Package ‘ForIT’

December 10, 2025

Title Functions to Estimate Tree Volume and Phytomass in the Italian
Forest Inventory 2005

Version 2.5.2

Description Tabacchi et al. (2011) published a very detailed study producing a uniform system of functions to estimate tree volume and
phytomass components (stem, branches, stool). The estimates of the 2005 Italian forest inventory (<https://www.inventarioforestale.org/it/>)
are based on these functions. The study documents the domain of applicability of each function and the equations to quantify estimates
accuracies for individual estimates as well as for aggregated estimates. This package makes the functions available in the R environment.
Version 2 exposes two distinct functions for individual and summary estimates. To facilitate access to the functions, tree species
identification is now based on EPPO species codes (<https://data.eppo.int/>).

Encoding UTF-8

LazyData true

RoxygenNote 7.3.2

Imports magrittr, dplyr (>= 1.1.0), purrr, tibble, tidyr,
RColorBrewer, metR, rlang, ggplot2, Matrix

Suggests testthat

URL https://gitlab.com/NuoroForestrySchool/ForIT.git,
https://zenodo.org/records/5790157

Depends R (>= 2.10)

NeedsCompilation no

Author Nicola Puletti [aut, cre] (ORCID:
<https://orcid.org/0000-0002-2142-959X>),
Mirko Grotti [aut],
Roberto Scotti [aut] (ORCID: <https://orcid.org/0000-0001-7394-4473>)

Maintainer Nicola Puletti `<nicola.puletti@gmail.com>`

Repository CRAN

Date/Publication 2025-12-10 11:00:10 UTC

Contents

`ForIT_DataBase` *'ForIT'-package Database - Ver.2*

Description

The package exposes 5 tightly interconnected tibbles:

`INFCspecies`, `INFCcatalog`, `Quantities`, `INFCparam`, `INFCf_domains`

Usage

```
INFCspecies

INFCcatalog

Quantities

INFCparam

INFCf_domains
```

Format

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 44 rows and 3 columns.

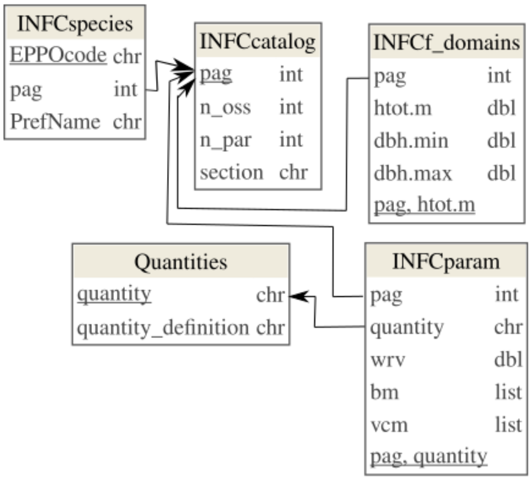
An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 26 rows and 4 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 5 rows and 2 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 130 rows and 5 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 617 rows and 4 columns.

Details



Tables columns

`INFCspecies`

- `EPPOcode [PK]`: species code, adopting EPPO database
- `pag`: section page number in the original reference (Tabacchi et al., 2011a)
- `PrefName`: EPPO preferred name for the species

`INFCcatalog`

- `pag [PK]`: section page number in the original reference (Tabacchi et al., 2011a)
- `n_oss`: number of sample trees for the section
- `n_par`: number of parameters in the equations for the section
- `section`: section name (species or species group)

`Quantities`

- `quantity [PK]`: code of the estimated quantity
- `quantity_definition`: estimated quantity definition and measurement units

`INFCparam`

- `pag [PK]`: section page number in the original reference (Tabacchi et al., 2011a)
- `quantity [PK]`: code of the estimated quantity (see Quantities)
- `wrv`: weighted residual variance
- `bm`: functions coefficients (a list of arrays)
- `vcm`: variance-covariance matrices (a list of ’dspMatrix’)

`INFCf_domains`

- `pag [PK]`: section page number in the original reference (Tabacchi et al., 2011a)

- `htot.m` `[PK]`: tree height class [m] (class width 1 m)
- `dbh.min`: minimum tree diameter class [cm] (class width 1 cm)
- `dbh.max`: maximum tree diameter class [cm] (class width 1 cm)

Columns `bm` and `vcm` are lists, the dimensions of the arrays and matrices they store vary depending on `n_par`.
Matrices in `vcm` are symmetric, stored as "dspMatrix" class objects.
Database schema is defined, verified and illustrated using package `dm`

```
library(dm)
ForIT_DB <- dm(INFCcatalog,
               INFCspecies,
               Quantities,
               INFCparam,
               INFCf_domains) %>%
  dm_add_pk(INFCcatalog, pag, check = TRUE) %>%

  dm_add_pk(INFCspecies, EPPOcode, check = TRUE) %>%
  dm_add_fk(INFCspecies, pag, INFCcatalog, check = TRUE) %>%

  dm_add_pk(Quantities, quantity, check = TRUE) %>%

  dm_add_pk(INFCparam, c(pag, quantity), check = TRUE) %>%
  dm_add_fk(INFCparam, pag, INFCcatalog, check = TRUE) %>%
  dm_add_fk(INFCparam, quantity, Quantities, check = TRUE) %>%

  dm_add_pk(INFCf_domains, c(pag, htot.m), check = TRUE) %>%
  dm_add_fk(INFCf_domains, pag, INFCcatalog, check = TRUE)

dm_examine_constraints(ForIT_DB)

dm_draw(ForIT_DB, rankdir = "BT", view_type = "all", column_types = T)
```

`ForIT_test_data` *'ForIT'-package TEST-data - Ver.2*

Description

A tiny test dataset including example data displayed in Tabacchi et al. (2011), the basic reference for ForIT package.

Usage

```
ForIT_test_data
```

Format

A data frame with 16 rows and 5 variables:

Details

The dataset is produced by the following code.

```
ForIT_test_data <- dplyr::tribble(
  ~UC, ~IdF, ~specie, ~d130, ~h_dendro,
  # UC: Plot Id (Unità Campionaria)
  # IdF: Stem ID (Identificativo Fusto)
  # specie: EPPO species code (see https://gd.eppo.int/)
  #  - ACRCA: Acer campestre
  #  - ABIAL: Abies alba
  #  - FAUSY: Fagus sylvatica
  # d130: trunk diameter at breast height [cm]
  # h_dendro: tree height [m]
 # Example data in Tabacchi et al. (2011) pag. 25
  "U1","01","ACRCA",10,7,
  "U1","02","ACRCA",15,9,
  "U1","03","ACRCA",20,12,
  "U1","04","ACRCA",30,20,
  "U1","05","ACRCA",32,21,
  "U1","06","ACRCA",24,18,
  "U1","07","ACRCA",36,21,
  "U1","08","ACRCA",40,22,
  "U1","09","ACRCA",8,8,
  "U1","10","ACRCA",18,12,

 # Example continuation, pag. 27
  "U2","01","ABIAL",38,21,
  "U2","02","ABIAL",52,28,
  "U2","03","FAUSY",25,16,
  "U2","04","FAUSY",30,18,
  "U2","05","FAUSY",12,10,

 # Extra lines, to test for 'out of domain'
  "U0","01","ACRCA",22,14,   # pag. 24
  "U0","02","ACRCA",30,10
 )
```

`INFCdomain` *The range of applicability of* `INFCvpe()` *function*

Description

A `data.frame` containing the "range of applicability" (or "domain") of `INFCvpe()` function

Format

A data frame with 18563 observations on the following 2 variables.

`key` a character vector

`in.range` a factor with levels `y`

References

Tabacchi G., Di Cosmo L., Gasparini P., Morelli S., 2011a. *Stima del volume e della fitomassa delle principali specie forestali italiane. Equazioni di previsione, tavole del volume e tavole della fitomassa arborea epigea. Stima del volume e della fitomassa delle principali specie forestali italiane. Equazioni di previsione, tavole del volume e tavole della fitomassa arborea epigea*. 412 pp. [ITA, ita]

`INFCtabulate` *Reproduce the tables that Tabacchi et al. published in 2011*

Description

The tables published in the work on which this package is based, convey a very relevant part of the information produced: printed numbers serve as reference to verify that coded functions return expected results and, more specifically, empty spaces in the printed tables signal function applicability domain. In other words, measurement data used to estimate function coefficients values, cover only the portion of the `(dbh, htot)` plane where numbers are printed.

Usage

```
INFCtabulate(
  EPPOcode,
  quantity = "vol",
  dbh.by = 5,
  htot.by = 3,
  digits = 1,
  print_tab = T
)
```

Arguments

`EPPOcode`	tree species code defined by the EPPO database `https://gd.eppo.int/search`. Lookup 'INFCspecies' dataframe to retrieve recognized codes.
`quantity`	for each species (or species group) different quantities can be estimated. Quantity's definitions and Ids are exposed by the 'Quantities' dataframe. Default value is "vol", estimation of timber volume.
`dbh.by`	...
`htot.by`	increment value between rows (respectively columns) expressed in 'cm' (respectively 'm') for dbh (respectively total height, `htot`). Default 5 cm (respectively 1 m).

`digits`	number of decimal digits to expose in the table. Default one decimal digit.
`print_tab`	defaults to TRUE in order to produce a text output. If set to FALSE no printing will occur (see 'return')

Value

Function principal output is the printout of the volume or phytomass tables. If print_tab = FALSE, the function will only return a tibble with a list column containing the tabulation of the required estimation equation/s. Using default values, tables will be identical (or anyway similar) to the corresponding published tables, with white (NA) cells delimiting the domain of applicability of the equation.

Examples

```
## Not run:
  INFCtabulate(c("ABIAL", "ACRCA"),
                quantity = "vol",
                dbh.by = 5,
                htot.by = 3,
                digits = 1)
  # EPPO code:  ABIAL  - pag =  33  - quantity =  vol
  #     htot.m
  # dbh.cm    7    10    13    16     19     22     25     28     31
  # 9  23.2  32.4    NA    NA     NA     NA     NA     NA     NA
  # 14   NA  77.9 100.2    NA     NA     NA     NA     NA     NA
  # 19   NA 142.3 183.3 224.3     NA     NA     NA     NA     NA
  # 24   NA    NA 291.1 356.4  421.8  487.2     NA     NA     NA
  # 29   NA    NA    NA 518.9  614.3  709.8  805.2     NA     NA
  # 34   NA    NA    NA 711.6  842.8  974.0 1105.2 1236.4     NA
  # 39   NA    NA    NA    NA 1107.2 1279.8 1452.5 1625.1 1797.7
  # 44   NA    NA    NA    NA     NA 1627.2 1847.0 2066.7 2286.5
  # 49   NA    NA    NA    NA     NA 2016.3 2288.8 2561.4 2833.9
  # 54   NA    NA    NA    NA     NA     NA 2778.0 3109.0 3439.9
  # 59   NA    NA    NA    NA     NA     NA 3314.4 3709.5 4104.6
  # 64   NA    NA    NA    NA     NA     NA     NA 4363.1 4828.0


  # ---
  #   EPPO code:  ACRCA  - pag =  231  - quantity =  vol
  # htot.m
  # dbh.cm  7.5  10.5  13.5  16.5   19.5   22.5
  # 9.5  26.8  36.8    NA    NA     NA     NA
  # 14.5   NA  83.6 106.9    NA     NA     NA
  # 19.5   NA 149.7 192.0 234.3  276.6     NA
  # 24.5   NA    NA 302.2 369.0  435.7     NA
  # 29.5   NA    NA    NA 534.2  631.0  727.8
  # 34.5   NA    NA    NA 729.9  862.4  994.8
  # 39.5   NA    NA    NA    NA 1129.9 1303.5
  # ---

## End(Not run)
```

`INFCvpe` *Estimate bole volume or tree phytomass for individual stems, with associated accuracy info*

Description

Using the functions developed for INFC 2005 (the 2005 Italian national forest inventory), stem volume or tree compartment phytomass are estimated for each (`EPPOcode`, `dbh.cm`, `htot.m`) input tuple. Accompaining the main value, accuracy estimates are returned, as attributes. The functions are documented in Tabacchi et al. (2011a)

Usage

```
INFCvpe(EPPOcode, dbh.cm, htot.m, quantity = "vol")
```

Arguments

`EPPOcode`	Character vector of tree species code, as defined in EPPO database, (See `INFCspecies()` and `https://gd.eppo.int`)
`dbh.cm`	Numeric vector of stem/s breast height diameter (in cm)
`htot.m`	Numeric vector of tree total height/s (in m). Length equal to dbh.cm vector or one. In this case same value will be replicated for all dbh.cm entries
`quantity`	(default = `vol`) Character vector specifying required quantity, one of `c("vol", "dw1" : "dw4")`. Use `Quantities()` to retrieve codes definitions. Length equal to dbh.cm vector or one. In this case same value will be replicated for all dbh.cm entries

Details

Output value will have following added attributes with estimates accuracy evaluations for each stem:

1. `pag` - page number, referred to original source
2. `wrv` - weighted residual variance
3. `Var_ea` - variance for an estimated average
   or variance for 'confidence interval' estimation, see `prediction.lm(.., interval = "confidence")`
4. `Var_ie` - variance for an individual estimate
   or 'prediction variance', (see `prediction.lm(.., interval = "prediction")` and Freese, 1964 - in:Tabacchi, 2011
5. `InDomain` - logical indicating whether the (dbh, htot) point lies out of the domain explored by the experimental data (see 'INFCtabulate()')

Value

The functions returns a Numeric vector of the same length of the `dbh.cm` argument, with accuracy info as attributes

See Also

`INFCvpe_summarise()` and functions related to `INFCvpe_sum()` to produce estimates of aggregates with better accuracy evaluation

Examples

```
# COMPARE WITH Tabacchi (2011a) page 25 ----
(v <- INFCvpe("ACRCA", dbh.cm = 22, htot.m = 14))
# [1] 252.9581
# attr(,"pag")
# [1] 231
# attr(,"wrv")
# [1] 2.271e-05
# attr(,"Var_ea")
# [1] 33.17182
# attr(,"Var_ie")
# [1] 1075.883
# attr(,"InDomain")
# [1] TRUE

# Standard Error of the Estimate
see <- sqrt(attr(v, "Var_ie"))
# Degrees of freedom
df <- INFCcatalog$n_oss[INFCcatalog$pag == attr(v, "pag")] -
      INFCcatalog$n_par[INFCcatalog$pag == attr(v, "pag")]
# confidence level
p <- 95/100
# Confidence Interval Half Width
cihw <- qt(1-(1-p)/2, df) * see
cat(" *** Volume confidence interval (p = ", p*100, "%) is [", round(v, 1),
    " +/- ", round(cihw, 1), "] dm^3\n", sep = "")

# ESTIMATION OF PHYTOMASS ----
Quantities[5,] %>% as.data.frame()
#   quantity         quantity_definition
# 1      dw4 phytomass of the whole tree [kg]
tree_phy <- INFCvpe(c("ACRCA", "ALUCO"),
                    dbh.cm = c(22, 15),
                    htot.m = c(14, 16),
                    quantity = "dw4")
tree_phy
# [1] 185.1291  87.7970
# attr(,"pag")
# [1] 231 245
# attr(,"wrv")
# [1] 3.142e-05 2.104e-05
# attr(,"Var_ea")
# [1] 45.89002  9.12407
# attr(,"Var_ie")
# [1] 1488.5135  281.8072
# attr(,"InDomain")
# [1] TRUE TRUE
```

```
# PROCESSING A TALLY DATA-FRAME ----
tst_vol <- ForIT_test_data %>%
  dplyr::mutate(vol = INFCvpe(specie, d130, h_dendro),
                OutOfDomain = !attr(vol, "InDomain"))
tst_vol %>%
  dplyr::filter(OutOfDomain)
tst_vol %>%
  dplyr::filter(UC == "U1")

# SUMS AND direct ACCUARACY AGGREGATION (instead of via ?INFCvpeSUM) ----
df <- function(pag) return(
  INFCcatalog %>%
    dplyr::right_join(tibble::tibble(pag = !!pag), by = "pag") %>%
    dplyr::transmute(df = n_oss - n_par) %>%
    purrr::pluck(1)
)
p <- 95/100
tst_vol %>%
  dplyr::mutate(cihw = qt(1-(1-p)/2,
                          df(attr(vol, "pag"))) *
                  sqrt(attr(vol, "Var_ie"))
  ) %>%
  dplyr::filter(!OutOfDomain) %>%
  dplyr::group_by(specie) %>%
  dplyr::summarise(.groups = "drop",
                   est = sum(vol),
                   cihw = sqrt(sum(cihw^2)),
  ) %>%
  dplyr::left_join(INFCspecies %>% dplyr::select(EPPOcode, pag),
                   by = c("specie" = "EPPOcode")) %>%
  dplyr::left_join(INFCcatalog %>% dplyr::select(pag, section),
                   by = "pag") %>%
  dplyr::select(-c(specie, pag)) %>%
  dplyr::rename(specie = section) %>%
  dplyr::mutate(dplyr::across(c("est", "cihw"), ~round(.x, 1))) %>%
  dplyr::arrange(specie) %>%
  dplyr::select(specie, est, cihw) -> tab
tab[c(2,1,3),] %>%
  t()
rm(tst_vol, tab, df)
```

`INFCvpeSUM` *Estimate tree bole volume or phytomass for stems groups, with associated accuracy info*

Description

Cumulative estimation of the volume or phytomass of groups of trees is just the summation of the values computed with `INFCvpe()`, but the computation of accuracy estimates is improved using

these summation functions.
Two approaches are available.

- Via `INFCvpe_summarise()` that processes and returns a data frame
- or by following aggregation functions within a standard `summarise()`:
  - `INFCvpe_sum()`
  - `INFCvpe_ConfInt()`
  - `INFCvpe_OutOfDomain()`

Usage

```
INFCvpe_summarise(
  in.data,
  EPPOcode_C,
  dbh_C,
  h_tot_C,
  quantity = "vol",
  p = 0.95
)

INFCvpe_sum(EPPOcode, dbh, h_tot, quantity = "vol")

INFCvpe_ConfInt(EPPOcode, dbh, h_tot, quantity = "vol", p = 0.95)

INFCvpe_OutOfDomain(EPPOcode, dbh, h_tot)
```

Arguments

`in.data`	A dataframe (or tibble) containing tally data to be matched with "EPPOcode_C", "dbh_C" and "htot_C" arguments
`EPPOcode_C`	A string, the name of the column in `in.data` with the species EPPO codes
`dbh_C`	A string, the name of the column in `in.data` with the breast height diameter values
`h_tot_C`	A string, the name of the column in `in.data` with the tree total height values
`quantity`	(default = `"vol"`) A character vector specifying required quantity/ies: `c("vol", "dw1" : "dw4")`. Use `Quantities()` to decode definitions. • for `INFCvpe_summarise()`, if `length(unique(quantity))` > 1, rows in in.data will be replicated for each value. • for `INFCvpe_SUM functions`, length(quantity) must be 1
`p`	(default `p = 95%`) probability used to compute `cihw` (with length = 1 or length = length(dbh)) OPZIONE 2 `INFCvpe_SUM functions`:
`EPPOcode`	A character vector with the species EPPO codes (with length = 1 or length = length(dbh))
`dbh`	A numeric vector with the brest height diameter values
`h_tot`	A numeric vector with the tree total height values (with length = 1 or length = length(dbh))

Details

Functions developed following Tabacchi et al. (2011), pages 23-26.

Value

- `INFCvpe_summarise()` returns a dataframe (tibble) with the grouping columns defined with `group_by()`, and the following columns:
  - `quantity`: as additional grouping column,
  - `n` : number of trees in the group,
  - `n_out` : the number of `(dbh, htot)` pairs that are 'out of the domain',
  - `est` : the estimated value,
  - `cihw` : confidence interval half width
  - `p`: probability used computing `cihw`
- `INFCvpe_SUM` - the functions of this family return a numeric vector, aggregating rows within the same group,
  - `INFCvpe_sum()` returns the sum of the estimated quantities,
  - `INFCvpe_ConfInt()` returns 'confidence interval half width',
  - `INFCvpe_OutOfDomain()` returns the number of 'out of domain' `(dhb, h_tot)` pairs included in the summation

See Also

`INFCvpe()` to compute individual estimates, with detailed accuracy evaluation

Examples

```
## Not run:
Sezione <- function(EPPOcodes){
  # retrieve 'Sezione' name, decoding EPPO codes
  INFCspecies %>%
    dplyr::filter(EPPOcode %in% EPPOcodes) %>%
    dplyr::left_join(INFCcatalog,by = "pag")%>%
    dplyr::select(section) %>%
    purrr::pluck(1)
}

tst <- ForIT_test_data %>%
  dplyr::filter(UC != "U0")
# select Tabachi et al. example data

tst %>%
  dplyr::group_by(specie) %>%
  INFCvpe_summarise("specie", "d130", "h_dendro") %>%
  dplyr::ungroup() %>%
  dplyr::mutate(specie = Sezione(specie),
                dplyr::across(c("est", "cihw"), ~round(.x, 1))
  ) %>%
  dplyr::select(specie, est, cihw) %>%
  dplyr::arrange(specie) %>%
```

```
  dplyr::slice(2, 1, 3) %>%
  t() %>%
  provideDimnames(base = list(dimnames(.)[[1]], ""), unique=FALSE)
# Compare ForIT (ver 2) output
## specie "Aceri"  "Abete bianco" "Faggio"
## est    "4623.0" "4044.2"       "1079.4"
## cihw   "567.5"  "661.2"        "275.4"
# with 'Tabella 2' in Tabacchi et al. (2011, pag. 27)
## specie "aceri"  "abete bianco" "faggio"
## est    "4623.0" "4044.2"       "1079.4"
## cihw   "567.4"  "662.4"        "279.2"

# Using 'INFCvpe_summarise()'

## Overall totals
tst %>%
  INFCvpe_summarise("specie", "d130", "h_dendro", quantity = c("vol", "dw4"))

## Group by dbh class ('cld')
tst %>%
  dplyr::mutate(cld = ceiling(d130/5)*5) %>%
  dplyr::group_by(UC, specie, cld) %>%
  INFCvpe_summarise("specie", "d130", "h_dendro")

## Group by sampling unit ('UC')
tst %>%
  dplyr::group_by(UC) %>%
  INFCvpe_summarise("specie", "d130", "h_dendro", quantity = "dw4")

# Using 'INFCvpeSUM' aggregation functions

## Esitmate 'dw4' phytomass, by sampling unit ('UC')
tst %>%
  dplyr::group_by(UC) %>%
  dplyr::summarise(
    n_stems = dplyr::n(),
    OoD = INFCvpe_OutOfDomain(specie, d130, h_dendro),
    dw4 = INFCvpe_sum(specie, d130, h_dendro, quantity = "dw4"),
    dw4_ConfInt = INFCvpe_ConfInt(specie, d130, h_dendro, quantity = "dw4")
  )

## Esitmate volume, by sampling unit ('UC')
tst %>%
  dplyr::group_by(UC) %>%
  dplyr::summarise(
    n_stems = dplyr::n(),
    OoD = INFCvpe_OutOfDomain(specie, d130, h_dendro),
    vol = INFCvpe_sum(specie, d130, h_dendro),
    vol_ConfInt = INFCvpe_ConfInt(specie, d130, h_dendro)
  )

rm(tst, Sezione)
```

```
## End(Not run)
```

`INFC_CVgrid` *'ForIT'-package Auxiliary pre-computed data - Ver.2*

Description

A large dataset used by 'INFCaccuracyPlot0()' to speed the production of a fine resolution CV surface for the plots.

Usage

```
INFC_CVgrid
```

Format

A data frame with 167560 rows and 7 variables:

pag see 'INFCcatalog' primary key
quantity see 'Quantities'
dbh trunk diameter at breast height (dbh), in cm
h_tot tree height, in m
cv_ie coefficient of variation for an individual estimate
cv_ea coefficient of variation for the estimate of an average
est estimated value for the selected 'quantity'. See 'INFCvpe()' for more details
n_par number of parameters that the function requires
inD is the (dbh, htot) point within the function domain?

Details

The dataset is produced by the following code.

```
Populate_INFC_CVgrid <- function() {
INFCcatalog %>%
  select(pag) %>%
  inner_join(INFCspecies %>%
               select(pag, EPPOcode),
             by = "pag") %>%
  group_by(pag) %>%
  summarise(EPPOcode = first(EPPOcode),
            .groups = "drop") %>%
  inner_join(Quantities %>% select(quantity), by = character()) %>%
  mutate(grid.k = pmap(list(pag, EPPOcode, quantity), compute_grid0)) %>%
  select(-EPPOcode) %>%
  unnest(cols = c(grid.k)) %>%
  return()
}
```

`PlottingINFCaccuracy` *Plotting the accuracy and reliability region (or 'domain') of the volume and phytomass estimation functions*

Description

Volume and phytomass functions are tabulated in Tabacchi et al. (2011a). The tabulation covers a limited region of the `dbh` by `h_tot` rectangle. This region is the "domain" of the reliable estimates, based on the distribution of the sample trees used to calibrate the functions. The coefficient of variation (CV = standard_deviation / estimate) is computed and plotted (as 'filled contours') for the whole rectangular area, the limits of the region of reliable estimates (the "domain"), is superimposed as a light colored line. Function output is a `ggplot` object that can be used by its self or as a background on top of which the user can plot his/her data to verify eventual accuracy or reliability problems.
Two functions are available.

- `INFCaccuracyPlot()` - allows the plots to be fully customized but, beware, all values required for the 'fill' will be computed and, at finer resolution, the process can be slow.
- `INFCaccuracyPlot0()` - produces, much faster, the plots at the finest resolution, using pre-calculated values stored in a specific auxiliary data.frame (see `INFC_CVgrid`), necessarily leaving less customization freedom.

(** `compute_grid0()` - is an internal function exported for the sake of the `Populate_INFC_CVgrid()` function **)

Usage

```
INFCaccuracyPlot(
  EPPOcod,
  quantity = "vol",
  ie.Var = FALSE,
  cv.ul = 0.1,
  fixed = TRUE,
  plot.est = FALSE,
  dbh.step = 5,
  htot.step = dbh.step,
  dbh.buf = 1,
  htot.buf = dbh.buf
)

INFCaccuracyPlot0(
  EPPOcod,
  quantity = "vol",
  ie.Var = FALSE,
  cv.ul = 0.1,
  fixed = TRUE,
  plot.est = FALSE
```

```
)

compute_grid0(pag, EPPOcod, quantity)
```

Arguments

`EPPOcod`	A string, one of the EPPO tree species codes listed in `INFCspecies` table (Reference: `https://gd.eppo.int`)
`quantity`	(optional) A string specifying the quantity to be estimated, one of `c("vol", "dw1" : "dw4")`. Lookup `Quantities` table to retrieve codes definitions. Defaults to "vol".
`ie.Var`	(optional) Logical. Choose variance estimator: • `TRUE` = variance for an 'individual estimate' • `FALSE` = variance for the 'estimate of an average' value Default `ie.Va` = `FALSE`
`cv.ul`	(optional) Numeric. Cutoff CV level for the plot. Defaults to 0.1
`fixed`	(optional) Logical. Contour plot breaks: • `TRUE` = break levels are fixed • `FALSE` = breaks are tailored to the specific case (in order to split the values within the range of interest [0, `cv.ul`], into equally numerous bins) Default `fixed` = `TRUE`
`plot.est`	(optional) Logical. Add the 'estimated quantity' layer as contour lines. Default `plot.est` = `FALSE`
`dbh.step`	(optional) Numeric. Computation with smaller step produces a plot with better resolution but increases consistently computation time (see `INFCaccuracyPlot0()`). To reduce computation time, the step defaults to 5.
`htot.step`	(optional) Numeric. As for dbh.
`dbh.buf`	(optional) Numeric. Extra space in the plot beyond the 'domain'. Default: 1
`htot.buf`	(optional) Numeric. As for dbh.
`pag`	for the internal function `compute_grid0()`

Value

`INFCaccuracyPlot` The function returns a ggplot object.

Examples

```
## Not run:
INFCaccuracyPlot("FRXAN") # 'INFCaccuracyPlot()' can be slow because
#       it computes all the CV values needed to fill backgroud plot,
#              hence default values are set to a coarser resolution.
\donttest{
  INFCaccuracyPlot("FRXAN",
                   dbh.step = 1,
                   htot.step = 1)
  # computing with high resolution is slow
```

```
}

INFCaccuracyPlot0("FRXAN")
# 'INFCaccuracyPlot0()' is quick, it uses stored values
INFCaccuracyPlot0("FRXAN", "dw4")
INFCaccuracyPlot0("FRXAN", "dw4", ie.Var = TRUE)
# deafult fixed break values are not alwais optimal
INFCaccuracyPlot0("FRXAN", "dw4", ie.Var = TRUE, fixed = FALSE, cv.ul=.9)
# tailoring can improve
INFCaccuracyPlot0("FRXAN", plot.est = TRUE)
# 'quantity' estimation iso-lines can be superimposed


background <- INFCaccuracyPlot0("ACROP", plot.est = TRUE)
foreground <-  ForIT_test_data %>%
  dplyr::filter(specie == "ACROP") %>%
  dplyr::mutate(vol = INFCvpe(specie, d130, h_dendro)) %>%
  ggplot2::geom_point(map = ggplot2::aes(h_dendro, d130, size = vol))
background + foreground  # Adding a custom foreground
rm(background, foreground)

INFCaccuracyPlot0("ABIAL")
# high resolution and quick, using pre-calculated backgroung values
INFCaccuracyPlot("ABIAL")
# default values produce a coarser resolution

## End(Not run)
```

Index