Package 'THREC'

January 20, 2025

Title Tree Height Response Calibration for Swedish Forests

Type Package

Version 1.0.0

Date 2023-12-01

Description A tool that allows users to estimate tree height in the long-term forest experiments in Sweden. It utilizes the multilevel nonlinear mixed-effect height models developed for the forest experiments and consists of four functions for the main species, other conifer species, and other broadleaves. Each function within the system returns a data frame that includes the input data and the estimated heights for any missing values. Ogana et al. (2023) <doi:10.1016/j.foreco.2023.120843>\n Arias-Rodil et al. (2015) <doi:10.1371/JOURNAL.PONE.0143521>.

Encoding UTF-8

RoxygenNote 7.2.3

LazyData TRUE

Imports Matrix, magic, Deriv (>= 1.0), dplyr (>= 1.0.0), tidyr (>= 1.1.0)

Depends R (>= 3.5.0)

License GPL (>= 3)

NeedsCompilation no

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Contents

`broad` *Tree data from the long-term forest experiments in Sweden*

Description

A subset of the data used for the development of multilevel mixed-effect height functions for the Swedish long-term forest experiments. For illustration purpose, the species code was changed. Report ...

Usage

```
data(broad)
```

Format

`broad`**:**

A data frame with 117 rows and 9 columns:

yta Plot number

rev Revision number

t_l Species code

hojd Sampled tree height in meters

dia Diameter at breast height in centimeter

hdom Height of the tree with the largest diameter per plot regardless of the species

ddom Largest diameter per plot regardless of the species

QMD Quadratic mean diameter in centimeter per plot

G Basal area in meter square per hectare

Source

doi:10.1016/j.foreco.2023.120843

Examples

```
data(broad)
```

`broadleaves` *A response calibration function for the other broadleaves*

Description

This function performs a response calibration of the height function for other broadleaves. The other broadleaves include Black alder, Grey alder, Trembling aspen, Beech, Small-leaved lime, Rowan, Goat willow, Poplars, and other deciduous species. This function is not recommended for Oak species.

Usage

```
broadleaves(DATA)
```

Arguments

`DATA`	data frame containing at least yta, rev, t_l, dia, hdom, ddom, and hojd.

Value

data frame with estimated height

Note

yta: plot number, rev: revision, t_l: species code, dia: diameter at breast height, hdom: height of the tree with the largest diameter (ddom) regardless of the species (m), hojd: sample tree height with missing values. In cases where hdom is not present in the inventory data, site index (SI) can serve as an alternative, although the estimated height may exhibit slight variations.

Author(s)

Ogana F.N. and Arias-Rodil M.

References

Ogana et al. (2023) https://doi.org/10.1016/j.foreco.2023.120843

Arias-Rodil et al. (2015) https://doi.org/10.1371/JOURNAL.PONE.0143521

See Also

`conifers()`, which estimate the tree height of other conifer species.

Examples

```
library(THREC)

# sample data
data(broad)

broadleaves(broad)
```

`conifers` *A response calibration function for the other conifer species*

Description

This function performs a response calibration of the height function for other conifer species. The other conifer species include: Silver fir, Douglas fir, Sitka spruce, Siberian larch, European larch, other larch, Lodgepole pine, other fir, other spruces.

Usage

```
conifers(DATA)
```

Arguments

`DATA`	data frame containing at least yta, rev, t_l, dia, hdom, ddom, and hojd.

Value

data frame with estimated height

Note

yta: plot number, rev: revision, t_l: species code, dia: diameter at breast height, hdom: height of the tree with the largest diameter (ddom) regardless of the species (m), hojd: sample tree height with missing values. In cases where hdom is not present in the inventory data, site index (SI) can serve as an alternative, although the estimated height may exhibit slight variations.

Author(s)

Ogana F.N. and Arias-Rodil M.

References

Ogana et al. (2023) https://doi.org/10.1016/j.foreco.2023.120843

Arias-Rodil et al. (2015) https://doi.org/10.1371/JOURNAL.PONE.0143521

See Also

`broadleaves()`, which estimate the tree height of 'other broadleaves'.

Examples

```
library(THREC)

# sample data
data(broad)

conifers(broad)
```

`main_species` *Main species generalized function response calibration*

Description

This function performs a response calibration for main species at once. The main species include Scots pine, Norway spruce, and birch.

Usage

```
main_species(DATA)
```

Arguments

`DATA`	data frame containing at least yta, rev, t_l, dia, QMD, G, hdom, and hojd.

Value

data frame with estimated height

Note

yta: plot number, rev: revision, t_l: species code, dia: diameter at breast height, QMD: quadratic mean diameter, G: basal area per ha, hdom: height of the tree with the largest diameter (ddom) regardless of the species (m), hojd: sample tree height with missing values. In cases where hdom is not present in the inventory data, site index (SI) can serve as an alternative, although the estimated height may exhibit slight variations.

Author(s)

Ogana F.N. and Arias-Rodil M.

References

Ogana et al. (2023) https://doi.org/10.1016/j.foreco.2023.120843

Arias-Rodil et al. (2015) https://doi.org/10.1371/JOURNAL.PONE.0143521

See Also

`species_specific()`, which estimate the tree height of the main species based on species-specific height functions.

Examples

```
library(THREC)

# sample data
data(Treeht)

main_species(Treeht)
```

`species_specific` *Species-specific response calibration for Scots pine, Norway spruce, and Birch*

Description

This function uses the plot- and revision-level random effects to predict missing tree height of Scots pine, Norway spruce and birch. It contains the species-specific height functions.

Usage

```
species_specific(DATA)
```

Arguments

`DATA`	data frame containing at least yta, rev, t_l, dia, QMD, G, hdom, hojd.

Value

data frame with estimated height

Note

yta: plot number, rev: revision, t_l: species code (1: Scot pine; 2: Norway spruce; 3: Silver birch; 4: Downy birch), dia: diameter at breast height, QMD: quadratic mean diameter, G: basal area per ha, hdom: height of the tree with the largest diameter (ddom) regardless of the species (m), hojd: sample tree height with missing values. In cases where hdom is not present in the inventory data, site index (SI) can serve as an alternative, although the estimated height may exhibit slight variations.

Author(s)

Ogana F.N. and Arias-Rodil M.

References

Ogana et al. (2023) https://doi.org/10.1016/j.foreco.2023.120843

Arias-Rodil et al. (2015) https://doi.org/10.1371/JOURNAL.PONE.0143521

See Also

main_species(), which estimate the tree height of the main species based on equation 16 i.e., generalized function with species as a covariate (dummy variable).

Examples

```
library(THREC)

# sample data
data(Treeht)

species_specific(Treeht)
```

Treeht *Tree data from the long-term forest experiments in Sweden*

Description

A subset of the data used for the development of multilevel mixed-effect height functions for the Swedish long-term forest experiments Report ...

Usage

```
data(Treeht)
```

Format

Treeht**:**

A data frame with 334 rows and 9 columns:

yta Plot number

rev Revision number

t_l Species code

hojd Sampled tree height in meters

dia Diameter at breast height in centimeter

hdom Height of the tree with the largest diameter per plot regardless of the species

ddom Largest diameter per plot regardless of the species

QMD Quadratic mean diameter in centimeter per plot

G Basal area in meter square per hectare

Source

doi:10.1016/j.foreco.2023.120843

Examples

```
data(Treeht)
```

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