Package 'slashGY'

May 31, 2018

Title Growth and yield simulator for Slash pine (Pinus elliottii)

Version 1.0.0.000

Description
slashGY is a systems of equations to predict and project growth and yield of Slash pine (Pinus elliottii) stands with or without silvicultural traits using tree- or stand-level information.

Depends R (>= 3.3.3)

License GPL-2

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

Suggests knitr,
rmarkdown

VignetteBuilder knitr

R topics documented:

dummy *Convert information as the right dummy variable numbers*

Description

dummy Convert logical information or selectin to the right values as categories that will be use in the G&Y Model.

Usage

```
dummy(PFERT = FALSE, BEDDED = FALSE, HERB = FALSE, BURN = FALSE,
  TYPEFERT = "NA", AGEFERT = NA, SOIL = "NA")
```

Arguments

PFERT	TRUE if fertilized at planting. Default is FALSE.
BEDDED	TRUE if bedded (site preparation). Default is FALSE.
HERB	TRUE if herbicide was used. Default is FALSE.
BURN	TRUE if burned was used. Default is FALSE.
TYPEFERT	Type of fertilization at AGEFERT. N: only Nitrogen. NP: N and P. Default is NA.
AGEFERT	Numeric value of stand age (in years) where fertilization is planned. Required if definied TYPEFERT.
SOIL	Soil type. C: Group C. D: Group D. Default is NA.

Value

A list containing:

- Z1 Dummy variable if fertilized at planting then Z1 = 1.
- Z2 Dummy variable if bedded (site preparation) then Z2 = 1.
- Z3 Dummy variable if herbicide was used then Z3 = 1.
- ZB Dummy variable if burned was used then ZB = 1.
- T1 Dummy variable if only Nitrogen fertilization at AGEFERT then T1 = 1.
- T2 Dummy variable if N and P fertilization at AGEFERT then T2 = 1.
- AGEFERT Numeric value of stand age (in years) where fertilization is planned.
- S1 Dummy variable if soil is Goup C then S1 = 1.
- S2 Dummy variable if soil is Goup D then S2 = 1.

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

Examples

```
dummy(PFERT=TRUE, BEDDED=TRUE, HERB=FALSE, BURN=FALSE, TYPEFERT='NA', AGEFERT=NA, SOIL='C')
dummy(PFERT=FALSE, BEDDED=FALSE, HERB=FALSE, BURN=FALSE, TYPEFERT='NP', AGEFERT=15, SOIL='NA')
```

`module.BA` *Predicts and projects stand basal area based on stand-level information.*

Description

`module.BA` Predicts and projects stand basal area based on number of trees per acre and dominant height at the stand-level considering silvicultural information.

Usage

```
module.BA(N0 = NA, HDOM0 = NA, AGE0 = NA, Z1 = 0, Z2 = 0, Z3 = 0,
  ZB = 0, T1 = 0, T2 = 0, AGEFERT = NA, S1 = 0, S2 = 0,
  projection = FALSE, BA0 = NA, N1 = NA, HDOM1 = NA)
```

Arguments

`N0`	Numeric value of number of trees per acre at age 0 (or initial age).
`HDOM0`	Numeric value of Dominant Height (feet) at age 0.
`AGE0`	Numeric value of initial stand age (years).
`Z1`	If fertilized at planting then Z1 = 1. Default is 0.
`Z2`	If bedded (site preparation) then Z2 = 1. Default is 0.
`Z3`	If herbicide was used then Z3 = 1. Default is 0.
`ZB`	If burned was used then ZB = 1. Default is 0.
`T1`	If only Nitrogen fertilization at AGEFERT then T1 = 1. Default is 0.
`T2`	If N and P fertilization at AGEFERT then T2 = 1. Default is 0.
`AGEFERT`	Numeric value of stand age (in years) where fertilization is planned. Required if T1=1 or T2=1.
`S1`	If soil is Goup C then S1 = 1. Default is 0.
`S2`	If soil is Goup D then S2 = 1. Default is 0.
`projection`	If TRUE then model projection from provided BA0 is executed for a 1 year increment. Default: FALSE.
`BA0`	Numeric value of Basal Area (ft2/acre) at age 0 (required for model projection).
`N1`	Numeric value of number of trees per acre at age 1 for projection.
`HDOM1`	Numeric value of Dominant Height (ft) at age 1 for projection.

Value

A list containing:

- `BA0` Predicted Basal Area at age 0 (ft2/acre).
- `BA1` Projected Basal Area at age 1 (ft2/acre).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

Examples

```
# Example 1 - Predicting BA
module.BA(N0=493, HDOM0=41.57, AGE0=12,Z1=1, Z2=1, Z3=1, ZB=1, T1=1, T2=0,
AGEFERT=1, S1=0, S2=0)$BA0

# Example 2 - Projecting BA
SI <- stand.SITE(HDOM=41.57, AGE=12)$SI
HDOM1 <-stand.SITE(SI=SI, AGE=13)$HDOM
N1 <- module.N(N0=493, AGE0=12, AGE1=13)$N1
module.BA(N0=493, HDOM0=41.57, AGE0=12, projection=TRUE, BA0=99.74, N1=N1, HDOM1=HDOM1)$BA1
```

`module.input` *Module of input tree- or stand-level data to prepare it for further simulations.*

Description

`module.input` Prepares tree- or stand-level data from a single plot, checks and completes missing values, and calculates several stand-level parameters including total volume. It also reads required information for further simulations including simulation age and details of future thinning. Some information is only traspassed to other modules. Note that form tree-level data individual tree (complete or incomplete) information is required.

Usage

```
module.input(TYPE = "PLOT", TREEDATA = NA, AREA = NA, SI = NA,
  HDOM0 = NA, AGE0 = NA, BA0 = NA, N0 = NA, AGEF = 50,
  PFERT = FALSE, BEDDED = FALSE, HERB = FALSE, BURN = FALSE,
  TYPEFERT = "NA", AGEFERT = NA, SOIL = "NA", THINNING = FALSE,
  AGET = NA, NT = NA, t = 1, d = 1.95, method = 2)
```

Arguments

`TYPE`	Character for type of input data. PLOT: stand-level data information, TREE: tree-level information. Default is PLOT
`TREEDATA`	Data frame with tree-level information with columns: PLOTID, TREEID, DBH, HT (these should be identical names).
`AREA`	Numeric value of size of the inventory plot (ft2). Required for TYPE='TREE'.
`SI`	Numeric value of Site Index (ft) (Dominant Height of the plot at age 50 years).
`HDOM0`	Numeric value of Dominant Height (ft) at initial age (or age 0).
`AGE0`	Numeric value of initial stand age or age 0 (years).

BA0	Numeric value of Basal Area (ft2/ha) at age 0 (required for model projection).
N0	Numeric value of number of trees per hectare at age 0.
AGEF	Numeric value of final stand age (in years) of simulation. Default is 50.
PFERT	If TRUE then fertilized at planting. Default is FALSE.
BEDDED	If TRUE then bedded (site preparation). Default is FALSE.
HERB	If TRUE then herbicide was used. Default is FALSE.
BURN	If TRUE then burned was used. Default is FALSE.
TYPEFERT	Type of fertilization at AGEFERT. N: only Nitrogen. NP: N and P. Default is NA.
AGEFERT	Numeric value of stand age (in years) where fertilization is planned. Required if definied TYPEFERT.
SOIL	Type of Soil. C: Group C. D: Group D. Default is NA.
THINNING	If TRUE then a thinning is implemented according to AGET and NT. Default is FALSE.
AGET	Numeric value of stand age (in years) where thinning is planned.
NT	Numeric value of trees to be removed when thinning at age AGET.
t	Numeric value top stem diameter outside bark for merchantability limit (in).
d	Numeric value of a DBH threshold limit for merchantable trees (in).
method	Numeric value that identifies the method to estimate missing heights from TYPE='TREE'. 1: parametrized DBH-height model that requires DBH, BA and AGE, 2: fits a simple DBH-height model from available measurements using the equation: ln(Ht) = b0 + b1/DBH. Default method=2.

Value

A list containing the following:

- SI Site Index (ft).
- AGE0 Initial stand age or age 0 (years).
- HDOM0 Dominant Height (ft) at initial age (or age 0).
- BA0 Basal Area (ft2/ha) at age 0.
- N0 Number of trees per hectare at age 0.
- QD Mean quadratic diameter (in) at age 0.
- SDIR0 Relative stand density index (%) at age 0.
- VOL_OB0 Total stand-level volume outside bark (ft3/ha) at age 0.
- VOL_IB0 Total stand-level volume inside bark (ft3/ha) at age 0.
- VOLm_OB0 Merchantable stand-level volume outside bark (ft3/ha) at age 0.
- VOLm_IB0 Merchantable stand-level volume inside bark (ft3/ha) at age 0.
- AGEF Final stand age (in years) of simulation.
- Z1 Dummy variable if fertilized at planting then Z1 = 1.
- Z2 Dummy variable if bedded (site preparation) then Z2 = 1.
- Z3 Dummy variable if herbicide was used then Z3 = 1.
- ZB Dummy variable if burned was used then ZB = 1.
- T1 Dummy variable if only Nitrogen fertilization at AGEFERT then T1 = 1.

- T2 Dummy variable if N and P fertilization at AGEFERT then T2 = 1.
- AGEFERT Numeric value of stand age (in years) where fertilization is planned.
- S1 Dummy variable if soil is Goup C then S1 = 1.
- S2 Dummy variable if soil is Goup D then S2 = 1.
- THINNING Logical that indicates if thinning is implemented according to AGET and NT.
- AGET Stand age (in years) where thinning is planned.
- NT Number of trees to be removed when thinning at age AGET.
- t Top stem diameter outside bark for merchantability limit (in).
- d DBH threshold limit for merchantable trees (in).
- method Selection of the method to estimate missing heights from TYPE ='TREE'.

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

Examples

```
# Example 1 - Input stand-level data
module.input(TYPE='PLOT', BA0=93, SI=70, AGE0=18, N0=282, AGEF=19)
module.input(TYPE='PLOT', BA0=93, HDOM0=54, AGE0=18, N0=282, AGEF=19)
module.input(TYPE='PLOT', HDOM0=54, AGE0=18, N0=282, AGEF=19) # BA obtained by prediction

# Example 2 - Input with individual tree data
treedata <- subset(treedata, is.na(DBH)==FALSE)
module.input(TYPE='TREE', TREEDATA=treedata, AREA=3240, AGE0=5, AGEF=21)
```

---

module.N *Predicts the number of trees (mortality) at next age based on stand-level informtion.*

Description

module.N Estimates the number of trees (mortality) from initial age (AGE0) to next age (AGE1) based on stand level information based on the equation: N1 = N0 x exp(-(-c1 x -c2 x Z) x ((AGE1^c3)-(AGE0^c3)))

Usage

```
module.N(N0 = NA, AGE0 = NA, AGE1 = NA, THINNING = FALSE, AGET = NA)
```

Arguments

N0	Numeric value of number of trees per hectare at age 0.
AGE0	Numeric value of intial stand age or age 0 (years).
AGE1	Numeric value of final stand age or age 1 for prediction (years).
THINNING	If TRUE then thinning happened. Default is FALSE.
AGET	Optional numeric value of stand age (in years) where thinning is planned.

Value

A value with the number of trees per hectare at age 1 (N1).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

Examples

```
module.N(N0=376, AGE0=12, AGE1=21)$N1  # Whitout thinning
module.N(N0=376, AGE0=12, AGE1=31, THINNING=TRUE, AGET=18)$N1  # Whitout thinning
```

`module.simulation` *Module that performs the simulations by projections at the desired age starting from initial conditions.*

Description

`module.simulation` Performs model projections of a stand to a final age based on information provided by the input module that contains: SI, AGE0, HDOM0, BA0, N0, QD0, SDIR0, VOL_0B0, VOL_IB0, VOLm_0B0, VOLm_IB0, AGEF, THINNING, AGET, BAR, t, d and method. Provides with a data frame with all relevant information for simulations from AGE0 to AGEF and thinning (if requested).

Usage

```
module.simulation(stand = NULL)
```

Arguments

`stand`	List with information originated from `module.input` containing: SI, AGE0, HDOM0, BA0, N0, QD0, SDIR0, VOL_0B0, VOL_IB0, VOLm_0B0, VOLm_IB0, AGEF, THINNING, AGET, BAR, t, d, method.

Value

A list containing a data frame (sim.stand) containing the columns below with simulations from AGE0 to AGEF and a logical value indicating if thinning was requested.

- `AGE` Stand age form simulations from AGE0 to AGEF (years).
- `HDOM` Dominant Height (ft).
- `SI` Site Index (ft).
- `BA` Basal Area (ft2/ha).
- `N` Number of trees per hectare.
- `QD` Mean quadratic diameter (in).

- SDIR Relative stand density index (%).
- VOL_OB Total stand-level volume outside bark (ft3/ha).
- VOL_IB Total stand-level volume inside bark (ft3/ha).
- VOLm_OB Merchantable stand-level volume outside bark (ft3/ha).
- VOLm_IB Merchantable stand-level volume inside bark (ft3/ha).
- CI Competition Index (required for THINNING=TRUE).
- BAU Basal Area (ft2/ha) of unthinned counterpart (required for THINNING=TRUE).
- NU Number of trees per hectare of unthinned counterpart (required for THINNING=TRUE).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

See Also

module.input

Examples

```
# Example 1 - Input from plot-level data (not thinning)
sim1 <- module.input(TYPE='PLOT', BA0=93, HDOM0=54, AGE0=18, N0=282, AGEF=19)
module.simulation(stand=sim1)

# Example 2 - Input from tree-level data
treedata <- subset(treedata, is.na(DBH)==FALSE)
sim2 <- module.input(TYPE='TREE', TREEDATA=treedata, AREA=3240, AGE0=5, AGEF=21)
module.simulation(stand=sim2)

# Example 3 - Input from plot-level data (with thinning)
sim3 <- module.input(TYPE='PLOT', BA0=93, SI=70, AGE0=18, N0=282, AGEF=25,
                     THINNING=TRUE, AGET=22, NT=70)
sims <- module.simulation(stand=sim3)$sim.stand
sims
plot(sims$AGE,sims$BAU,type="l",xlim=c(15,30),ylim=c(0,10000),col=2,
     xlab='Age (years)', ylab='Basal Area (feet2/acre)')
par(new=TRUE)
plot(sims$AGE,sims$BA,type="l",xlim=c(15,30),ylim=c(0,10000),col=1,
     xlab='Age (years)', ylab='Basal Area (feet2/acre)')
par(new=FALSE)
```

module.VOL *Calculates the total stand-level volume based on stand-level information.*

Description

module.VOL Calculates the total stand-level volume inside and outside bark for a Slash pine stands based a selected method.

Usage

```
module.VOL(HDOM = NA, BA = NA, N = NA, AGE = NA, methodVOL = 1)
```

Arguments

HDOM	Numeric value of Site Index (ft) (Dominant Height of the plot at age 25 years).
BA	Numeric value of Basal Area of the plot (ft2/acre).
N	Numeric value of number of trees per acre.
AGE	Numeric value of Age of the plot (in years).
methodVOL	Numeric value that identifies the method to compute the total stand-level.Default method = 1. 1: parametrized DBH-height model that requires HDOM, N, BA and AGE. 2: parametrized DBH-height model that requires only HDOM and BA.

Value

A list containing the parameters:

- VOL_OB Total stand-level volume outside bark (ft3/acre).
- VOL_IB Total stand-level volume inside bark (ft3/acre).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

Examples

```
# Example 1 - Method 1
module.VOL(HDOM=46, BA=100, N=376, AGE=12, methodVOL=1)

# Example 2 - Method 2
module.VOL(HDOM=46, BA=100, N=376, AGE=12, methodVOL=2)

# Example 3 - Method 3
module.VOL(HDOM=46, BA=100, N=376, AGE=12, methodVOL=3)
```

`module.VOLm` *Calculates the stand-level merchantable volume based on stand-level information.*

Description

`module.VOLm` Calculates the stand-level merchantable volume inside and outside bark from a plot based on the equation: VOLm = VOL x exp(m1 x ((t/QD)^m2) + m3 x (N^m4) x (d/QD)^m5)

Usage

```
module.VOLm(N = NA, QD = NA, t = NA, d = NA, VOL_OB = NA,
  VOL_IB = NA)
```

Arguments

`N`	Numeric value of number of trees per acre.
`QD`	Numeric value of mean Quadratic Diameter (in).
`t`	Numeric value top stem diameter outside bark for merchantability limit (in).
`d`	Numeric value of a DBH threshold limit for merchantable trees (in).
`VOL_OB`	Total stand-level volume outside bark (ft3/acre).
`VOL_IB`	Total stand-level volume inside bark (ft3/acre).

Value

A list containing the parameters:

- `VOLm_OB` Merchantable stand-level volume outside bark (ft3/acre).
- `VOLm_IB` Merchantable stand-level volume inside bark (ft3/acre).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

See Also

`module.VOL`

Examples

```
VOL_OB<-module.VOL(HDOM=46, BA=100, N=376, AGE=12)$VOL_OB
VOL_IB<-module.VOL(HDOM=46, BA=100, N=376, AGE=12)$VOL_IB
module.VOLm(N=376, QD=7, t=1, d=1.96, VOL_OB=VOL_OB, VOL_IB=VOL_IB)
```

prepare.tree *Checks and prepares tree-level data from a single plot and calculates some stand-level parameters.*

Description

prepare.tree Checks and prepares tree-level data from a single plot and then calculates stand-level parameters such as basal area, number of trees per hectarea and dominant height. The provided vector of total heights can have missing information. If there are missing trees, there are two methods to use: 1) Estimates heights according to a parametrized DBH-height model, or 2) Estimates heights by fitting a simple DBH-height model that requires at least 10 measurements. Missing values are indentified as 'NA'.

Usage

```
prepare.tree(TREEID = NA, DBH = NA, HT = NA, AREA = NA, AGE = NA,
  methodHT = 2)
```

Arguments

TREEID	Vector of unique tree identification.
DBH	Vector of diameter at breast height (DBH, in). Must be complete and have the same size and order as TREEID.
HT	Vector of total height (ft). Must be of the same size and order as TREEID.
AREA	Numeric value of area of the inventory plot (ft2).
AGE	Numeric value of stand age (years). Required if method = 1.
methodHT	Numeric value that identifies the method to estimate missing heights. 1: parametrized DBH-height model, 2: fits a simple DBH-height model from available measurements. Default method = 2.

Value

A list containing the following:

- BA Basal Area (ft2/acre).

- N Number of trees per acre.

- HDOM Dominant Height (ft).

- tree.table Data frame with all tree data an observed heights (for the ones provided) and estimated heights (for those missing). The data frame contains the columns: TREEID, DBH and HT.

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

See Also

tree.HT

Examples

```
# Example - Stand-level information from inventory data
treedata <- subset(treedata, is.na(DBH)==FALSE)
TREEID <- treedata$TREEID
DBH <- treedata$DBH
HT <- treedata$HT
prepare.tree(TREEID=TREEID, DBH=DBH, HT=HT, AREA=3240, AGE=5, methodHT=2)
```

---

stand.SDI *Calculates relative stand density index for Slash pine (*Pinus ellioti*)*

Description

stand.SDI Calculates the relative stand density index (RSDI, %) for Slash in a single plot using the expression: RSDI = 100xNx(QD/10)^1.605/SDImax. For Slash pine (*Pinus ellioti*) SDImax is 400 trees/acre. All parameters are required to compute the RSDI.

Usage

```
stand.SDI(N = NA, QD = NA)
```

Arguments

N	Numeric value of the number of trees per acre.
QD	Numeric value of mean quadratic diameter (in).

Value

A value for the relative stand density index (RSDI, %).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

Examples

```
stand.SDI(QD=7, N=376)
```

---

stand.SITE *Calculates dominant height for a plot.*

Description

stand.SITE Calculates dominant height, based on site index (at reference age 25 year) and stand age for a plot considering silvicultural managements (i.e. site preparation, fertilization).

Usage

```
stand.SITE(HDOM = NA, SI = NA, AGE = NA, Z1 = 0, Z2 = 0, Z3 = 0,
  T1 = 0, T2 = 0, AGEFERT = NA)
```

Arguments

HDOM	Numeric value of mean Dominant Height (ft).
SI	Numeric value of Site Index (ft) (Dominant Height of the plot at age 25 years).
AGE	Numeric value of stand Age (years).
Z1	If fertilized at planting then Z1 = 1. Default is 0.
Z2	If bedded (site preparation) then Z2 = 1. Default is 0.
Z3	If herbicide was used then Z3 = 1. Default is 0.
T1	If only Nitrogen fertilization at AGEFERT then T1 = 1. Default is 0.
T2	If N and P fertilization at AGEFERT then T2 = 1. Default is 0.
AGEFERT	Numeric value of stand age (in years) where fertilization is planned. Required if T1=1 or T2=1.

Value

A list containing the parameters:

- HDOM Dominant Height (ft).
- SI Site Index (ft).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2010) - Forest management effects on in situ and ex situ slash pine forest carbon balance Forest Ecology and Management, 260(5), 795-805; https://doi.org/10.1016/j.foreco.2010.05.038

Examples

```
# Example 1 - No fertilization
stand.SITE(SI=70,AGE=18)$HDOM

# Example 2 - With fertilization
stand.SITE(SI=70,AGE=18,T2=1, AGEFERT=15)$HDOM

# Example 3 - Site Index
stand.SITE(HDOM=54,AGE=18)$SI
```

---

stand.STAND *Calculates the mean quadratic diameter, basal area or number of trees.*

Description

stand.STAND Calculates the mean quadratic diameter, basal area or number of trees based on stand-level information of the plot. At least two parameters are required to calculate the third missing parameter.

Usage

```
stand.STAND(BA = NA, N = NA, QD = NA)
```

Arguments

BA	Numeric value of basal area of the plot (ft2/acre).
N	Numeric value of number of trees per acre.
QD	Numeric value of mean quadratic diameter (in).

Value

A list containing the parameters:

- BA Basal Area (ft2/acre).
- N Number of trees per acre.
- QD Mean Quadratic Diameter (in).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

Examples

```
stand.STAND(QD=7, N=376)$BA     # Missing BA
stand.STAND(BA=100, QD=7)$N     # Missing N
stand.STAND(BA=100, N=376)$QD   # Missing QD
```

---

tree.HDOM *Calculate dominant height for a plot based on tree-level data.*

Description

tree.HDOM Calculate the dominant height for a plot based on tree-level data based on the top 25th percentile of the tree heights. The provided vector of heights should be complete without missing data.

Usage

```
tree.HDOM(HT, DBH, AREA)
```

Arguments

HT	Vector of tree heights (ft) for a given plot (must be complete).
DBH	Vector of diameter at breast height (DBH, in). Must be complete and have the same size and order of HT.
AREA	Numeric value of area of the inventory plot (ft2).

Value

A value with Dominant Height (HDOM, ft) for the plot.

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

Examples

```
treedata <- subset(treedata, is.na(DBH)==FALSE)
HT <- treedata$HT
DBH <- treedata$DBH
AREA <- 3240
tree.HDOM(HT=HT, DBH=DBH, AREA=AREA)
```

---

tree.HDOM25 *Calculate dominant height for a plot based on tree-level data.*

Description

tree.HDOM25 Calculate the dominant height for a plot based on tree-level data based on the top 25th percentile of the tree heights. The provided vector of heights should be complete without missing data.

Usage

```
tree.HDOM25(HT)
```

Arguments

HT	Vector of tree heights (ft) for a given plot (must be complete).

Value

A value with Dominant Height (HDOM, ft) for the plot.

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

Examples

```
HT <- treedata$HT[!is.na(treedata$HT)]
tree.HDOM25(HT=HT)
```

`tree.HT` *Estimates the total height of trees for a single plot.*

Description

`tree.HT` Estimates the total height of trees that have missing height from tree-level data. For the missing trees there are two methods to use: 1) Estimates heights according to a parametrized DBH-height model, or 2) Estimates heights by fitting a simple DBH-height model that requires at least 10 measurements. Missing values are indentified as 'NA'.

Usage

```
tree.HT(DBH, HT, AREA = NA, AGE = NA, BA = NA, N = NA, methodHT = 2)
```

Arguments

`DBH`	Vector of diameter at breast height (DBH, in). Must be complete and have the same size and order as TREEID.
`HT`	Vector of total height (ft). Must be of the same size and order as TREEID.
`AREA`	Numeric value of area of the inventory plot (ft2).
`AGE`	Numeric value of stand age (years). Required if methodHT = 1.
`BA`	Numeric value of Basal Area (ft2/acre). Required if methodHT = 1.
`N`	Numeric value of number of trees per acre. Required if methodHT = 1.
`methodHT`	Numeric value that identifies the method to estimate missing heights. 1: parametrized DBH-height model that requires DBH, BA and AGE, 2: fits a simple DBH-height model from available measurements using the equation: ln(HT) = b0 + b1/DBH. Default methodHT = 2.

Value

A list containing the following:

- `HTFIN` A vector of final tree heigths (ft), replacing the missing values for estimated heigths and retaining the observed heights.

- `r2` A value with the coefficient of determination from the fitting the DBH-height model when methodHT = 2.

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

References

Gonzalez-Benecke et al. (2014) - IParameterization of the 3-PG model for Pinus elliottii stands using alternative methods to estimate fertility rating, biomass partitioning and canopy closure. Forest Ecology and Management, 327(1): 55–75; https://doi.org/10.1016/j.foreco.2014.04.030

Examples

```
# Example 1 - Method 1 - Parametrized DBH-height model
DBH <- c(9.3,11.1,15.5,9,14.8,27.3,11.4,6.6,12.6,17.5,6.3,7.2,11.5,13.6,7.3,12,11.9,8.1,7.6,5)
HT <- c(11.8,12.3,NA,NA,15.3,18,12,NA,14.5,NA,NA,NA,NA,NA,10.3,14.6,NA,NA,NA,NA)
tree.HT(DBH=DBH, HT=HT, AREA=200, AGE=47, methodHT=1)

# Example 2 - Method 2 - Simple DBH-height model
DBH <- c(9.3,11.1,15.5,9,14.8,27.3,11.4,6.6,12.6,17.5,6.3,7.2,11.5,13.6,7.3,12,11.9,8.1,7.6,5)
HT <- c(11.8,12.3,NA,NA,15.3,18,12,NA,14.5,NA,NA,NA,NA,NA,10.3,14.6,NA,NA,NA,NA)
tree.HT(DBH=DBH, HT=HT, methodHT=2)
```

---

tree.STAND — *Calculates the basal area, number of trees and mean quadratic diameter for a plot based on tree-level data.*

Description

tree.STAND Calculates the basal area, number of trees and mean quadratic diameter for a plot based on tree-level data.

Usage

```
tree.STAND(DBH, AREA)
```

Arguments

DBH	Vector of diameter at breast height (DBH, in). Must be complete
AREA	Numeric value of the size of the plot (ft2).

Value

A list containing the parameters:

- BA Basal Area (ft2/acre).
- N Number of trees per acre.
- QD Mean Quadratic Diameter (in).

Author(s)

Priscila Someda-Dias, Salvador A. Gezan

Examples

```
# Example - Stand information from inventory data
DBH <- treedata$DBH[!is.na(treedata$DBH)]
tree.STAND(DBH=DBH, AREA=3240)
```

`treedata` *Data from inventory at tree-level to test*

Description

A dataset containing the measurements at tree-level of 60 trees in the same plot. The age of meadurement is 5 years and plot area is 3240 square meters.

Usage

```
treedata
```

Format

A data frame with 60 observations and 5 variables:

- `PLOTID` Unique plot identification. For a single plot, all trees should have the same PLOTID.
- `TREEID` Unique tree identification.
- `DBH` Diameter at breast height (DBH, inches). Must have the same size and order as TREEID.
- `HT` Total height (feet). Must be of the same size and order as TREEID.
- `OBS` Aditional information about the tree.

Source

http://www.sfrc.ufl.edu/CFGRP/

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