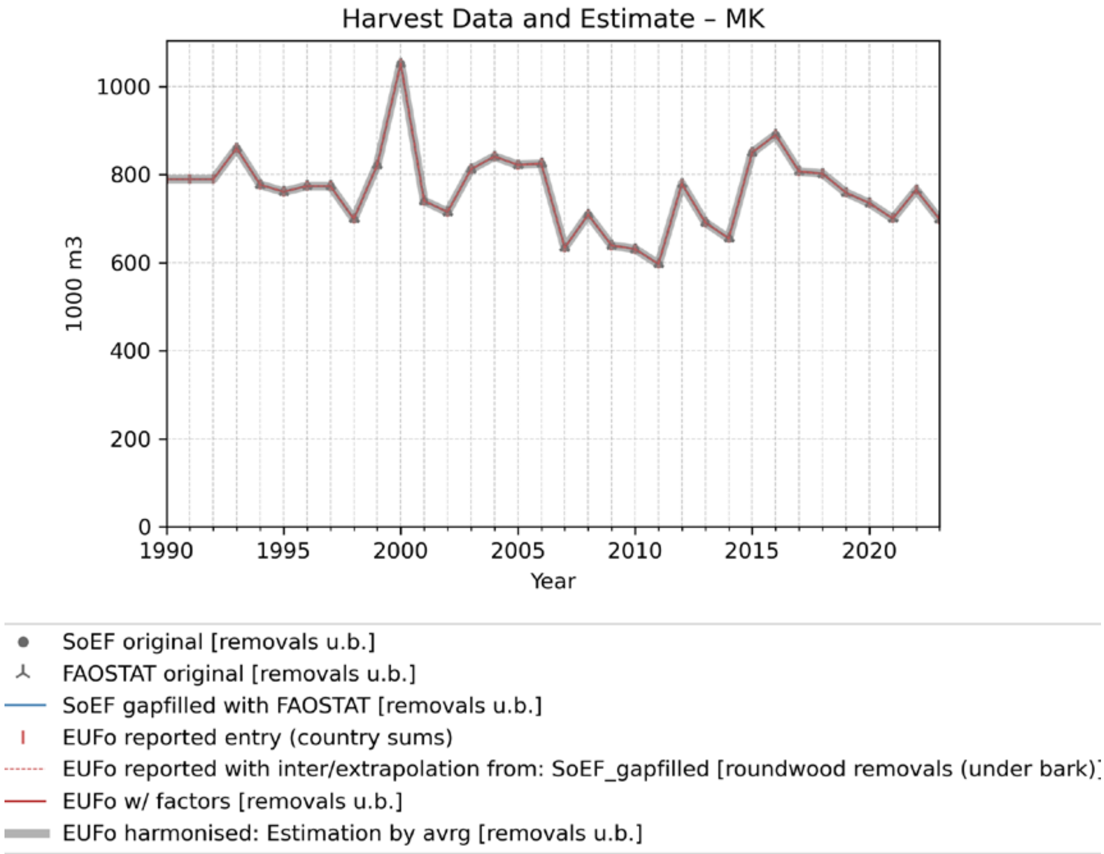
Harvest Data and Estimate – IT
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

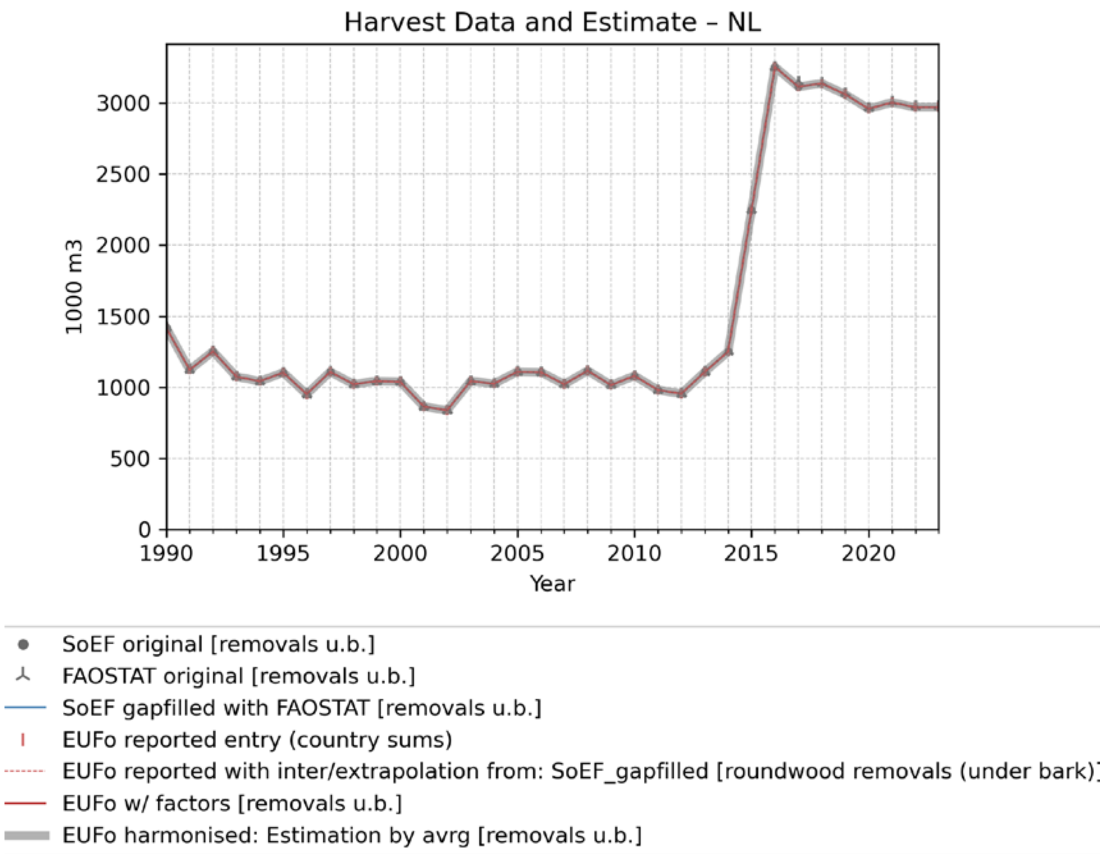

Harvest Data and Estimate – LT
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

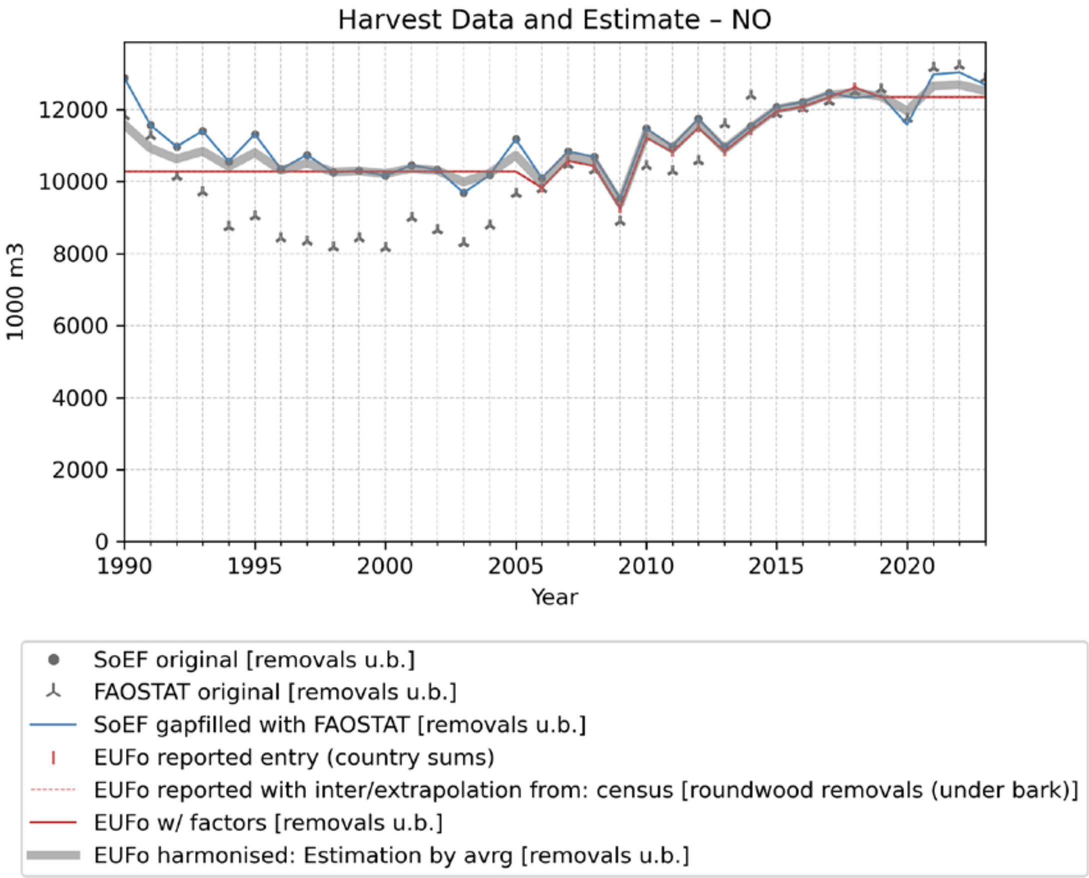

Harvest Data and Estimate – LU
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

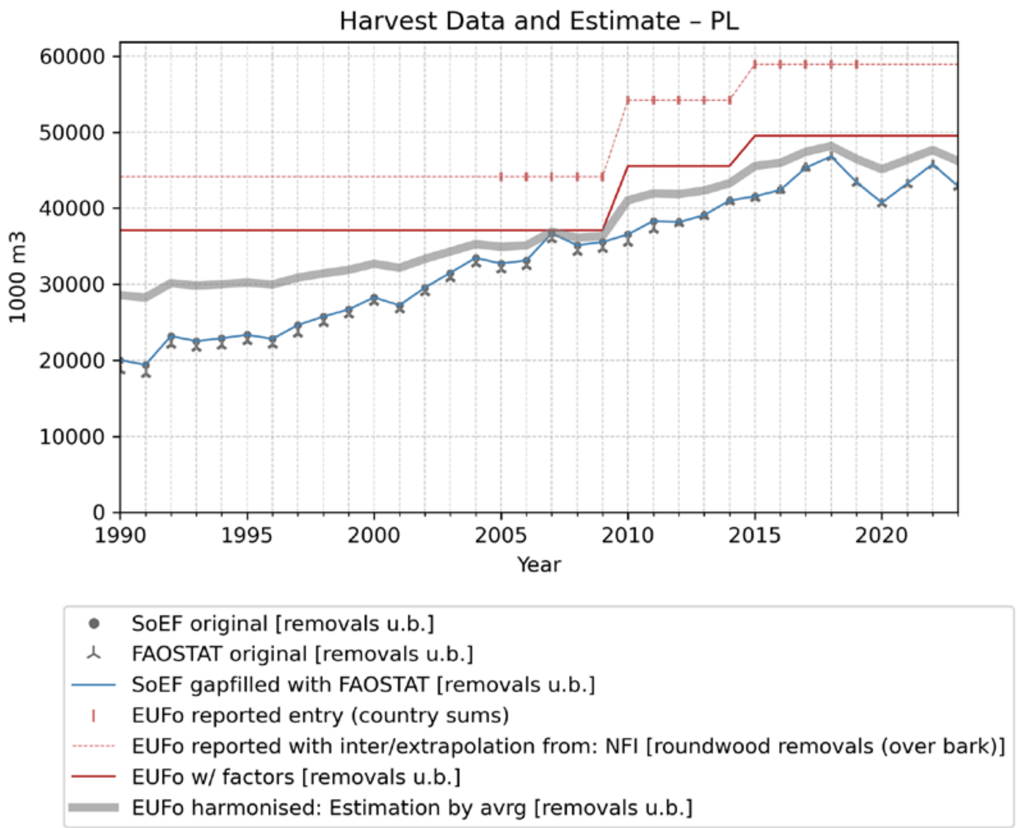

Harvest Data and Estimate – LV
17500
15000
12500
10000
7500
5000
2500
0
1000 m3
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

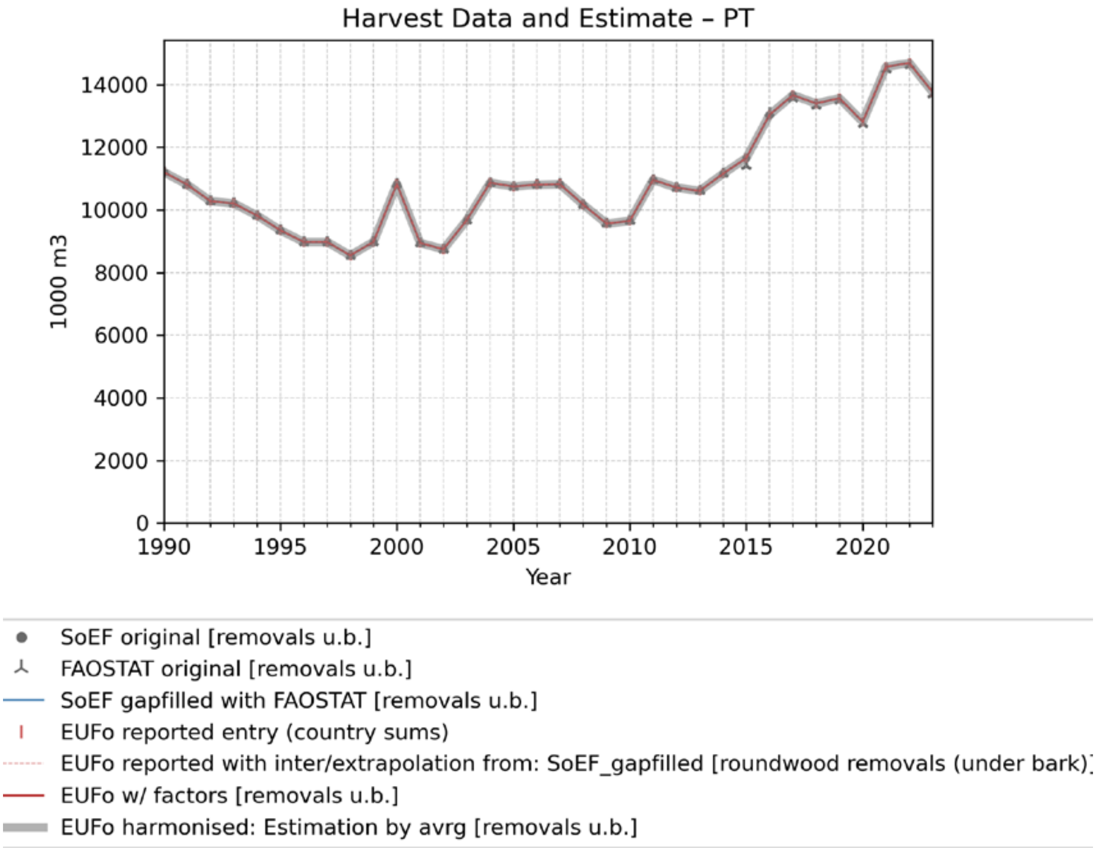

Harvest Data and Estimate – MD
1400
1200
1000
800
600
400
200
0
1000 m3
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

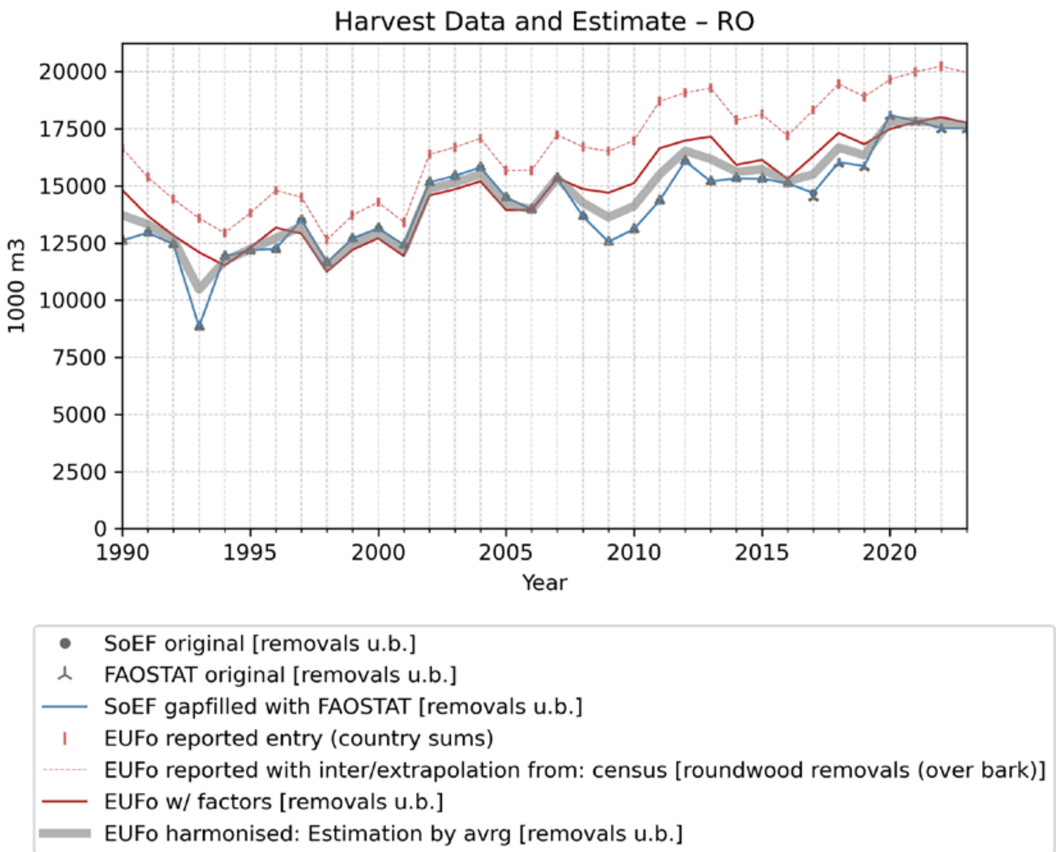

Harvest Data and Estimate – MK
1000 m3
0
200
400
600
800
1000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

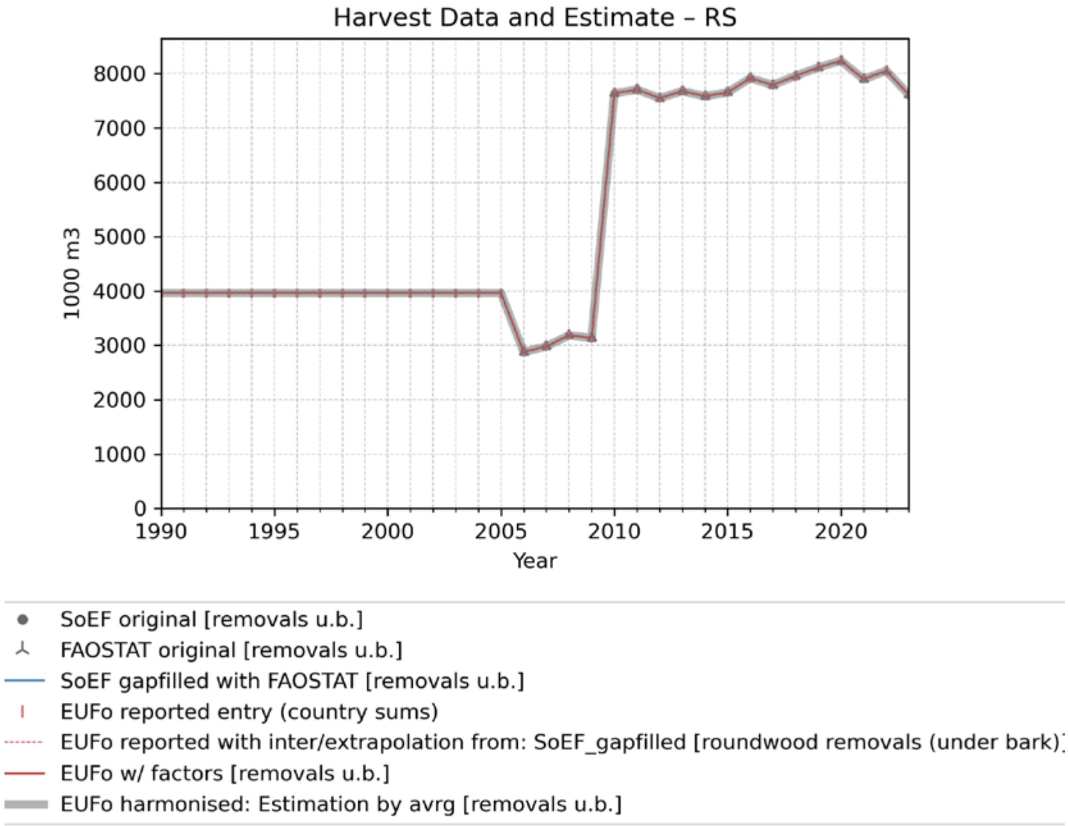

Harvest Data and Estimate – NL
1000 m3
0
500
1000
1500
2000
2500
3000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

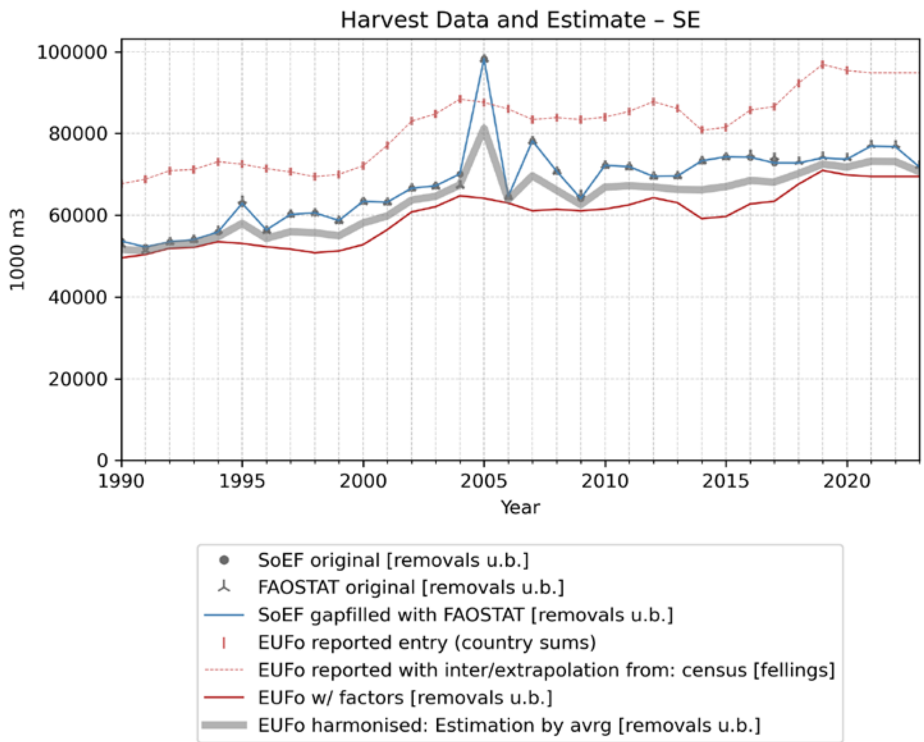

Harvest Data and Estimate – NO
1000 m3
0
2000
4000
6000
8000
10000
12000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

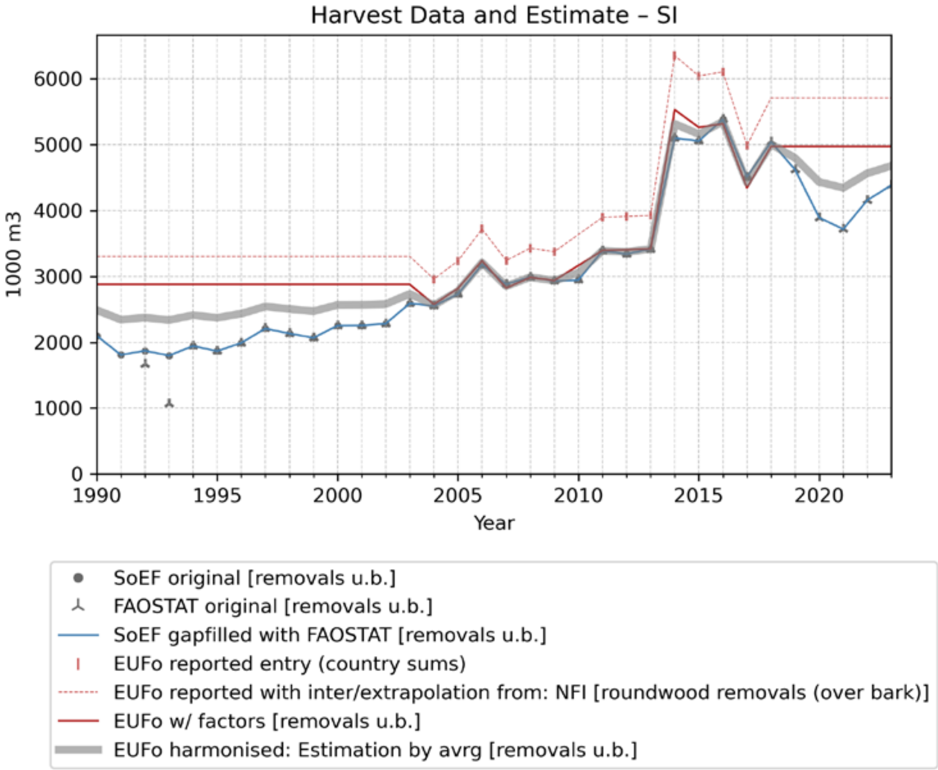

Harvest Data and Estimate – PL
1000 m3
0
10000
20000
30000
40000
50000
60000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

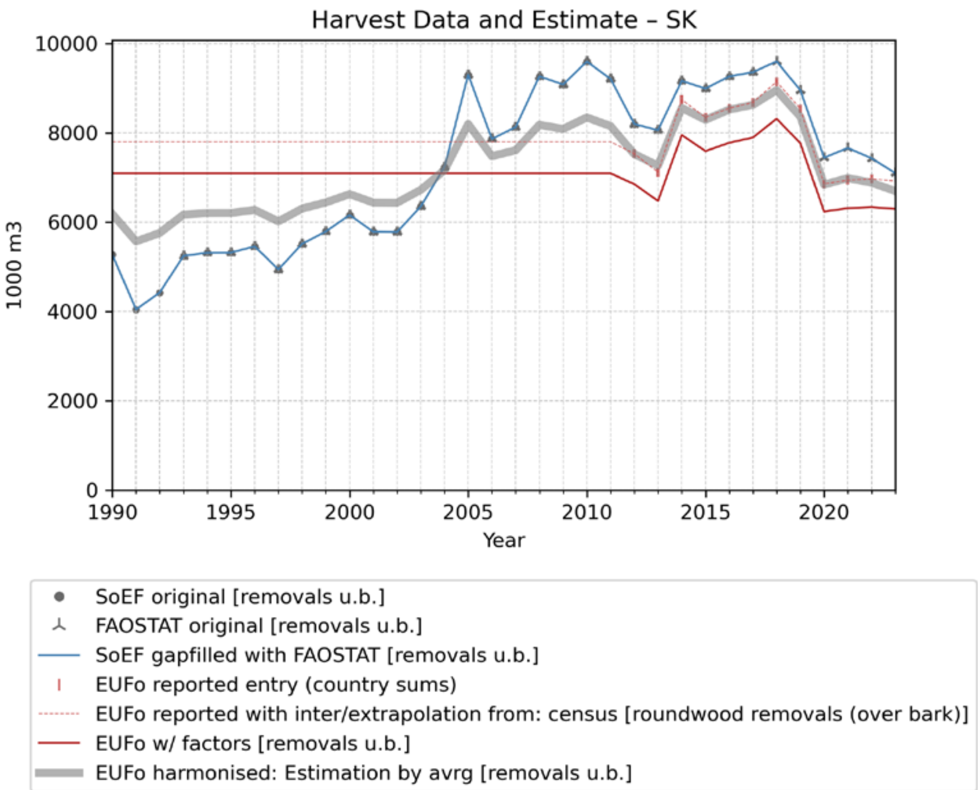

Harvest Data and Estimate – PT
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

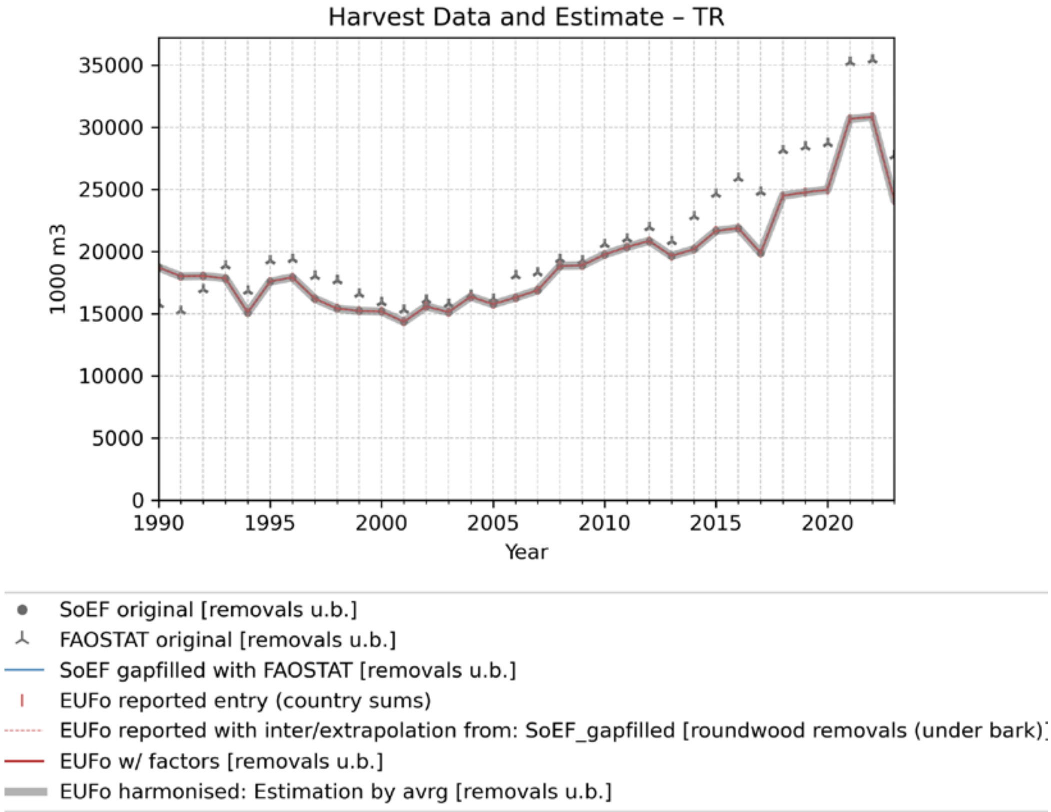

Harvest Data and Estimate – RO
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

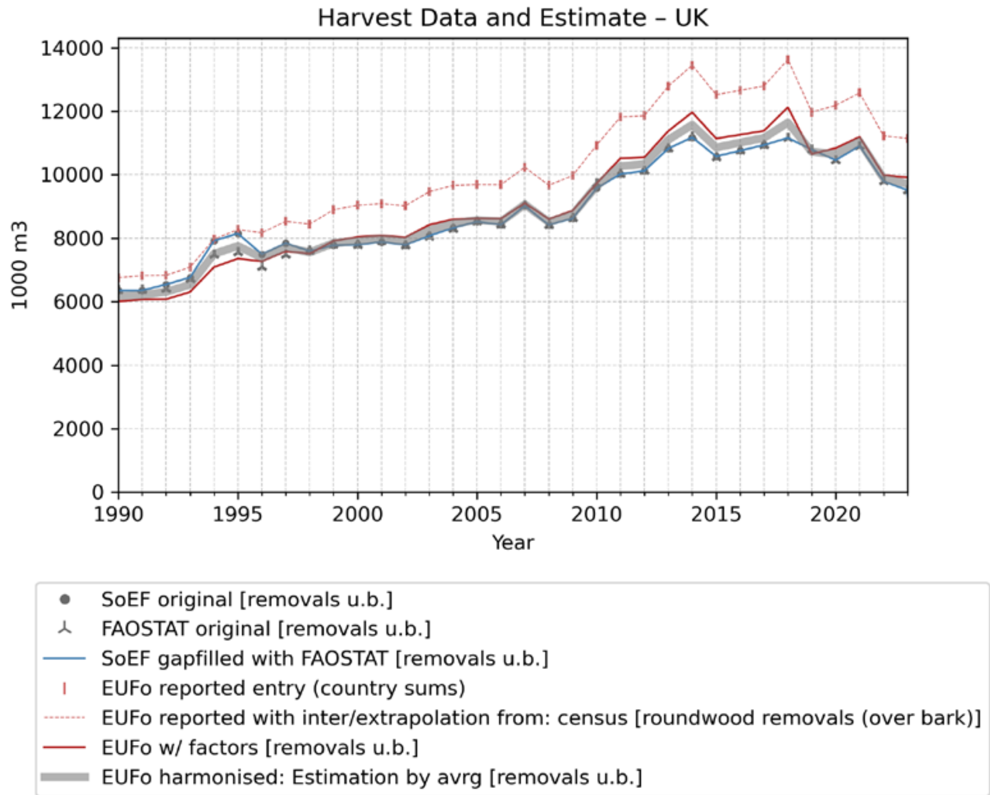

Harvest Data and Estimate – RS
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

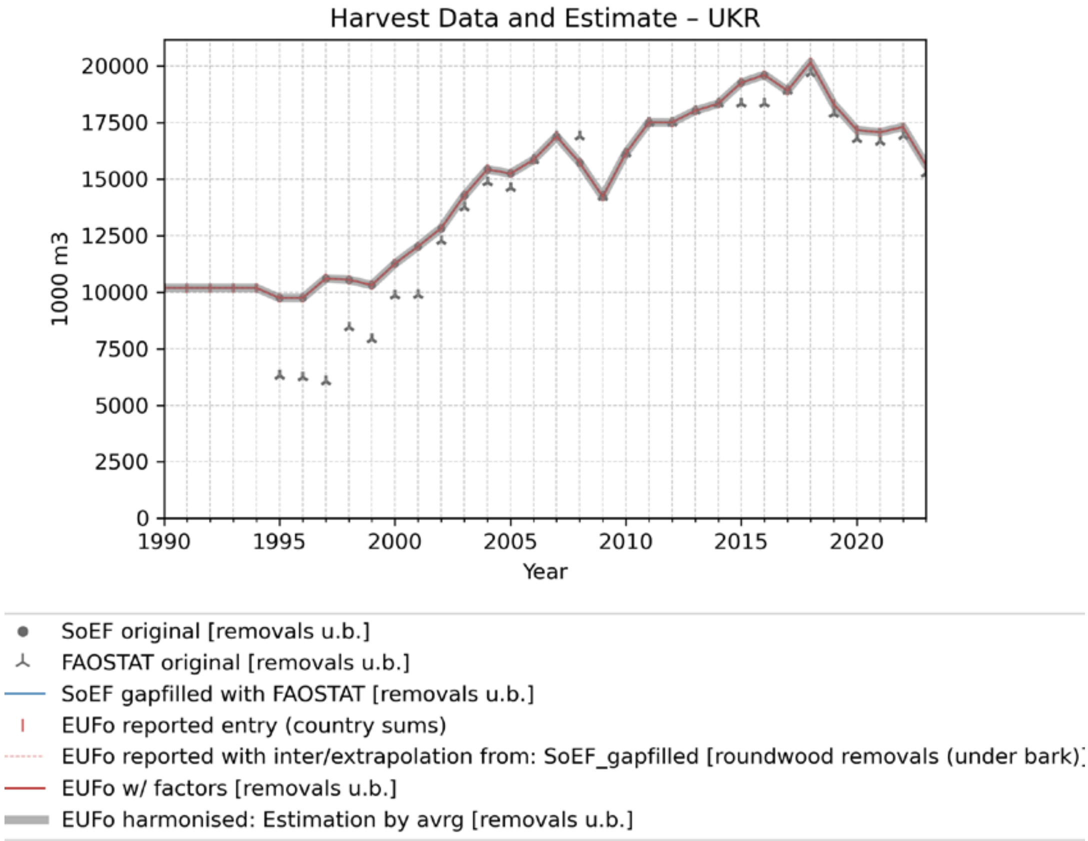

Harvest Data and Estimate – SE
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [fellings]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]


Harvest Data and Estimate – SI
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: NFI [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]


Harvest Data and Estimate – SK
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

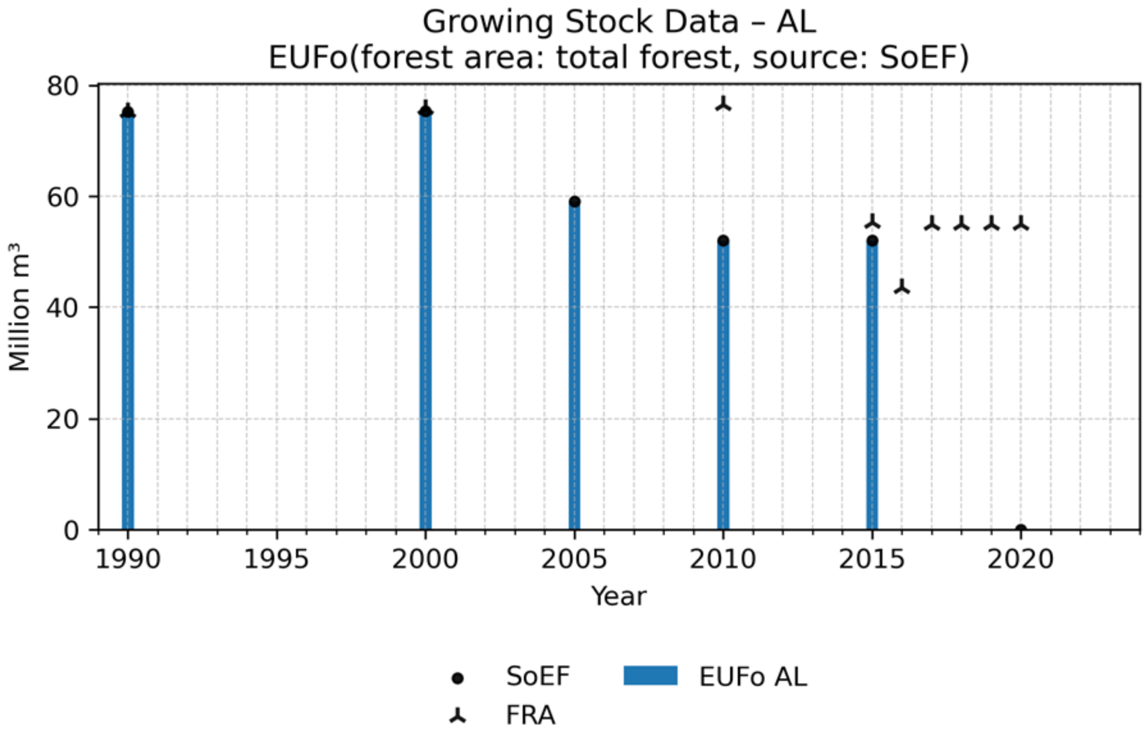

Harvest Data and Estimate – TR
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

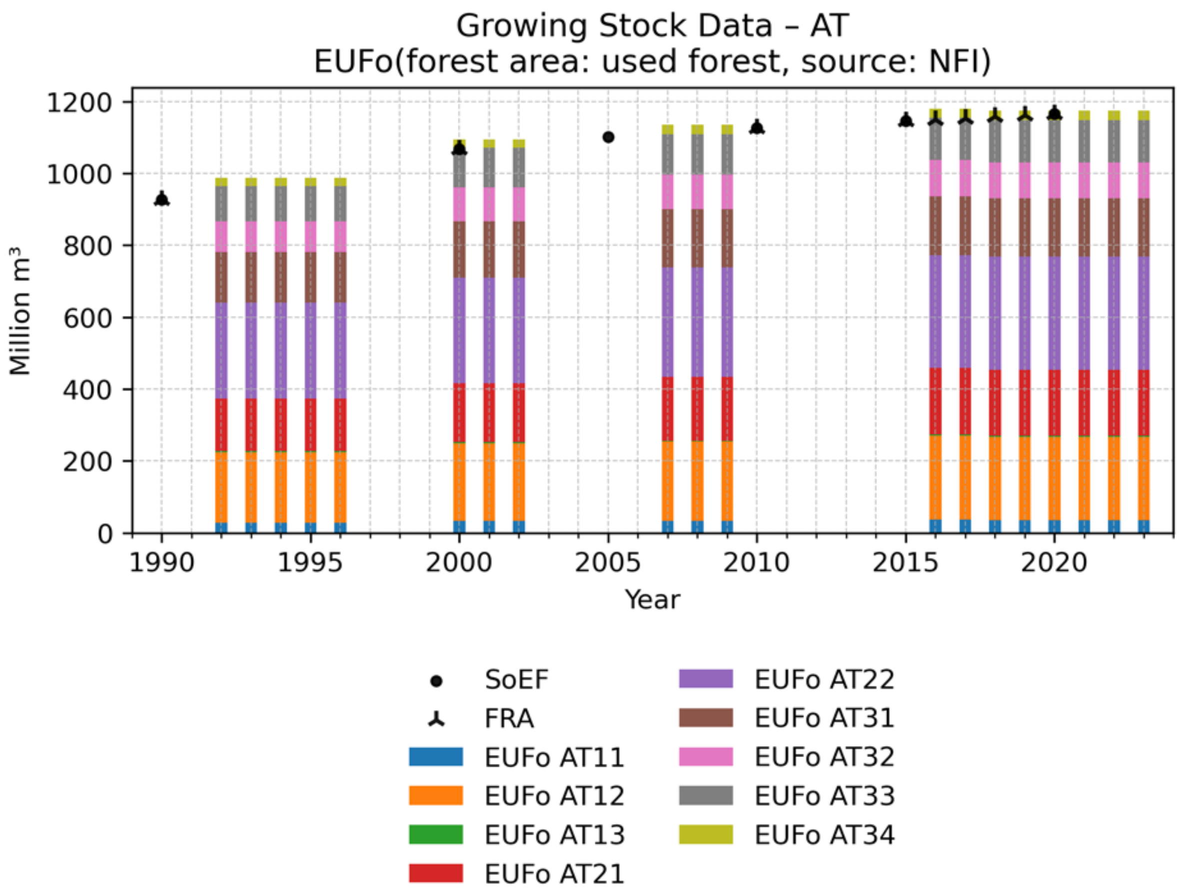

Harvest Data and Estimate – UK
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: census [roundwood removals (over bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

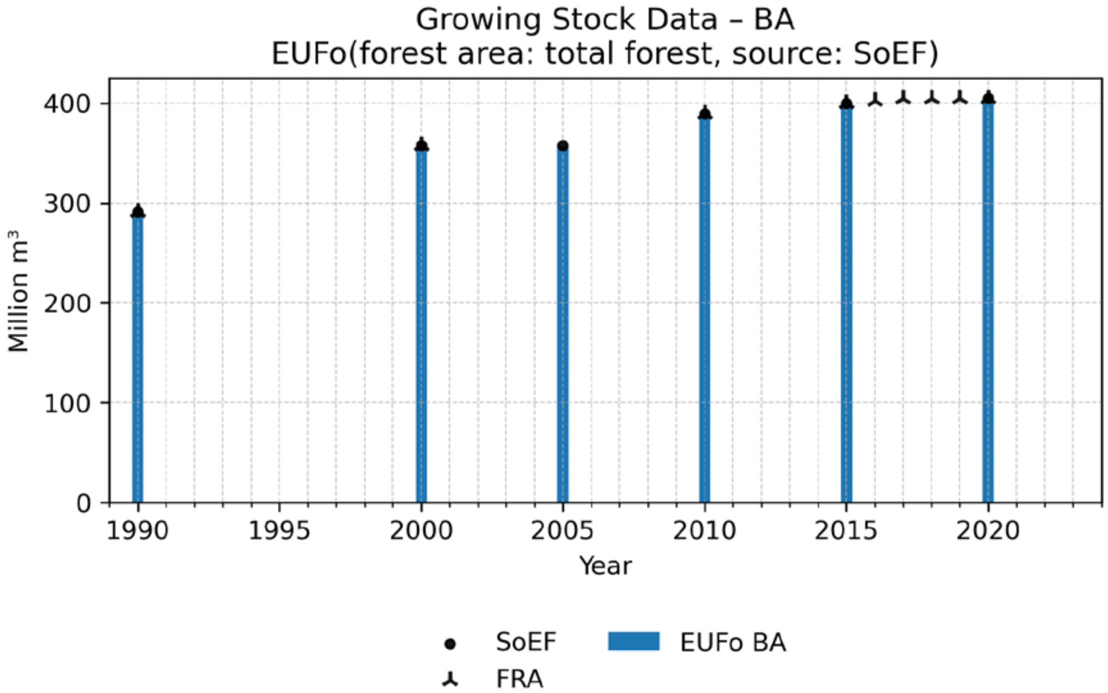


Harvest Data and Estimate – UKR
1000 m3
Year
SoEF original [removals u.b.]
FAOSTAT original [removals u.b.]
SoEF gapfilled with FAOSTAT [removals u.b.]
EUFo reported entry (country sums)
EUFo reported with inter/extrapolation from: SoEF_gapfilled [roundwood removals (under bark)]
EUFo w/ factors [removals u.b.]
EUFo harmonised: Estimation by avrg [removals u.b.]

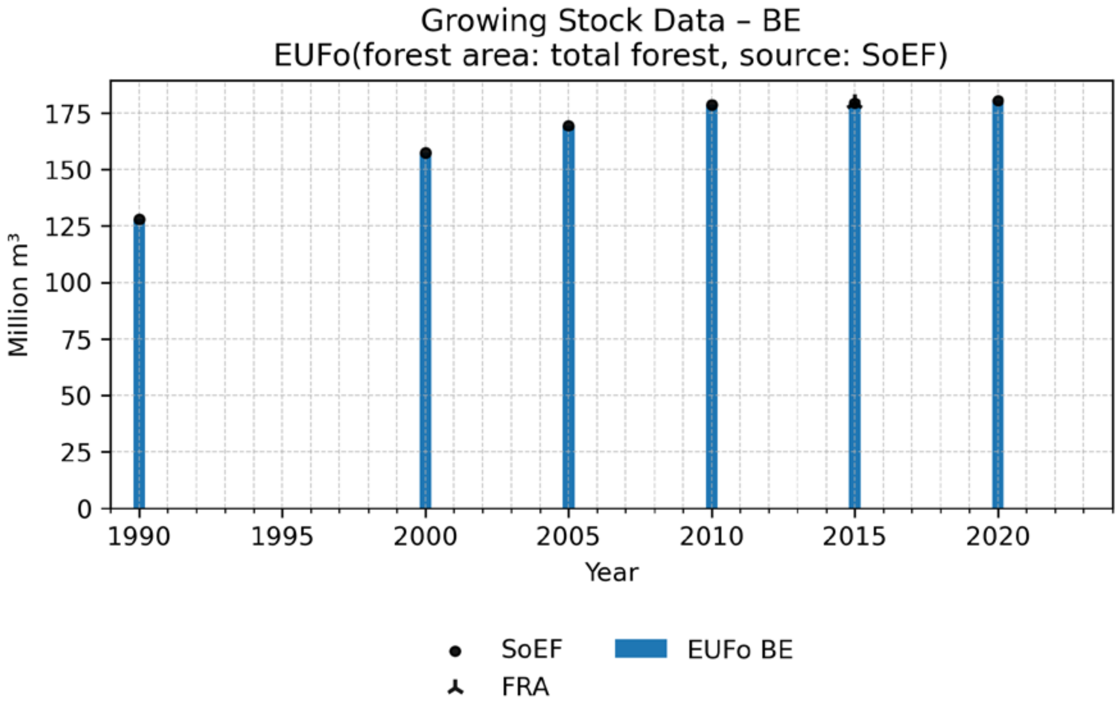
6.4. Comparison of forest growing stock data sources between SoEF, FRA, and EUFo ordered by country code



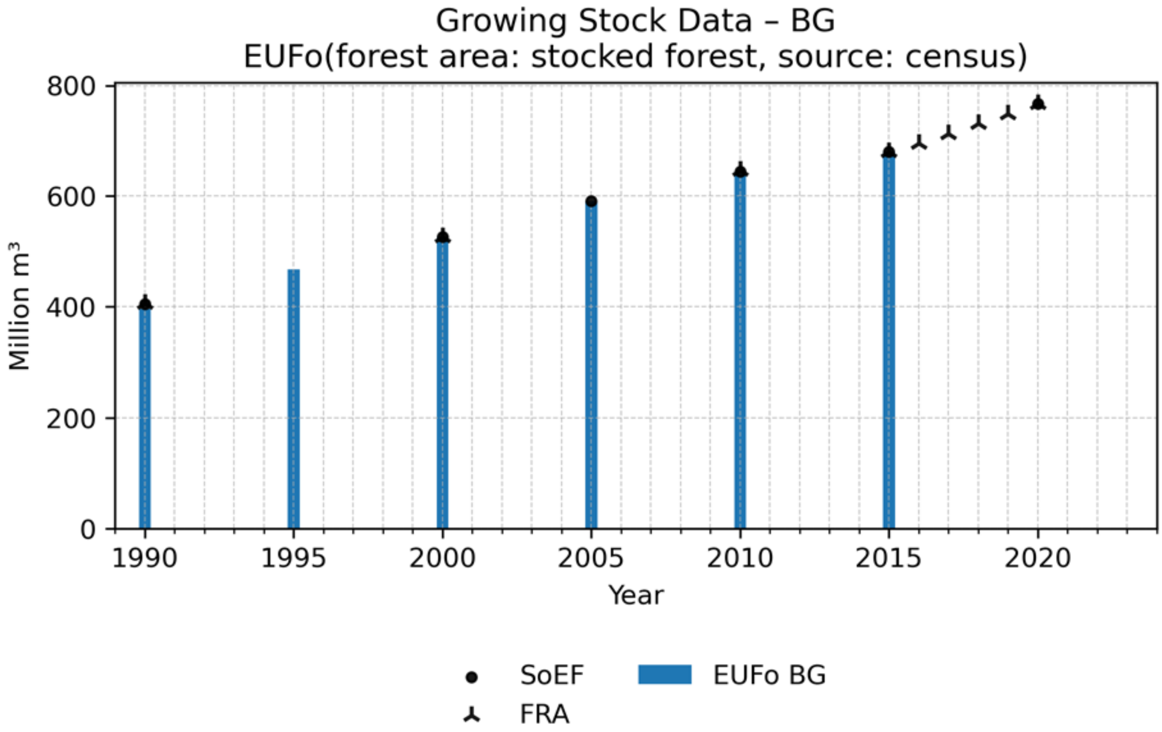


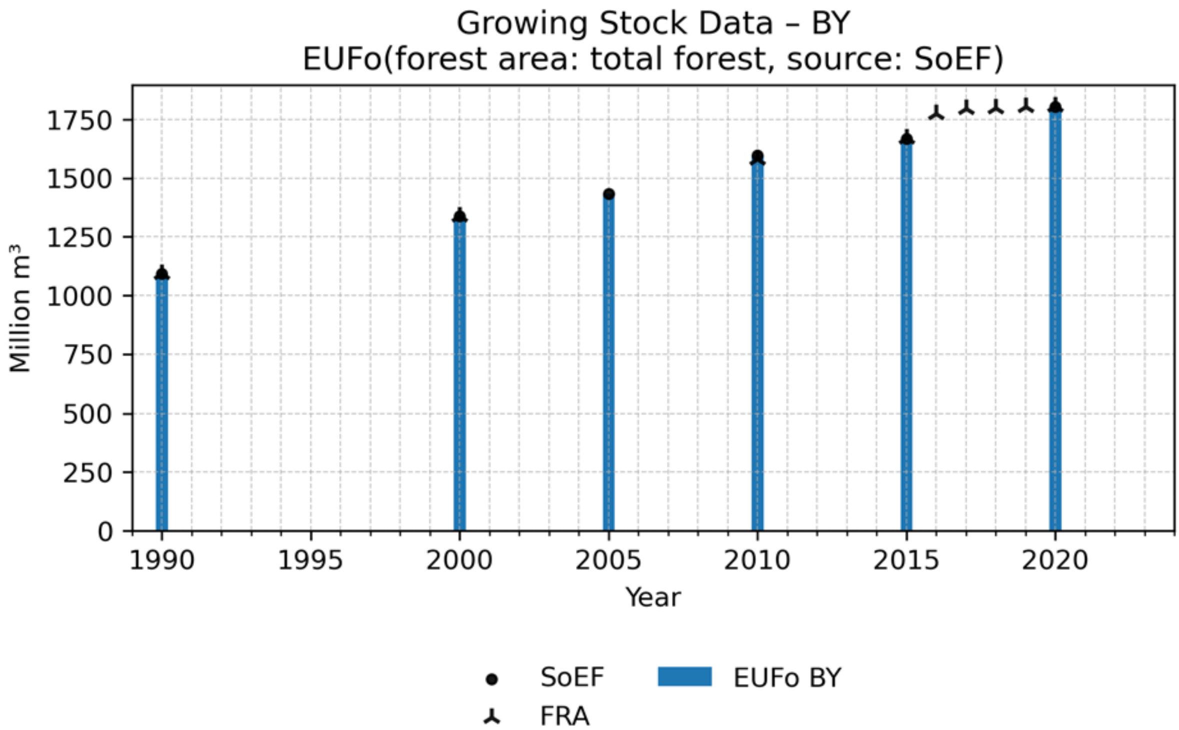


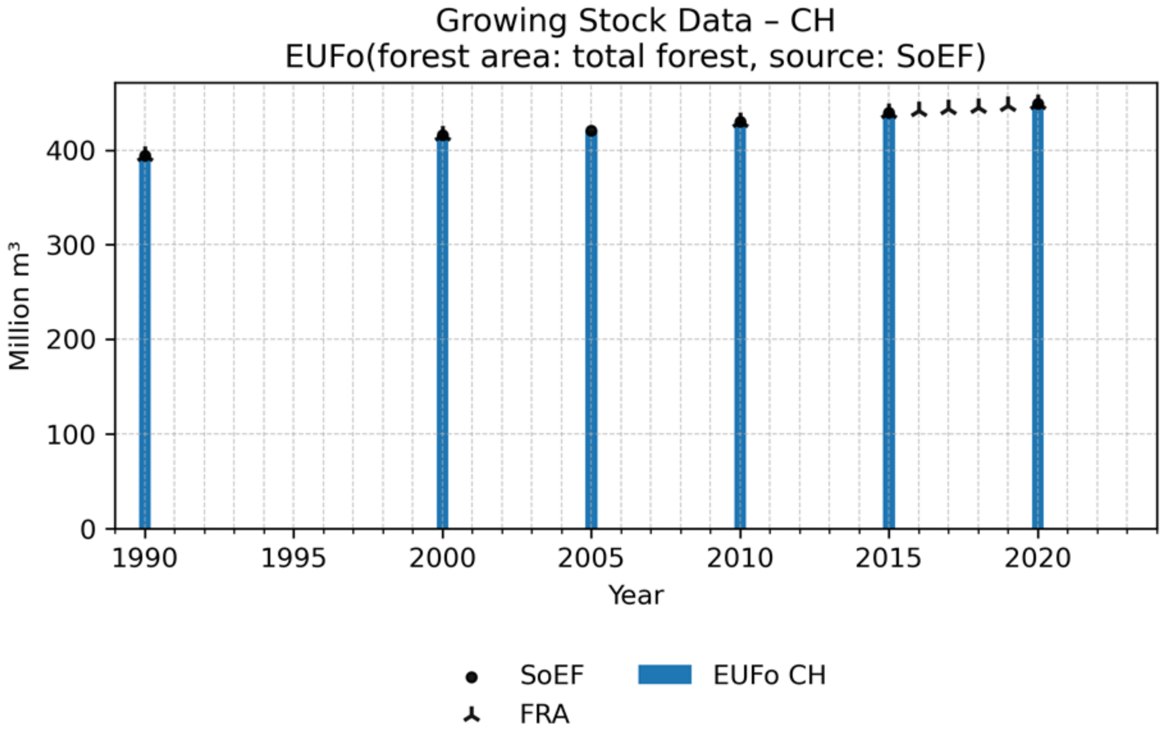
Growing Stock Data – BA
EUFo(forest area: total forest, source: SoEF)
400
300
200
100
0
Million m³
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo BA



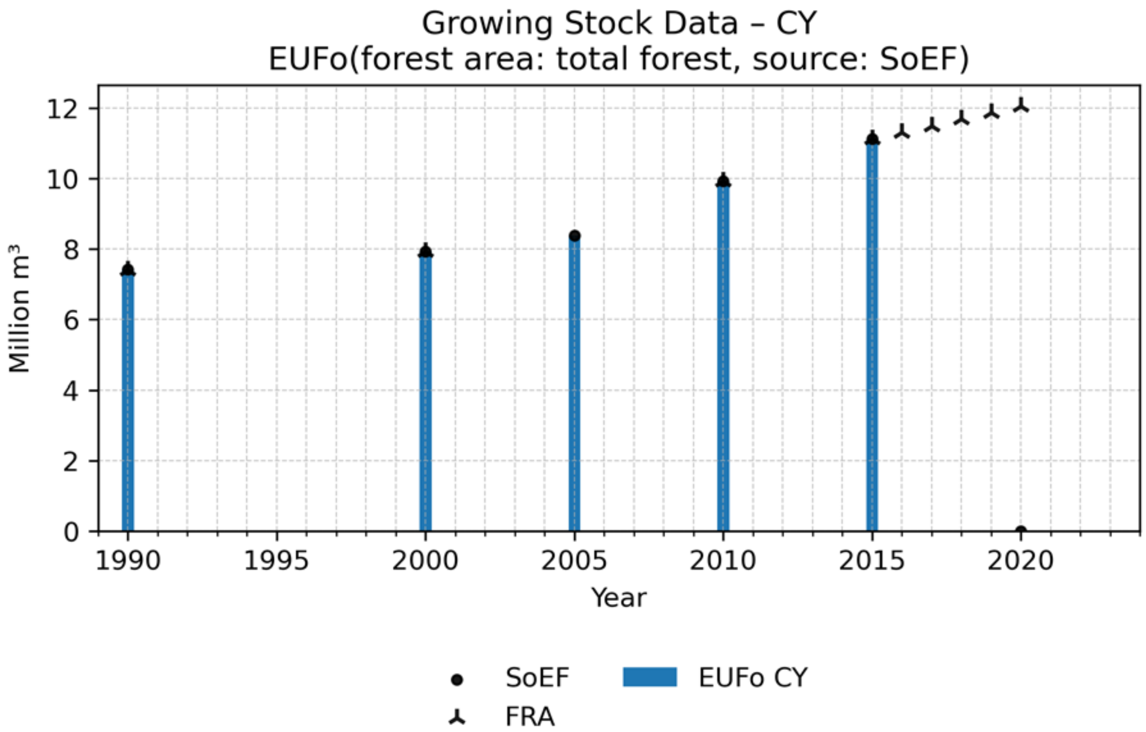
Growing Stock Data – BE
EUFo(forest area: total forest, source: SoEF)
175
150
125
100
75
50
25
0
Million m³
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo BE


Growing Stock Data – BG
EUFo(forest area: stocked forest, source: census)
800
600
400
200
0
Million m³
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
EUFo BG
FRA

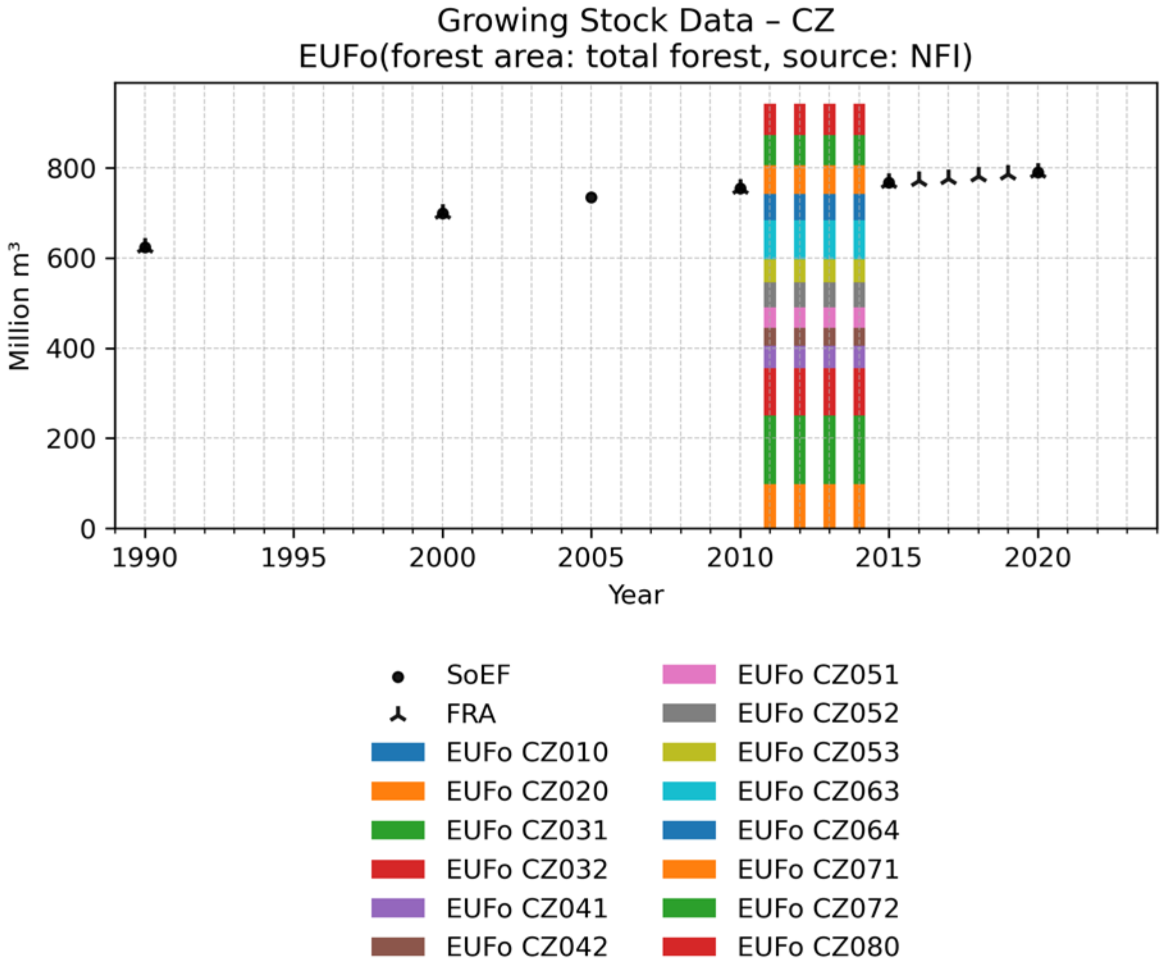

Growing Stock Data – BY
EUFo(forest area: total forest, source: SoEF)
1750
1500
1250
1000
750
500
250
0
Million m³
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
EUFo BY
FRA



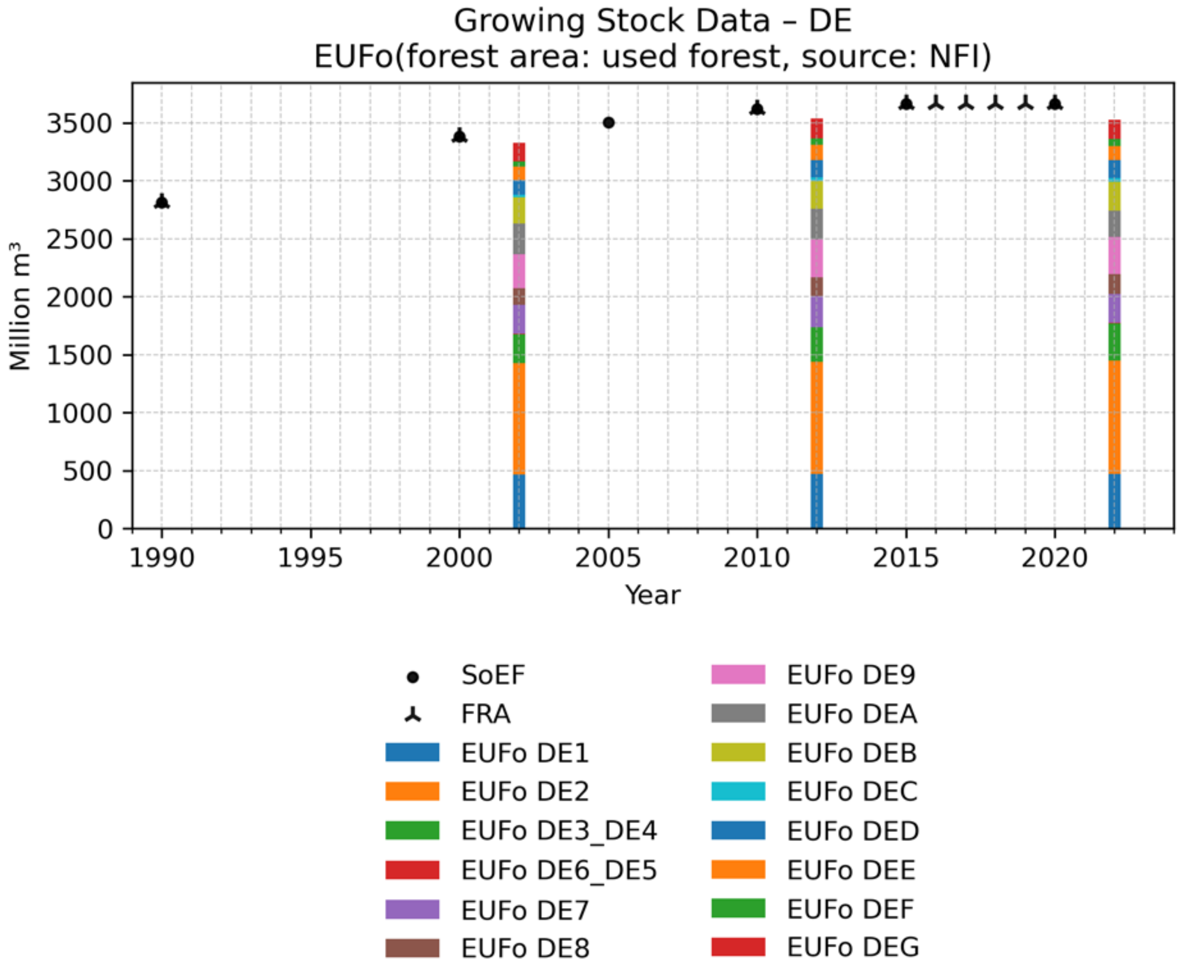
Growing Stock Data – CH
EUFo(forest area: total forest, source: SoEF)
Million m³
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
EUFo CH
FRA



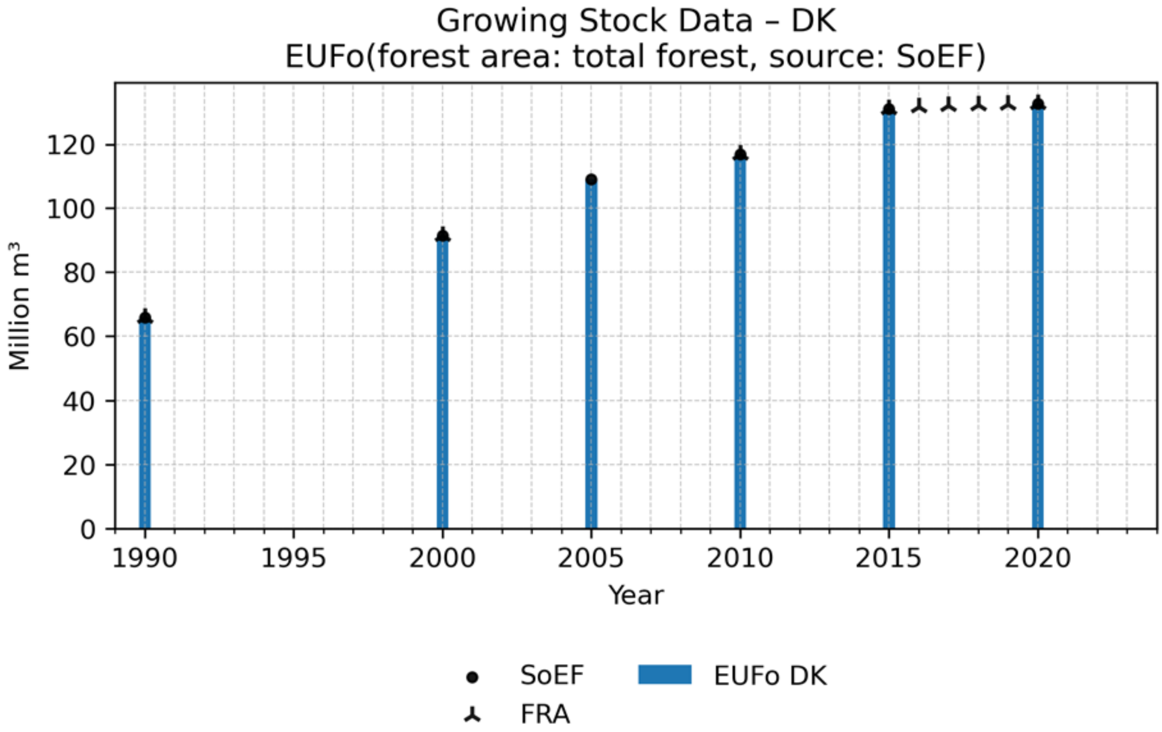
Growing Stock Data – CY
EUFo(forest area: total forest, source: SoEF)
Million m³
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
EUFo CY
FRA

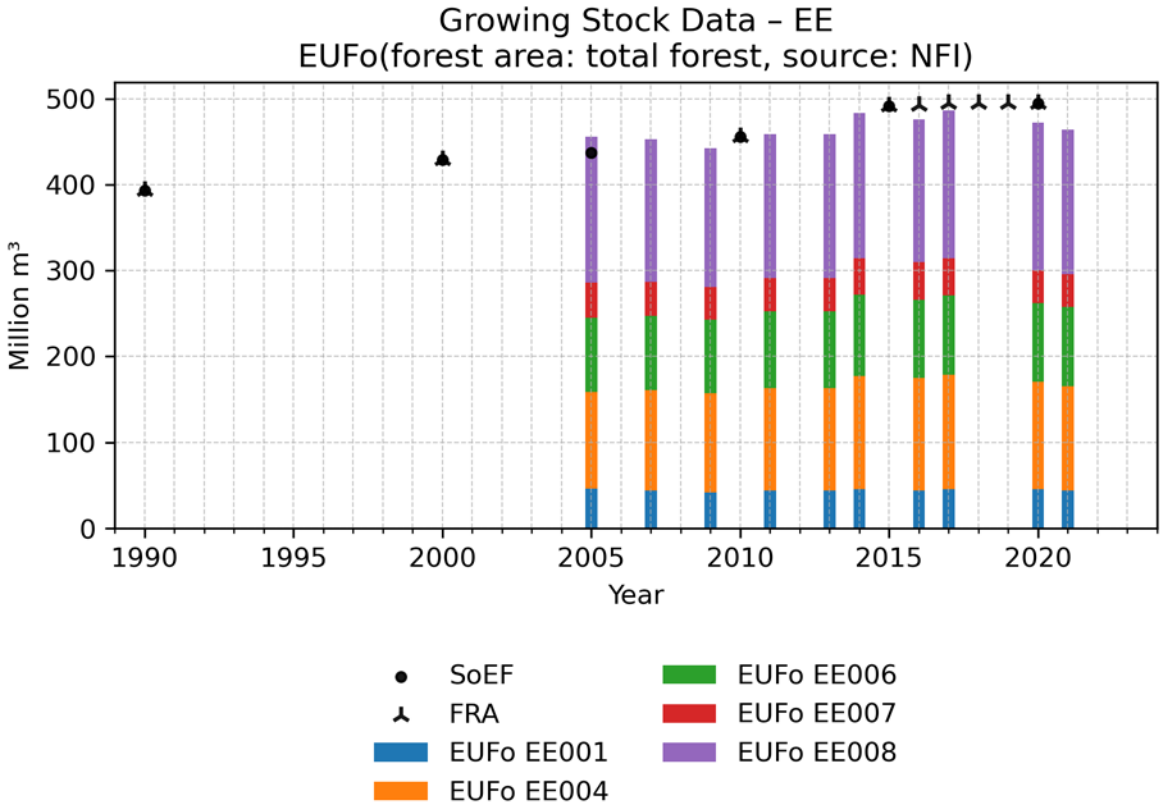


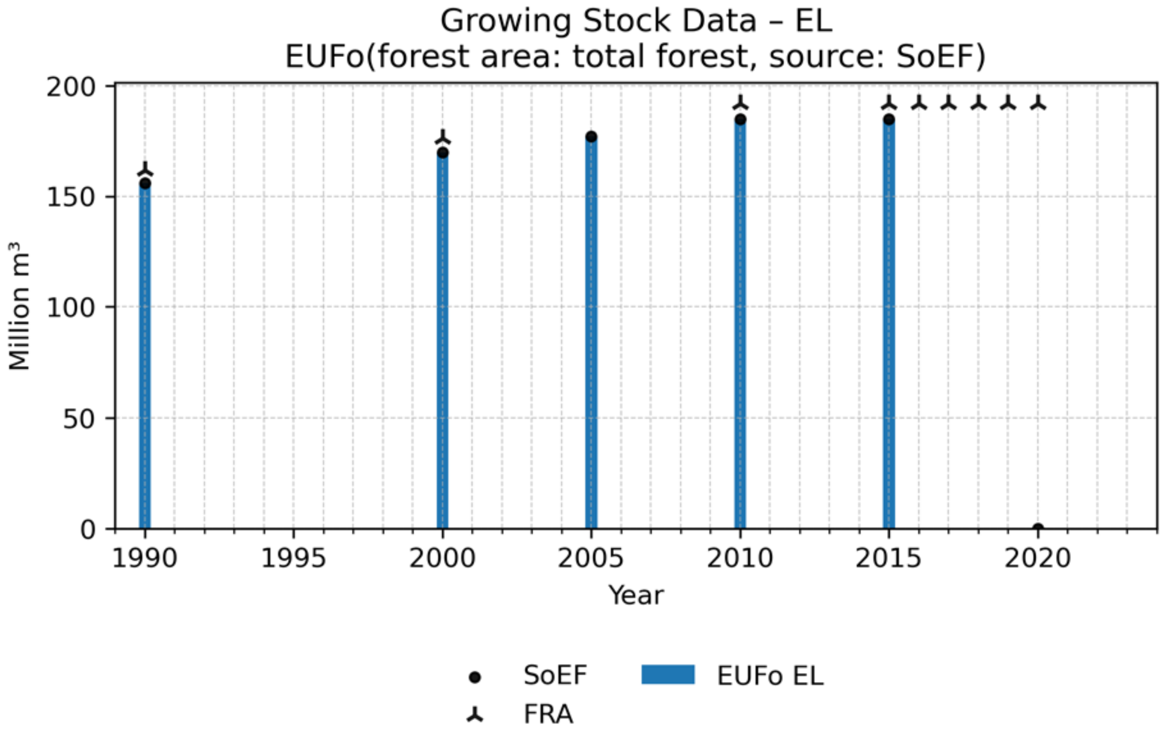
Growing Stock Data – CZ
EUFo(forest area: total forest, source: NFI)
Million m³
0
200
400
600
800
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo CZ010
EUFo CZ020
EUFo CZ031
EUFo CZ032
EUFo CZ041
EUFo CZ042
EUFo CZ051
EUFo CZ052
EUFo CZ053
EUFo CZ063
EUFo CZ064
EUFo CZ071
EUFo CZ072
EUFo CZ080

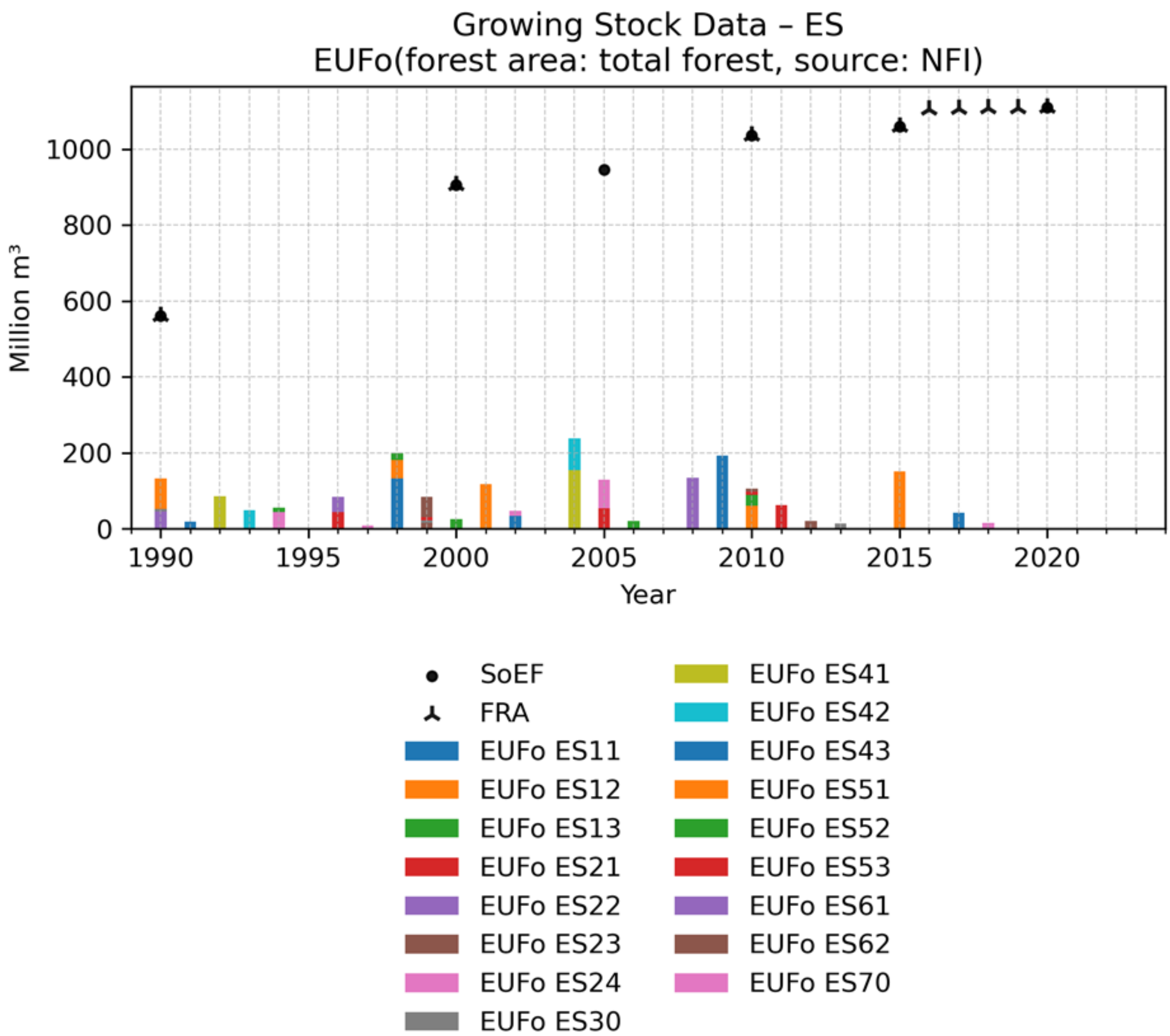


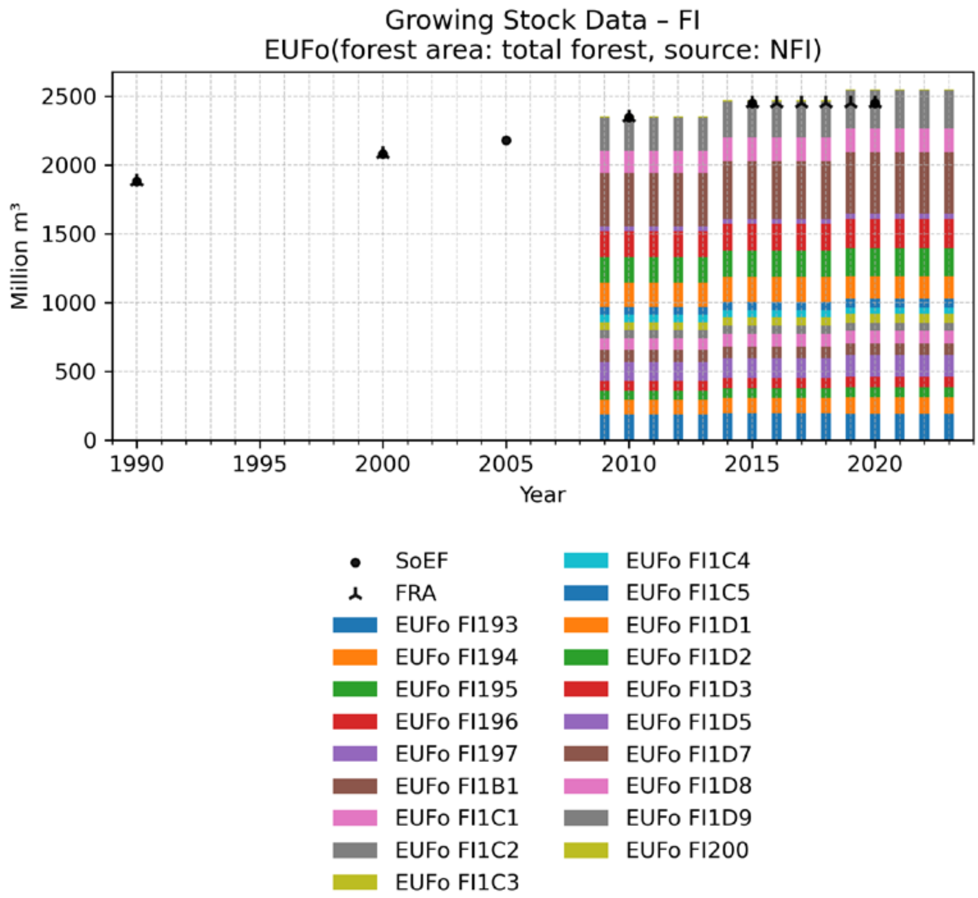
Growing Stock Data – DE
EUFo(forest area: used forest, source: NFI)
Million m³
Year
0
500
1000
1500
2000
2500
3000
3500
1990
1995
2000
2005
2010
2015
2020
SoEF
FRA
EUFo DE1
EUFo DE2
EUFo DE3_DE4
EUFo DE6_DE5
EUFo DE7
EUFo DE8
EUFo DE9
EUFo DEA
EUFo DEB
EUFo DEC
EUFo DED
EUFo DEE
EUFo DEF
EUFo DEG

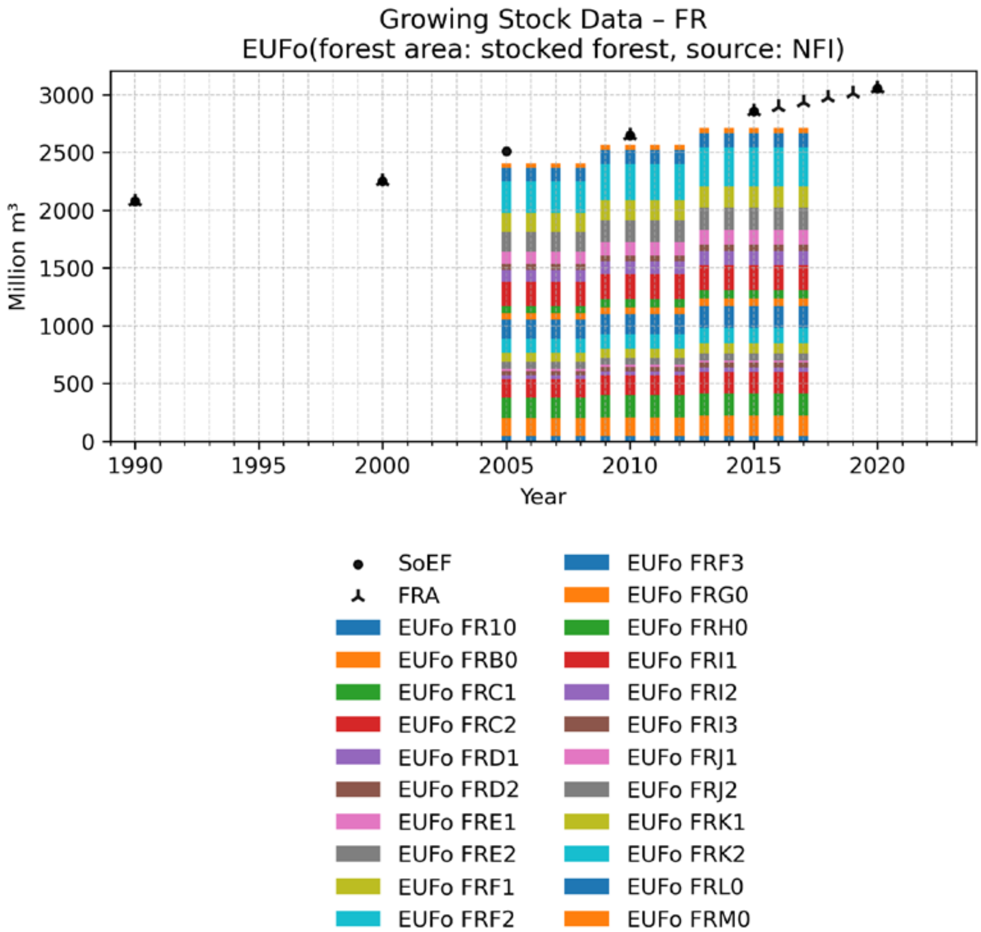

Growing Stock Data – DK
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo DK

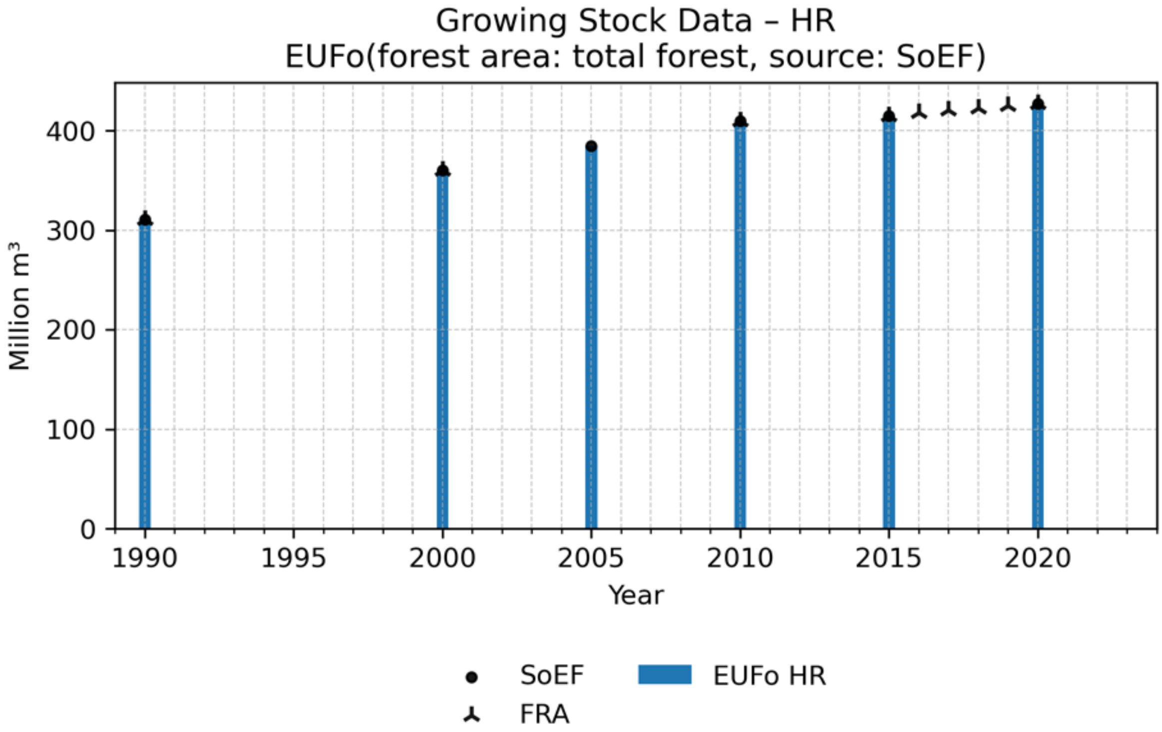

Growing Stock Data – EE
EUFo(forest area: total forest, source: NFI)
Million m³
Year
SoEF
FRA
EUFo EE001
EUFo EE004
EUFo EE006
EUFo EE007
EUFo EE008

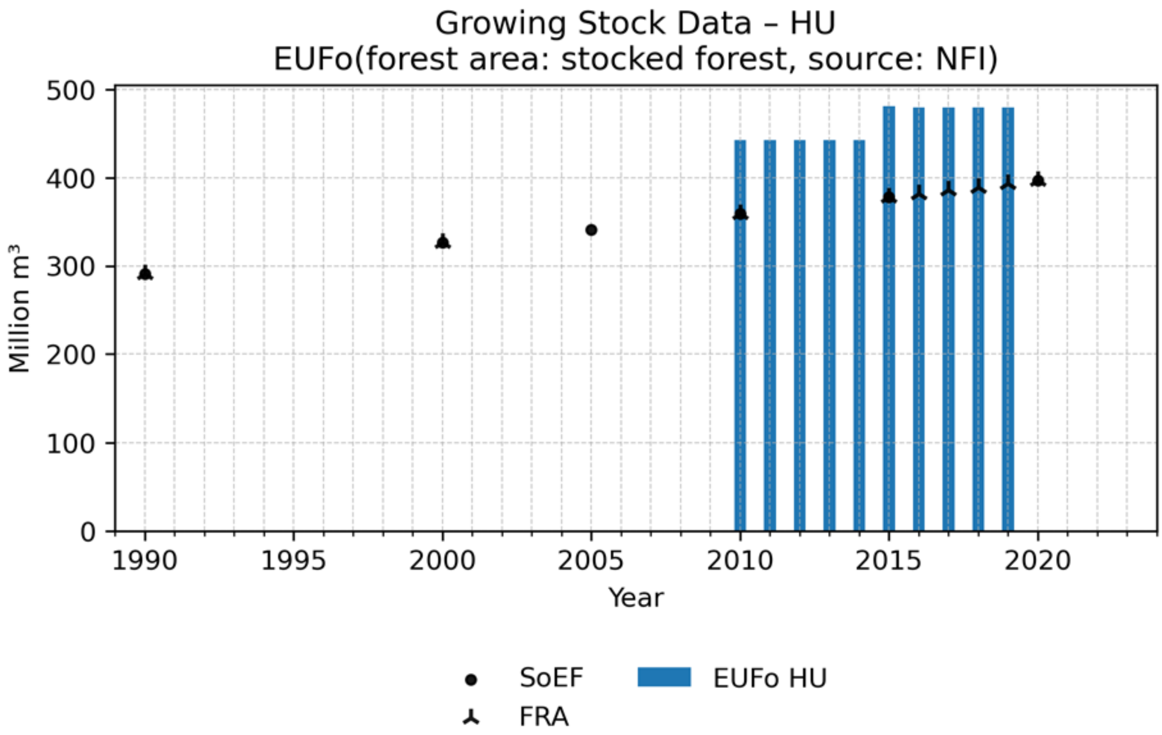

Growing Stock Data – EL
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo EL

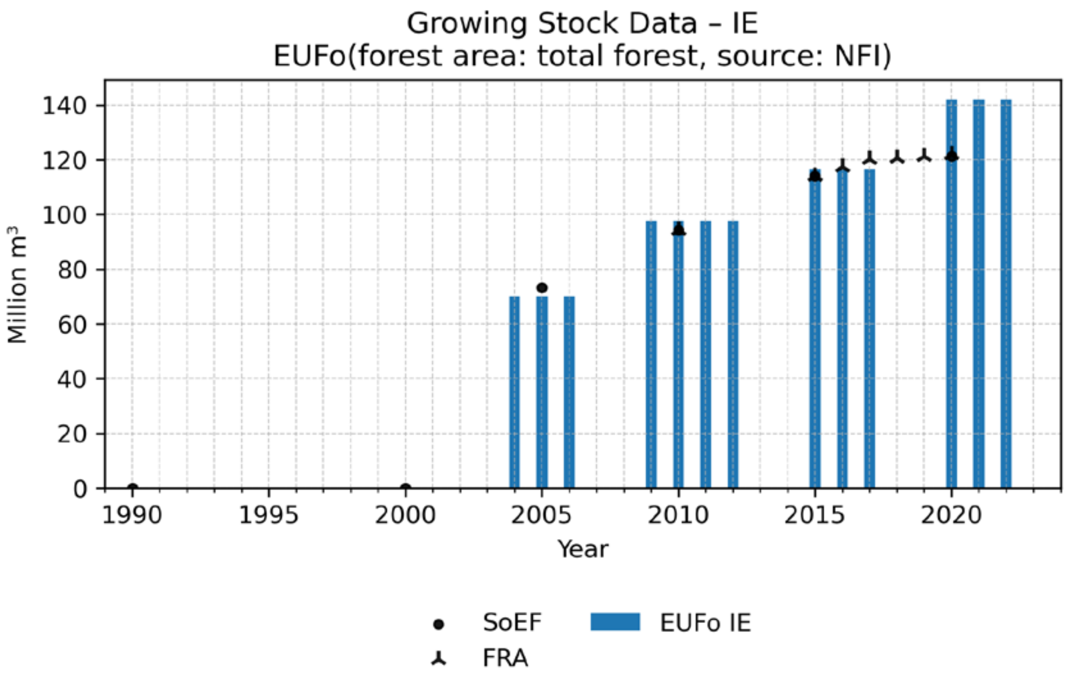

Growing Stock Data – ES
EUFo(forest area: total forest, source: NFI)
Million m³
Year
SoEF
FRA
EUFo ES11
EUFo ES12
EUFo ES13
EUFo ES21
EUFo ES22
EUFo ES23
EUFo ES24
EUFo ES30
EUFo ES41
EUFo ES42
EUFo ES43
EUFo ES51
EUFo ES52
EUFo ES53
EUFo ES61
EUFo ES62
EUFo ES70

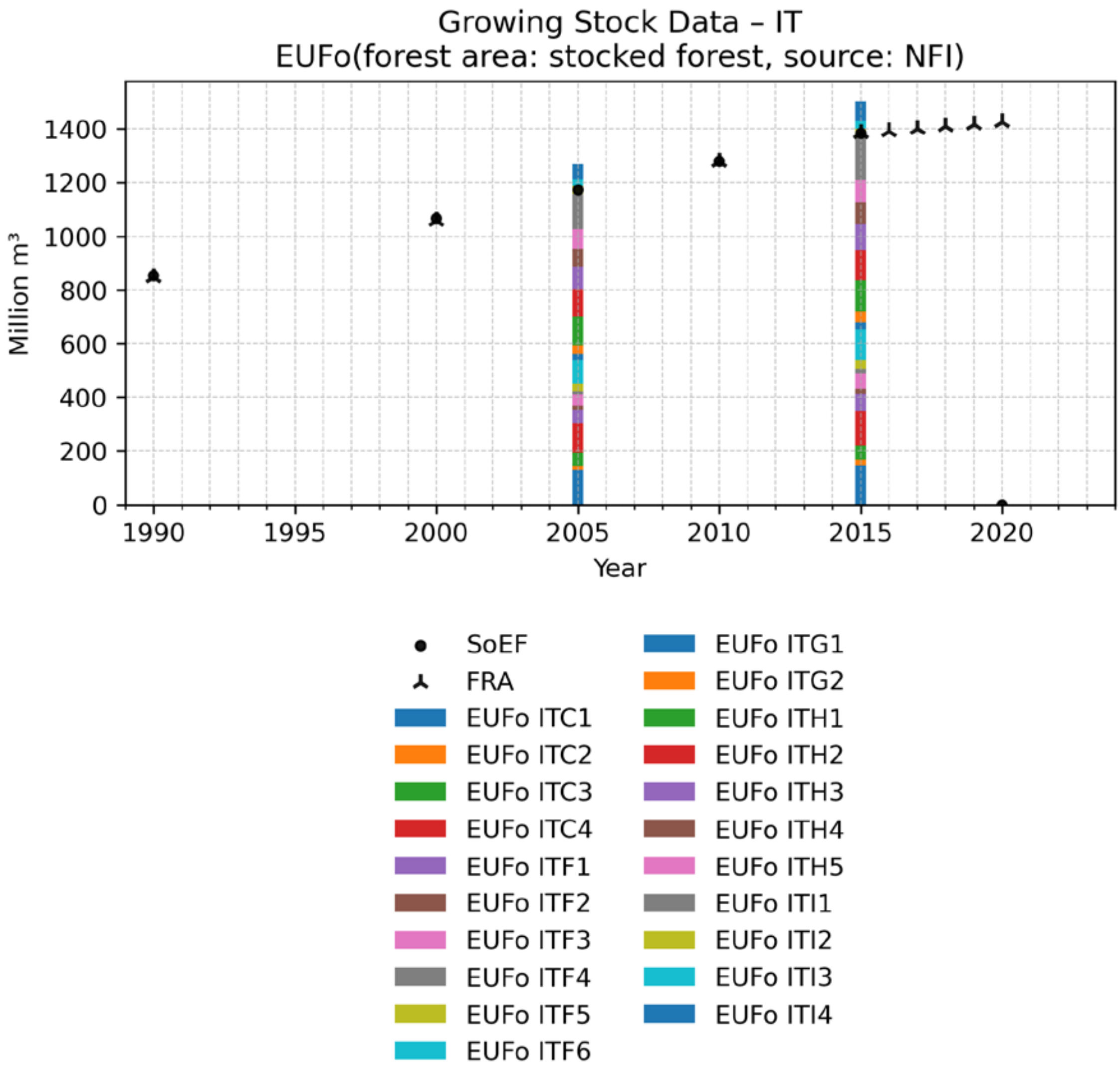

Growing Stock Data – FI
EUFo(forest area: total forest, source: NFI)
Million m³
Year
0
500
1000
1500
2000
2500
1990
1995
2000
2005
2010
2015
2020
SoEF
FRA
EUFo FI193
EUFo FI194
EUFo FI195
EUFo FI196
EUFo FI197
EUFo FI1B1
EUFo FI1C1
EUFo FI1C2
EUFo FI1C3
EUFo FI1C4
EUFo FI1C5
EUFo FI1D1
EUFo FI1D2
EUFo FI1D3
EUFo FI1D5
EUFo FI1D7
EUFo FI1D8
EUFo FI1D9
EUFo FI200

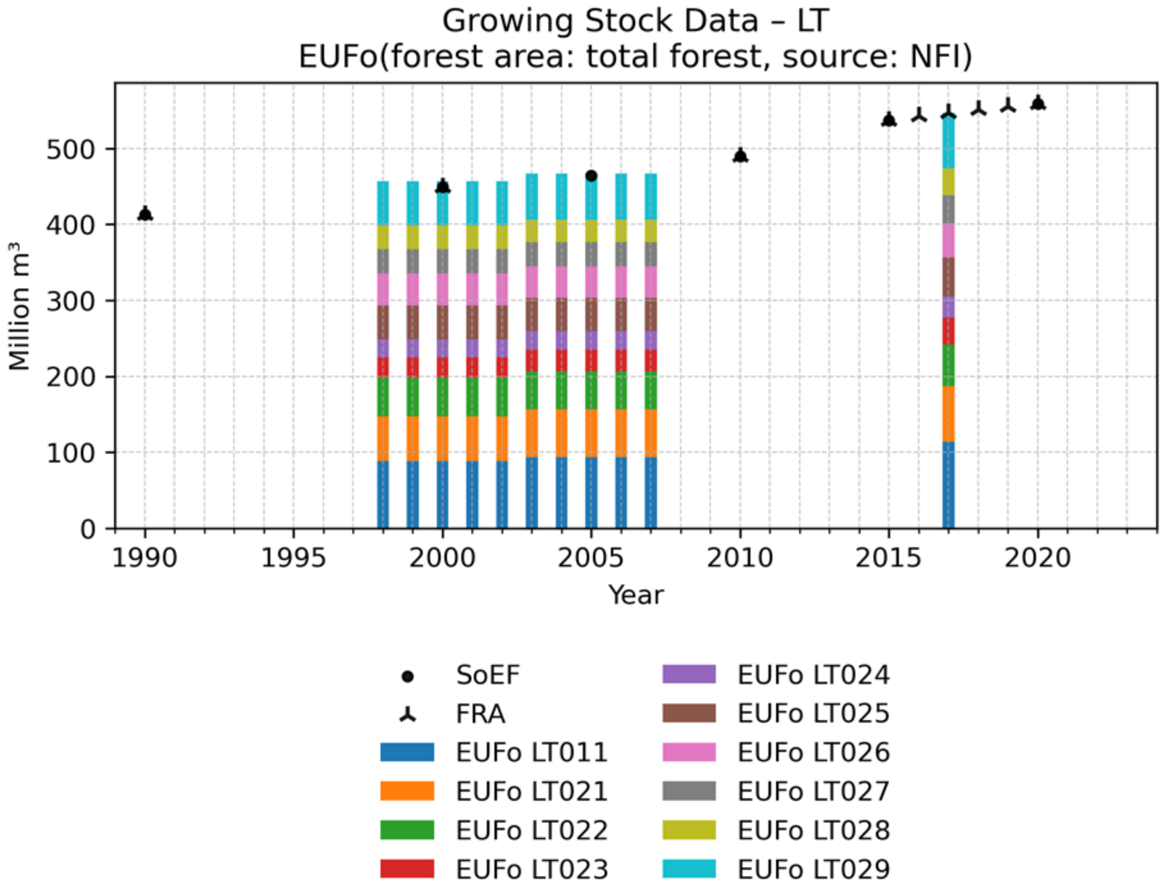

Growing Stock Data – FR
EUFo(forest area: stocked forest, source: NFI)
Million m³
Year
0
500
1000
1500
2000
2500
3000
1990
1995
2000
2005
2010
2015
2020
SoEF
FRA
EUFo FR10
EUFo FRB0
EUFo FRC1
EUFo FRC2
EUFo FRD1
EUFo FRD2
EUFo FRE1
EUFo FRE2
EUFo FRF1
EUFo FRF2
EUFo FRF3
EUFo FRG0
EUFo FRH0
EUFo FRI1
EUFo FRI2
EUFo FRI3
EUFo FRJ1
EUFo FRJ2
EUFo FRK1
EUFo FRK2
EUFo FRL0
EUFo FRM0

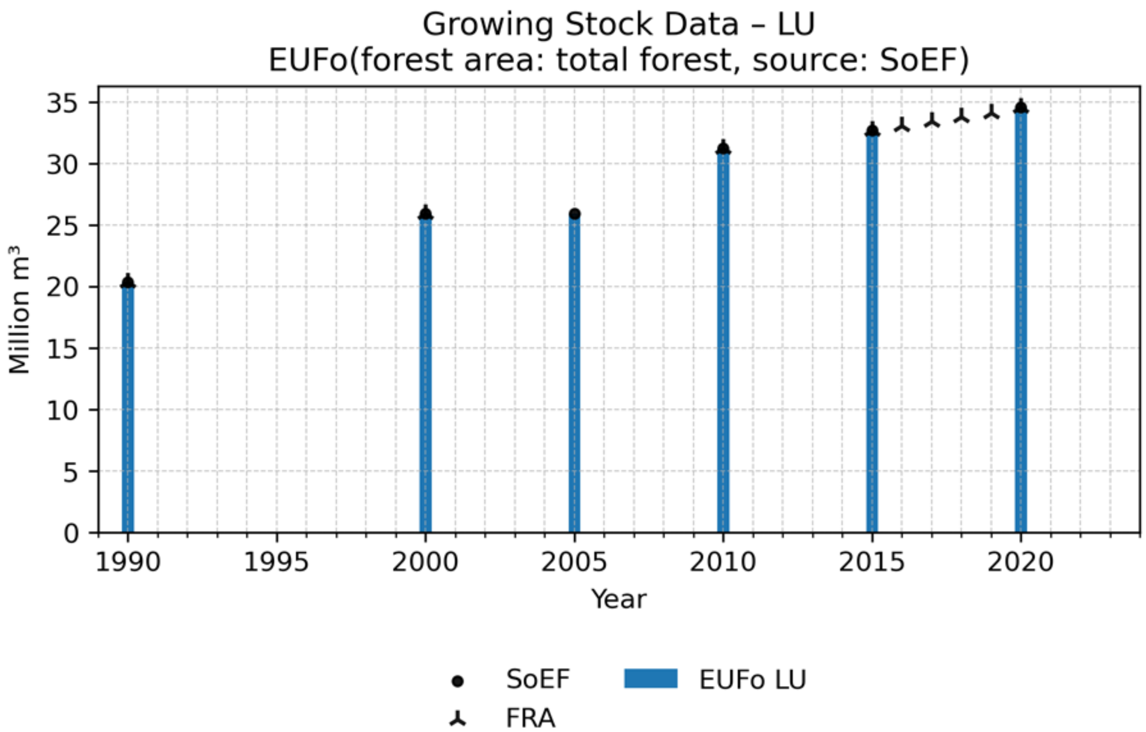

Growing Stock Data – HR
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
EUFo HR
FRA

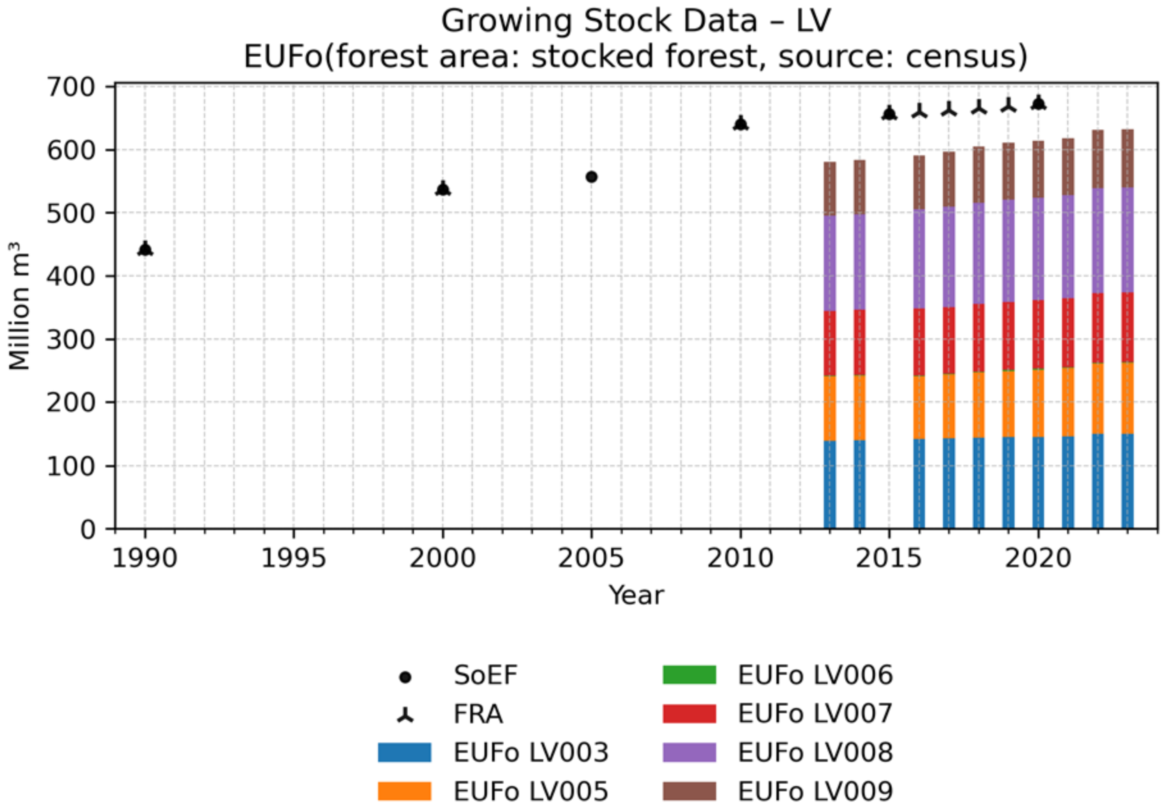

Growing Stock Data – HU
EUFo(forest area: stocked forest, source: NFI)
Million m³
Year
SoEF
EUFo HU
FRA

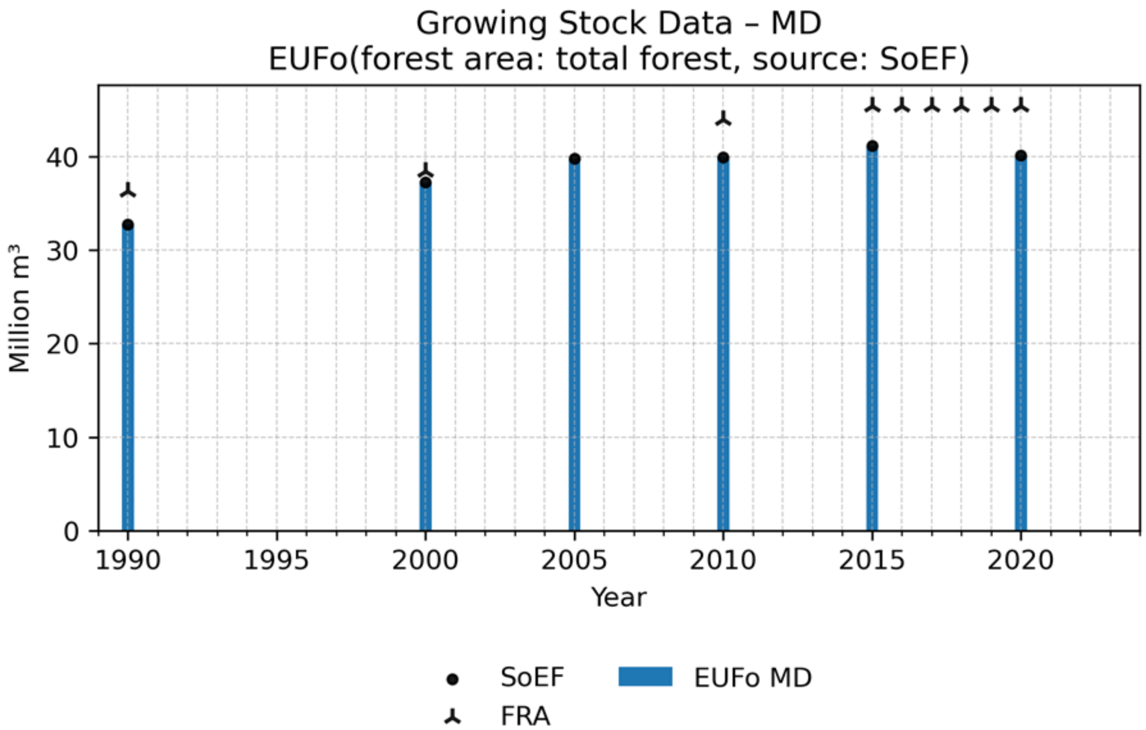

Growing Stock Data – IE
EUFo(forest area: total forest, source: NFI)
Million m³
Year
SoEF
FRA
EUFo IE

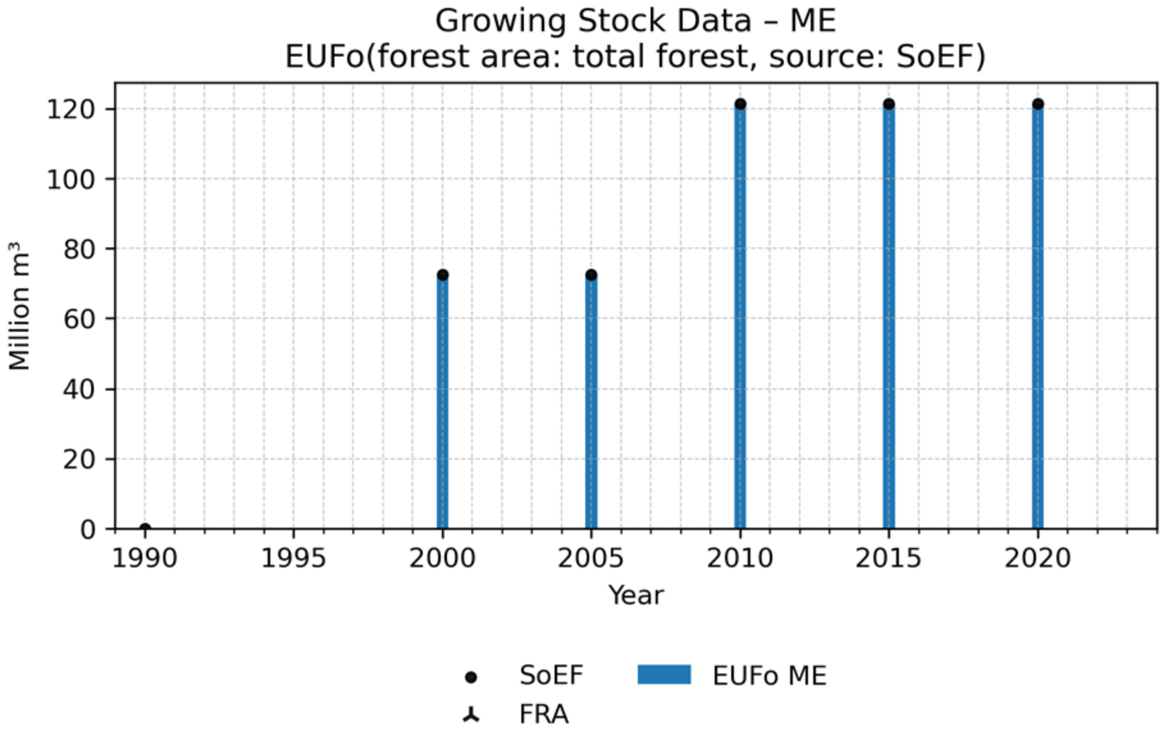

Growing Stock Data – IT
EUFo(forest area: stocked forest, source: NFI)
Million m³
Year
SoEF
FRA
EUFo ITC1
EUFo ITC2
EUFo ITC3
EUFo ITC4
EUFo ITF1
EUFo ITF2
EUFo ITF3
EUFo ITF4
EUFo ITF5
EUFo ITF6
EUFo ITG1
EUFo ITG2
EUFo ITH1
EUFo ITH2
EUFo ITH3
EUFo ITH4
EUFo ITH5
EUFo ITI1
EUFo ITI2
EUFo ITI3
EUFo ITI4

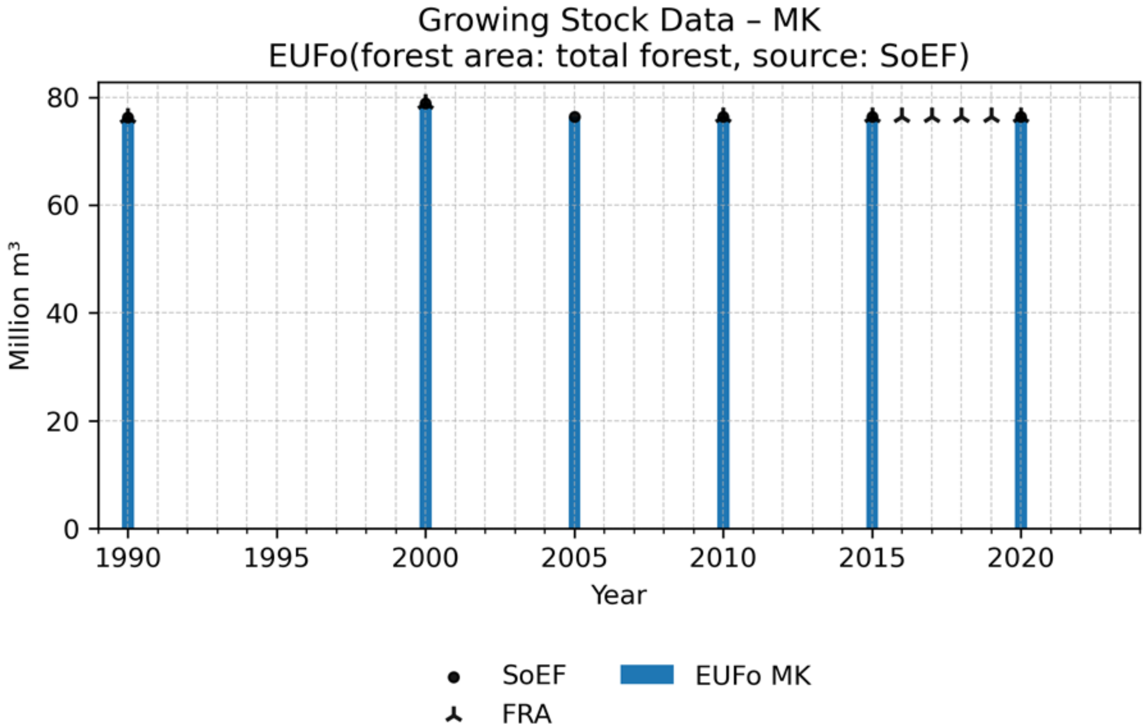

Growing Stock Data – LT
EUFo(forest area: total forest, source: NFI)
Million m³
Year
SoEF
FRA
EUFo LT011
EUFo LT021
EUFo LT022
EUFo LT023
EUFo LT024
EUFo LT025
EUFo LT026
EUFo LT027
EUFo LT028
EUFo LT029

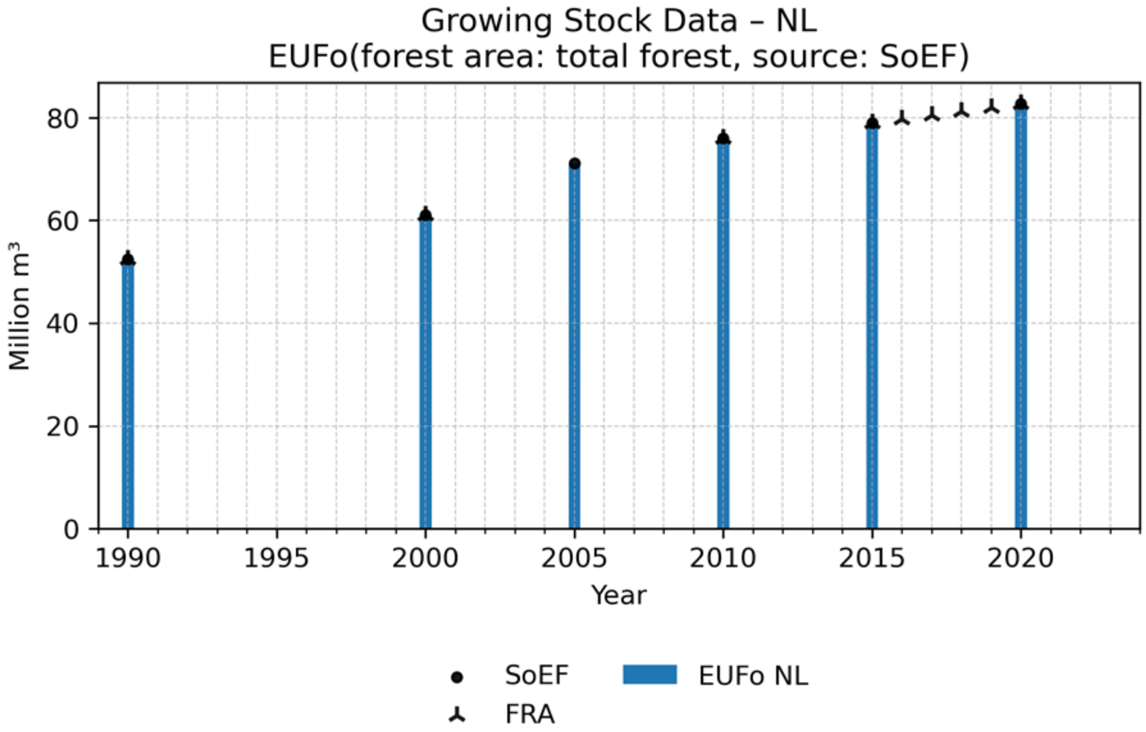

Growing Stock Data – LU
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo LU


Growing Stock Data – LV
EUFo(forest area: stocked forest, source: census)
Million m³
Year
SoEF
FRA
EUFo LV003
EUFo LV005
EUFo LV006
EUFo LV007
EUFo LV008
EUFo LV009

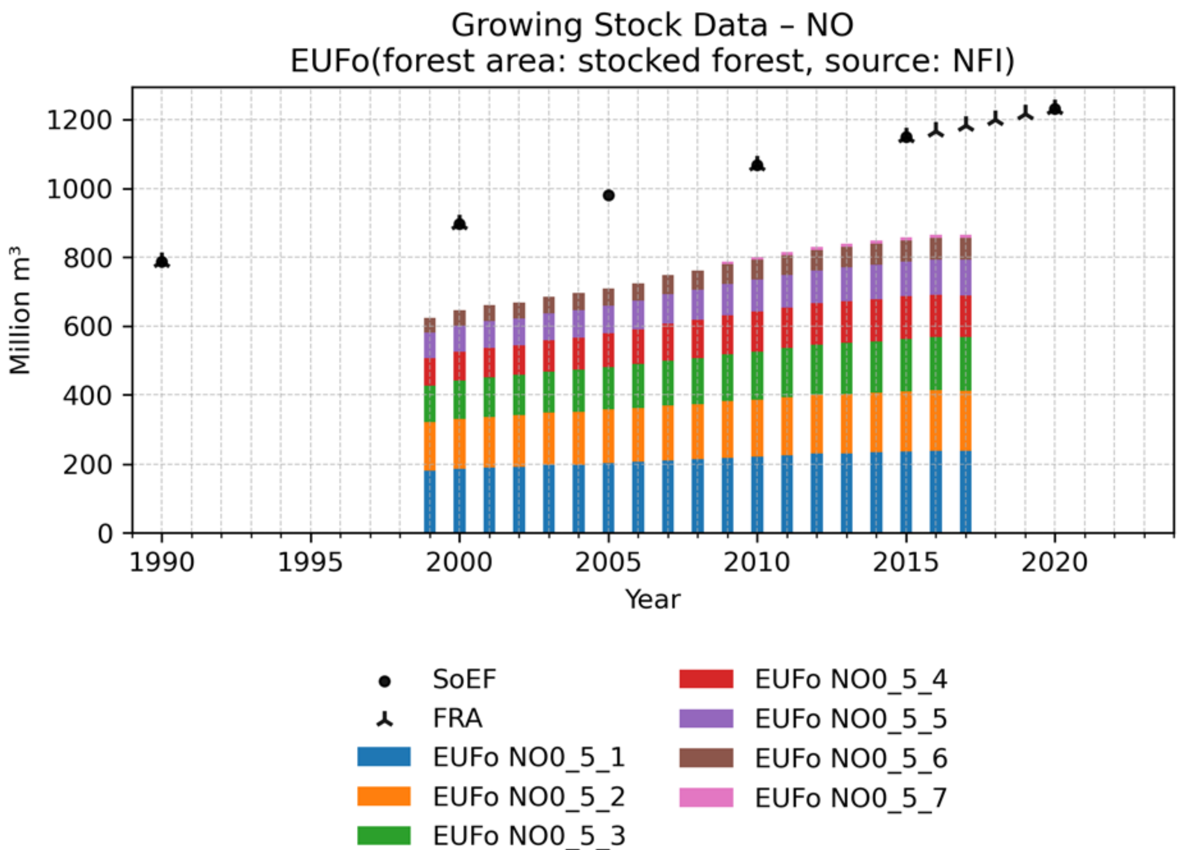

Growing Stock Data – MD
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo MD


Growing Stock Data – ME
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo ME

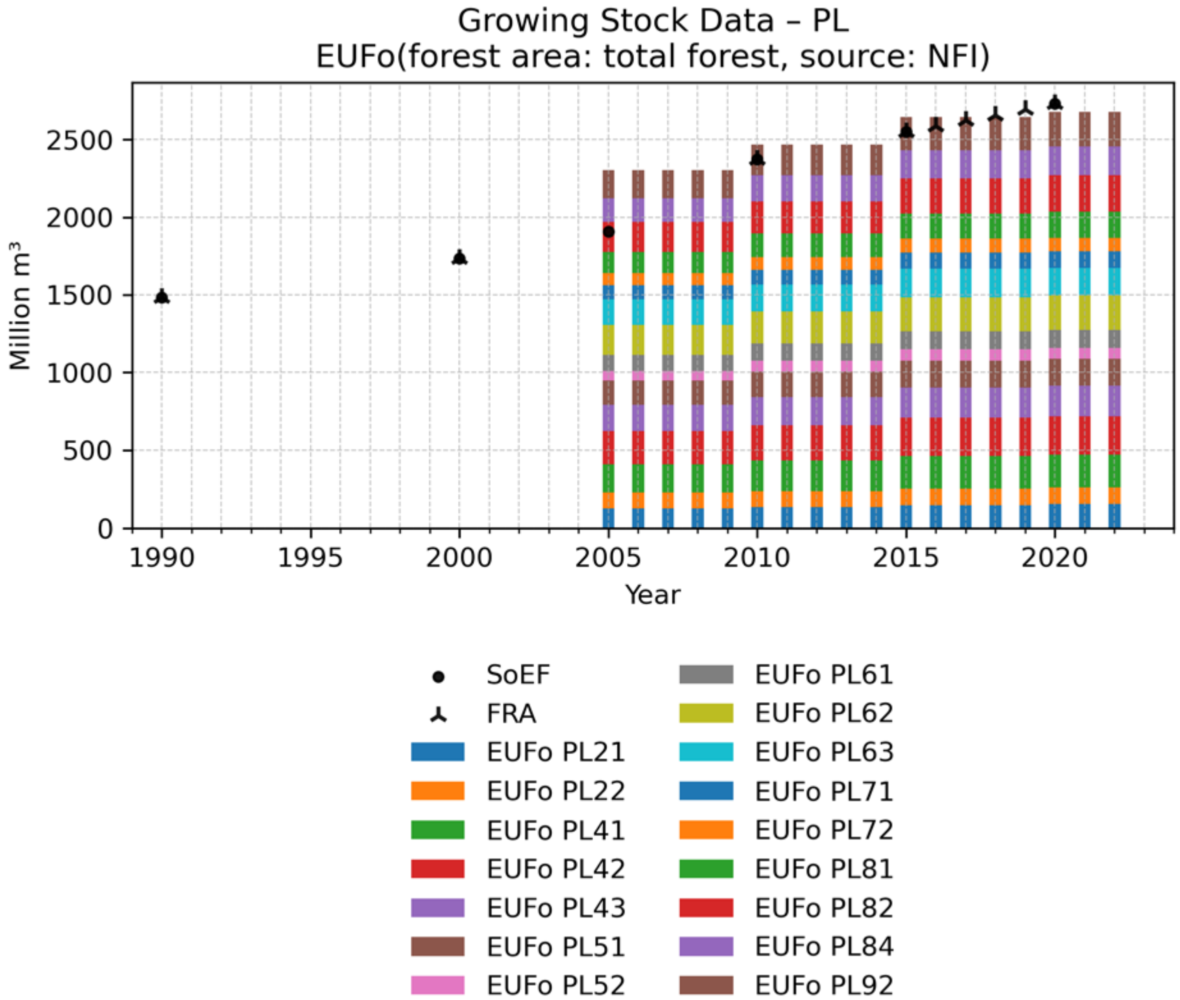

Growing Stock Data – MK
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo MK

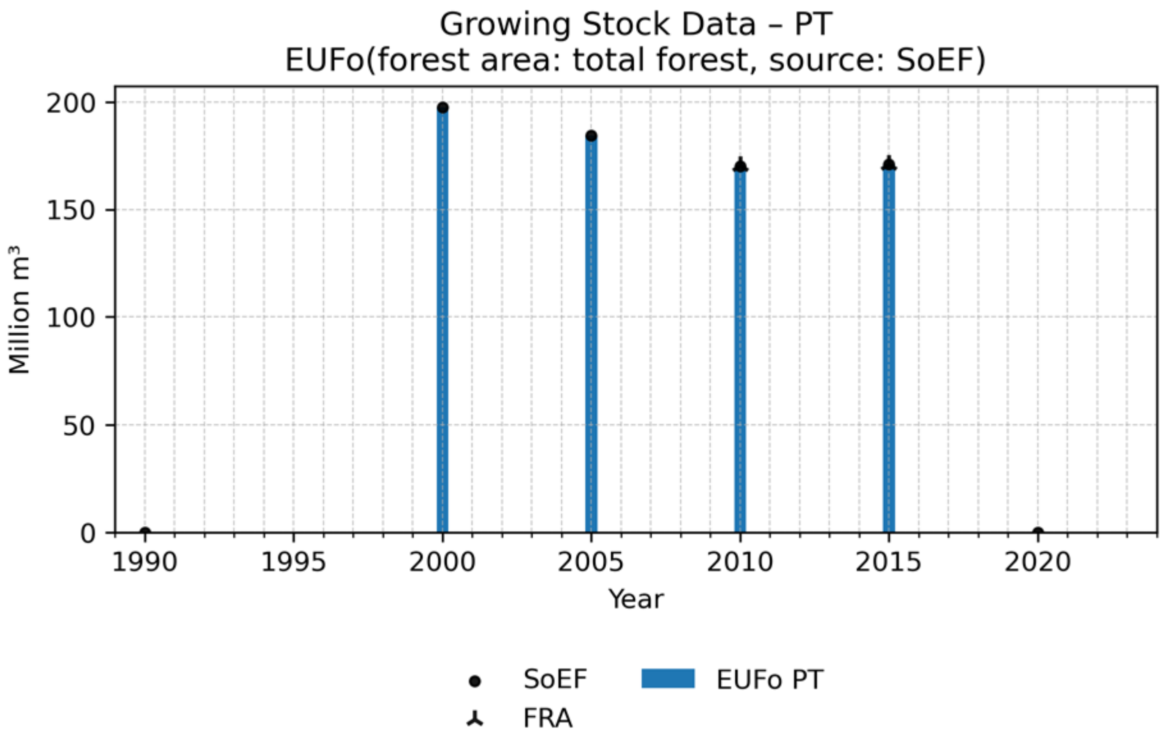


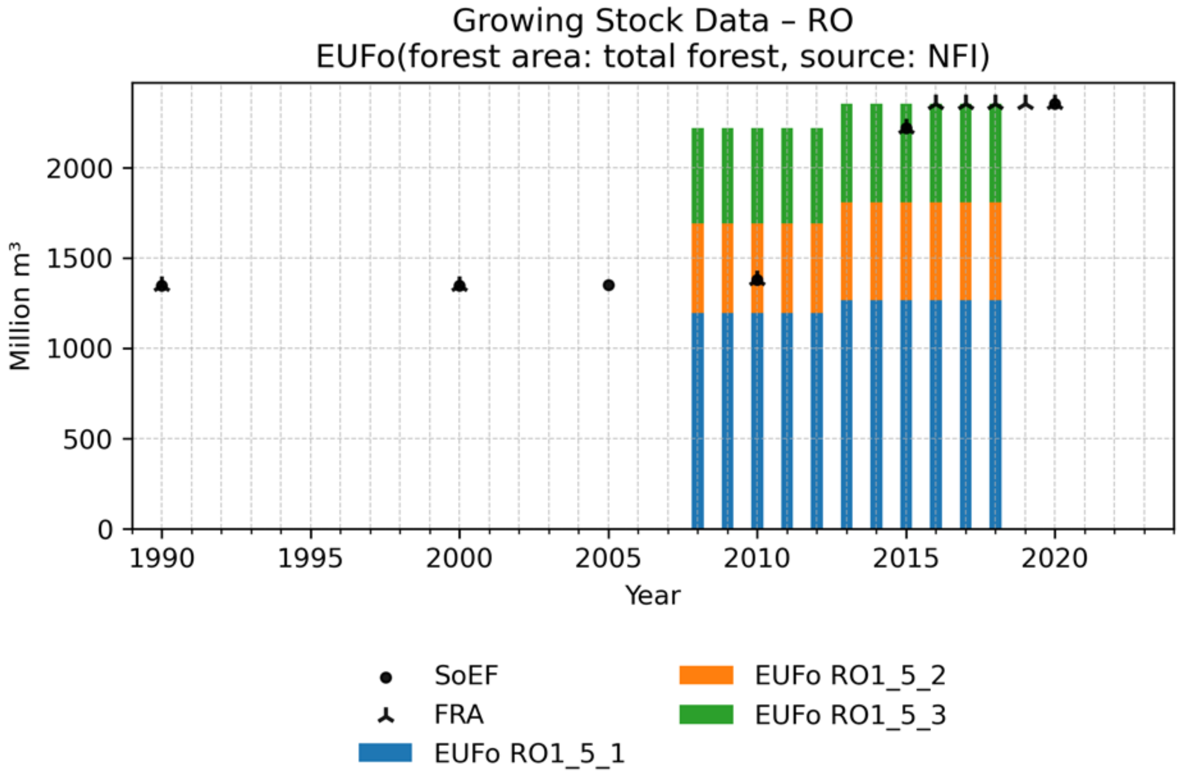
Growing Stock Data – NL
EUFo(forest area: total forest, source: SoEF)
80
60
40
20
0
Million m³
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo NL

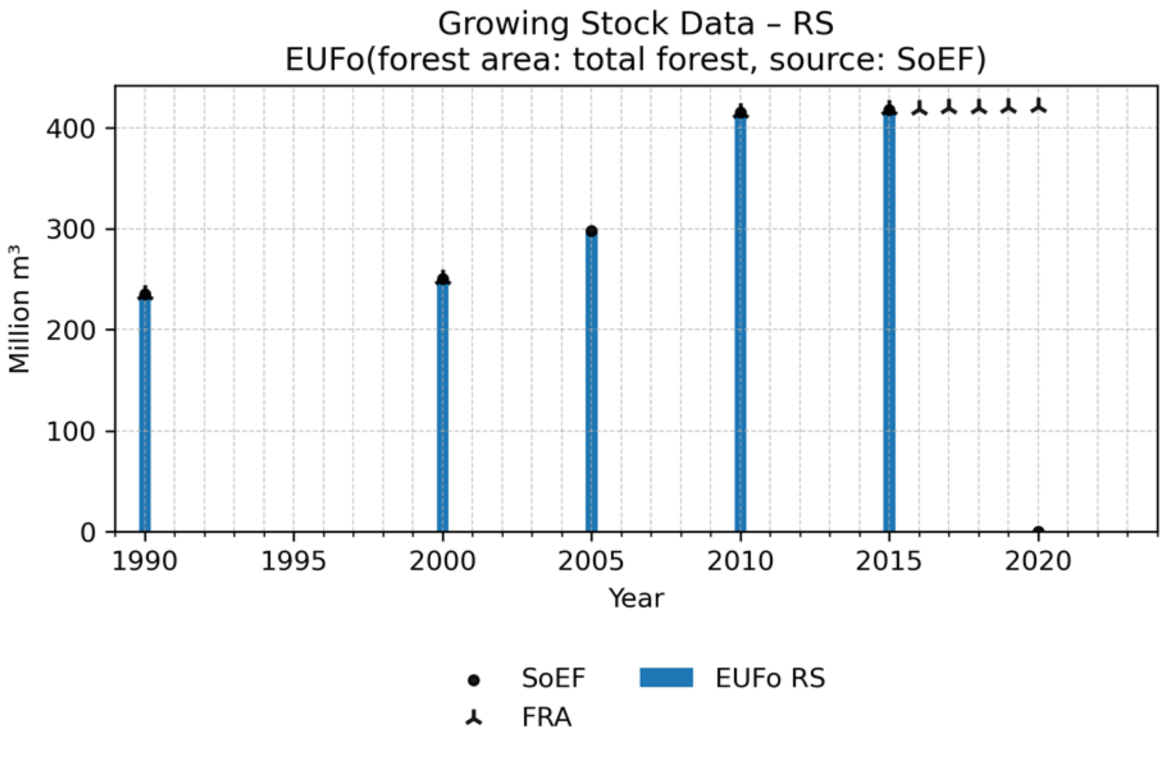


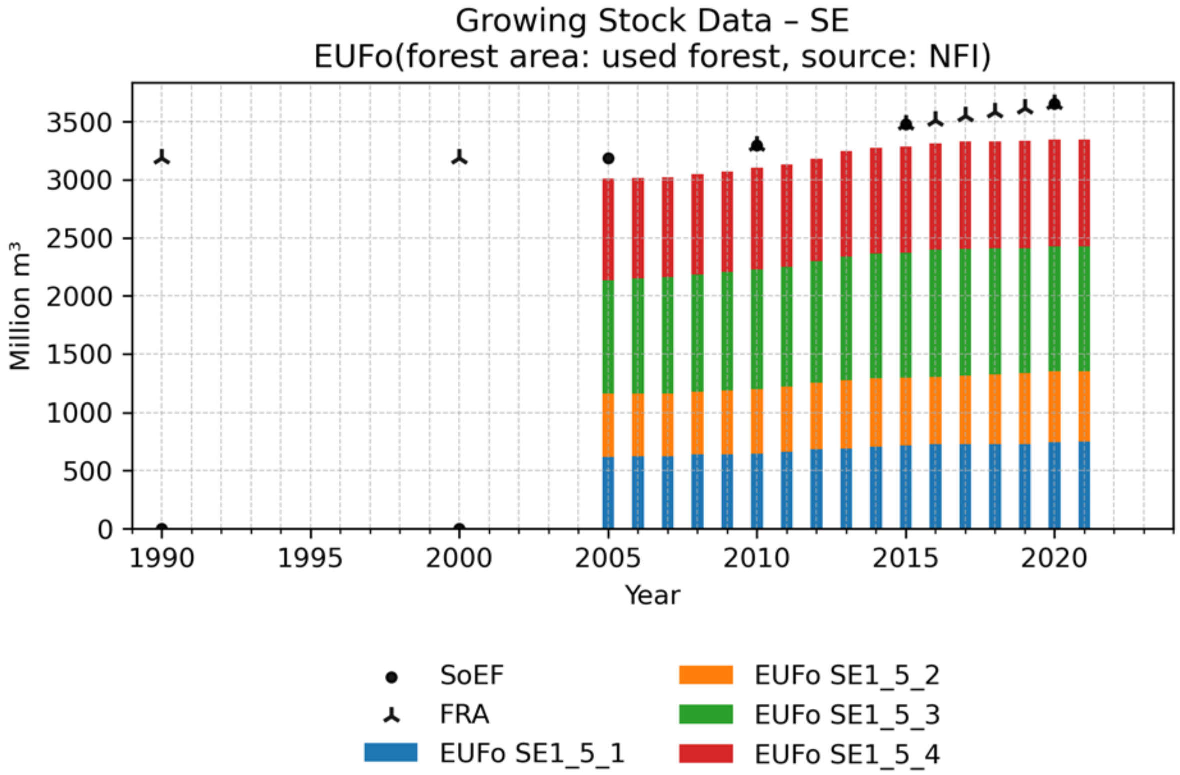
Growing Stock Data – NO
EUFo(forest area: stocked forest, source: NFI)
1200
1000
800
600
400
200
0
Million m³
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo NO0_5_1
EUFo NO0_5_2
EUFo NO0_5_3
EUFo NO0_5_4
EUFo NO0_5_5
EUFo NO0_5_6
EUFo NO0_5_7


Growing Stock Data – PL
EUFo(forest area: total forest, source: NFI)
Million m³
2500
2000
1500
1000
500
0
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo PL21
EUFo PL22
EUFo PL41
EUFo PL42
EUFo PL43
EUFo PL51
EUFo PL52
EUFo PL61
EUFo PL62
EUFo PL63
EUFo PL71
EUFo PL72
EUFo PL81
EUFo PL82
EUFo PL84
EUFo PL92

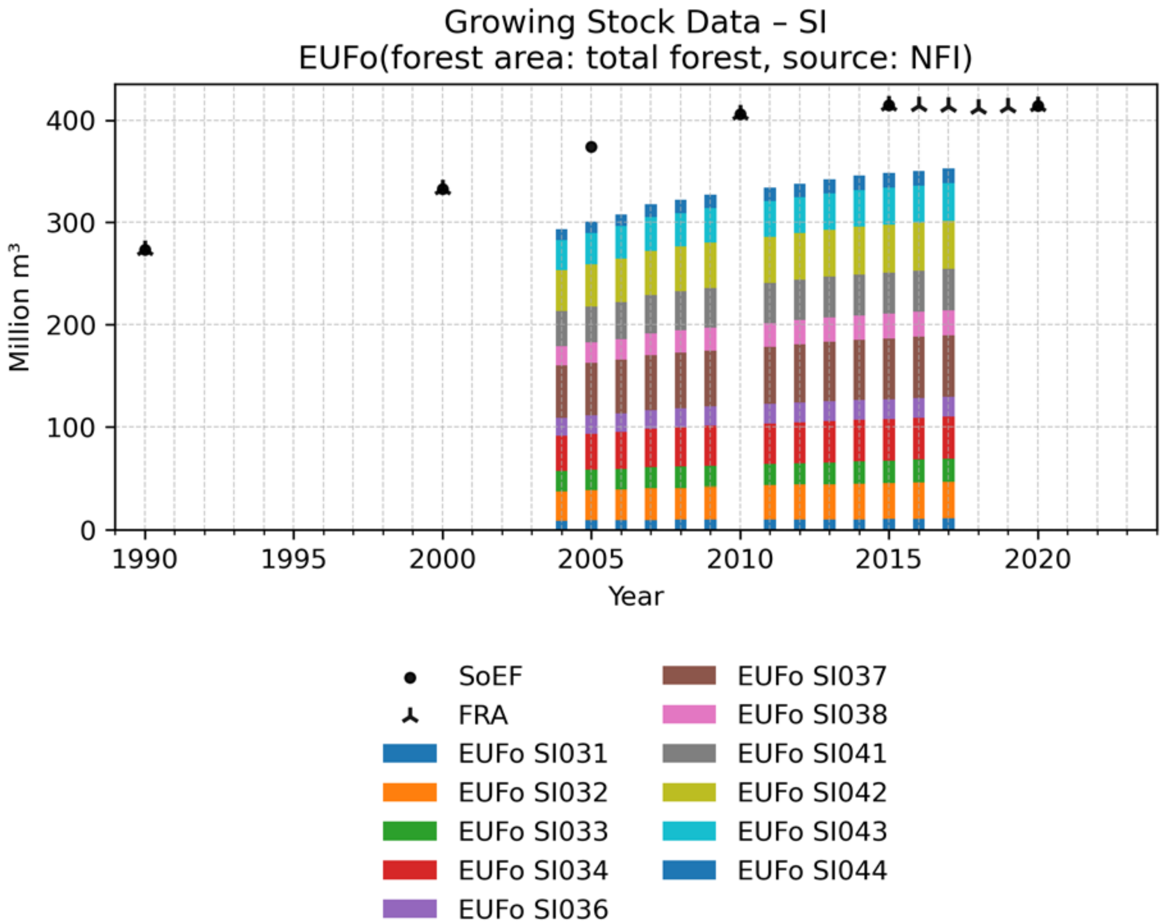

Growing Stock Data – PT
EUFo(forest area: total forest, source: SoEF)
Million m³
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo PT


Growing Stock Data – RO
EUFo(forest area: total forest, source: NFI)
Million m³
0
500
1000
1500
2000
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo RO1_5_1
EUFo RO1_5_2
EUFo RO1_5_3

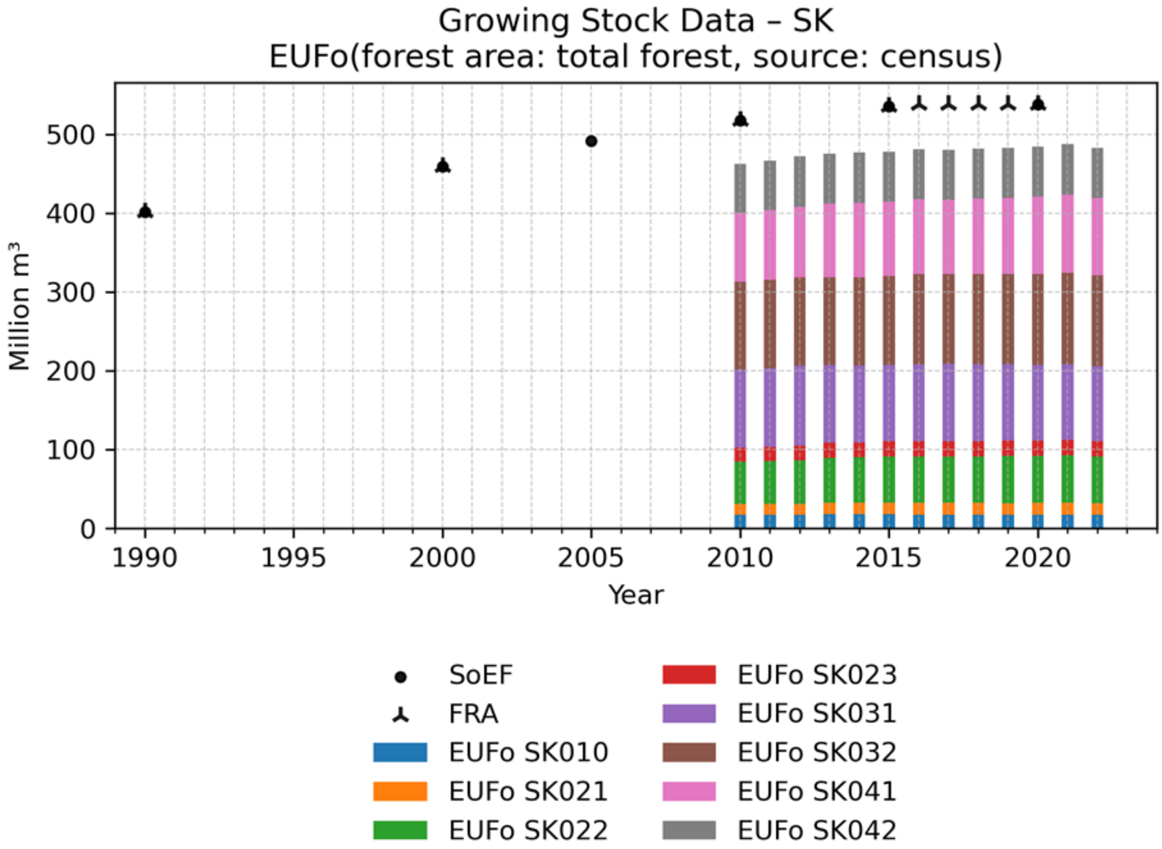

Growing Stock Data – RS
EUFo(forest area: total forest, source: SoEF)
Million m³
0
100
200
300
400
1990
1995
2000
2005
2010
2015
2020
Year
SoEF
FRA
EUFo RS

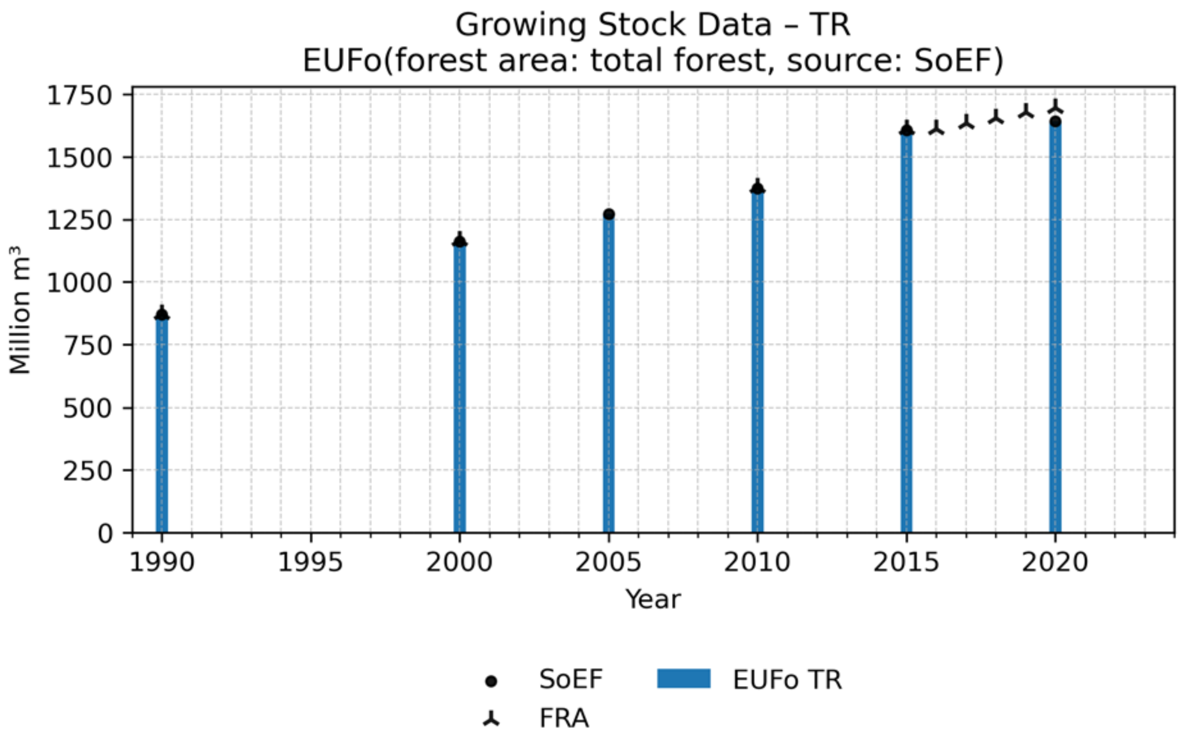


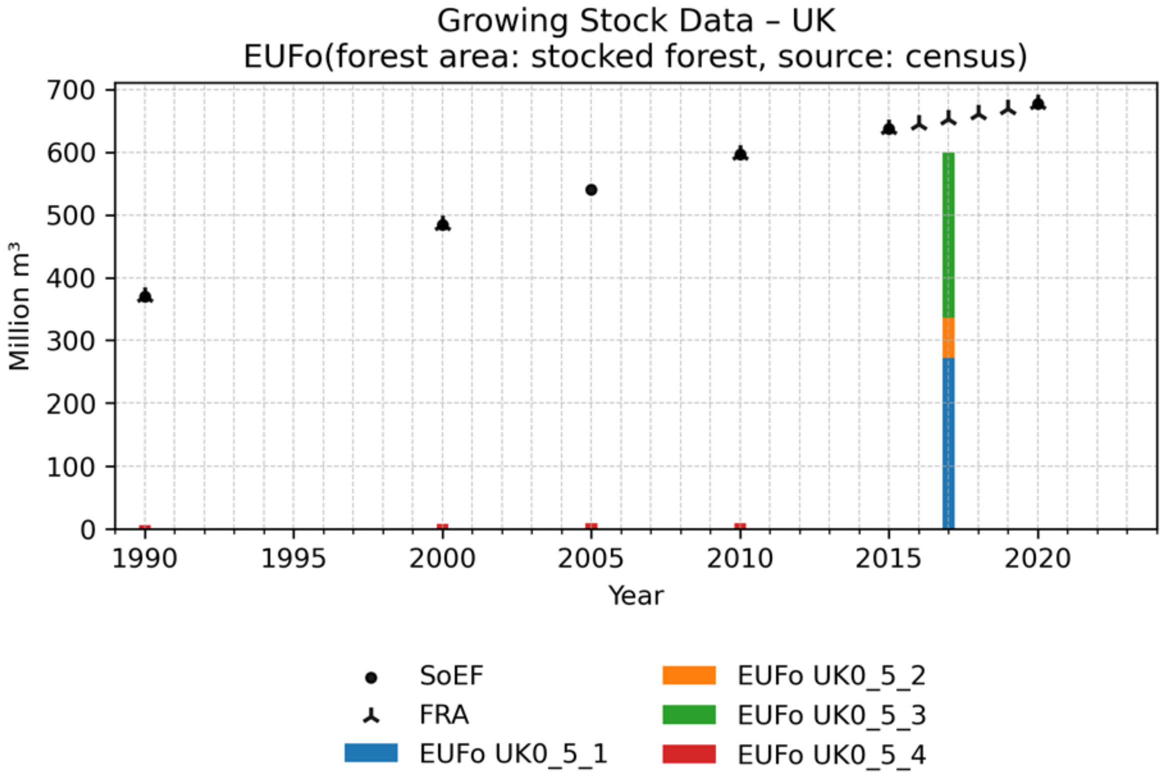
Growing Stock Data – SE
EUFo(forest area: used forest, source: NFI)
Million m³
Year
0
500
1000
1500
2000
2500
3000
3500
1990
1995
2000
2005
2010
2015
2020
SoEF
FRA
EUFo SE1_5_1
EUFo SE1_5_2
EUFo SE1_5_3
EUFo SE1_5_4

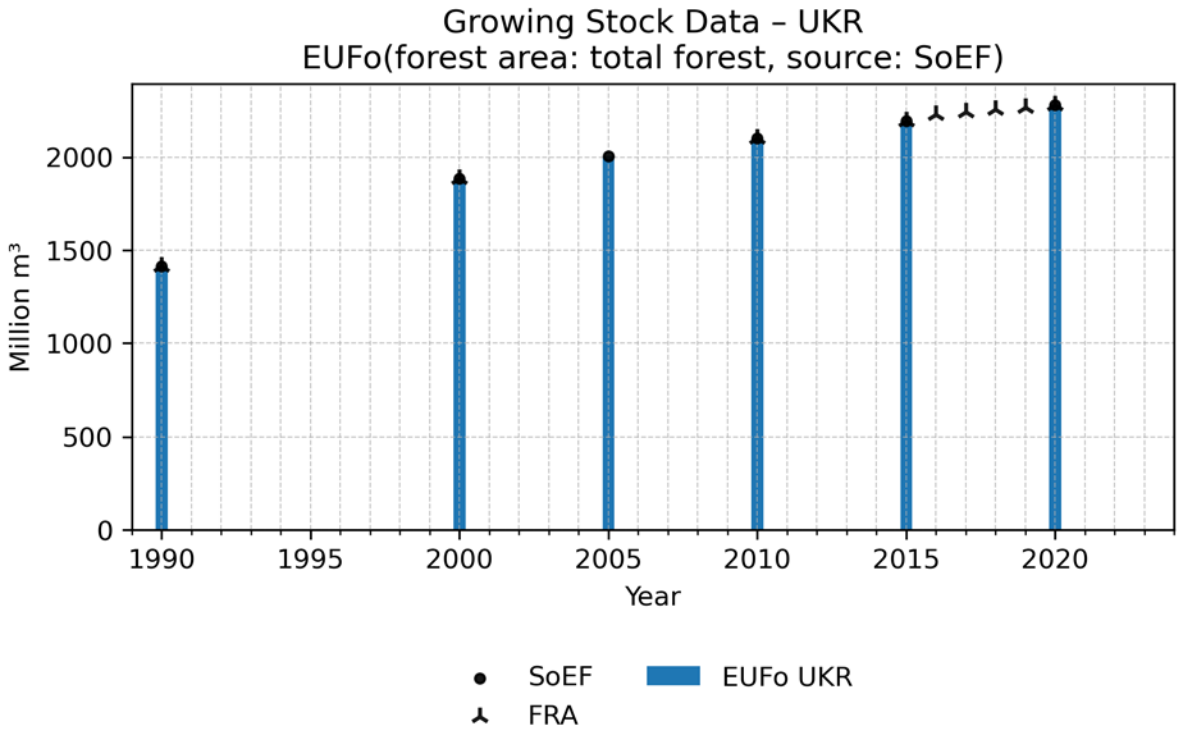


Growing Stock Data – SI
EUFo(forest area: total forest, source: NFI)
Million m³
Year
0
100
200
300
400
1990
1995
2000
2005
2010
2015
2020
SoEF
FRA
EUFo SI031
EUFo SI032
EUFo SI033
EUFo SI034
EUFo SI036
EUFo SI037
EUFo SI038
EUFo SI041
EUFo SI042
EUFo SI043
EUFo SI044

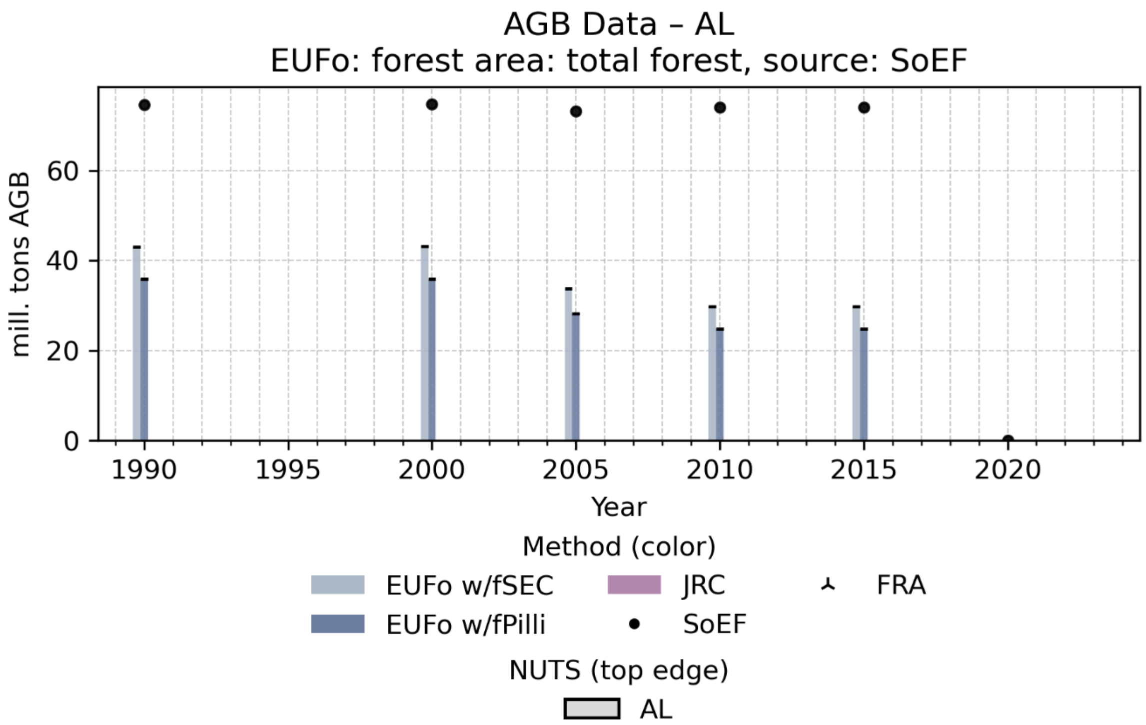

Growing Stock Data – SK
EUFo(forest area: total forest, source: census)
Million m³
Year
SoEF
FRA
EUFo SK010
EUFo SK021
EUFo SK022
EUFo SK023
EUFo SK031
EUFo SK032
EUFo SK041
EUFo SK042

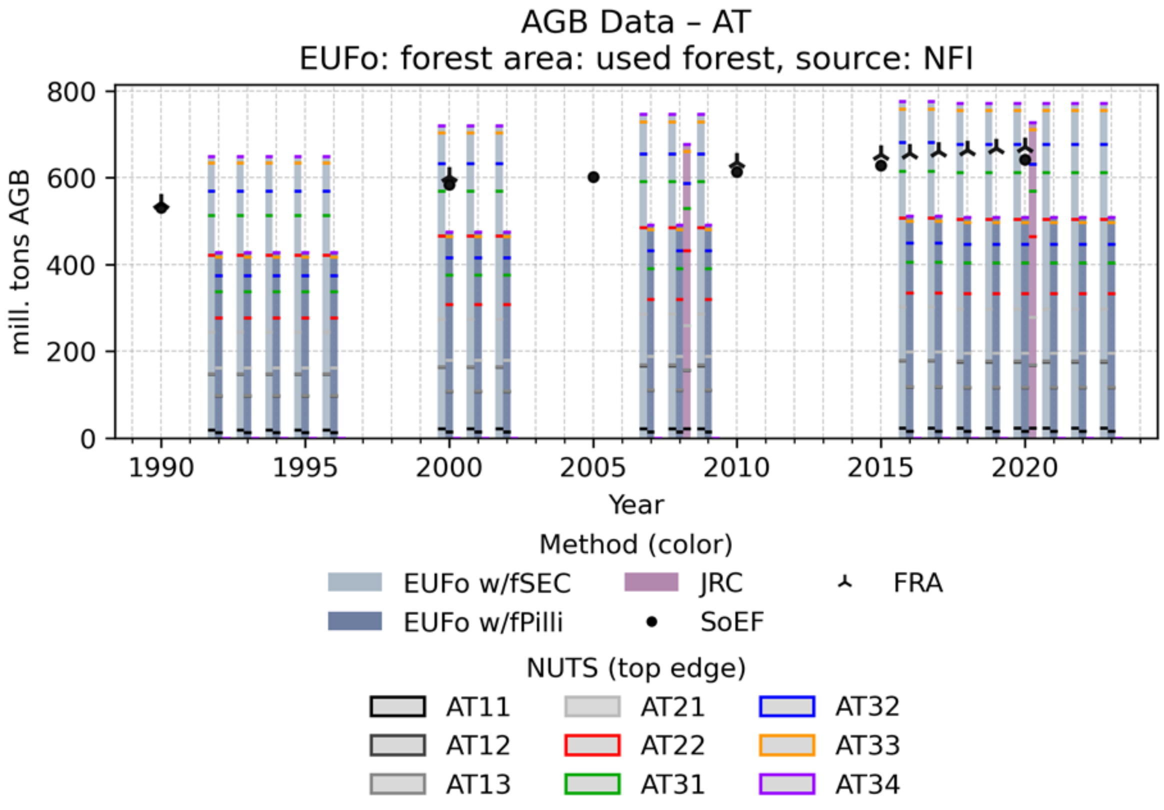

Growing Stock Data – TR
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo TR

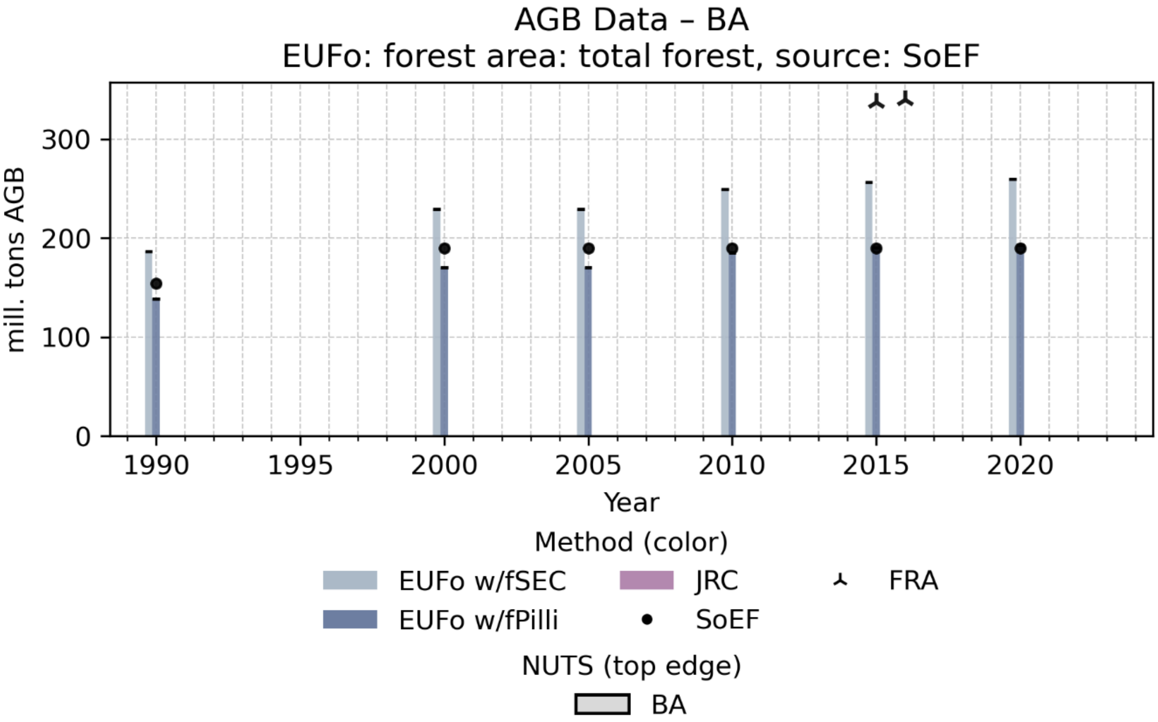

Growing Stock Data – UK
EUFo(forest area: stocked forest, source: census)
Million m³
Year
SoEF
FRA
EUFo UK0_5_1
EUFo UK0_5_2
EUFo UK0_5_3
EUFo UK0_5_4


Growing Stock Data – UKR
EUFo(forest area: total forest, source: SoEF)
Million m³
Year
SoEF
FRA
EUFo UKR

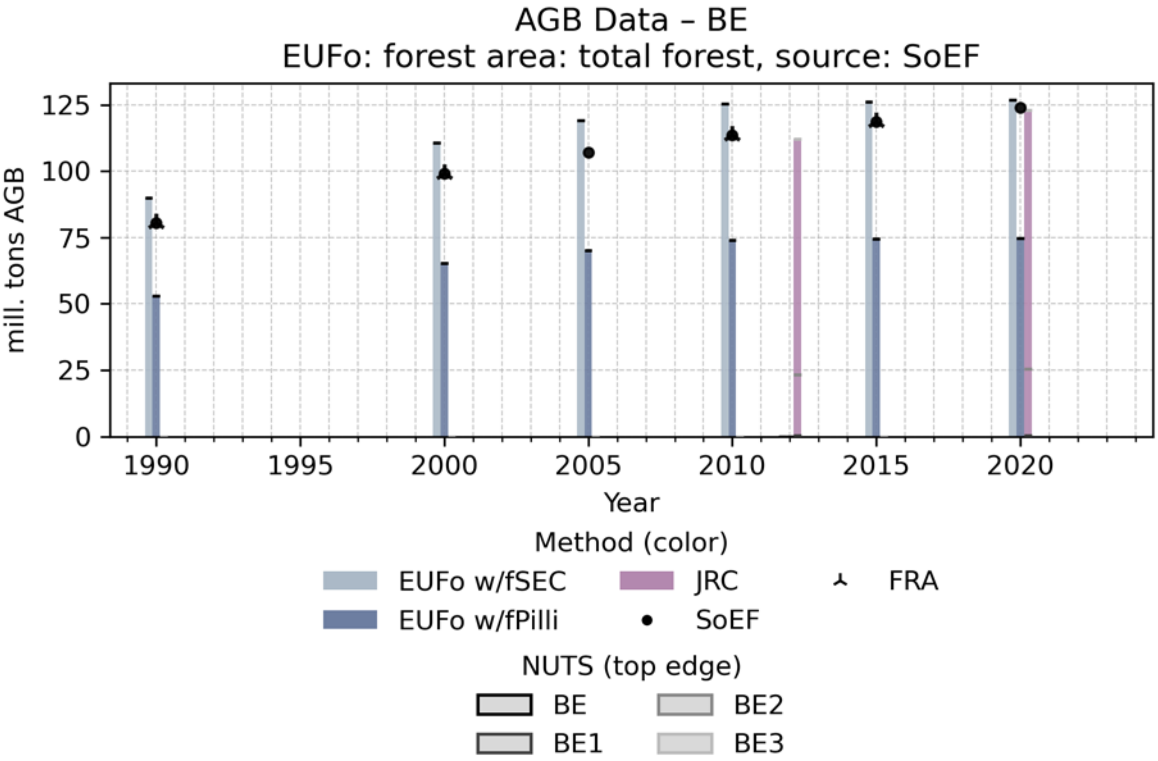
6.5. Comparison of reported Above Ground Biomass data and EUFo estimates by two-digit country code



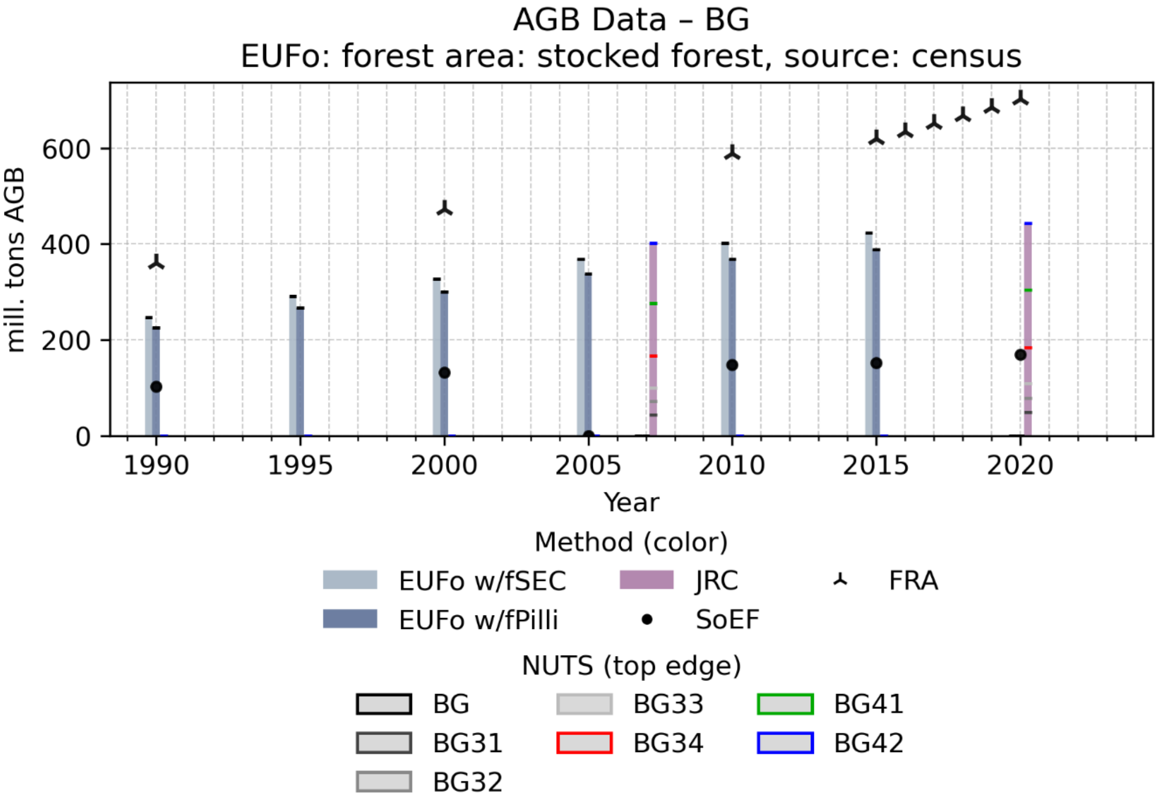


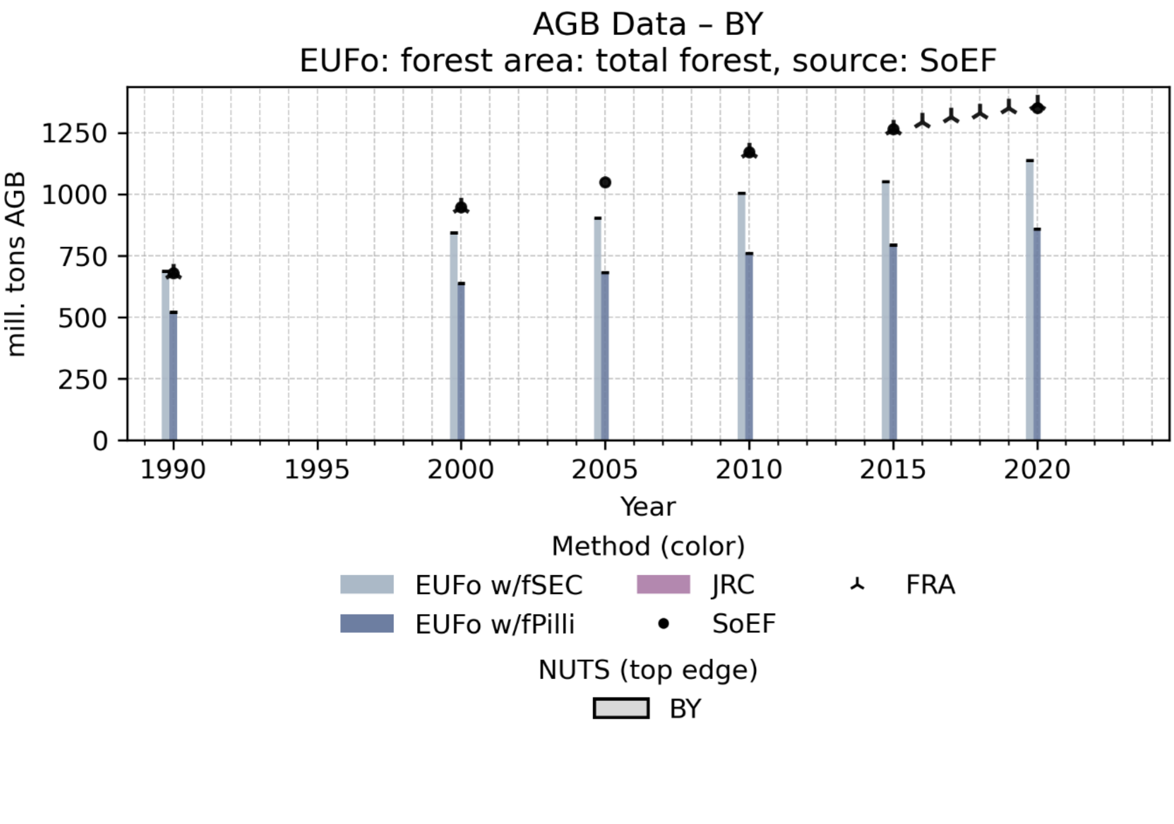


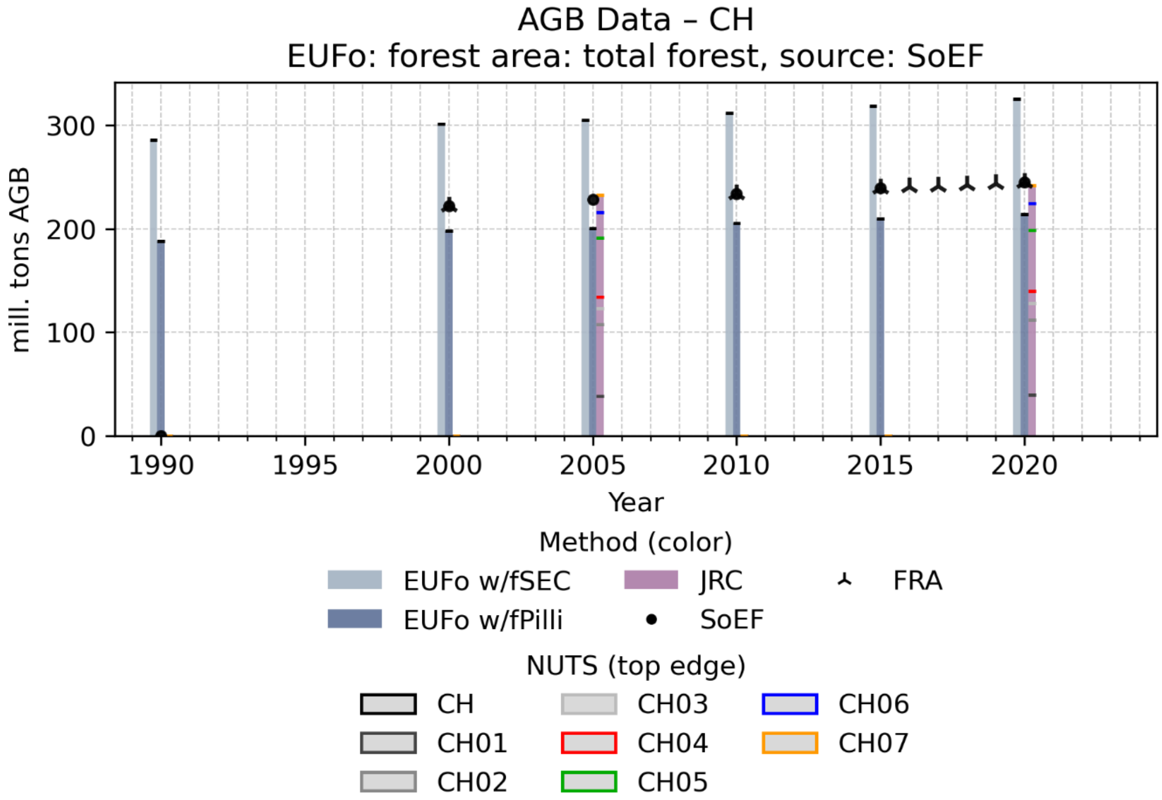
AGB Data – BA
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
100
200
300
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
BA

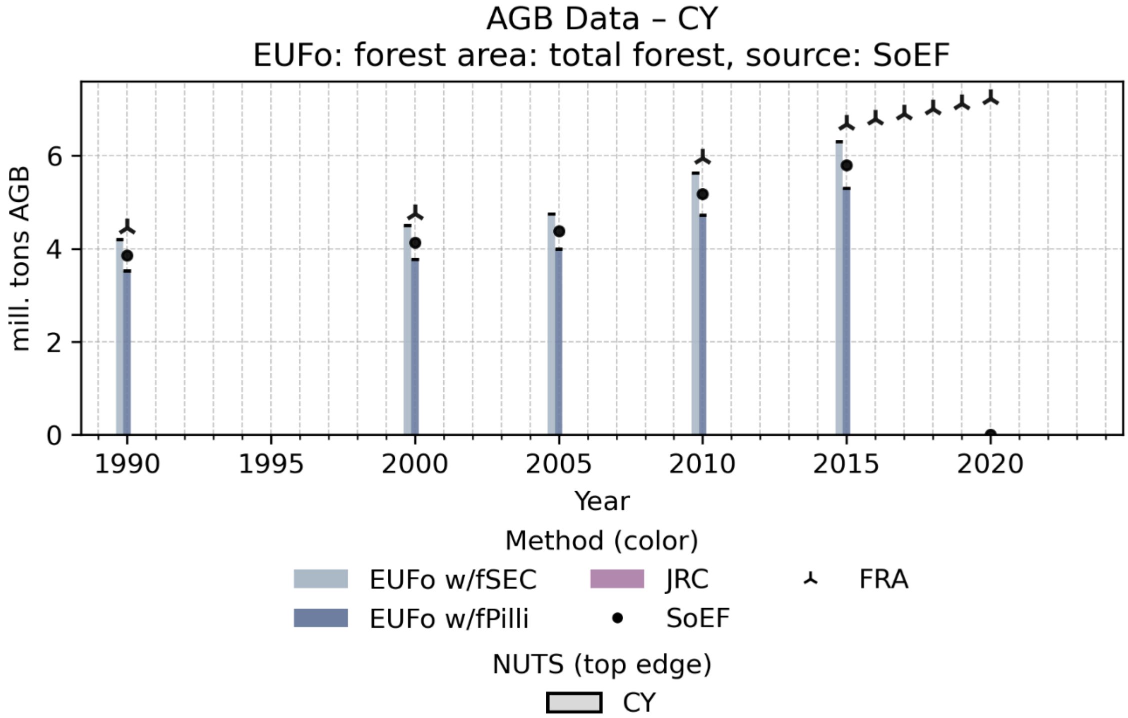


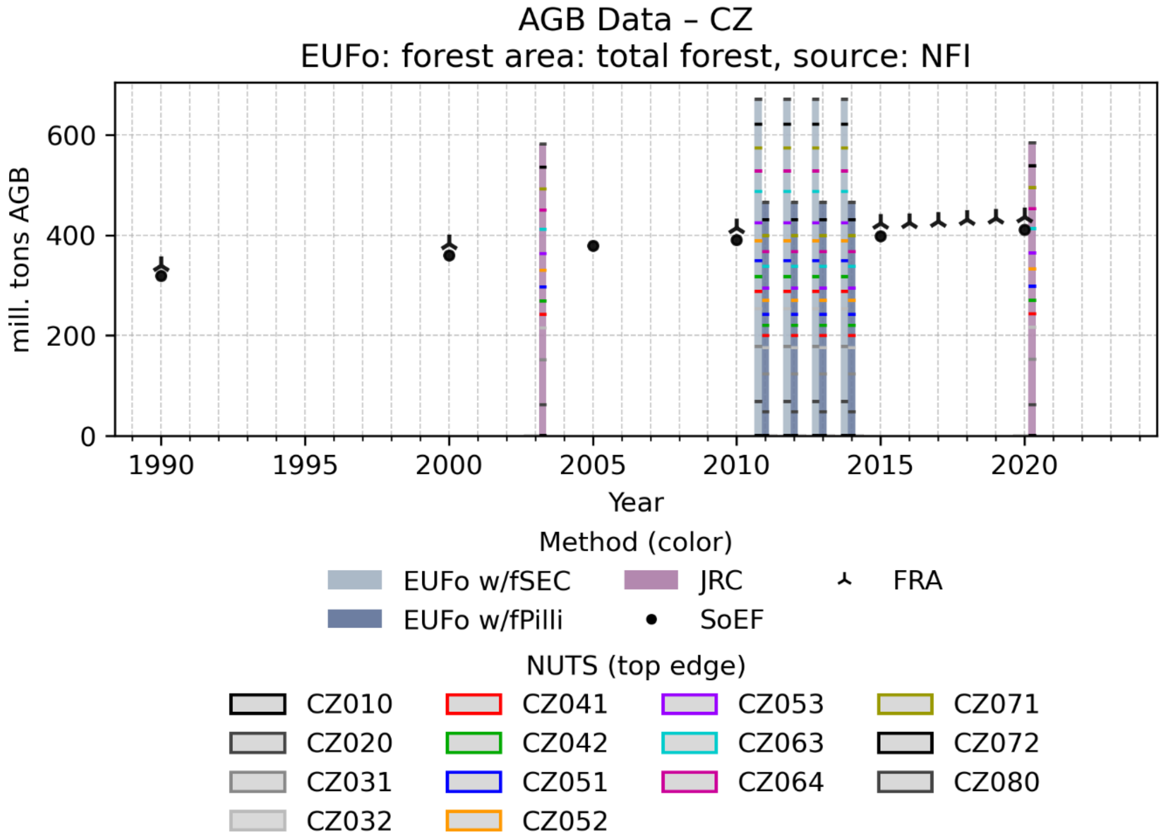
AGB Data – BE
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
25
50
75
100
125
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
BE
BE1
BE2
BE3

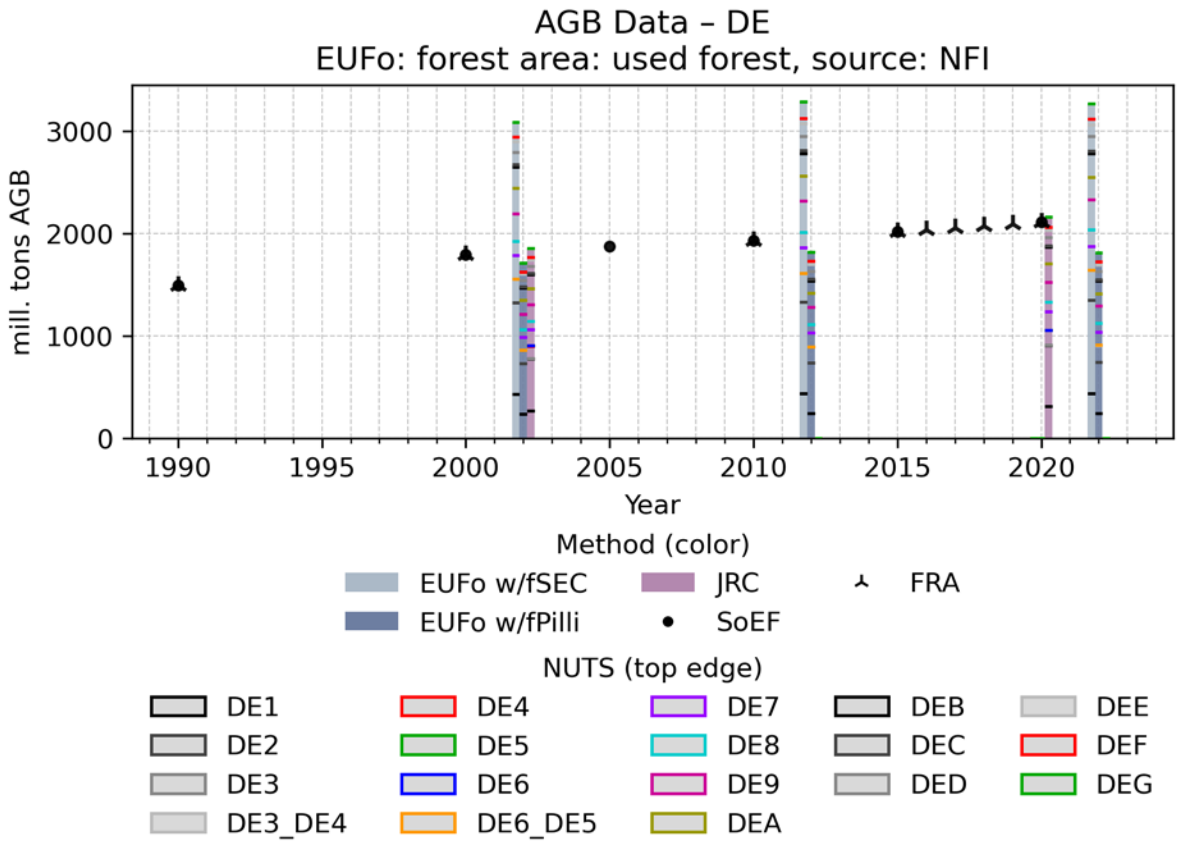

AGB Data – BG
EUFo: forest area: stocked forest, source: census
mill. tons AGB
600
400
200
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
JRC
FRA
EUFo w/fPilli
SoEF
NUTS (top edge)
BG
BG33
BG41
BG31
BG34
BG42
BG32

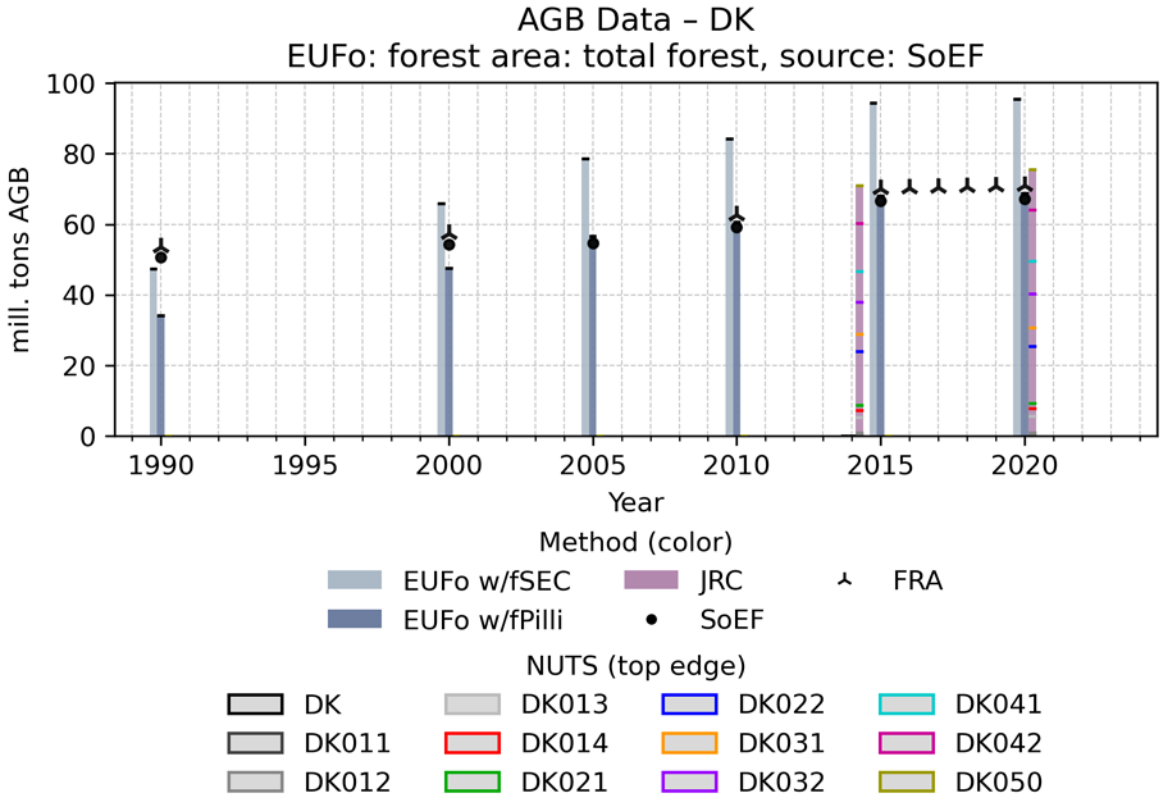

AGB Data – BY
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
1250
1000
750
500
250
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
JRC
FRA
EUFo w/fPilli
SoEF
NUTS (top edge)
BY

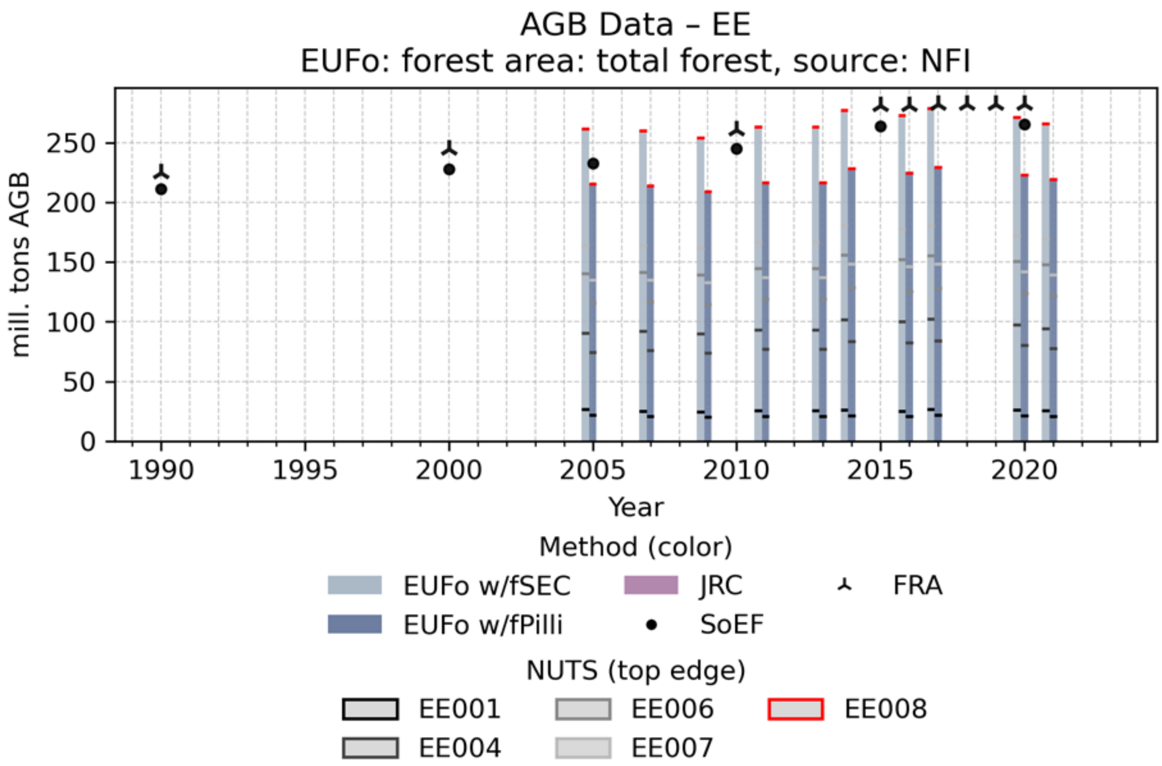

AGB Data – CH
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
CH
CH01
CH02
CH03
CH04
CH05
CH06
CH07

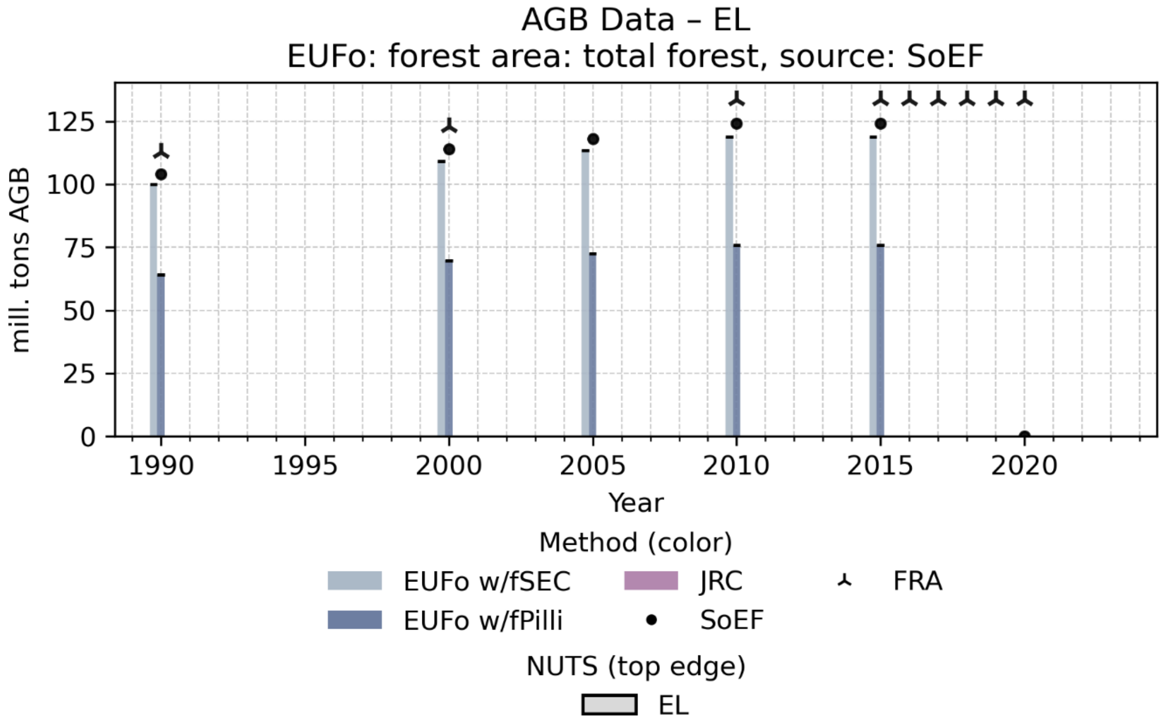

AGB Data – CY
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
CY

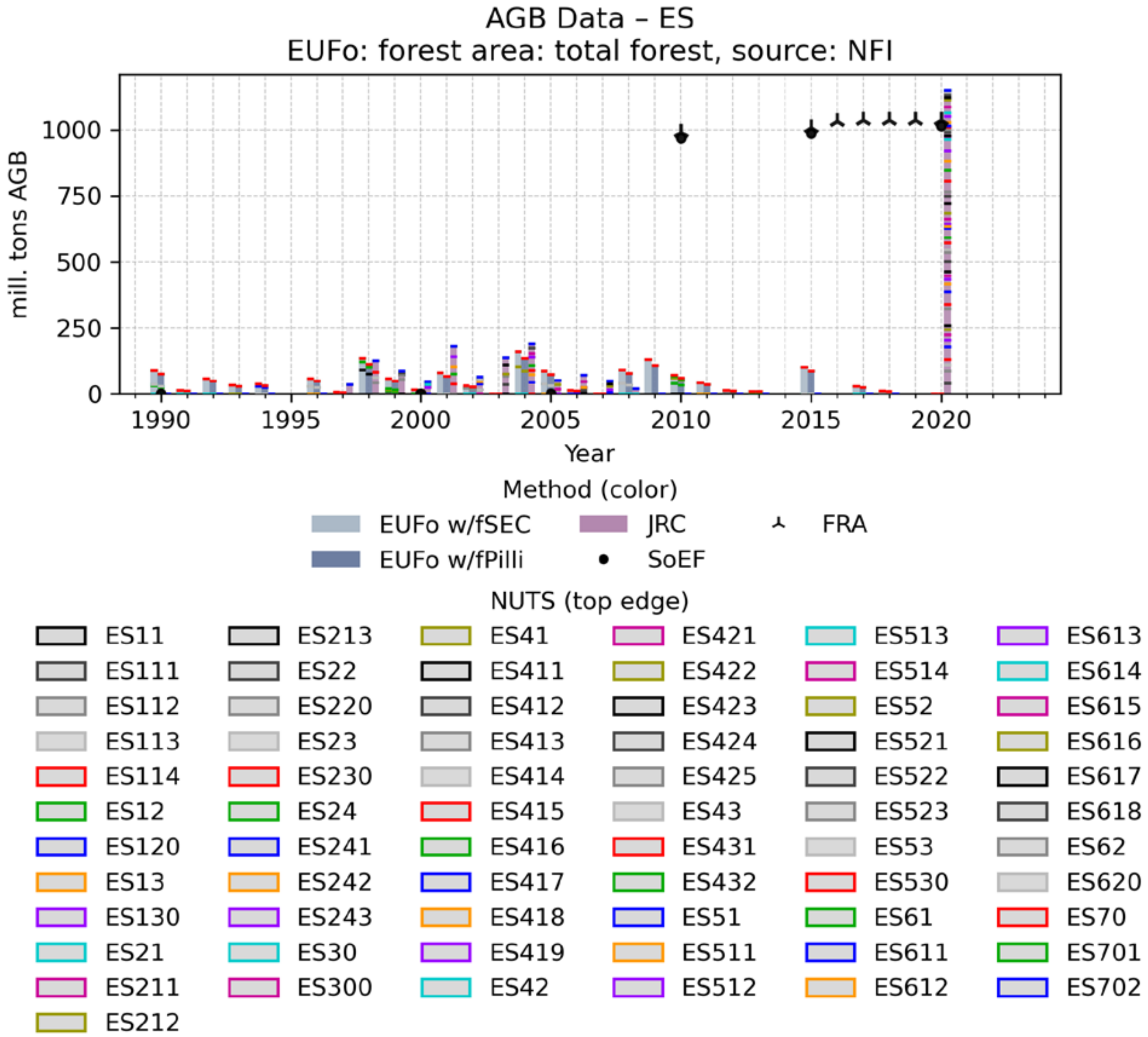

AGB Data – CZ
EUFo: forest area: total forest, source: NFI
mill. tons AGB
0
200
400
600
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
CZ010
CZ020
CZ031
CZ032
CZ041
CZ042
CZ051
CZ052
CZ053
CZ063
CZ064
CZ071
CZ072
CZ080

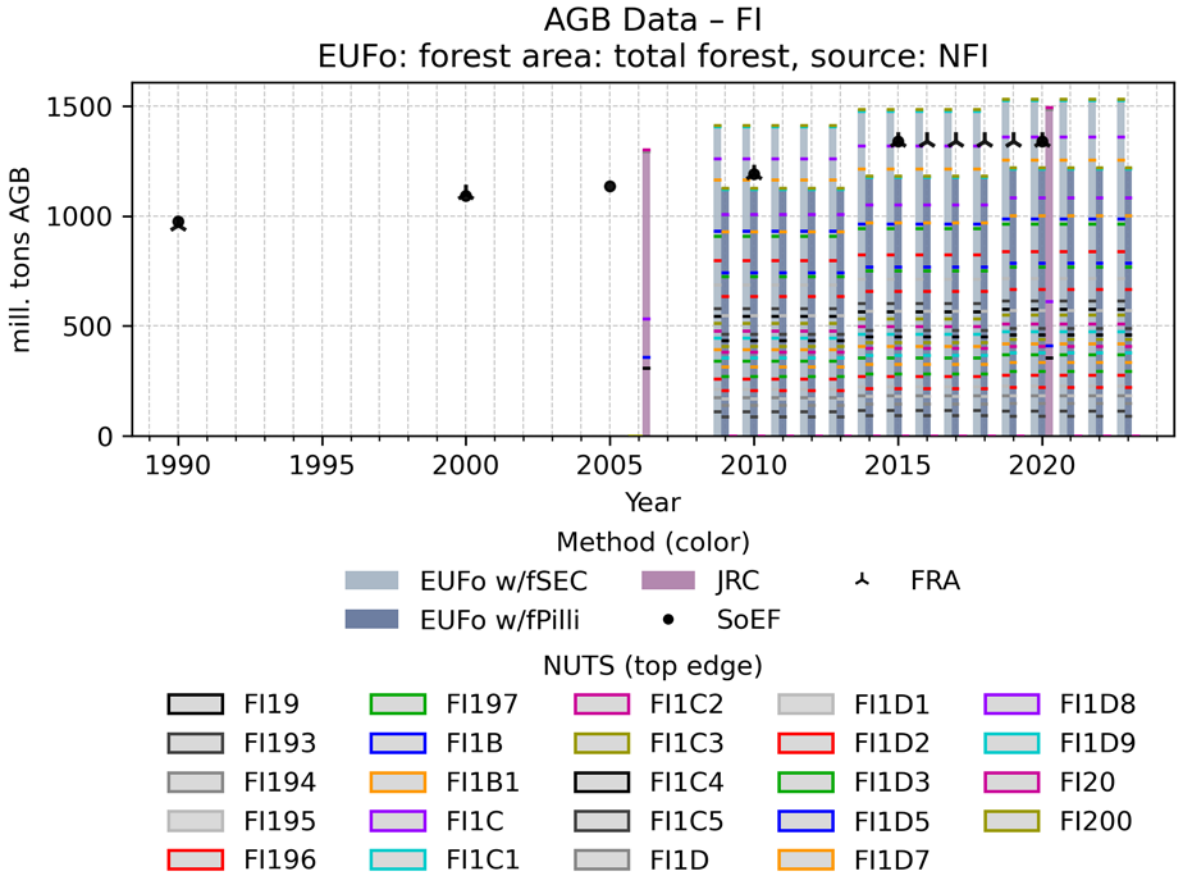

AGB Data – DE
EUFo: forest area: used forest, source: NFI
mill. tons AGB
0
1000
2000
3000
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
DE1
DE2
DE3
DE3_DE4
DE4
DE5
DE6
DE6_DE5
DE7
DE8
DE9
DEA
DEB
DEC
DED
DEE
DEF
DEG


AGB Data – DK
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
JRC
FRA
EUFo w/fPilli
SoEF
NUTS (top edge)
DK
DK013
DK022
DK041
DK011
DK014
DK031
DK042
DK012
DK021
DK032
DK050

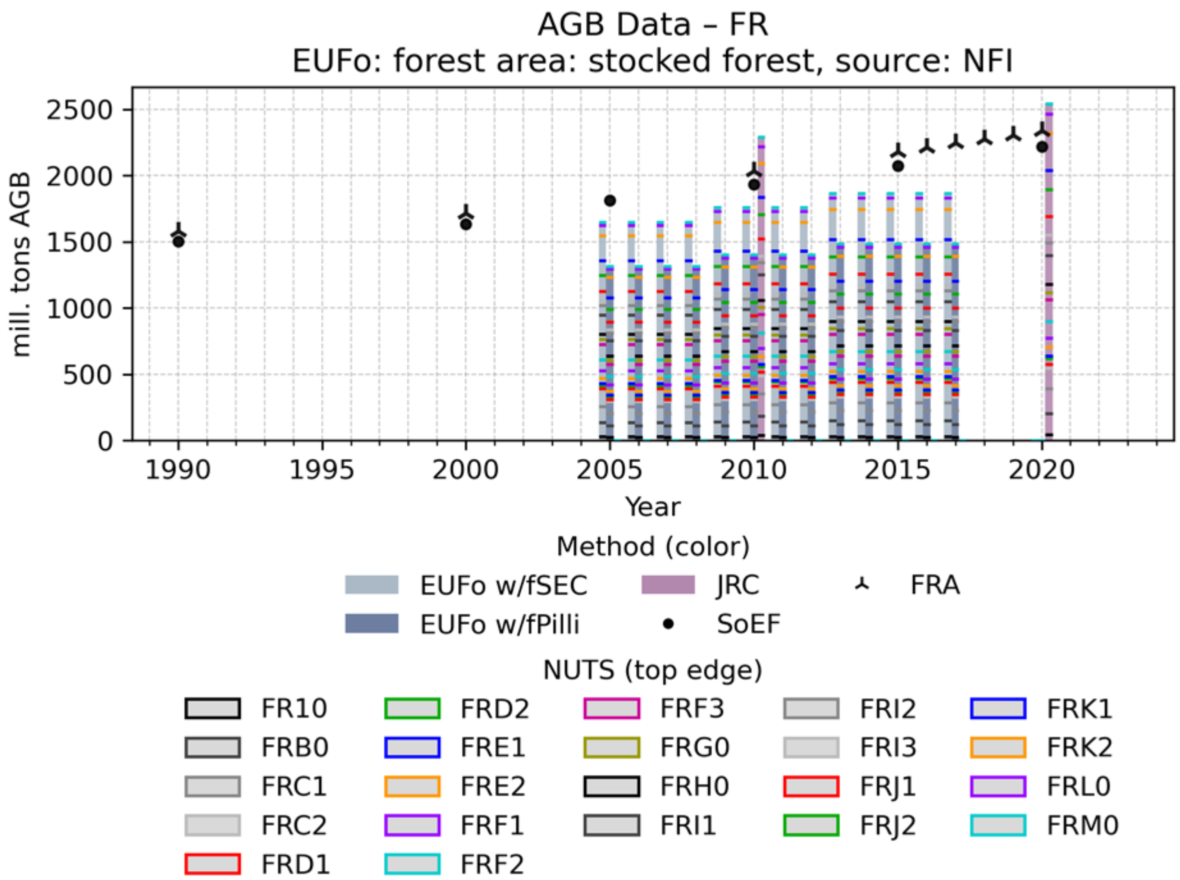

AGB Data – EE
EUFo: forest area: total forest, source: NFI
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
JRC
FRA
EUFo w/fPilli
SoEF
NUTS (top edge)
EE001
EE006
EE008
EE004
EE007


AGB Data – EL
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
25
50
75
100
125
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
EL

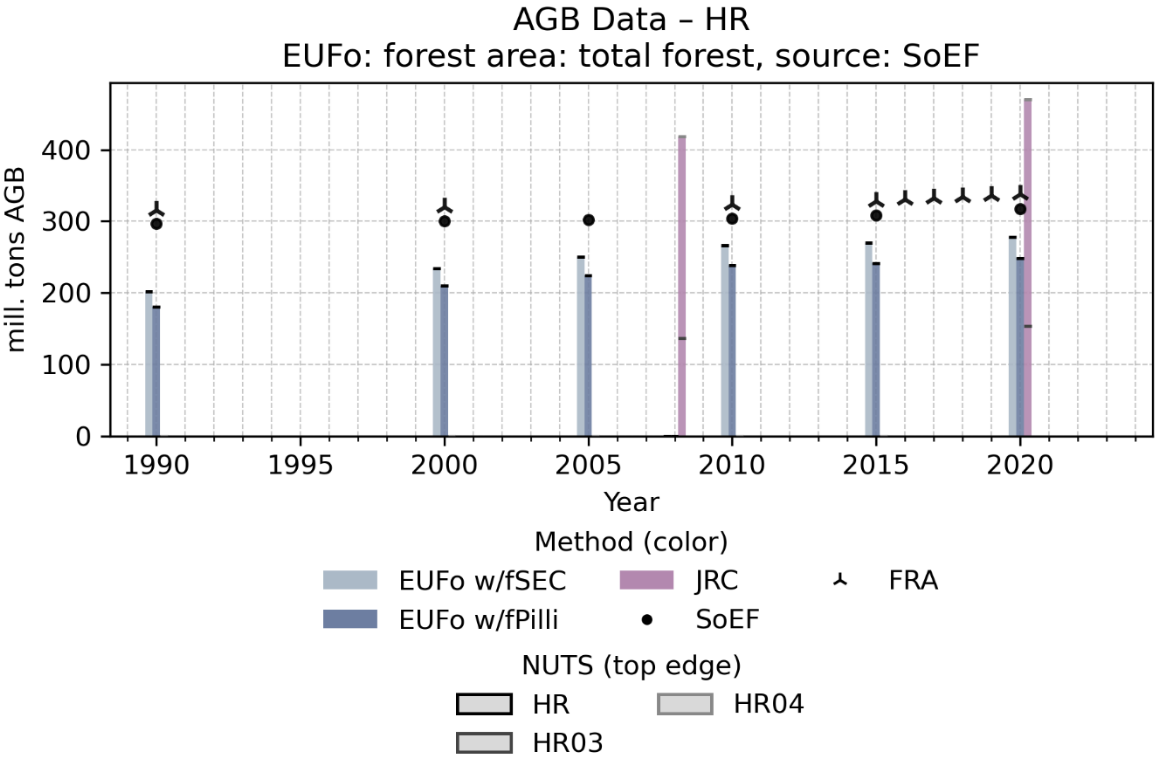

AGB Data – ES
EUFo: forest area: total forest, source: NFI
mill. tons AGB
0
250
500
750
1000
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
ES11
ES111
ES112
ES113
ES114
ES12
ES120
ES13
ES130
ES21
ES211
ES212
ES213
ES22
ES220
ES23
ES230
ES24
ES241
ES242
ES243
ES30
ES300
ES41
ES411
ES412
ES413
ES414
ES415
ES416
ES417
ES418
ES419
ES42
ES421
ES422
ES423
ES424
ES425
ES43
ES431
ES432
ES51
ES511
ES512
ES513
ES514
ES52
ES521
ES522
ES523
ES53
ES530
ES61
ES611
ES612
ES613
ES614
ES615
ES616
ES617
ES618
ES62
ES620
ES70
ES701
ES702

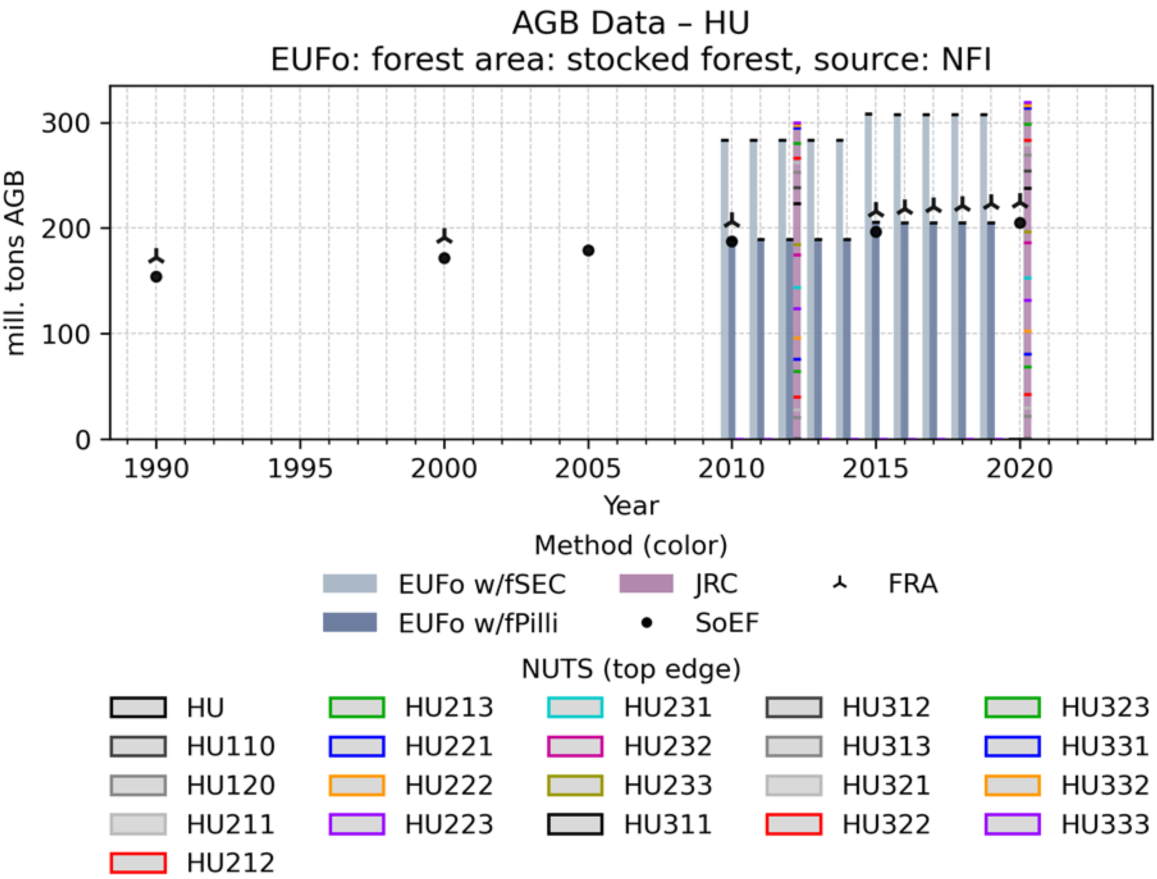


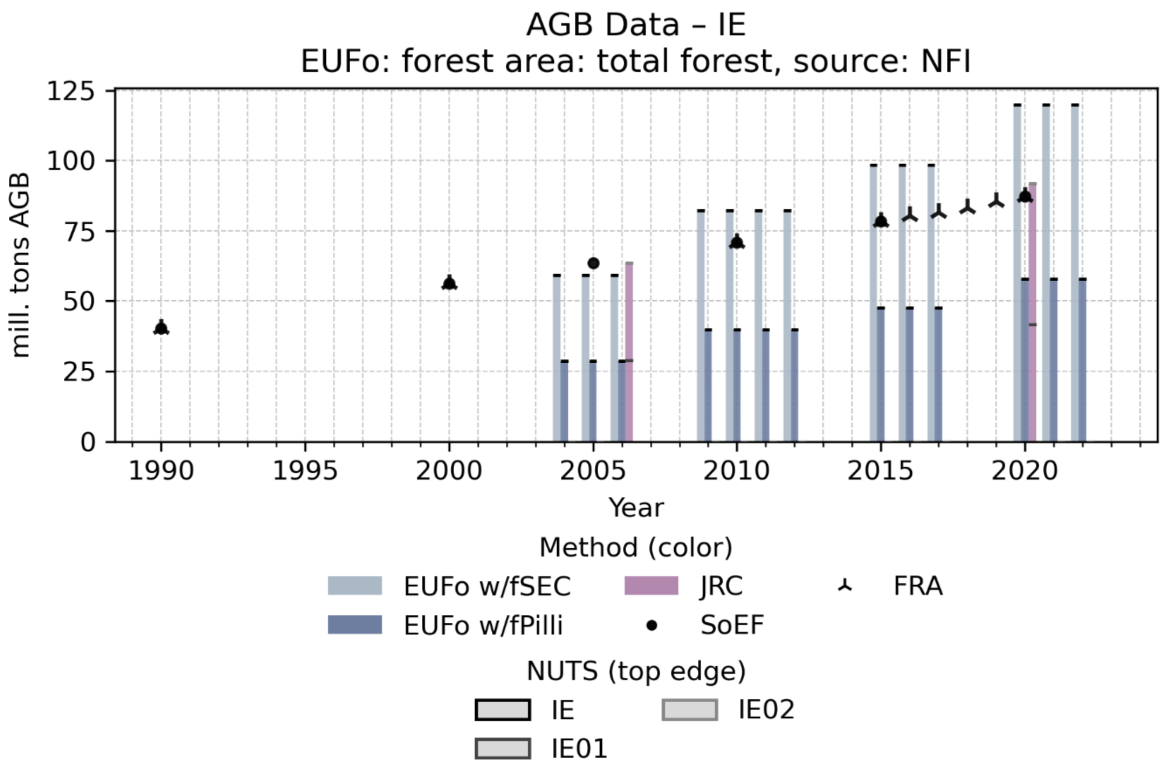
AGB Data – FI
EUFo: forest area: total forest, source: NFI
mill. tons AGB
0
500
1000
1500
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
FI19
FI193
FI194
FI195
FI196
FI197
FI1B
FI1B1
FI1C
FI1C1
FI1C2
FI1C3
FI1C4
FI1C5
FI1D
FI1D1
FI1D2
FI1D3
FI1D5
FI1D7
FI1D8
FI1D9
FI20
FI200



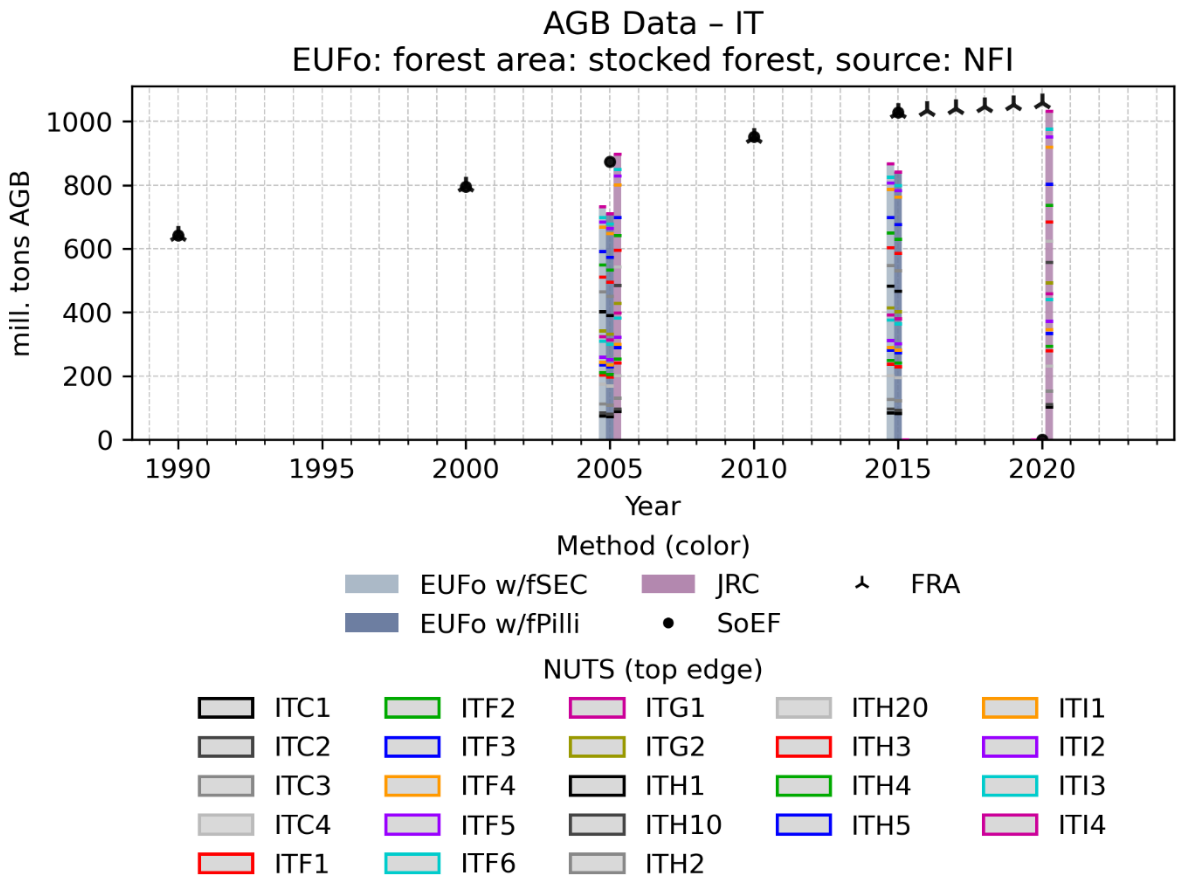
AGB Data – FR
EUFo: forest area: stocked forest, source: NFI
mill. tons AGB
0
500
1000
1500
2000
2500
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
FR10
FRB0
FRC1
FRC2
FRD1
FRD2
FRE1
FRE2
FRF1
FRF2
FRF3
FRG0
FRH0
FRI1
FRI2
FRI3
FRJ1
FRJ2
FRK1
FRK2
FRL0
FRM0


AGB Data – HR
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
100
200
300
400
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
HR
HR03
HR04

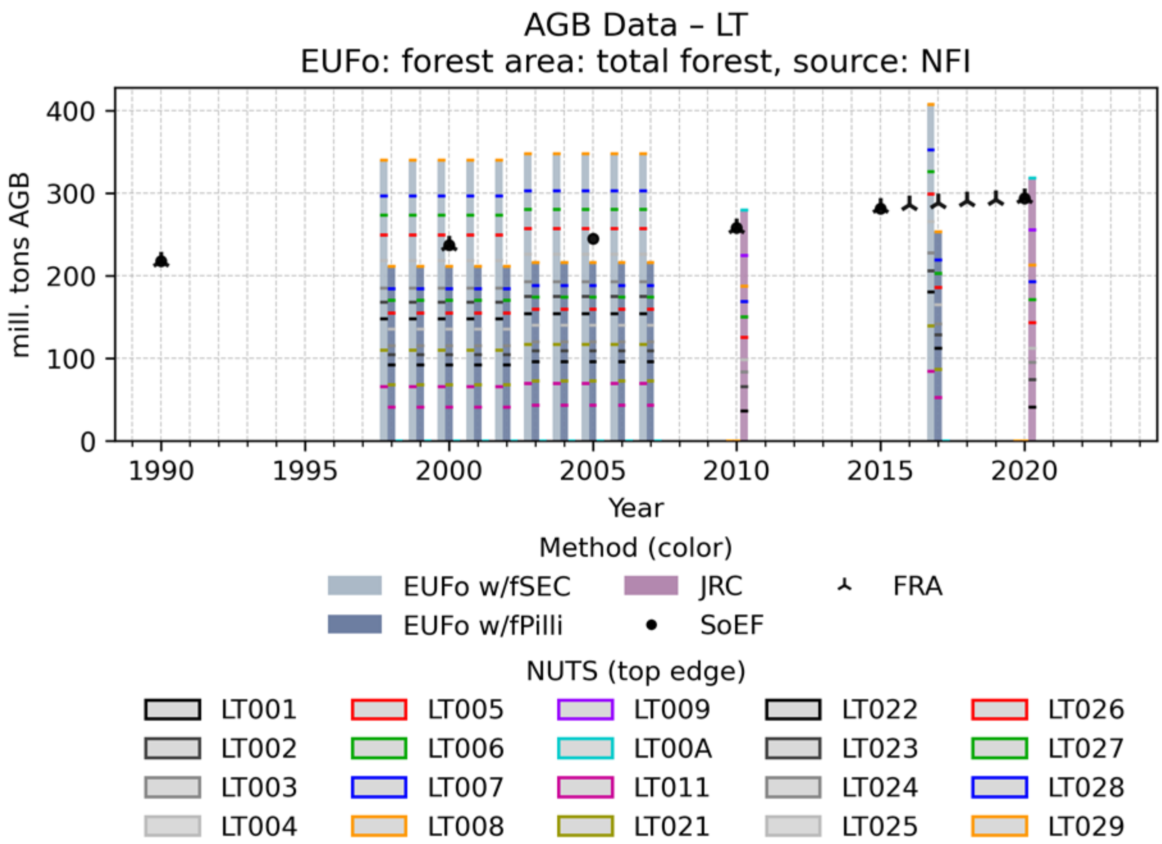

AGB Data – HU
EUFo: forest area: stocked forest, source: NFI
mill. tons AGB
0
100
200
300
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
HU
HU110
HU120
HU211
HU212
HU213
HU221
HU222
HU223
HU231
HU232
HU233
HU311
HU312
HU313
HU321
HU322
HU323
HU331
HU332
HU333

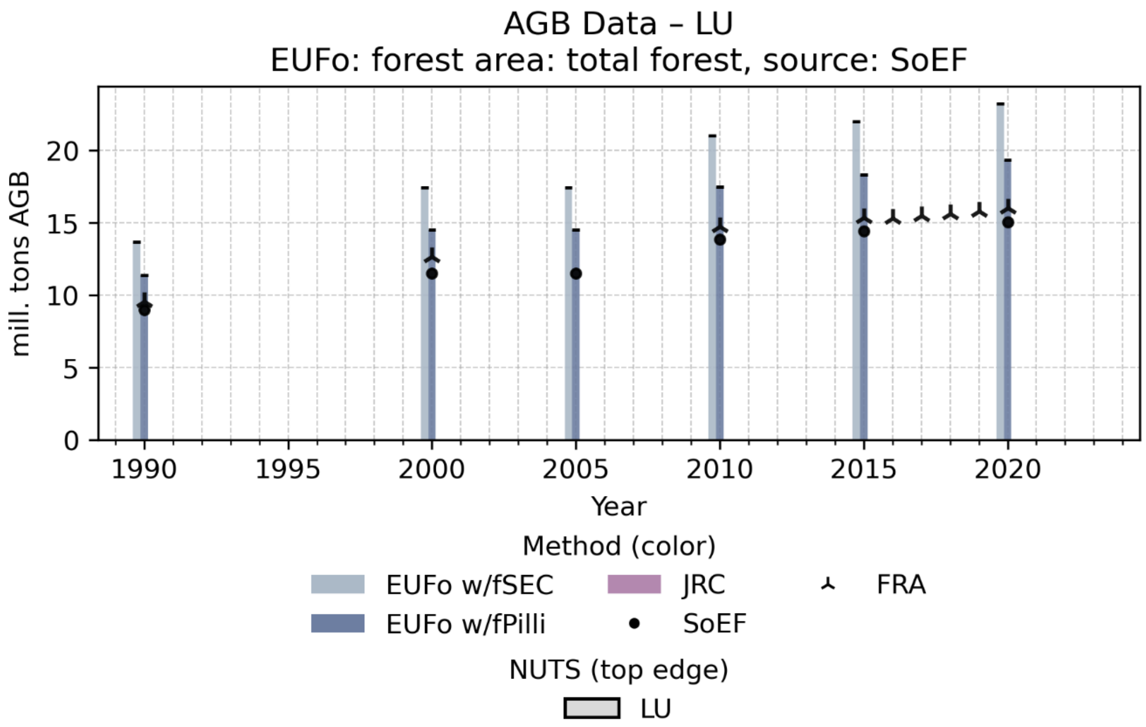


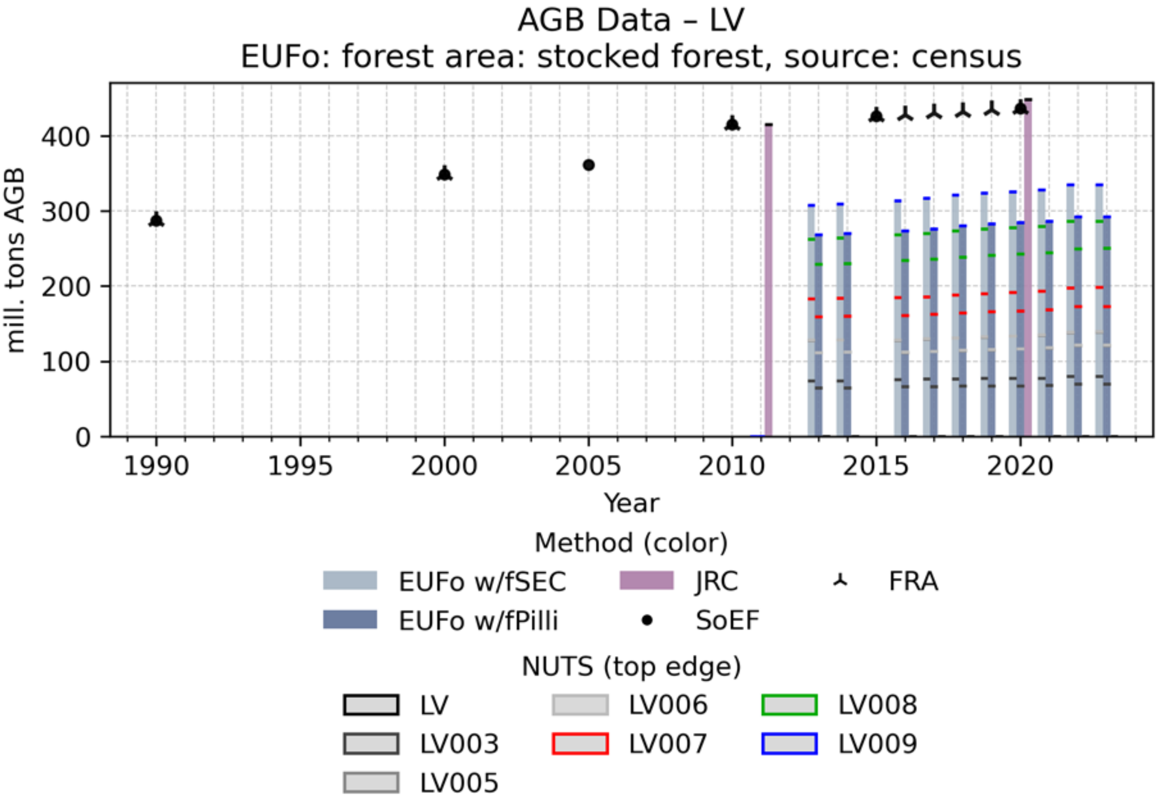
AGB Data – IE
EUFo: forest area: total forest, source: NFI
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
IE
IE01
IE02

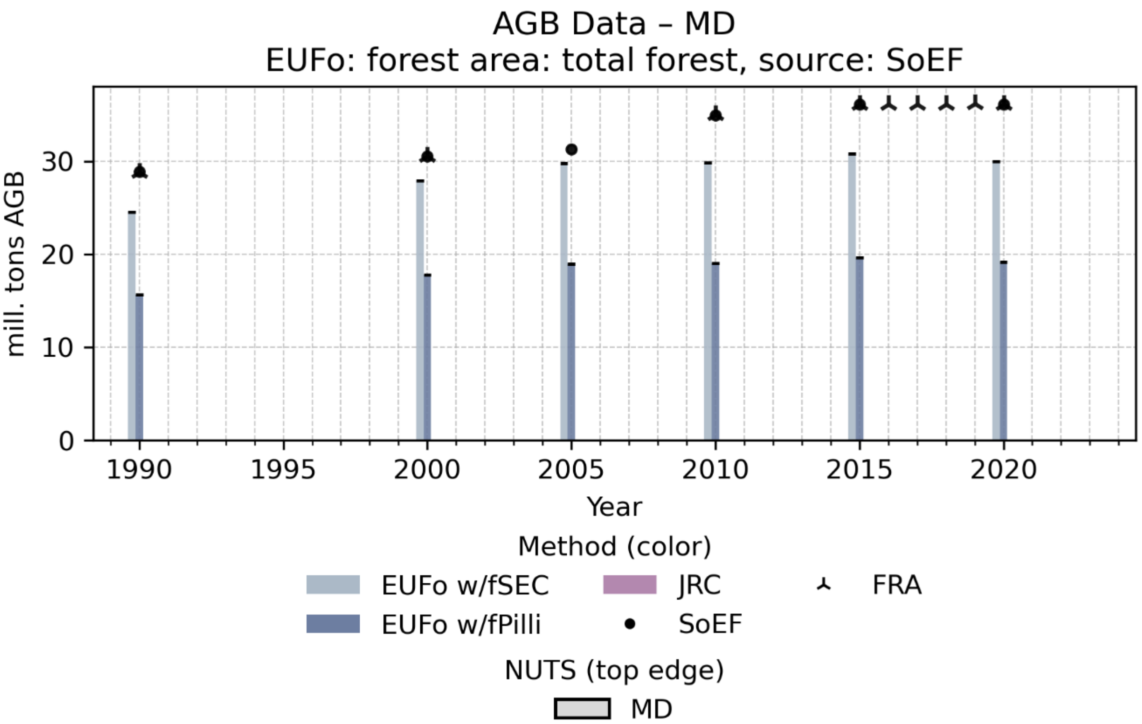


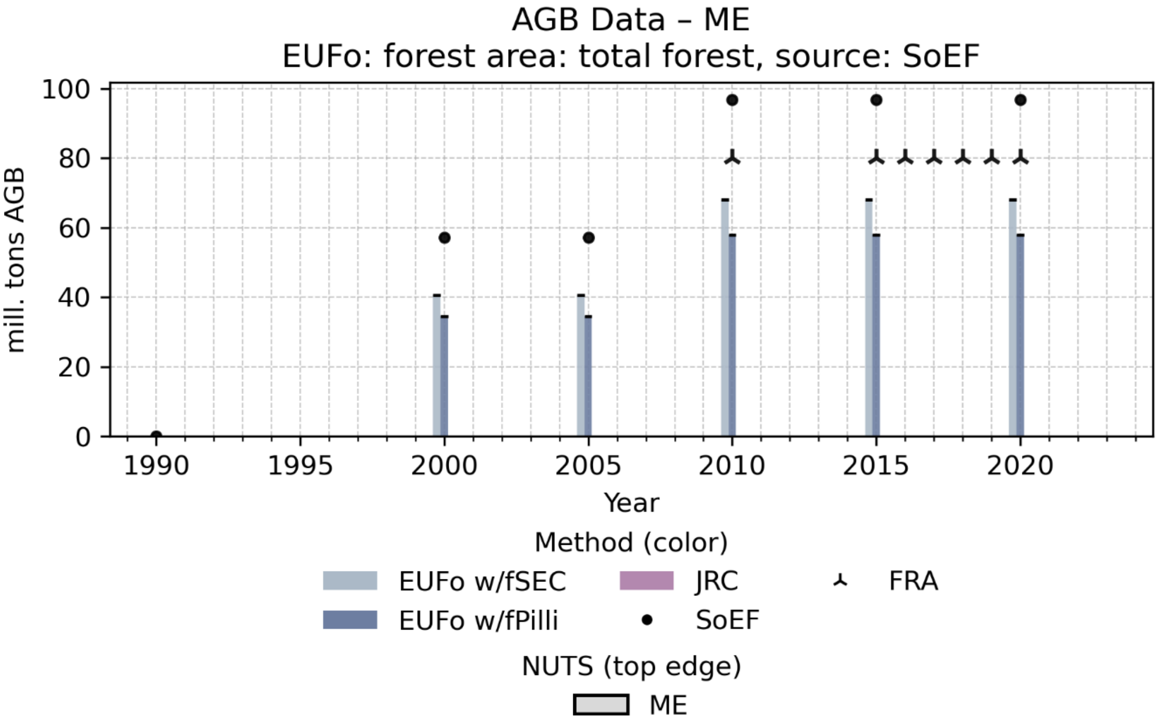
AGB Data – IT
EUFo: forest area: stocked forest, source: NFI
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
ITC1
ITC2
ITC3
ITC4
ITF1
ITF2
ITF3
ITF4
ITF5
ITF6
ITG1
ITG2
ITH1
ITH10
ITH2
ITH20
ITH3
ITH4
ITH5
ITI1
ITI2
ITI3
ITI4

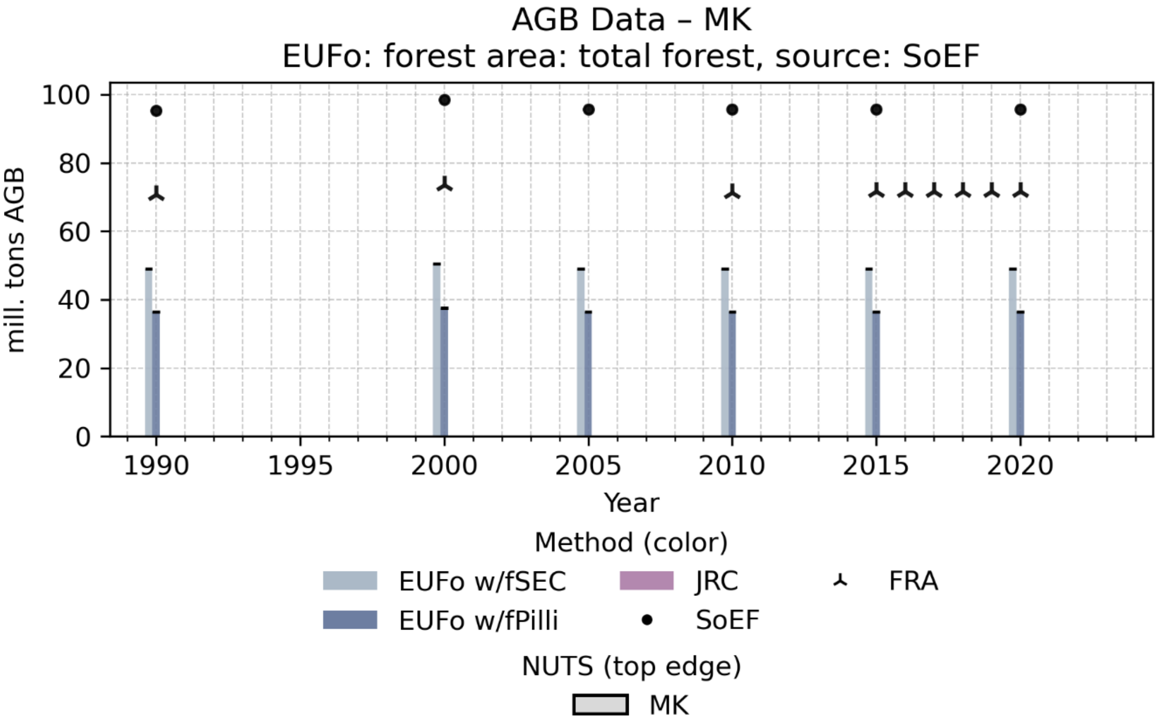

AGB Data – LT
EUFo: forest area: total forest, source: NFI
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
LT001
LT002
LT003
LT004
LT005
LT006
LT007
LT008
LT009
LT00A
LT011
LT021
LT022
LT023
LT024
LT025
LT026
LT027
LT028
LT029

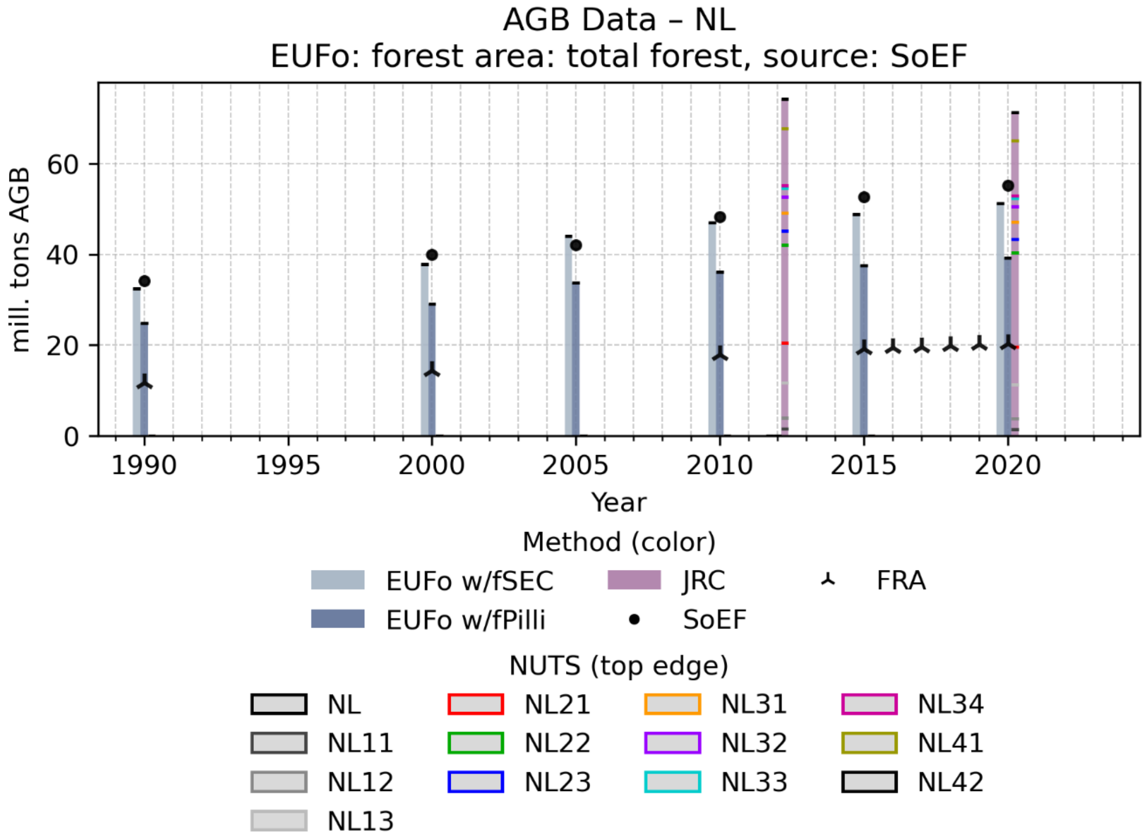

AGB Data – LU
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
LU

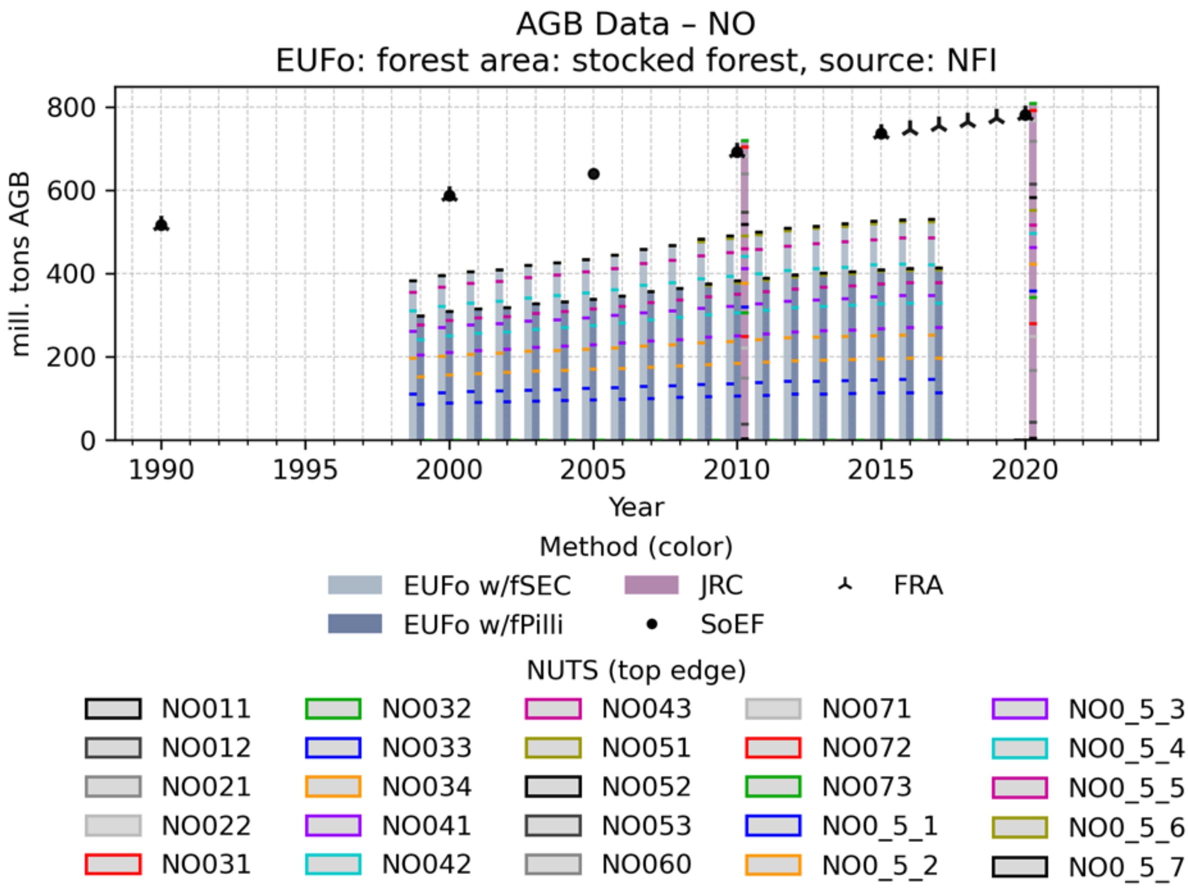

AGB Data – LV
EUFo: forest area: stocked forest, source: census
mill. tons AGB
0
100
200
300
400
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
LV
LV003
LV005
LV006
LV007
LV008
LV009

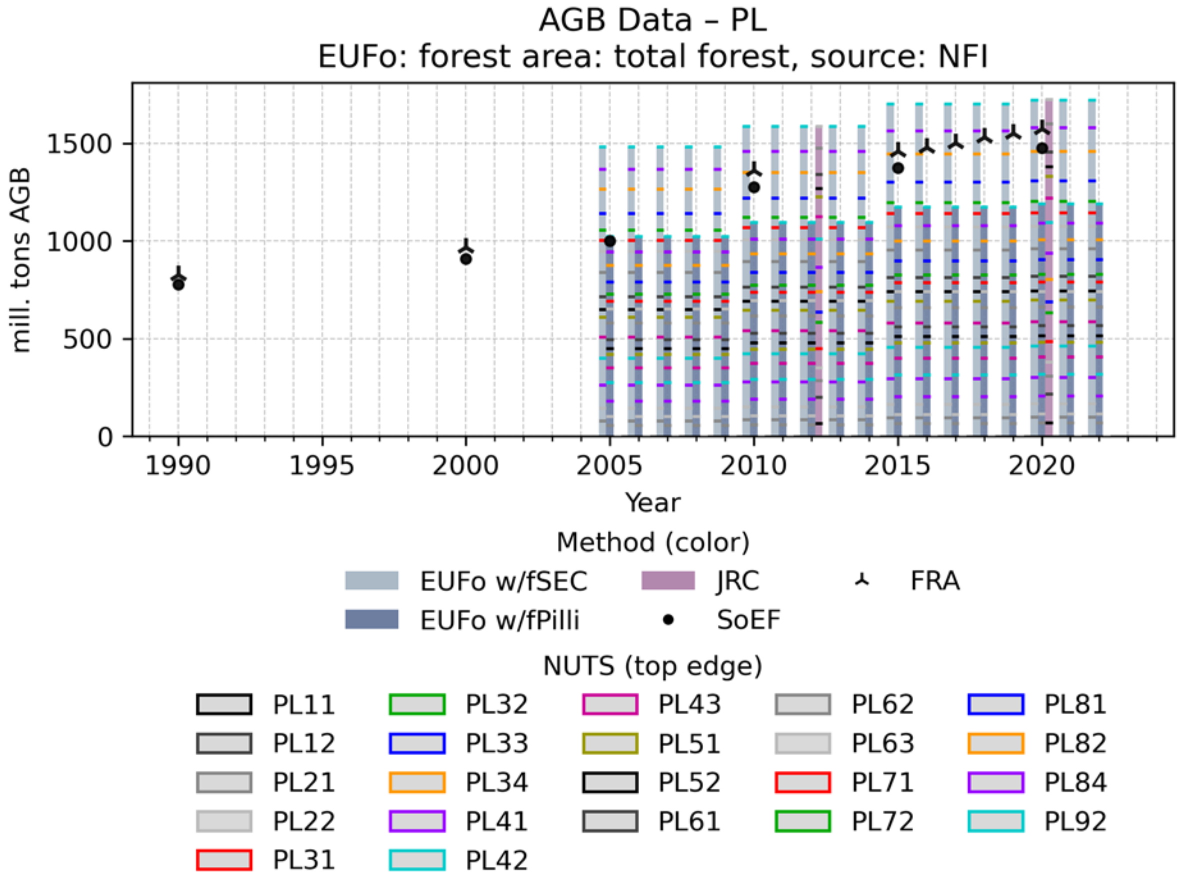

AGB Data – MD
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
10
20
30
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
MD

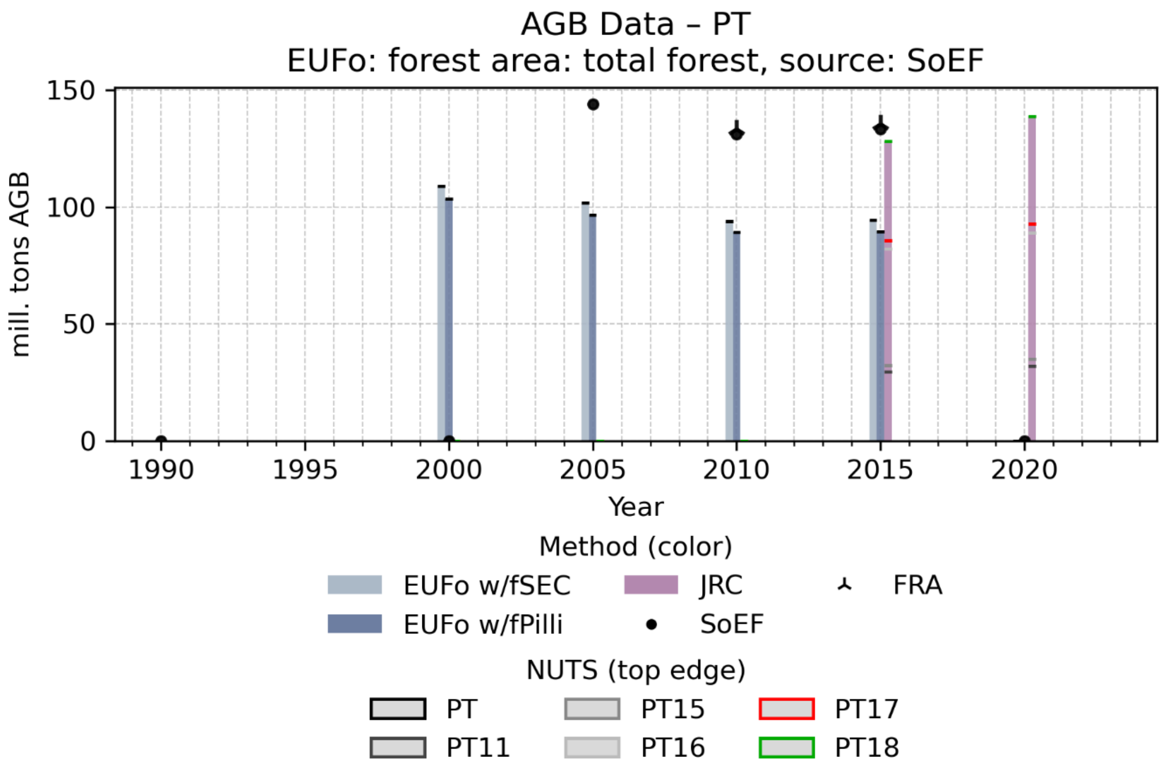

AGB Data – ME
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
JRC
FRA
EUFo w/fPilli
SoEF
NUTS (top edge)
ME

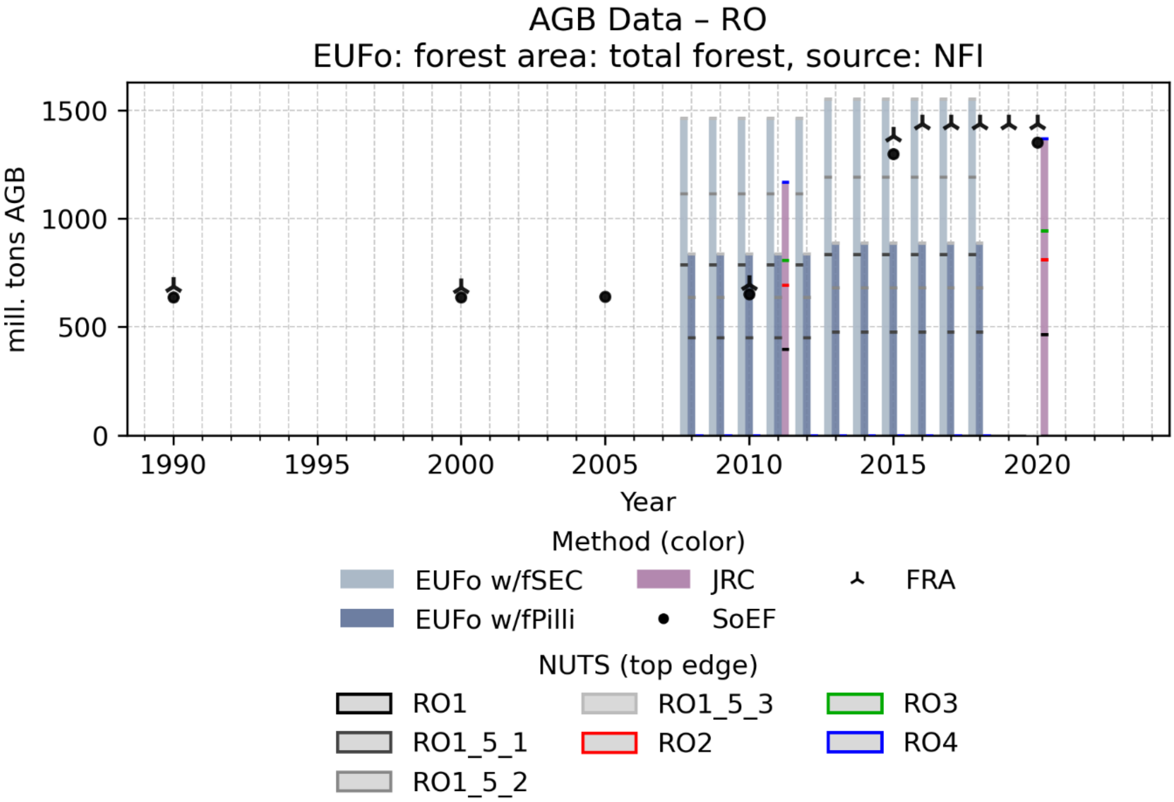

AGB Data – MK
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
JRC
FRA
EUFo w/fPilli
SoEF
NUTS (top edge)
MK


AGB Data – NL
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
20
40
60
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
NL
NL11
NL12
NL13
NL21
NL22
NL23
NL31
NL32
NL33
NL34
NL41
NL42

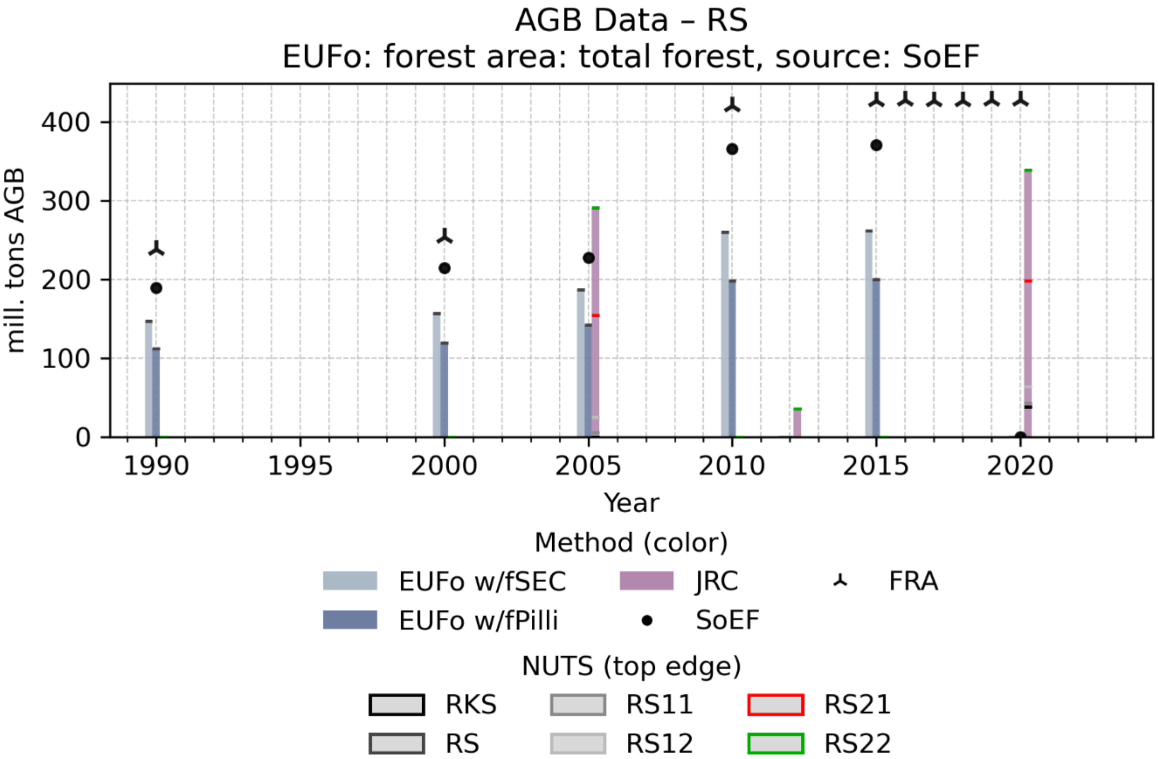

AGB Data – NO
EUFo: forest area: stocked forest, source: NFI
mill. tons AGB
0
200
400
600
800
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
NO011
NO012
NO021
NO022
NO031
NO032
NO033
NO034
NO041
NO042
NO043
NO051
NO052
NO053
NO060
NO071
NO072
NO073
NO0_5_1
NO0_5_2
NO0_5_3
NO0_5_4
NO0_5_5
NO0_5_6
NO0_5_7


AGB Data – PL
EUFo: forest area: total forest, source: NFI
mill. tons AGB
0
500
1000
1500
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
PL11
PL12
PL21
PL22
PL31
PL32
PL33
PL34
PL41
PL42
PL43
PL51
PL52
PL61
PL62
PL63
PL71
PL72
PL81
PL82
PL84
PL92

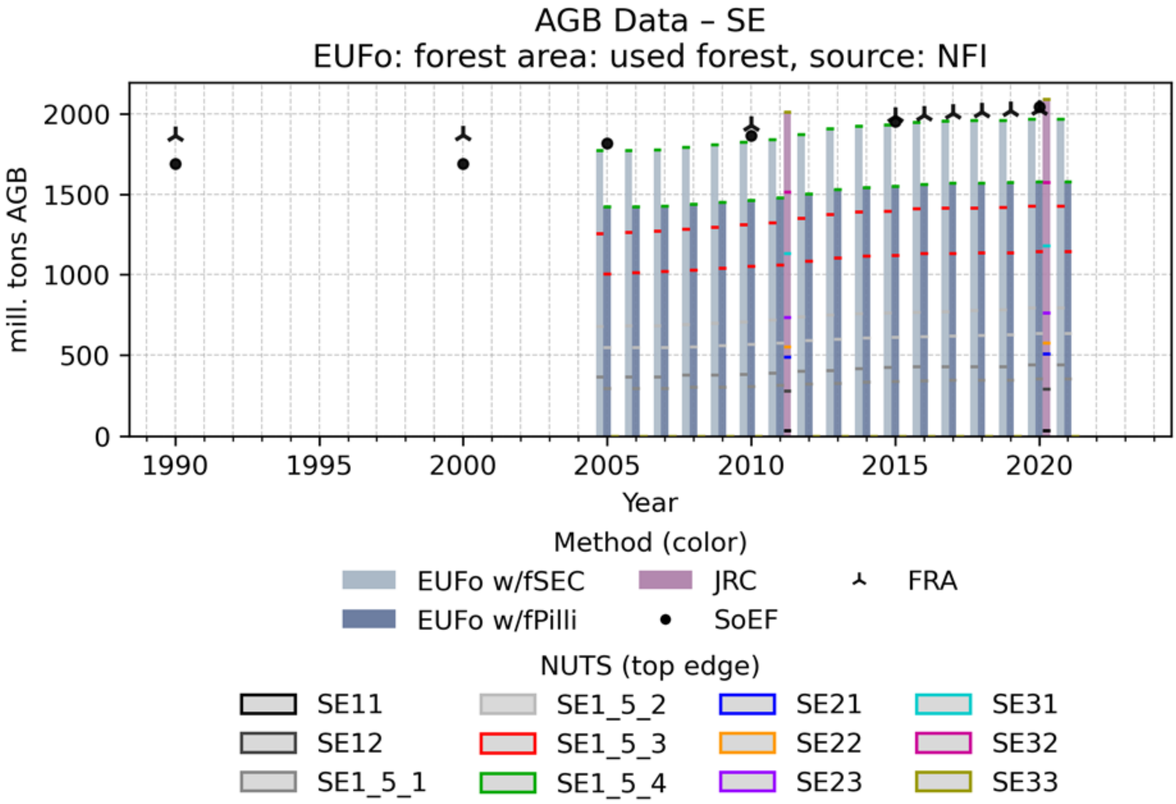

AGB Data – PT
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
50
100
150
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
PT
PT11
PT15
PT16
PT17
PT18

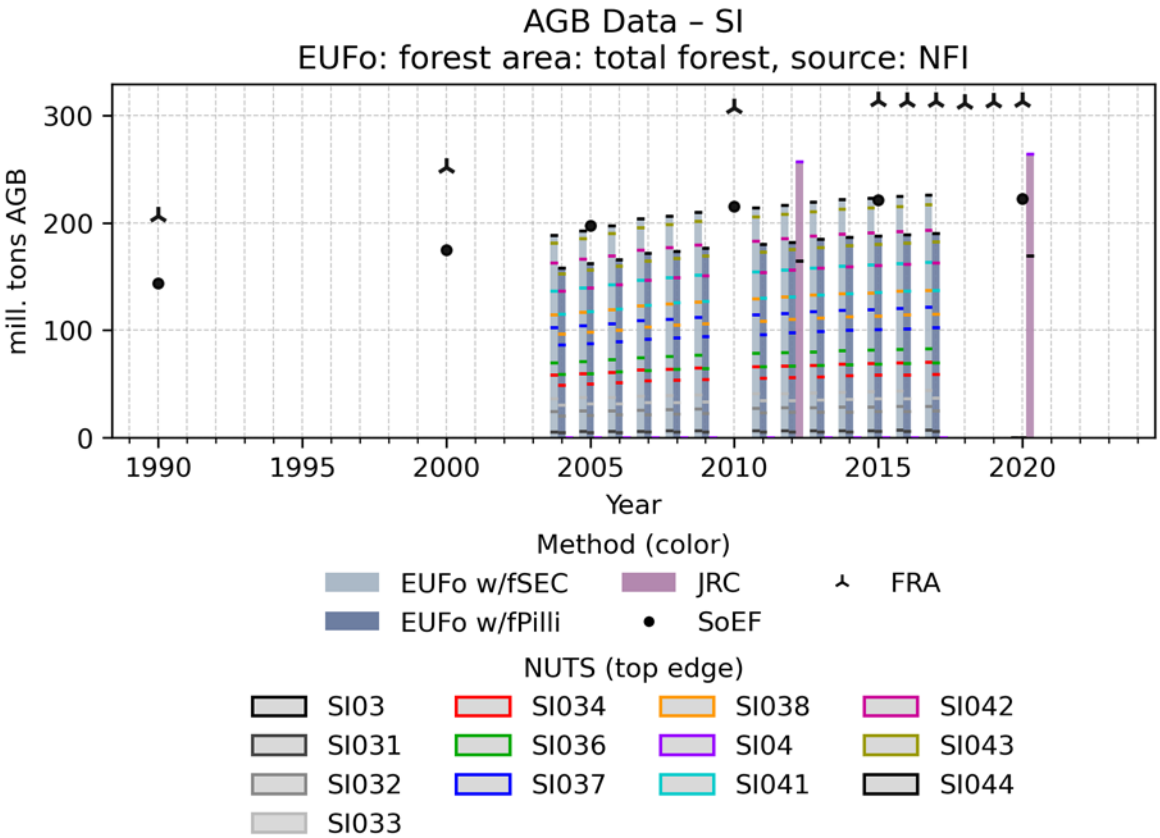


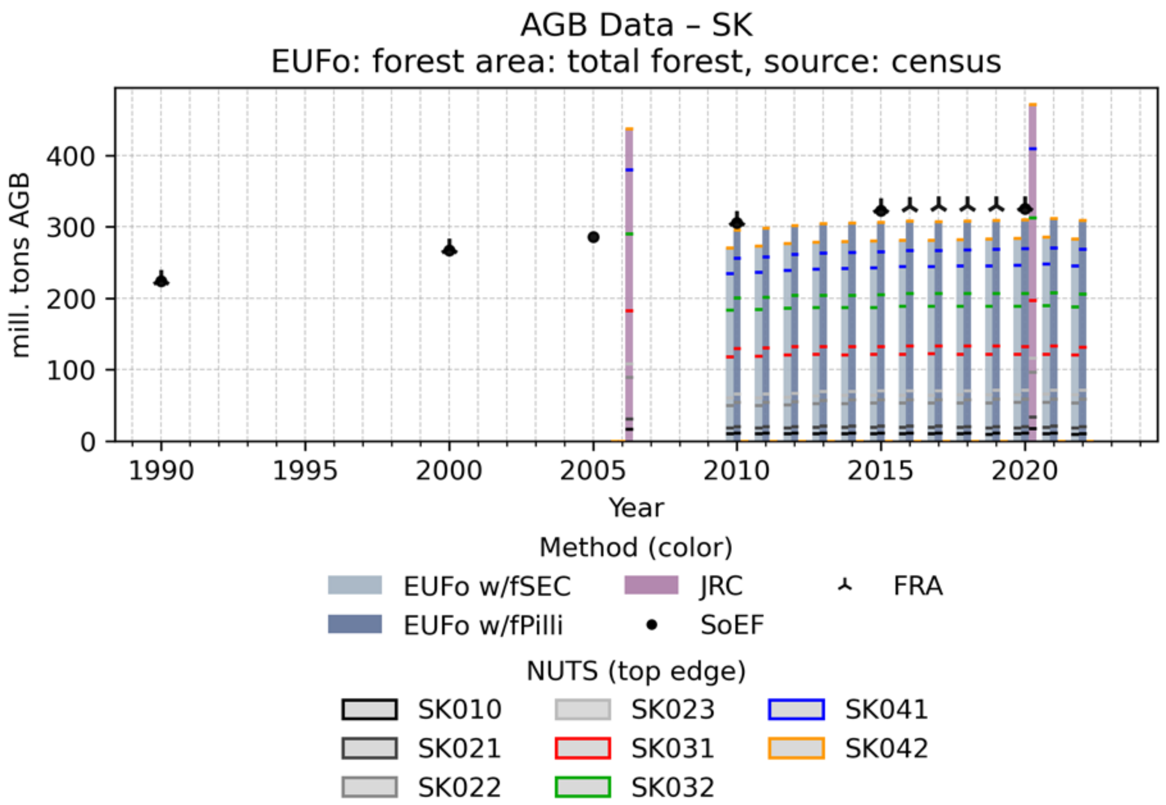
AGB Data – RO
EUFo: forest area: total forest, source: NFI
mill. tons AGB
1500
1000
500
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
RO1
RO1_5_1
RO1_5_2
RO1_5_3
RO2
RO3
RO4

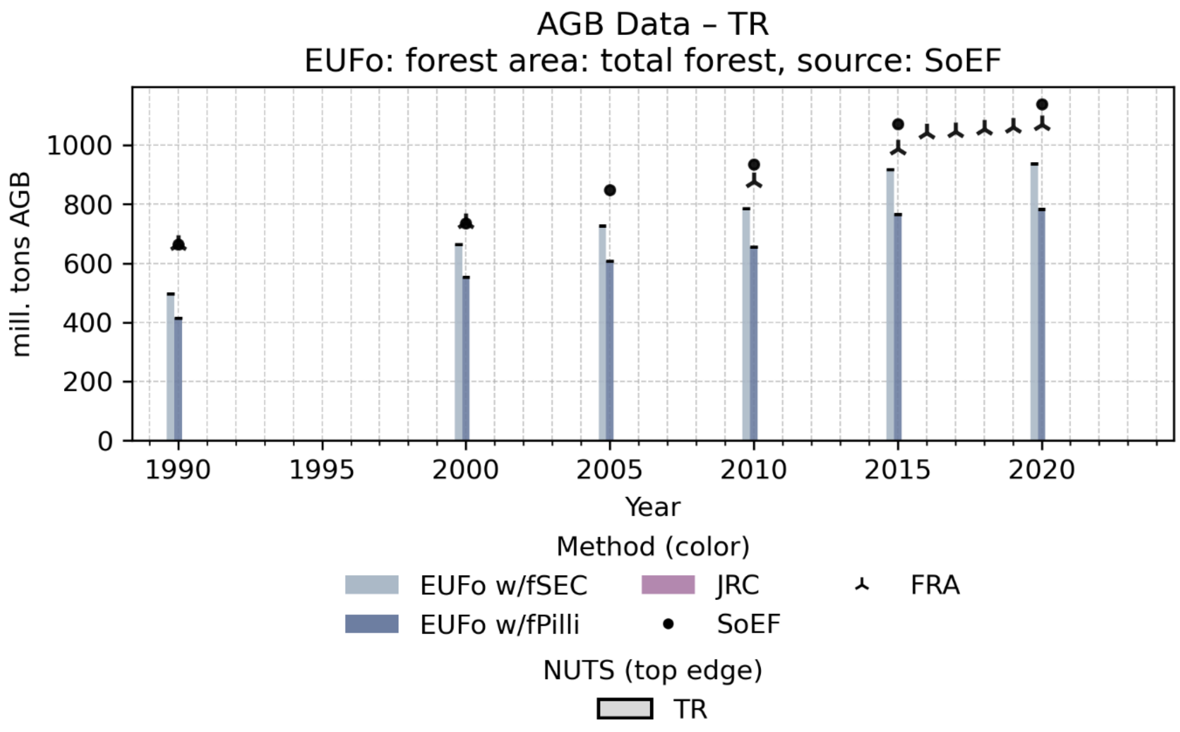


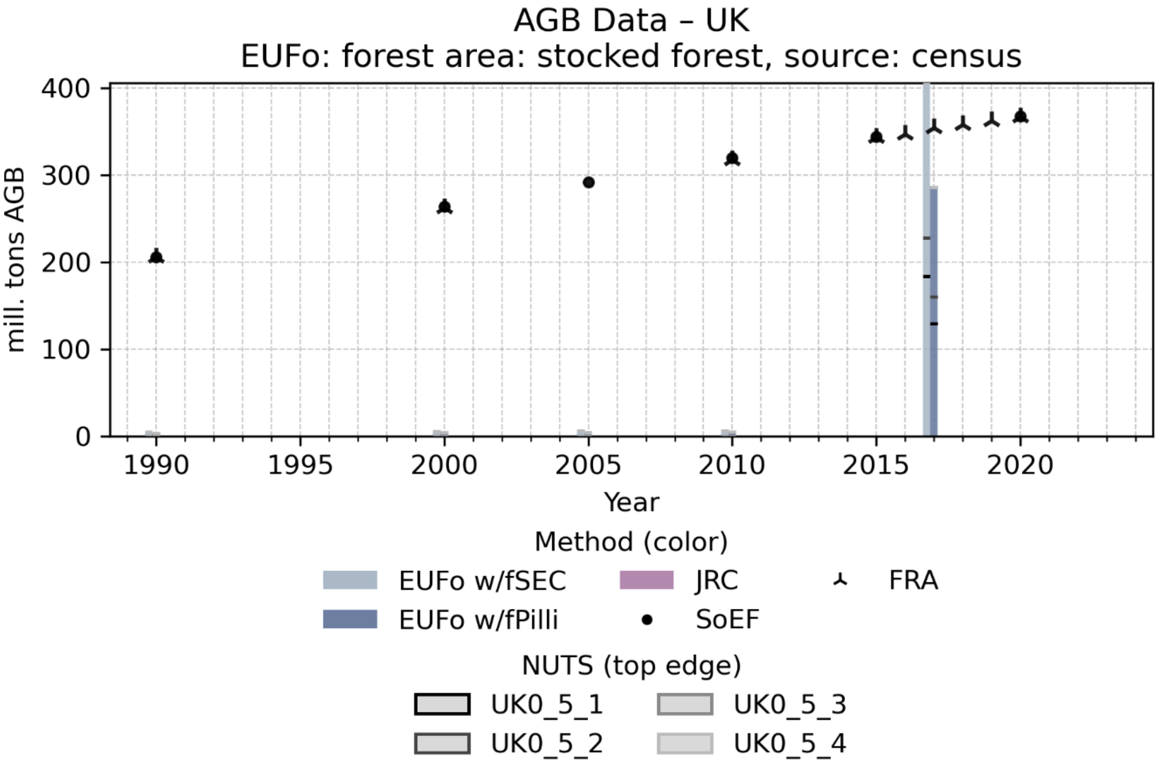
AGB Data – RS
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
RKS
RS
RS11
RS12
RS21
RS22

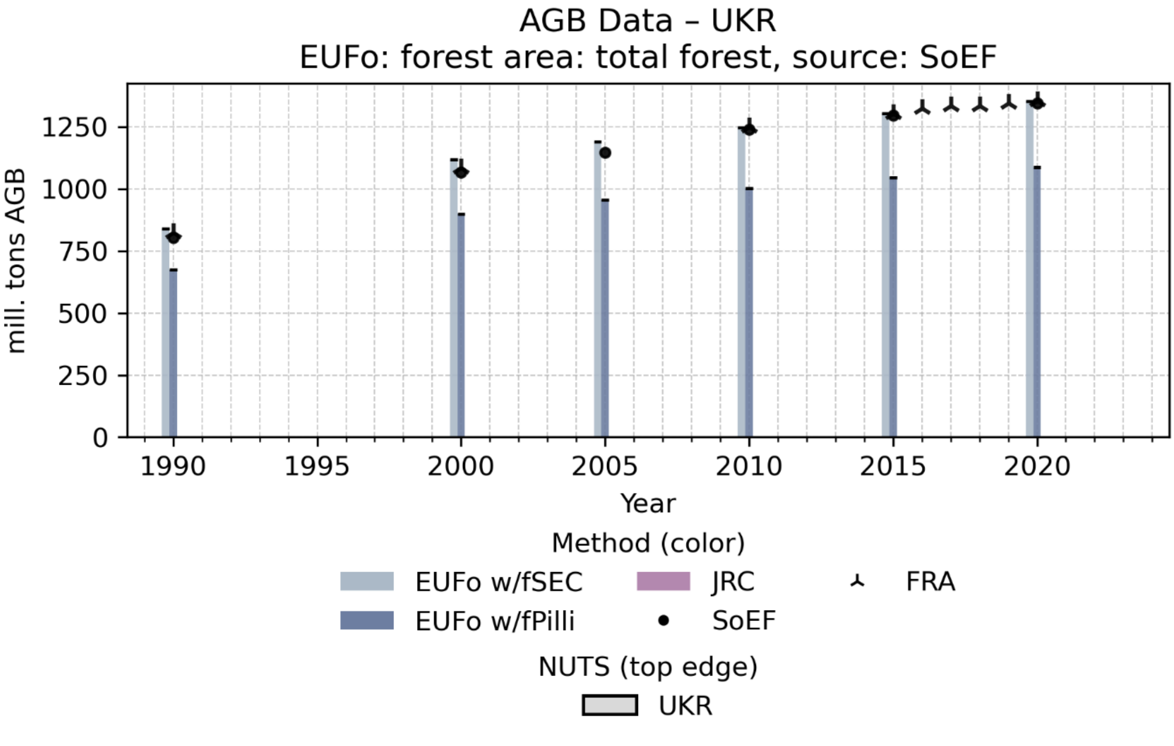

AGB Data – SE
EUFo: forest area: used forest, source: NFI
mill. tons AGB
0
500
1000
1500
2000
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
SE11
SE12
SE1_5_1
SE1_5_2
SE1_5_3
SE1_5_4
SE21
SE22
SE23
SE31
SE32
SE33


AGB Data – SI
EUFo: forest area: total forest, source: NFI
mill. tons AGB
0
100
200
300
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
SI03
SI031
SI032
SI033
SI034
SI036
SI037
SI038
SI04
SI041
SI042
SI043
SI044


AGB Data – SK
EUFo: forest area: total forest, source: census
mill. tons AGB
0
100
200
300
400
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
SK010
SK021
SK022
SK023
SK031
SK032
SK041
SK042


AGB Data – TR
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
0
200
400
600
800
1000
1990
1995
2000
2005
2010
2015
2020
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
TR


AGB Data – UK
EUFo: forest area: stocked forest, source: census
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
UK0_5_1
UK0_5_2
UK0_5_3
UK0_5_4


AGB Data – UKR
EUFo: forest area: total forest, source: SoEF
mill. tons AGB
Year
Method (color)
EUFo w/fSEC
EUFo w/fPilli
JRC
SoEF
FRA
NUTS (top edge)
UKR