Package 'florestal'

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Type Package

Title Results for Forest Inventories

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Author Igor Cobelo Ferreira

Maintainer Igor Cobelo Ferreira <cobelo.igor@gmail.com>

Description The functions return sampling parameters for forest inventories with tables and graphics. Methods used in the
package refers to Pellico e Brena (1997) <https://bit.ly/2BDbHJI>.

License GPL (>= 3)

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ace *Stratified Casual Sampling and Phytosociological Parameters*

Description

Calculates the stratified casual and phytosociological sampling parameters.

Usage

```
ace(x,a,aj,E=0.1,p=0.05,ampl=5,prot=NULL,prop=F,rn=F,spivi=15,un=F,pt=T,save=T)
```

Arguments

x	A data frame with seven columns: strata in the first (in numerals), plots in the second (in numerals), numbering of individuals in the third (in numerals), species in the fourth, height in the fifth (in meters), diameter in the sixth (in centimeters) and volume in the seventh (in cubic meters).
a	Plot area, in hectares.
aj	Area of each stratum, in hectares.
E	Required error, in decimal value. Default is 0.1.
p	Significance level, in decimal value. Default is 0.05.
ampl	Amplitude of diameter class range. Default is 5.
prot	Protected species.
prop	Logical argument. If FALSE (default), the allocation of plots by stratum will follow Neyman's optimal allocation method. If TRUE, will follow the proportional allocation by area.
rn	Logical argument. If TRUE, calculates the sample intensity once again, with the degrees of freedom from the previous result.
spivi	number of species in the IVI plot. Default is 15.
un	Logical argument. If TRUE, the species column have an unique specie, as a planted forest. If FALSE (default), have multiple species (more than one).
pt	Logical argument. If TRUE (default), the language of the outputs is Portuguese. If FALSE, the language is English.
save	Logical argument. If TRUE (default), a docx file will be saved in the temporary files directory (run 'tempfile ()') (if save=TRUE) with the generated tables and graphics.

Value

A list of tables and graphs, and a docx file saved in the temporary files directory (run 'tempfile ()') (if save=TRUE). The console displays the sampling intensity and whether there is significant difference between the strata from the F test of the single-factor ANOVA and a Tukey's test for significant differences between strata, with 95 per cent confidence.

Author(s)

Igor Cobelo Ferreira

References

Pellico Netto, S.; Brena, D. (1997). Inventario florestal. Curitiba: Universidade Federal do Parana, 316 p.

Examples

```
library(florestal)

#loads the data
data("est2")
head(est2)

#Calculate the sampling parameters

IF_ace <- ace(est2,a=0.1,aj=c(12.6,10.2))
```

---

acs *Simple Casual Sampling and Phytosociological Parameters*

Description

Calculates the simple casual and phytosociological sampling parameters.

Usage

```
acs(x,A,a,E=0.1,p=0.05,prot=NULL,ampl=5,rn=FALSE,spivi=15,un=FALSE,pt=TRUE,save=TRUE)
```

Arguments

x	A data frame with six columns: plots in the first (in numerals), numbering of individuals in the second (in numerals), species in the third, height in the fourth (in meters), diameter in the fifth (in centimeters) and volume in the sixth (in cubic meters).
A	Total area, in hectares.
a	Plot area, in hectares.
E	Required error, in decimal value. Default is 0.1.
p	Significance level, in decimal value. Default is 0.05.
prot	Optional. Protected species.
ampl	Amplitude of diameter class range. Default is 5.
rn	Logical argument. If TRUE, calculates the sample intensity once again, with the degrees of freedom from the previous result.

spivi	number of species in the IVI plot. Default is 15.
un	Logical argument. If TRUE, the species column have an unique specie, as a planted forest. If FALSE (default), have multiple species (more than one).
pt	Logical argument. If TRUE (default), the language of the outputs is Portuguese. If FALSE, the language is English.
save	Logical argument. If TRUE (default), a docx file will be saved in the temporary files directory (run 'tempfile ()') (if save=TRUE) with the generated tables and graphics.

Value

A list of tables and plots, and a docx file saved in the temporary files directory (run 'tempfile ()') (if save=TRUE). The console displays the sampling intensity.

Author(s)

Igor Cobelo Ferreira

References

Pellico Netto, S.; Brena, D. (1997). Inventario florestal. Curitiba: Universidade Federal do Parana, 316 p.

Examples

```
library(florestal)

#loads the data

data("simple2")
head(simple2)

#Calculate the sampling parameters

IF_acs <- acs(simple2,A=27,a=0.1)
```

---

bit *Bitterlich Method Sampling*

Description

Calculates the Bitterlich method (or point sampling).

Usage

```
bit(x,A,k,E=0.1,p=0.05,ampl=2,rn=FALSE,pt=TRUE,save=TRUE)
```

Arguments

x	A data frame with six columns: sample points in the first (in numerals), numbering of individuals in the second (in numerals), height in the third (in meters), diameter in the fourth (in centimeters), radial distance in the fifth (in meters) and volume in the last (in cubic meters).
A	Total area, in hectares.
k	Basal area factor.
E	Required error, in decimal value. Default is 0.1.
p	Significance level, in decimal value. Default is 0.05.
ampl	Amplitude of diameter class range. Default is 2.
rn	Logical argument. If TRUE, calculates the sample intensity once again, with the degrees of freedom from the previous result.
pt	Logical argument. If TRUE (default), the language of the outputs is Portuguese. If FALSE, the language is English.
save	Logical argument. If TRUE (default), a docx file will be saved in the temporary files directory (run 'tempfile ()') (if save=TRUE) with the generated tables and graphics.

Value

A list of tables and graphs, and a docx file saved in the temporary files directory (run 'tempfile ()') (if save=TRUE). The console displays the sampling intensity.

Note

The function calculates the critical distance to check for inclusion or exclusion of doubtful trees, being included in the sample only those with radial distance less than or equal to the critical distance. Even if there are no doubtful trees, the radial distance column (fifth column) is required, in blank.

Author(s)

Igor Cobelo Ferreira

References

Bitterlich, W. (1948). Die Winkelzahlprobe. Allg. Forst-u. Holzwirtsch. Ztg., 59 (1/2): 4-5.

Pellico Netto, S.; Brena, D. (1997). Inventario florestal. Curitiba: Universidade Federal do Parana, 316 p.

Examples

```
library(florestal)

#loads the data

data("bit2")
head(bit2)
```

```
#Calculate the sampling parameters

bit(bit2,A=12,k=2)
```

---

bit1 *Collected Data by the Bitterlich Method without Volume*

Description

Table format for input in the 'indvol' function, with mens="bit".

Usage

```
data("bit1")
```

Format

A data frame with 121 observations on the following 6 variables.

'Sampled Point' a numeric vector

Individual a numeric vector

Specie a character vector

'Height (m)' a numeric vector

'Diameter (cm)' a numeric vector

'Radial Distance (m)' a numeric vector

Examples

```
library(florestal)

#loads the data

data(bit1)
head(bit1)

#calculates the individual woody volume

bit2 <- indvol(bit1, mens="bit", f=0.7)
```

bit2 *Collected Data by the Bitterlich Method with Volume*

Description

Table format for input in the 'bit' function.

Usage

```
data("bit2")
```

Format

A data frame with 121 observations on the following 7 variables.

'Sampled Point' a numeric vector

Individual a numeric vector

Specie a character vector

'h (m)' a numeric vector

'd (cm)' a numeric vector

'Radial Distance (m)' a numeric vector

'Volume (m3)' a numeric vector

Examples

```
library(florestal)

#loads the data

data(bit2)
head(bit2)

#calculates the sampling parameters

bit(bit2,A=12,k=2)
```

census1 *Collected Data by a Census without Volume*

Description

Table format for input in the 'indvol' function, with mens="census".

Usage

```
data("census1")
```

Format

A data frame with 120 observations on the following 4 variables.

`Individual` a numeric vector

`Specie` a character vector

'`Height (m)`' a numeric vector

'`Diameter (cm)`' a numeric vector

Examples

```
library(florestal)

#loads the data

data(census1)
head(census1)

#calculates the individual woody volume

indvol(census1, mens="census", veg="cerradoss_df")
```

est1 *Collected Data by the Stratified Casual Sampling without Volume*

Description

Table format for input in the 'indvol' function, with mens="strata".

Usage

```
data("est1")
```

Format

A data frame with 120 observations on the following 6 variables.

`Stratum` a numeric vector

`Plot` a numeric vector

`Individual` a numeric vector

`Specie` a character vector

`'Height (m)'` a numeric vector

`'Diameter (cm)'` a numeric vector

Examples

```
library(florestal)

#loads the data

data(est1)
head(est1)

#calculates the individual woody volume
#create an object for each stratum and join with 'rbind'

IF_e1<-indvol(est1[est1$Stratum==1,],mens="strata",veg="cerradoss_df")
IF_e2<-indvol(est1[est1$Stratum==2,],mens="strata",veg="matas>10_df")

est2<-rbind(IF_e1,IF_e2)
```

---

est2 *Collected Data by the Stratified Casual Sampling with Volume*

Description

Table format for input in the 'ace' function.

Usage

```
data("est2")
```

Format

A data frame with 116 observations on the following 7 variables.

`Stratum` a numeric vector

`Plot` a numeric vector

`Individual` a numeric vector

`Specie` a character vector

`'h (m)'` a numeric vector

`'d (cm)'` a numeric vector

`'Volume (m3)'` a numeric vector

Examples

```
library(florestal)

#loads the data

data(est2)
head(est2)

#calculates the sampling parameters

IF_ace <- ace(est2,a=0.1,aj=c(12.6,10.2))
```

`fito` *Phytosociological Parameters*

Description

Calculates the phytosociological sampling parameters.

Usage

```
fito(sp,plot,d,A,stratum=NULL,spivi=15,pt=TRUE,save=TRUE)
```

Arguments

`sp`	A vector or data frame with the species.
`plot`	A vector or data frame with the plots.
`d`	A vector or data frame with the diameter.
`A`	Total area, in hectares.
`stratum`	Optional. A vector or data frame with the strata.
`spivi`	number of species in the IVI plot. Default is 15.
`pt`	Logical argument. If TRUE (default), the language of the outputs is Portuguese. If FALSE, the language is English.
`save`	Logical argument. If TRUE (default), a docx file will be saved in the temporary files directory (run 'tempfile ()') (if save=TRUE) with the generated tables and graphics.

Value

A list with an Importance Valor Index (IVI) plot and a phytosociological parameters table, and a docx file saved in the temporary files directory (run 'tempfile ()') (if save=TRUE) (if save=TRUE).

Author(s)

Igor Cobelo Ferreira

Examples

```
library(florestal)

#loads the data

data("simple1")
head(simple1)

#Calculate the phytosociological parameters

IF_fito <- fito(sp=simple1$Specie, plot=simple1$Plot, d= simple1$Diameter, A=27)
```

---

indvol *Individual Woody Volume and Joins Multiple Shafts*

Description

Calculates the individual woody volume from a manually entered equation, an equation from a listed vegetable formation or a form factor. It joins multiple shafts of the same individual through the mean square diameter and greater height.

Usage

```
indvol(x, mens="plot", vol=FALSE, myeq=NULL, veg=NULL, f=NULL, circ=FALSE)
```

Arguments

x	A data frame. - If have strata (mens="strata"), there must be six columns: strata in the first (in numerals), plots in the second (in numerals), numbering of individuals in the third (in numerals), species in the fourth (in character), height in the fifth (in meters) and diameter in the sixth (in centimeters). - If have only plots (mens="plot"), follows the same order but without the strata column (plot, individuals, species, height and diameter). - If have not plots (mens="census"), follows the same order but without the strata and plot columns (individuals, species, height and diameter). - If its sampling by the Bitterlich method (mens="bit"), the order of the columns is as in plots, but it is suggested that the sixth column is the radial distance (point, individuals, specie, height, diameter and radial distance). - If the goal is only to join multiple shafts that already contain volume, the volume should be in the last column (vol=TRUE).
mens	Indicates the mensuration process. If have strata (mens="strata"), plots (mens="plot"), whithout strata and plots (mens="census") or by the Bitterlich method (mens="bit").
vol	Logical. If already have a volume column (last), vol=TRUE.
myeq	Optional. User can calculate a diferent equation using height (h) and diameter (d), in quotes, e.g.: "0.000065661*d^(2.475293)*h^(0.300022)"

veg	Optional. A vegetable formation. See all: Equations
f	Optional. Form factor.
circ	Logical. If TRUE, the values of the argument "d" represent the circumference, and will be automatically transformed into a diameter. If FALSE (default), the values represent the diameter.

Details

The values in the column of individuals must be sequential (1,2,3,4 ...), repeating them if they represent the same individual.

For the Bitterlich method (mens="bit"), the volume is calculated considering each line an individual, not admitting multiple shafts.

Value

The function returns a new column with the individual volume (if vol = F) and the diameters of multiple shafts are joined by means of the square mean diameter, keeping the value of the highest height.

Author(s)

Igor Cobelo Ferreira

Examples

```
library(florestal)

#loads the data by an inventory with plots

data("simple1")
head(simple1)

#Using an equation entered manually

IF_simple <- indvol(x = simple1, mens="plot", myeq = "0.000065661*d^2.475293*h^0.300022")

#Using a form factor

IF_f <- indvol(x = simple1, mens="plot", f = 0.7)

#loads the data by an inventory with strata

data("est1")
head(est1)

#create an object for each stratum and join with 'rbind'

IF_e1<-indvol(est1[est1$Stratum==1,],mens="strata",veg="cerradoss_df")
IF_e2<-indvol(est1[est1$Stratum==2,],mens="strata",veg="matas>10_df")

est2<-rbind(IF_e1,IF_e2)
```

```
#loads the data by an inventory by the Bitterlich Method

data("bit1")
head(bit1)

IF_bit <- indvol(bit1, mens="bit", f=0.7)

#loads the data by an inventory from a census

data("census1")
head(census1)

IF_census <- indvol(census1, mens="census", veg="cerradoss_df")
```

`simple1` *Collected Data by a Simple Casual Sampling without Volume*

Description

Table format for input in the 'indvol' function, with mens="plot".

Usage

```
data("simple1")
```

Format

A data frame with 120 observations on the following 5 variables.

`Plot` a numeric vector

`Individual` a numeric vector

`Specie` a character vector

'`Height (m)`' a numeric vector

'`Diameter (cm)`' a numeric vector

Examples

```
library(florestal)

#loads the data

data(simple1)
head(simple1)

#calculates the individual woody volume

simple2 <- indvol(simple1, mens="plot", veg="cerradoss_df")
```

simple2 *Collected Data by a Simple Casual Sampling with Volume*

Description

Table format for input in the 'acs' function.

Usage

```
data("simple2")
```

Format

A data frame with 116 observations on the following 6 variables.

`Plot` a numeric vector

`Individual` a numeric vector

`Specie` a character vector

`'h (m)'` a numeric vector

`'d (cm)'` a numeric vector

`'Volume (m3)'` a numeric vector

Examples

```
library(florestal)

#loads the data

data(simple2)
head(simple2)

#calculates the parameters sampling

IF_acs <- acs(simple2, a=0.1, A=27)
```

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