Package ‘OBIC’

January 20, 2025

Type Package

Title Calculate the Open Bodem Index (OBI) Score

Version 3.0.3

Description The Open Bodem Index (OBI) is a method to evaluate the quality of soils of agricultural fields in The Netherlands and the sustainability of the current agricultural practices.
The OBI score is based on four main criteria: chemical, physical, biological and management, which consist of more than 21 indicators.
By providing results of a soil analysis and management info the 'OBIC' package can be use to calculate he scores, indicators and derivatives that are used by the OBI.
More information about the Open Bodem Index can be found at <https://openbodemindex.nl/>.

Depends R (>= 3.5.0)

Imports checkmate, data.table

License GPL-3

URL https://github.com/AgroCares/Open-Bodem-Index-Calculator

BugReports https://github.com/AgroCares/Open-Bodem-Index-Calculator/issues

Encoding UTF-8

LazyData true

RoxygenNote 7.3.2

Suggests testthat (>= 2.1.0), knitr, rmarkdown, ggplot2, patchwork, covr

VignetteBuilder knitr

NeedsCompilation no

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Contents

`add_management` *Estimate default values for management*

Description

This function adds default management input variables given soil type and land use

Usage

```
add_management(
  ID,
  B_LU_BRP,
  B_SOILTYPE_AGR,
  M_GREEN = NA,
  M_NONBARE = NA,
  M_EARLYCROP = NA,
  M_COMPOST = NA_real_,
  M_SLEEPHOSE = NA,
  M_DRAIN = NA,
  M_DITCH = NA,
  M_UNDERSEED = NA,
  M_LIME = NA,
  M_NONINVTILL = NA,
  M_SSPM = NA,
  M_SOLIDMANURE = NA,
  M_STRAWRESIDUE = NA,
  M_MECHWEEDS = NA,
  M_PESTICIDES_DST = NA
)
```

Arguments

ID	(character) A field id
B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
M_GREEN	(boolean) A soil measure. Are catch crops sown after main crop (optional, option: yes or no)
M_NONBARE	(boolean) A soil measure. Is parcel for 80 percent of the year cultivated and 'green' (optional, option: yes or no)
M_EARLYCROP	(boolean) A soil measure. Use of early crop varieties to avoid late harvesting (optional, option: yes or no)
M_COMPOST	(numeric) The frequency that compost is applied (optional, every x years)
M_SLEEPHOSE	(boolean) A soil measure. Is sleephose used for slurry application (optional, option: yes or no)
M_DRAIN	(boolean) A soil measure. Are under water drains installed in peaty soils (optional, option: yes or no)
M_DITCH	(boolean) A soil measure. Are ditched maintained carefully and slib applied on the land (optional, option: yes or no)
M_UNDERSEED	(boolean) A soil measure. Is grass used as second crop in between maize rows (optional, option: yes or no)
M_LIME	(boolean) measure. Has field been limed in last three years (option: yes or no)
M_NONINVTILL	(boolean) measure. Non inversion tillage (option: yes or no)
M_SSPM	(boolean) measure. Soil Structure Protection Measures, such as fixed driving lines, low pressure tires, and light weighted machinery (option: yes or no)
M_SOLIDMANURE	(boolean) measure. Use of solid manure (option: yes or no)
M_STRAWRESIDUE	(boolean) measure. Application of straw residues (option: yes or no)
M_MECHWEEDS	(boolean) measure. Use of mechanical weed protection (option: yes or no)
M_PESTICIDES_DST	(boolean) measure. Use of DST for pesticides (option: yes or no)

Value

A data.table with all default estimates for the management measures that are used for the Label Sustainable Soil Management. For each B_LU_BRP 15 management measures are given, all as boolean variables except for M_COMPOST being a numeric value.

Examples

```
add_management(ID = 1, B_LU_BRP = 256, B_SOILTYPE_AGR = 'dekzand')
add_management(ID = 1, B_LU_BRP = c(256,1019), B_SOILTYPE_AGR = rep('dekzand',2))
```

`binnenveld` *Example dataset for use in OBIC package*

Description

This table contains a series of agricultural fields with soil properties needed for illustration OBIC.

Usage

```
binnenveld
```

Format

An object of class `data.table` (inherits from `data.frame`) with 3251 rows and 55 columns.

Details

ID A field id (numeric)

YEAR The year that the crop is grown (integer)

B_LU_BRP A series with crop codes given the crop rotation plan (integer, source: the BRP)

B_SC_WENR The risk for subsoil compaction as derived from risk assessment study of Van den Akker (2006) (character).

B_GWL_CLASS The groundwater table class (character)

B_SOILTYPE_AGR The agricultural type of soil (character)

B_HELP_WENR The soil type abbreviation, derived from 1:50.000 soil map (character)

B_AER_CBS The agricultural economic region in the Netherlands (CBS, 2016) (character)

A_SOM_LOI The percentage organic matter in the soil (%) (numeric)

A_CLAY_MI The clay content of the soil (%) (numeric)

A_SAND_MI The sand content of the soil (%) (numeric)

A_SILT_MI The silt content of the soil (%) (numeric)

A_PH_CC The acidity of the soil, measured in 0.01M CaCl2 (-) (numeric)

A_CACO3_IF The carbonate content of the soil (%) (numeric)

A_N_RT The organic nitrogen content of the soil in mg N / kg (numeric)

A_CN_FR The carbon to nitrogen ratio (-) (numeric)

A_COM_FR The carbon fraction of soil organic matter (%) (numeric)

A_S_RT The total Sulfur content of the soil (in mg S per kg) (numeric)

A_N_PMN The potentially mineralizable N pool (mg N / kg soil) (numeric)

A_P_AL The P-AL content of the soil (numeric)

A_P_CC The plant available P content, extracted with 0.01M CaCl2 (mg / kg) (numeric)

A_P_WA The P-content of the soil extracted with water (mg P2O5 / 100 ml soil) (numeric)

A_CEC_CO The cation exchange capacity of the soil (mmol+ / kg), analysed via Cobalt-hexamine extraction (numeric)

A_CA_CO_PO The The occupation of the CEC with Ca (%) (numeric)

A_MG_CO_PO The The occupation of the CEC with Mg (%) (numeric)

A_K_CO_PO The occupation of the CEC with K (%) (numeric)

A_K_CC The plant available K content, extracted with 0.01M CaCl2 (mg / kg) (numeric)

A_MG_CC The plant available Mg content, extracted with 0.01M CaCl2 (ug / kg) (numeric)

A_MN_CC The plant available Mn content, extracted with 0.01M CaCl2 (ug / kg) (numeric)

A_ZN_CC The plant available Zn content, extracted with 0.01M CaCl2 (ug / kg) (numeric)

A_CU_CC The plant available Cu content, extracted with 0.01M CaCl2 (ug / kg) (numeric)

A_EW_BCS The presence of earth worms (optional, score 0-1-2, numeric)

A_SC_BCS The presence of compaction of subsoil (optional, score 0-1-2, numeric)

A_GS_BCS The presence of waterlogged conditions, gley spots (optional, score 0-1-2, numeric)

A_P_BCS The presence / occurrence of water puddles on the land, ponding (optional, score 0-1-2, numeric)

A_C_BCS The presence of visible cracks in the top layer (optional, score 0-1-2, numeric)

A_RT_BCS The presence of visible tracks / rutting or trampling on the land (optional, score 0-1-2, numeric)

A_RD_BCS The rooting depth (optional, score 0-1-2, numeric)

A_SS_BCS The soil structure (optional, score 0-1-2, numeric)

A_CC_BCS he crop cover on the surface (optional, score 0-1-2, numeric)

M_COMPOST The frequency that compost is applied (optional, every x years, numeric)

M_GREEN A soil measure. Are catch crops sown after main crop (optional, option: yes or no, boolean)

M_NONBARE A soil measure. Is parcel for 80 percent of the year cultivated and 'green' (optional, option: yes or no, boolean)

M_EARLYCROP A soil measure. Use of early crop varieties to avoid late harvesting (optional, option: yes or no, boolean)

M_SLEEPHOSE A soil measure. Is sleephose used for slurry application (optional, option: yes or no, boolean)

M_DRAIN A soil measure. Are under water drains installed in peaty soils (optional, option: yes or no, boolean)

M_DITCH A soil measure. Are ditched maintained carefully and slib applied on the land (optional, option: yes or no, boolean)

M_UNDERSEED A soil measure. Is grass used as second crop in between maize rows (optional, option: yes or no, boolean)

M_LIME A soil measure. Has field been limed in last three years (option: yes or no, boolean)

M_NONINVTILL A soil measure. Non inversion tillage (option: yes or no, boolean)

M_SSPM A soil measure. Soil Structure Protection Measures, such as fixed driving lines, low pressure tires, and light weighted machinery (option: yes or no, boolean)

M_SOLIDMANURE A soil measure. Use of solid manure (option: yes or no, boolean)

M_STRAWRESIDUE A soil measure. Application of straw residues (option: yes or no, boolean)

M_MECHWEEDS A soil measure. Use of mechanical weed protection (option: yes or no, boolean)

M_PESTICIDES_DST A soil measure. Use of DST for pesticides (option: yes or no, boolean)

`bouwsteen_tb` *Table with water retention properties of 'bouwstenen'*

Description

This table contains water retention curve parameters and typical mineral composition of 18 'bouwstenen'

Usage

```
bouwsteen_tb
```

Format

An object of class `data.table` (inherits from `data.frame`) with 36 rows and 14 columns.

Details

bouwsteen soil type bouwsteen

omschrijving description of 'bouwsteen'

thres residual water content (cm3/cm3). Table 3 of Wosten 2001

thsat water content at saturation (cm3/cm3). Table 3 of Wosten 2001

Ks saturated hydraulic conductivity (cm/d). Table 3 of Wosten 2001

alpha parameter alpha of pF curve (1/cm) Table 3 of Wosten 2001

l parameter l of pF curve (-). Table 3 of Wosten 2001

n parameter n of pF curve (-). Table 3 of Wosten 2001

sand% sand content (%) within soil mineral parts. Middle value of Table 1 of Wosten 2001

silt% silt content (%) within soil mineral parts. Middle value of Table 1 of Wosten 2001

clay% clay content (%) within soil mineral parts. Middle value of Table 1 of Wosten 2001

OM% organic matter content (%). Middle value of Table 1 of Wosten 2001

bulkdensity soil bulk density (g/cm3). Middle value of Table 2 of Wosten 2001

M50 size of sand particles (um). Middle value of Table 2 of Wosten 2001 calc_aggregatestability

Calculate aggregate stability index based on occupation CEC

Description

This function calculates an aggregate stability index given the CEC and its occupation with major cations.

Usage

```
calc_aggregatestability(
  B_SOILTYPE_AGR,
  A_SOM_LOI,
  A_K_CO_PO,
  A_CA_CO_PO,
  A_MG_CO_PO
)
```

Arguments

B_SOILTYPE_AGR	(character) The type of soil
A_SOM_LOI	(numeric) The organic matter content of soil in percentage
A_K_CO_PO	(numeric) The occupation of the CEC with K (%)
A_CA_CO_PO	(numeric) The occupation of the CEC with Ca (%)
A_MG_CO_PO	(numeric) The occupation of the CEC with Mg (%)

Value

The aggregate stability index of a soil given the Cation Exchange Capacity and its composition with major cations. A numeric value.

Examples

```
calc_aggregatestability(B_SOILTYPE_AGR = 'dekzand', A_SOM_LOI = 3.5,
A_K_CO_PO = 6,A_CA_CO_PO = 83 ,A_MG_CO_PO = 9)
calc_aggregatestability(B_SOILTYPE_AGR = c('dekzand','rivierklei'), A_SOM_LOI = c(3.5,6.5),
A_K_CO_PO = c(6,9),A_CA_CO_PO = c(83,75) ,A_MG_CO_PO = c(9,4))
```

calc_bcs *Calculate the BodemConditieScore*

Description

This function calculates the BodemConditieScore given input from manual observations made in the field. The individual parameters are scored in three classes: poor (0), neutral (1) or good (2) More information on this test can be found here

Usage

```
calc_bcs(
  B_LU_BRP,
  B_SOILTYPE_AGR,
  A_SOM_LOI,
  D_PH_DELTA,
  A_EW_BCS = NA,
  A_SC_BCS = NA,
  A_GS_BCS = NA,
  A_P_BCS = NA,
  A_C_BCS = NA,
  A_RT_BCS = NA,
  A_RD_BCS = NA,
  A_SS_BCS = NA,
  A_CC_BCS = NA,
  type = "score"
)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
D_PH_DELTA	(numeric) The pH difference with the optimal pH.
A_EW_BCS	(numeric) The presence of earth worms (score 0-1-2)
A_SC_BCS	(numeric) The presence of compaction of subsoil (score 0-1-2)
A_GS_BCS	(numeric) The presence of waterlogged conditions, gley spots (score 0-1-2)
A_P_BCS	(numeric) The presence / occurrence of water puddles on the land, ponding (score 0-1-2)
A_C_BCS	(numeric) The presence of visible cracks in the top layer (score 0-1-2)
A_RT_BCS	(numeric) The presence of visible tracks / rutting or trampling on the land (score 0-1-2)
A_RD_BCS	(integer) The rooting depth (score 0-1-2)
A_SS_BCS	(integer) The soil structure (score 0-1-2)

A_CC_BCS (integer) The crop cover on the surface (score 0-1-2)

type (character) Define output of the function. Options: score (integrated score) and indicator (score per indicator)

Value

A visual soil assessment score derived from field observations driven by organic matter content and soil structure properties. Returns a numeric value.

References

mijnbodemconditie.nl

Examples

```
calc_bcs(B_LU_BRP = 265, B_SOILTYPE_AGR = 'dekzand', A_SOM_LOI = 3.5, D_PH_DELTA = 0.4,
A_EW_BCS = 1, A_SC_BCS = 1, A_GS_BCS = 1, A_P_BCS = 1, A_C_BCS = 1, A_RT_BCS =1, A_RD_BCS = 1,
A_SS_BCS = 1, A_CC_BCS = 1)
```

---

calc_bulk_density *Calculate the bulk density*

Description

This function calculates the bulk density of the soil based on texture and organic matter

Usage

```
calc_bulk_density(B_SOILTYPE_AGR, A_SOM_LOI, A_CLAY_MI = NULL)
```

Arguments

B_SOILTYPE_AGR (character) The agricultural type of soil

A_SOM_LOI (numeric) The percentage organic matter in the soil (%)

A_CLAY_MI (numeric) The clay content of the soil (%)

Value

The bulk density of an arable soil (kg / m3). A numeric value.

Examples

```
calc_bulk_density(B_SOILTYPE_AGR = 'zeeklei', A_SOM_LOI = 6.5, A_CLAY_MI = 28)
calc_bulk_density(B_SOILTYPE_AGR = 'dekzand', A_SOM_LOI = 3.5)
calc_bulk_density(B_SOILTYPE_AGR = c('dekzand','rivierklei'), A_SOM_LOI = c(3.5,8.5))
```

calc_cec — *Calculate a soil fertility index based on the CEC*

Description

This function calculates the capacity of the soil to buffer cations

Usage

```
calc_cec(A_CEC_CO)
```

Arguments

A_CEC_CO	(numeric) The cation exchange capacity (mmol+ / kg)

Value

The capacity of the soil to buffer cations. A numeric value.

Examples

```
calc_cec(A_CEC_CO = 85)
calc_cec(A_CEC_CO = c(85,125,326))
```

calc_copper_availability — *Calculate the availability of the metal Cu*

Description

This function calculates the availability of Cu for plant uptake

Usage

```
calc_copper_availability(
  B_LU_BRP,
  A_SOM_LOI,
  A_CLAY_MI,
  A_K_CC,
  A_MN_CC,
  A_CU_CC
)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
A_SOM_LOI	(numeric) The organic matter content of the soil (%)
A_CLAY_MI	(numeric) The clay content of the soil (%)
A_K_CC	(numeric) The plant available potassium, extracted with 0.01M CaCl2 (mg / kg),
A_MN_CC	(numeric) The plant available Mn content, extracted with 0.01M CaCl2 (ug / kg)
A_CU_CC	(numeric) The plant available Cu content, extracted with 0.01M CaCl2 (ug / kg)

Value

The function of the soil to supply Copper. A numeric value.

Examples

```
calc_copper_availability(B_LU_BRP = 265, A_SOM_LOI = 3.5, A_CLAY_MI = 4,A_K_CC = 65,
A_MN_CC = 110, A_CU_CC = 250)
calc_copper_availability(B_LU_BRP = 265, 3.5, 4,65, 110, 250)
calc_copper_availability(B_LU_BRP = c(1019,265), c(3.5,5), c(4,8),c(65,95), c(110,250), c(250,315))
```

---

calc_cropclass *Determine classification rules for crops used to prepare crops.obic*

Description

This function determines crop classes given crop response to P, K and S fertilizers

Usage

```
calc_cropclass(B_LU_BRP, B_SOILTYPE_AGR, nutrient)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
nutrient	(character) The nutrient for which crop classification is needed. Options include P, K and S.

Value

The crop class representing its sensitivity for P, K or S deficiency. A character value.

References

CBAV (2022) Handboek Bodem en Bemesting,https://www.handboekbodemenbemesting.nl/

Examples

```
calc_cropclass(B_LU_BRP = 256, B_SOILTYPE_AGR = 'dekzand', nutrient = 'P')
calc_cropclass(B_LU_BRP = c(256,1027), B_SOILTYPE_AGR = c('dekzand','rivierklei'),nutrient = 'P')
```

`calc_crumbleability` *Calculate the crumbleability*

Description

This function calculates the crumbleability. This value can be evaluated by `ind_crumbleability`

Usage

```
calc_crumbleability(A_SOM_LOI, A_CLAY_MI, A_PH_CC)
```

Arguments

A_SOM_LOI	(numeric) The organic matter content of soil (%)
A_CLAY_MI	(numeric) The clay content of the soil (%)
A_PH_CC	(numeric) The pH of the soil, measured in 0.01M CaCl2

Value

The crumbleability index of a soil, a measure for a physical soil property. A numeric value.

Examples

```
calc_crumbleability(A_SOM_LOI = 3.5, A_CLAY_MI = 12, A_PH_CC = 5.4)
calc_crumbleability(A_SOM_LOI = c(3.5,12), A_CLAY_MI = c(4,12), A_PH_CC = c(5.4, 7.1))
```

`calc_grass_age` *Calculate the average age of the grass*

Description

This function calculates the average age of the grass

Usage

```
calc_grass_age(ID, B_LU_BRP)
```

Arguments

`ID`	(numeric) The ID of the field
`B_LU_BRP`	(numeric) The crop code (gewascode) from the BRP

Details

The function assumes that the order of crop codes are descending, so the latest year is on top.

Value

The age of the grassland within a crop rotation plan. A numeric value.

Examples

```
calc_grass_age(ID = rep(1,5), B_LU_BRP = c(1091,265,256,256,1091))
calc_grass_age(ID = rep(1,5), B_LU_BRP = c(265,265,265,265,1091))
```

`calc_magnesium_availability` *Calculate the capacity of soils to supply Magnesium*

Description

This function calculates an index for the availability of Magnesium in soil

Usage

```
calc_magnesium_availability(
  B_LU_BRP,
  B_SOILTYPE_AGR,
  A_SOM_LOI,
  A_CLAY_MI,
  A_PH_CC,
  A_CEC_CO,
  A_K_CO_PO,
  A_MG_CC,
  A_K_CC
)
```

Arguments

`B_LU_BRP`	(numeric) The crop code from the BRP
`B_SOILTYPE_AGR`	(character) The agricultural type of soil
`A_SOM_LOI`	(numeric) The percentage organic matter in the soil (%)
`A_CLAY_MI`	(numeric) The clay content of the soil (%)

A_PH_CC	(numeric) The acidity of the soil, measured in 0.01M CaCl2 (-)
A_CEC_CO	(numeric) The cation exchange capacity of the soil (mmol+ per kg), analyzed via Cobalt-hexamine extraction
A_K_CO_PO	(numeric) The occupation of the CEC with potassium (%)
A_MG_CC	(numeric) The plant available content of Mg in the soil (mg Mg per kg) extracted by 0.01M CaCl2
A_K_CC	(numeric) The plant available potassium, extracted with 0.01M CaCl2 (mg per kg),

Value

An index representing the availability of Magnesium in a soil. A numeric value.

Examples

```
calc_magnesium_availability(B_LU_BRP = 265, B_SOILTYPE_AGR = 'dekzand',
A_SOM_LOI = 3.5,A_CLAY_MI = 8.5,A_PH_CC = 5.4,
A_CEC_CO = 185,A_K_CO_PO = 4.5,A_MG_CC = 125,A_K_CC = 65)
```

---

calc_makkink *Add Makkink correction factors and crop cover to crop rotation table*

Description

This function adds Makkink correction factors for ET and crop cover to the crop rotation table

Usage

```
calc_makkink(B_LU_BRP)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP

Value

A datatable with the crop dependent Makkink correction factor per month. Output is a single data.table with for each B_LU_BRP code the monthly correction factor. Columns of the data.table are: crop_makkink, month, year, mcf and crop_cover.

Examples

```
calc_makkink(B_LU_BRP = 265)
calc_makkink(B_LU_BRP = c(265,1019))
```

calc_management *Calculate the 'performance' of sustainable soil management*

Description

This function evaluates the contribution of sustainable soil management following the Label Sustainable Soil Management.

Usage

```
calc_management(
  A_SOM_LOI,
  B_LU_BRP,
  B_SOILTYPE_AGR,
  B_GWL_CLASS,
  D_SOM_BAL,
  D_CP_GRASS,
  D_CP_POTATO,
  D_CP_RUST,
  D_CP_RUSTDEEP,
  D_GA,
  M_COMPOST,
  M_GREEN,
  M_NONBARE,
  M_EARLYCROP,
  M_SLEEPHOSE,
  M_DRAIN,
  M_DITCH,
  M_UNDERSEED,
  M_LIME,
  M_NONINVTILL,
  M_SSPM,
  M_SOLIDMANURE,
  M_STRAWRESIDUE,
  M_MECHWEEDS,
  M_PESTICIDES_DST
)
```

Arguments

A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
B_GWL_CLASS	(character) The groundwater table class
D_SOM_BAL	(numeric) The organic matter balance of the soil (in kg EOS per ha)

D_CP_GRASS	(numeric) The fraction grassland in crop rotation
D_CP_POTATO	(numeric) The fraction potato crops in crop rotation
D_CP_RUST	(numeric) The fraction rustgewassen in crop rotation
D_CP_RUSTDEEP	(numeric) The fraction diepe rustgewassen in crop rotation (-)
D_GA	(numeric) The age of the grassland (years)
M_COMPOST	(numeric) The frequency that compost is applied (optional, every x years)
M_GREEN	(boolean) measure. are catch crops sown after main crop (option: yes or no)
M_NONBARE	(boolean) measure. is parcel for 80 percent of the year cultivated and 'green' (option: yes or no)
M_EARLYCROP	(boolean) measure. use of early crop varieties to avoid late harvesting (option: yes or no)
M_SLEEPHOSE	(boolean) measure. is sleepslangbemester used for slurry application (option: yes or no)
M_DRAIN	(boolean) measure. are under water drains installed in peaty soils (option: yes or no)
M_DITCH	(boolean) measure. are ditched maintained carefully and slib applied on the land (option: yes or no)
M_UNDERSEED	(boolean) measure. is maize grown with grass underseeded (option: yes or no)
M_LIME	(boolean) measure. Has field been limed in last three years (option: yes or no)
M_NONINVTILL	(boolean) measure. Non inversion tillage (option: yes or no)
M_SSPM	(boolean) measure. Soil Structure Protection Measures, such as fixed driving lines, low pressure tires, and light weighted machinery (option: yes or no)
M_SOLIDMANURE	(boolean) measure. Use of solid manure (option: yes or no)
M_STRAWRESIDUE	(boolean) measure. Application of straw residues (option: yes or no)
M_MECHWEEDS	(boolean) measure. Use of mechanical weed protection (option: yes or no)
M_PESTICIDES_DST	(boolean) measure. Use of DST for pesticides (option: yes or no)

Value

The evaluated soil management score according to the Label Sustainable Soil Management. A nmumeric value.

Examples

```
calc_management(A_SOM_LOI = 4.5,B_LU_BRP = 3732, B_SOILTYPE_AGR = 'dekzand',
B_GWL_CLASS = 'GtIV',D_SOM_BAL = 1115,D_CP_GRASS = 0.2,D_CP_POTATO = 0.5,
D_CP_RUST = 0.3,D_CP_RUSTDEEP = 0.2,D_GA = 0,M_COMPOST = rep(25,1),
M_GREEN = TRUE, M_NONBARE = TRUE, M_EARLYCROP = TRUE, M_SLEEPHOSE = TRUE,
M_DRAIN = TRUE, M_DITCH = TRUE, M_UNDERSEED = TRUE,M_LIME = TRUE,
M_NONINVTILL = TRUE, M_SSPM = TRUE, M_SOLIDMANURE = TRUE,M_STRAWRESIDUE = TRUE,
M_MECHWEEDS = TRUE,M_PESTICIDES_DST = TRUE)
```

calc_man_ess *Calculate the 'performance' of sustainable soil management given a required ecosystem service*

Description

This function evaluates the contribution of sustainable soil management for a given ecosystem service

Usage

```
calc_man_ess(
  A_SOM_LOI,
  B_LU_BRP,
  B_SOILTYPE_AGR,
  B_GWL_CLASS,
  D_SOM_BAL,
  D_CP_GRASS,
  D_CP_POTATO,
  D_CP_RUST,
  D_CP_RUSTDEEP,
  D_GA,
  M_COMPOST,
  M_GREEN,
  M_NONBARE,
  M_EARLYCROP,
  M_SLEEPHOSE,
  M_DRAIN,
  M_DITCH,
  M_UNDERSEED,
  M_LIME,
  M_NONINVTILL,
  M_SSPM,
  M_SOLIDMANURE,
  M_STRAWRESIDUE,
  M_MECHWEEDS,
  M_PESTICIDES_DST,
  type
)
```

Arguments

A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
B_GWL_CLASS	(character) The groundwater table class

D_SOM_BAL	(numeric) The organic matter balance of the soil (in kg EOS per ha)
D_CP_GRASS	(numeric) The fraction grassland in crop rotation
D_CP_POTATO	(numeric) The fraction potato crops in crop rotation
D_CP_RUST	(numeric) The fraction rustgewassen in crop rotation
D_CP_RUSTDEEP	(numeric) The fraction diepe rustgewassen in crop rotation (-)
D_GA	(numeric) The age of the grassland (years)
M_COMPOST	(numeric) The frequency that compost is applied (optional, every x years)
M_GREEN	(boolean) measure. are catch crops sown after main crop (option: yes or no)
M_NONBARE	(boolean) measure. is parcel for 80 percent of the year cultivated and 'green' (option: yes or no)
M_EARLYCROP	(boolean) measure. use of early crop varieties to avoid late harvesting (option: yes or no)
M_SLEEPHOSE	(boolean) measure. is sleepslangbemester used for slurry application (option: yes or no)
M_DRAIN	(boolean) measure. are under water drains installed in peaty soils (option: yes or no)
M_DITCH	(boolean) measure. are ditched maintained carefully and slib applied on the land (option: yes or no)
M_UNDERSEED	(boolean) measure. is maize grown with grass underseeded (option: yes or no)
M_LIME	(boolean) measure. Has field been limed in last three years (option: yes or no)
M_NONINVTILL	(boolean) measure. Non inversion tillage (option: yes or no)
M_SSPM	(boolean) measure. Soil Structure Protection Measures, such as fixed driving lines, low pressure tires, and light weighted machinery (option: yes or no)
M_SOLIDMANURE	(boolean) measure. Use of solid manure (option: yes or no)
M_STRAWRESIDUE	(boolean) measure. Application of straw residues (option: yes or no)
M_MECHWEEDS	(boolean) measure. Use of mechanical weed protection (option: yes or no)
M_PESTICIDES_DST	(boolean) measure. Use of DST for pesticides (option: yes or no)
type	(character) type of ecosystem service to evaluate the impact of soil management. Options: I_M_SOILFERTILITY, I_M_CLIMATE, I_M_WATERQUALITY, and I_M_BIODIVERSITY

Value

The evaluated soil management score for multiple soil ecosystem services. This is done for the following ESS: I_M_SOILFERTILITY, I_M_CLIMATE, I_M_WATERQUALITY and I_M_BIODIVERSITY

Examples

```
calc_man_ess(A_SOM_LOI = 4.5,B_LU_BRP = 3732, B_SOILTYPE_AGR = 'dekzand',
B_GWL_CLASS = 'GtIV',D_SOM_BAL = 1115,D_CP_GRASS = 0.2,D_CP_POTATO = 0.5,
D_CP_RUST = 0.3,D_CP_RUSTDEEP = 0.2,D_GA = 0,M_COMPOST = rep(25,1),
M_GREEN = TRUE, M_NONBARE = TRUE, M_EARLYCROP = TRUE, M_SLEEPHOSE = TRUE,
M_DRAIN = TRUE, M_DITCH = TRUE, M_UNDERSEED = TRUE,M_LIME = TRUE,
M_NONINVTILL = TRUE, M_SSPM = TRUE, M_SOLIDMANURE = TRUE,M_STRAWRESIDUE = TRUE,
M_MECHWEEDS = TRUE,M_PESTICIDES_DST = TRUE,type="I_M_SOILFERTILITY")
```

`calc_nleach` *Calculate the N leaching*

Description

This function calculates the potential N leaching of a soil.

Usage

```
calc_nleach(
  B_SOILTYPE_AGR,
  B_LU_BRP,
  B_GWL_CLASS,
  D_NLV,
  B_AER_CBS,
  leaching_to
)
```

Arguments

B_SOILTYPE_AGR	(character) The type of soil
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_GWL_CLASS	(character) The groundwater table class
D_NLV	(numeric) The N supplying capacity of a soil (kg N ha-1 jr-1) calculated by calc_nlv
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)
leaching_to	(character) whether it computes N leaching to groundwater ("gw") or to surface water ("ow")

Value

The potential nitrogen leaching from the soil originating from soil nitrogen mineralization processes. A numeric value.

Examples

```
calc_nleach('dekzand',265,'GtIII',145,'Zuidwest-Brabant','gw')
calc_nleach('rivierklei',1019,'GtIV',145,'Rivierengebied','ow')
```

calc_nlv *Calculate the NLV*

Description

This function calculates the NLV (nitrogen producing capacity) for the soil

Usage

```
calc_nlv(B_LU_BRP, B_SOILTYPE_AGR, A_N_RT, A_CN_FR, D_OC, D_BDS, D_GA)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_N_RT	(numeric) The organic nitrogen content of the soil in mg N / kg
A_CN_FR	(numeric) The carbon to nitrogen ratio
D_OC	(numeric) The organic carbon content of the soil in kg C / ha
D_BDS	(numeric) The bulk density of the soil in kg / m3
D_GA	(numeric) The age of the grass if present

Value

The capacity of the soil to supply nitrogen (kg N / ha / yr). A numeric value.

Examples

```
calc_nlv(B_LU_BRP = 256, B_SOILTYPE_AGR = 'dekzand',A_N_RT = 2500,
A_CN_FR = 11, D_OC = 86000,D_BDS = 1300, D_GA = 4)
calc_nlv(1019,'dekzand',2315,13,86000,1345,0)
```

calc_n_efficiency *Calculate nitrogen use efficiency and leaching based on N surplus*

Description

This function gives an indication of the nitrogen use efficiency, the function calculates the N surplus and the resulting N leaching

Usage

```
calc_n_efficiency(
  B_LU_BRP,
  B_SOILTYPE_AGR,
  B_GWL_CLASS,
  B_AER_CBS,
  A_SOM_LOI,
  A_CLAY_MI,
  D_PBI,
  D_K,
  D_PH_DELTA,
  leaching_to,
  M_GREEN = FALSE,
  B_FERT_NORM_FR = 1
)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soilBRP
B_GWL_CLASS	(character) The groundwater table class
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)
A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
A_CLAY_MI	(numeric) The clay content of the soil (%)
D_PBI	(numeric) The value of phosphate availability calculated by calc_phosphate_availability
D_K	(numeric) The value of K-index calculated by calc_potassium_availability
D_PH_DELTA	(numeric) The pH difference with the optimal pH.
leaching_to	(character) whether it computes N leaching to groundwater ("gw") or to surface water ("ow")
M_GREEN	(boolean) A soil measure. Are catch crops sown after main crop (optional, option: yes or no)
B_FERT_NORM_FR	(numeric) The fraction of the application norm utilized

Value

The estimated index for the nitrogen use efficiency, as being affected by soil properties. A numeric value.

Examples

```
calc_n_efficiency(1019,'dekzand','GtIV','Zuidwest-Brabant',4.5,3.5,0.8,0.6,0.2,78,FALSE,1)
calc_n_efficiency(256,'veen','GtII','Centraal Veehouderijgebied',4.5,3.5,0.8,0.6,0.2,250,FALSE,1)
```

calc_organic_carbon — *Calculate amount of organic carbon*

Description

This function calculates the amount of organic carbon in the soil

Usage

```
calc_organic_carbon(A_SOM_LOI, D_BDS, D_RD)
```

Arguments

A_SOM_LOI	(numeric) The percentage organic matter in the soil
D_BDS	(numeric) The bulk density of the soil
D_RD	(numeric) The root depth of the crop

Value

The total amount of Carbon in the soil (kg C / ha). A numeric value.

Examples

```
calc_organic_carbon(A_SOM_LOI = 4.3, D_BDS = 1100, D_RD = 0.2)
calc_organic_carbon(A_SOM_LOI = c(1,4.3), D_BDS = c(1100,1300), D_RD = c(0.2,0.6))
```

calc_permeability — *Calculate the permeability of the top soil*

Description

This function calculates the permeability of the top soil

Usage

```
calc_permeability(A_CLAY_MI, A_SAND_MI, A_SILT_MI, A_SOM_LOI)
```

Arguments

A_CLAY_MI	(numeric) The clay content of the soil (%)
A_SAND_MI	(numeric) The sand content of the soil (%)
A_SILT_MI	(numeric) The silt content of the soil (%)
A_SOM_LOI	(numeric) The organic matter content of the soil (%)

calc_pesticide_leaching
Calculate risk of pesticide leaching

Description

This function calculates the risk of pesticide leaching from a soil. The risk is calculated by comparing the current leached fraction with a worst case scenario

Usage

```
calc_pesticide_leaching(
  B_SOILTYPE_AGR,
  A_SOM_LOI,
  A_CLAY_MI,
  A_SAND_MI,
  A_SILT_MI,
  D_PSP,
  M_PESTICIDES_DST,
  M_MECHWEEDS
)
```

Arguments

B_SOILTYPE_AGR	(character) The agricultural type of soil
A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
A_CLAY_MI	(numeric) The clay content of the soil (%)
A_SAND_MI	(numeric) The sand content of the soil (%)
A_SILT_MI	(numeric) The silt content of the soil (%)
D_PSP	(numeric) The precipitation surplus per crop calculated by calc_psp
M_PESTICIDES_DST	(boolean) measure. Use of DST for pesticides (option: TRUE or FALSE)
M_MECHWEEDS	(boolean) measure. Use of mechanical weed protection (option: TRUE or FALSE)

Value

The risk of pesticide leaching from soils. A numeric value.

Examples

```
calc_pesticide_leaching(B_SOILTYPE_AGR = 'rivierklei', A_SOM_LOI = 4,
A_CLAY_MI = 20, A_SAND_MI = 45, A_SILT_MI = 35,
D_PSP = 225, M_PESTICIDES_DST = TRUE,M_MECHWEEDS = TRUE)
calc_pesticide_leaching('rivierklei', 4, 20, 45, 35, 225, TRUE,TRUE)
calc_pesticide_leaching('dekzand', 4.8, 4.2, 85, 10.8, 225, TRUE,TRUE)
```

calc_phosphate_availability *Calculate the phosphate availability (PBI)*

Description

This function calculates the phosphate availability. This value can be evaluated by ind_phosphate_availability

Usage

```
calc_phosphate_availability(
  B_LU_BRP,
  A_P_AL = NULL,
  A_P_CC = NULL,
  A_P_WA = NULL
)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
A_P_AL	(numeric) The P-AL content of the soil
A_P_CC	(numeric) The P-CaCl2 content of the soil
A_P_WA	(numeric) The P-content of the soil extracted with water

Value

The phosphate availability index estimated from extractable soil P fractions. A numeric value.

Examples

```
calc_phosphate_availability(B_LU_BRP = 265, A_P_AL = 45, A_P_CC = 2.5)
calc_phosphate_availability(c(265,1019),A_P_AL = c(35,54),A_P_CC = c(2.5,4.5), A_P_WA = c(35,65))
```

calc_ph_delta *Calculate the difference between pH and optimum*

Description

This functions calculates the difference between the measured pH and the optimal pH according to the Bemestingsadvies

Usage

```
calc_ph_delta(
  B_LU_BRP,
  B_SOILTYPE_AGR,
  A_SOM_LOI,
  A_CLAY_MI,
  A_PH_CC,
  D_CP_STARCH,
  D_CP_POTATO,
  D_CP_SUGARBEET,
  D_CP_GRASS,
  D_CP_MAIS,
  D_CP_OTHER
)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_SOM_LOI	(numeric) The organic matter content of soil in percentage
A_CLAY_MI	(numeric) The percentage A_CLAY_MI present in the soil
A_PH_CC	(numeric) The pH-CaCl2 of the soil
D_CP_STARCH	(numeric) The fraction of starch potatoes in the crop plan
D_CP_POTATO	(numeric) The fraction of potatoes (excluding starch potatoes) in the crop plan
D_CP_SUGARBEET	(numeric) The fraction of sugar beets in the crop plan
D_CP_GRASS	(numeric) The fraction of grass in the crop plan
D_CP_MAIS	(numeric) The fraction of mais in the crop plan
D_CP_OTHER	(numeric) The fraction of other crops in the crop plan

Value

The difference between the actual and desired optimum soil pH. A numeric value.

References

Handboek Bodem en Bemesting tabel 5.1, 5.2 en 5.3

Examples

```
calc_ph_delta(B_LU_BRP = 265, B_SOILTYPE_AGR = "rivierklei", A_SOM_LOI = 5,
A_CLAY_MI = 20,A_PH_CC = 6, D_CP_STARCH = 0,D_CP_POTATO = 0.3,D_CP_SUGARBEET = 0.2,
D_CP_GRASS = 0,D_CP_MAIS = 0.2,D_CP_OTHER = 0.3)
calc_ph_delta(265, "rivierklei", 5,20,6, 0,0.3,0.2,0,0.2,0.3)
```

calc_pmn *Calculate the index for the microbial biological activity*

Description

This function assesses the microbial biological activity (of microbes and fungi) via the Potentially Mineralizable N pool, also called PMN (or SoilLife by Eurofins in the past).

Usage

```
calc_pmn(B_LU_BRP, B_SOILTYPE_AGR, A_N_PMN)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_N_PMN	(numeric) The potentially mineralizable N pool (mg N / kg soil)

Value

the normalized potentially mineralizable Nitrogen pool (mg N / kg), a numeric value.

Examples

```
calc_pmn(B_LU_BRP = 256, B_SOILTYPE_AGR = 'dekzand', A_N_PMN = 125)
calc_pmn(B_LU_BRP = c(256,1027), B_SOILTYPE_AGR = c('dekzand','rivierklei'), A_N_PMN = c(125,45))
```

calc_potassium_availability *Calculate the K availability*

Description

This function calculates the K availability of a soil.

Usage

```
calc_potassium_availability(
  B_LU_BRP,
  B_SOILTYPE_AGR,
  A_SOM_LOI,
  A_CLAY_MI,
  A_PH_CC,
  A_CEC_CO,
  A_K_CO_PO,
  A_K_CC
)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_SOM_LOI	(numeric) The organic matter content of the soil (%)
A_CLAY_MI	(numeric) The clay content of the soil (%)
A_PH_CC	(numeric) The acidity of the soil, measured in 0.01M CaCl2 (-)
A_CEC_CO	(numeric) The cation exchange capacity of the soil (mmol+ / kg), analyzed via Cobalt-hexamine extraction
A_K_CO_PO	(numeric) The occupation of the CEC with potassium (%)
A_K_CC	(numeric) The plant available potassium, extracted with 0.01M CaCl2 (mg / kg),

Value

The capacity of the soil to supply and buffer potassium. A numeric value.

Examples

```
calc_potassium_availability(B_LU_BRP = 265, B_SOILTYPE_AGR = 'dekzand',
A_SOM_LOI = 4, A_CLAY_MI = 11,A_PH_CC = 5.4, A_CEC_CO = 125,
A_K_CO_PO = 8.5, A_K_CC = 145)
calc_potassium_availability(265, 'dekzand',4, 11,5.4,  125,8.5, 145)
calc_potassium_availability(c(265,1019), rep('dekzand',2),c(4,6), c(11,14),
c(5.4,5.6),  c(125,145),c(8.5,3.5), c(145,180))
```

---

calc_psp *Calculate the precipitation surplus*

Description

This function calculates the precipitation surplus (in mm / ha) given the crop rotation plan.

Usage

```
calc_psp(B_LU_BRP, M_GREEN)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
M_GREEN	(boolean) A soil measure. Are catch crops sown after main crop (optional, options: TRUE, FALSE)

Value

The estimated precipitation surplus (in mm / ha) depending on averaged precipitation and evaporation. A numeric value.

Examples

```
calc_psp(B_LU_BRP = 265, M_GREEN = TRUE)
calc_psp(B_LU_BRP = c(265,1019,265,1019), M_GREEN = rep(TRUE,4))
```

---

calc_root_depth   *Determine the root depth of the soil for this crop*

Description

This function determines the depth of the soil

Usage

```
calc_root_depth(B_LU_BRP)
```

Arguments

B_LU_BRP	(numeric) The crop code (gewascode) from the BRP

Details

This is a helper function to estimate the rooting depth of crops, as being used for calculations for soil nutrient supplies. Be aware, this is not the real rooting depth; it rather represents the sampling depth of the soils collected for routine soil analsyis.

Value

The root depth of a crop corresponding to the sampling depth analyzed by agricultural labs. A numeric value.

Examples

```
calc_root_depth(B_LU_BRP = 256)
calc_root_depth(B_LU_BRP = c(256,265,1019,992))
```

calc_rotation_fraction *Calculates the fraction in the crop rotation*

Description

This function calculates the fraction present in the crop rotation

Usage

```
calc_rotation_fraction(ID, B_LU_BRP, crop)
```

Arguments

ID	(numeric) The ID of the field
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
crop	(character) The crop to check for. For relevant crop categories, see details.

Details

This function calculates the fraction present in the crop rotation for specific crop categories. These categories include "starch", "potato", "sugarbeet", "grass", "mais", "alfalfa","catchcrop","cereal","clover",'nature', rapeseed',"other","rustgewas",and "rustgewasdiep".

Value

The fraction of specific crop types within the crop rotation sequence. A numeric value.

Examples

```
calc_rotation_fraction(ID = rep(1,4), B_LU_BRP = c(265,1910,1935,1033),crop = 'potato')
calc_rotation_fraction(ID = rep(1,4), B_LU_BRP = c(265,1910,1935,1033),crop = 'grass')
```

calc_sbal_arable *Calculate the indicator for delta S-balance arable*

Description

This function calculates the change in S-balance compared to averaged S-supply as given in fertilizer recommendation systems.

Usage

```
calc_sbal_arable(D_SLV, B_LU_BRP, B_SOILTYPE_AGR, B_AER_CBS)
```

Arguments

D_SLV	(numeric) The value of SLV calculated by calc_slv
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_SOILTYPE_AGR	(character) The type of soil
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)

Value

Estimated contribution of the soil to the S balance of arable fields. A numeric value.

Examples

```
calc_sbal_arable(D_SLV = 65, B_LU_BRP = 1019, B_SOILTYPE_AGR = 'dekzand',
B_AER_CBS = 'Rivierengebied')
```

---

calc_sealing_risk *Calculate soil sealing risk*

Description

This function calculates the risks of soil sealing. This value can be evaluated by ind_sealing

Usage

```
calc_sealing_risk(A_SOM_LOI, A_CLAY_MI)
```

Arguments

A_SOM_LOI	(numeric) The organic matter content of soil (%)
A_CLAY_MI	(numeric) The clay content of the soil (%)

Value

The risk of soil sealing as affected by the soil organic matter and clay content. A numeric value.

Examples

```
calc_sealing_risk(A_SOM_LOI = 3.5, A_CLAY_MI = 7.5)
calc_sealing_risk(A_SOM_LOI = c(3.5,6.5), A_CLAY_MI = c(7.5,15))
```

calc_slv *Calculate the SLV*

Description

This function calculates a S-balance given the SLV (Sulfur supplying capacity) of a soil

Usage

```
calc_slv(B_LU_BRP, B_SOILTYPE_AGR, B_AER_CBS, A_SOM_LOI, A_S_RT, D_BDS)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The type of soil
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)
A_SOM_LOI	(numeric) The organic matter content of the soil (in percent)
A_S_RT	(numeric) The total Sulpher content of the soil (in mg S per kg)
D_BDS	(numeric) The bulk density of the soil (in kg per m3)

Value

The capacity of the soil to supply Sulfur (kg S / ha / yr). A numeric value.

Examples

```
calc_slv(B_LU_BRP = 1019, B_SOILTYPE_AGR = 'dekzand',
B_AER_CBS = 'Rivierengebied',A_SOM_LOI = 3.5,A_S_RT = 3500, D_BDS = 1400)
calc_slv(1019, 'dekzand', 'Rivierengebied',3.5,3500,1400)
calc_slv(c(256,1019), rep('dekzand',2), rep('Rivierengebied',2),c(6.5,3.5),
c(3500,7500),c(1400,1100))
```

calc_sombalance *Calculate simple organic matter balance*

Description

This function calculates a simple organic matter balance, as currently used in agricultural practice in the Netherlands.For more details, see www.os-balans.nl

Usage

```
calc_sombalance(B_LU_BRP, A_SOM_LOI, A_P_AL, A_P_WA, M_COMPOST, M_GREEN)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
A_P_AL	(numeric) The P-AL content of the soil (in mg P2O5 per 100g)
A_P_WA	(numeric) The P-water content of the soil (in mg P2O5 per Liter)
M_COMPOST	(numeric) The frequency that compost is applied (every x years)
M_GREEN	(boolean) measure. are catch crops sown after main crop (option: TRUE or FALSE)

Value

The estimated soil organic matter balance in kg EOS per ha per year. A numeric value.

Examples

```
calc_sombalance(B_LU_BRP = 1019,A_SOM_LOI = 4, A_P_AL = 35, A_P_WA = 40,
M_COMPOST = 4, M_GREEN = TRUE)
calc_sombalance(1019,4, 35, 40, 4, TRUE)
calc_sombalance(c(256,1024,1019),c(4,5,6), c(35,35,35), c(40,42,45), c(4,4,3), c(TRUE,FALSE,TRUE))
```

---

calc_waterretention *Calculate indicators for water retention in topsoil*

Description

This function calculates different kind of Water Retention Indices given the continuous pedotransferfunctions of Wosten et al. (2001) These include : 'wilting point','field capacity','water holding capacity','plant available water' and 'Ksat'

Usage

```
calc_waterretention(
  A_CLAY_MI,
  A_SAND_MI,
  A_SILT_MI,
  A_SOM_LOI,
  type = "plant available water",
  ptf = "Wosten1999"
)
```

Arguments

- `A_CLAY_MI` (numeric) The clay content of the soil (%)
- `A_SAND_MI` (numeric) The sand content of the soil (%)
- `A_SILT_MI` (numeric) The silt content of the soil (%)
- `A_SOM_LOI` (numeric) The organic matter content of the soil (%)
- `type` (character) The type of water retention index. Options include c('wilting point','field capacity','water holding capacity','plant available water','Ksat')
- `ptf` (character) Pedotransfer functions to calculate van Genuchten parameters. Options include c('Wosten1999', 'Wosten2001', 'Klasse')

Value

The function returns by default the amount of plant available water in the ploughing layer of the soil (in mm). A numeric value. If another type of output is selected, the function gives also the amount of water at 'wilting point' or 'field capacity' or 'water holding capacity'. Also the saturated permeability 'Ksat' can be selected. Units are always in mm, except for Water Holding Capacity (

References

Wosten et al. (2001) Pedotransfer functions: bridging the gap between available basic soil data and missing hydraulic characteristics. Journal of Hydrology 251, p123.

Examples

```
calc_waterretention(A_CLAY_MI = 20.5,A_SAND_MI = 65,A_SILT_MI = 14.5,A_SOM_LOI = 3.5)
calc_waterretention(A_CLAY_MI = 5,A_SAND_MI = 15,A_SILT_MI = 80,A_SOM_LOI = 6.5)
calc_waterretention(A_CLAY_MI = 5,A_SAND_MI = 15,A_SILT_MI = 80,A_SOM_LOI = 6.5,
type = 'water holding capacity')
```

`calc_waterstressindex` *Calculate the Water Stress Index*

Description

This function calculates the Water Stress Index (estimating the yield depression as a function of water deficiency or surplus)

Usage

```
calc_waterstressindex(B_HELP_WENR, B_LU_BRP, B_GWL_CLASS, WSI = "waterstress")
```

Arguments

B_HELP_WENR	(character) The soil type abbreviation, derived from 1:50.000 soil map
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_GWL_CLASS	(character) The groundwater table class
WSI	(character) The type of Water Stress Index is required. Options: droughtstress, wetnessstress and the (combined) waterstress

Value

The yield depression (in %) through wetness or drought stress (depending on the WSI selected). Numeric value.

References

STOWA (2005) Uitbreiding en Actualisering van de HELP-tabellen ten behoeve van het Waternood instrumentarium

Examples

```
calc_waterstressindex(B_HELP_WENR = 'ABkt',B_LU_BRP = 1019,B_GWL_CLASS = 'GtIV'
, WSI = 'droughtstress')
```

---

calc_winderodibility *Calculate indicator for wind erodibility*

Description

This function calculates the risk for wind erodibility of soils, derived from Van Kerckhoven et al. (2009) and Ros & Bussink (2013)

Usage

```
calc_winderodibility(B_LU_BRP, A_CLAY_MI, A_SILT_MI)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
A_CLAY_MI	(numeric) The clay content of the soil (%)
A_SILT_MI	(numeric) The silt content of the soil (%)

Value

The vulnerability of the soil for wind erosion. A numeric value.

Examples

```
calc_winderodibility(B_LU_BRP = 265, A_CLAY_MI = 4, A_SILT_MI = 15)
calc_winderodibility(B_LU_BRP = c(265,1019), A_CLAY_MI = c(4,18), A_SILT_MI = c(15,65))
```

---

calc_workability — *Calculate indicator for workability*

Description

This function calculates the workability of soils, given as a value of relative season length between 0 and 1. A relative season length of 1 indicates that the water table is sufficiently low for the soil to be workable for the entire growing season required by the crop. The required ground water table for workability is determined by soil type and soil properties. Hydrological variables determine the groundwater table for each day of the year. The option calcyieldloss allows for calculation of yield loss based on the relative season length, differentiating in yield loss between six groups of crops Based on Huinink (2018)

Usage

```
calc_workability(
  A_CLAY_MI,
  A_SILT_MI,
  B_LU_BRP,
  B_SOILTYPE_AGR,
  B_GWL_GLG,
  B_GWL_GHG,
  B_GWL_ZCRIT,
  calcyieldloss = FALSE
)
```

Arguments

A_CLAY_MI	(numeric) The clay content of the soil (%)
A_SILT_MI	(numeric) The silt content of the soil (%)
B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
B_GWL_GLG	(numeric) The lowest groundwater level averaged over the most dry periods in 8 years in cm below ground level
B_GWL_GHG	(numeric) The highest groundwater level averaged over the most wet periods in 8 years in cm below ground level
B_GWL_ZCRIT	(numeric) The distance between ground level and groundwater level at which the groundwater can supply the soil surface with 2mm water per day (in cm)
calcyieldloss	(boolean) whether the function includes yield loss, options: TRUE or FALSE (default).

Value

The workability of a soil, expressed as a numeric value representing the relative season length that the soil can be managed by agricultural activities.

References

Huinink (2018) Bodem/perceel geschiktheidsbeoordeling voor Landbouw, Bosbouw en Recreatie. BodemConsult-Arnhem

Examples

```
calc_workability(A_CLAY_MI = 18,A_SILT_MI = 25,B_LU_BRP = 265,
B_SOILTYPE_AGR = 'dekzand',B_GWL_GLG = 145,B_GWL_GHG = 85,B_GWL_ZCRIT = 400,
calcyieldloss = FALSE)
calc_workability(18,25,265,'dekzand',145,85,400,FALSE)
```

---

calc_zinc_availability

Calculate the availability of the metal Zinc

Description

This function calculates the availability of Zn for plant uptake

Usage

```
calc_zinc_availability(B_LU_BRP, B_SOILTYPE_AGR, A_PH_CC, A_ZN_CC)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_PH_CC	(numeric) The acidity of the soil, determined in 0.01M CaCl2 (-)
A_ZN_CC	The plant available Zn content, extracted with 0.01M CaCl2 (mg / kg)

Value

The function of the soil to supply zinc A numeric value.

Examples

```
calc_zinc_availability(B_LU_BRP = 265, B_SOILTYPE_AGR = 'dekzand',A_PH_CC = 4.5, A_ZN_CC = 3000)
calc_zinc_availability(B_LU_BRP = 265, 'dekzand',4,3500)
calc_zinc_availability(B_LU_BRP = c(1019,265), c('dekzand','rivierklei'),c(4.5,4.8),c(2500,4500))
```

cf_ind_importance *Helper function to weight and correct the risk and scores*

Description

Helper function to weight and correct the risk and scores

Usage

```
cf_ind_importance(x)
```

Arguments

x	The risk or score value to be weighted

Value

A transformed variable after applying a inverse weighing function so that lower values will gain more impact when applied in a weighed.mean function. A numeric value.

Examples

```
cf_ind_importance(x = 0.5)
cf_ind_importance(x = c(0.1,0.5,1.5))
```

column_description.obic *Column description for the OBIC*

Description

This table defines the columns used in the OBIC and which unit is used

Usage

```
column_description.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 216 rows and 6 columns.

Details

column The column name used in OBIC

type The type of column

description_nl A description of the column in Dutch

description_en A description of the column in English

unit The unit used for this column

method The method to measure/obtain the values for this column

---

crops.makkink — *Makkink correction factor table*

Description

This table contains the makkink correction factors for evapo-transpiration per month

Usage

```
crops.makkink
```

Format

An object of class `data.table` (inherits from `data.frame`) with 24 rows and 13 columns.

Details

crop_makkink Makkink crop category

1 Evapotranspiration correction factors for January

2 Evapotranspiration correction factors for February

3 Evapotranspiration correction factors for March

4 Evapotranspiration correction factors for April

5 Evapotranspiration correction factors for May

6 Evapotranspiration correction factors for June

7 Evapotranspiration correction factors for July

8 Evapotranspiration correction factors for August

9 Evapotranspiration correction factors for September

10 Evapotranspiration correction factors for October

11 Evapotranspiration correction factors for November

12 Evapotranspiration correction factors for December `crops.obic` *Linking table between crops and different functions in OBIC*

Description

This table helps to link the different crops in the OBIC functions with the crops selected by the user

Usage

```
crops.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 521 rows and 22 columns.

Details

crop_code The BRP gewascode of the crop

crop_name The name of the crop, in lower case

crop_waterstress Classification linking for linking crops to waterstress.obic

crop_intensity Whether crop is root/tuber crop, rest crop, or other.

crop_eos Effective soil organic matter produced by the crop in kg/ha

crop_eos_residue Effective soil organic matter from plant residues in kg/ha

crop_category Classification of crop per land use type (arable, maize, grass, nature)

crop_rotation Classification of crop to determine function within crop rotations

crop_crumbleability The category for this crop at crumbleability

crop_phosphate The category for this crop for evaluation phosphate availability

crop_sealing The category for this crop at soil sealing

crop_n The category for this crop for evaluation nitrogen

crop_k The category for this crop for evaluation potassium

crop_measure The category for this crop for evaluating measures

nf_clay Allowed effective N dose on clay soils

nf_sand.other Allowed effective N dose on sandy soils

nf_sand.south Allowed effective N dose on sandy soils sensitive to leaching

nf_loess Allowed effective N dose on loess soils

nf_peat Allowed effective N dose on peat soils

crop_name_scientific All-lower-case scientific name of the crop species. When crop is not species specific the genus of the crop is given

crop_season Crop category for length growing season

crop_makkink Crop category for makkink correction factors

eval.crumbleability *Coefficient table for evaluating crumbleability*

Description

This table contains the coefficients for evaluating the crumbleability. This table is used internally in `ind_crumbleability`

Usage

```
eval.crumbleability
```

Format

An object of class `data.table` (inherits from `data.frame`) with 16 rows and 4 columns.

evaluate_logistic *Evaluate using the general logistic function*

Description

This function evaluates the calculated values from an indicator using a general logistic function

Usage

```
evaluate_logistic(x, b, x0, v, increasing = TRUE)
```

Arguments

x	(numeric) The values of a calc function to be converted to an evaluation
b	(numeric) The growth rate
x0	(numeric) The offset of the x-axis
v	(numeric) Affects the growth rate near the maximum
increasing	(boolean) Should the evaluation increase (`TRUE`) with x or decrease (`FALSE`)?

Value

A transformed variable after applying a logistic evaluation function. A numeric value.

References

https://en.wikipedia.org/wiki/Generalised_logistic_function

Examples

```
evaluate_logistic(x = 5, b = 2, x0 = 3, v = 2.6)
evaluate_logistic(x = c(0.1,0.5,1.5,3.5), b = 2, x0 = 3, v = 2.6)
```

`evaluate_parabolic` *Evaluate using parabolic function with*

Description

This function evaluates the calculated values from an indicator using a parabolic function. After the optimum is reached the it stays at its plateau.

Usage

```
evaluate_parabolic(x, x.top)
```

Arguments

`x`	(numeric) The values of a calc function to be converted to an evaluation
`x.top`	(numeric) The value at which x reaches the plateau

Value

A transformed variable after applying a parabolic evaluation function. A numeric value.

Examples

```
evaluate_parabolic(x = 5, x.top = 8)
evaluate_parabolic(x = c(0.1,0.5,1.5,3.5), x.top = 6.5)
```

`format_aer` *Convert possible B_AER_CBS values to standardized values*

Description

This function formats information of Agricultural Economic Region so it can be understood by other OBIC functions

Usage

```
format_aer(B_AER_CBS)
```

Arguments

`B_AER_CBS`	(character) The agricultural economic region in the Netherlands (CBS, 2016)

Value

A standardized B_AER_CBS value as required for the OBIC functions. A character string.

Examples

```
format_aer(c("LG13","LG12"))
format_aer(c("LG13","LG12",'Rivierengebied'))
```

---

format_gwt — *Convert possible B_GWL_CLASS values to standardized values*

Description

This function formats ground water table information so it can be understood by other OBIC functions

Usage

```
format_gwt(B_GWL_CLASS)
```

Arguments

`B_GWL_CLASS`	(character) Ground water table classes

Value

A standardized B_GWL_CLASS value as required for the OBIC functions. A character string.

Examples

```
format_gwt(c('sVII', 'sVI'))
format_gwt(c('sVII', 'sVI','GtII', 'GtI'))
```

---

format_soilcompaction — *Convert possible B_SC_WENR values to standardized values*

Description

This function converts numeric values for B_SC_WENR to values used by other OBIC functions if numeric values are entered.

Usage

```
format_soilcompaction(B_SC_WENR)
```

Arguments

`B_SC_WENR`	(numeric and/or character) Data on soil compaction risk that may have to be converted to string

Value

A standardized B_GWL_CLASS value as required for the OBIC functions. A character string.

Examples

```
format_soilcompaction(c('10', '11'))
format_soilcompaction(c('2', '3',"Matig", "Groot"))
```

`ind_aggregatestability` *Calculate the indicator aggregate stability*

Description

This function calculates the indicator for the the aggregate stability of the soil by using the index calculated by `calc_aggregatestability`

Usage

```
ind_aggregatestability(D_AS)
```

Arguments

D_AS	(numeric) The value of aggregate stability calculated by `calc_aggregatestability`

Value

The evaluated score for the soil function aggregate stability. A numeric value between 0 and 1.

Examples

```
ind_aggregatestability(D_AS = 0.3)
ind_aggregatestability(D_AS = c(0.3,0.6,0.9))
```

ind_bcs *Calculate the indicator for BodemConditieScore*

Description

This function calculates the final score for the BodemConditieScore by using the scores calculated by calc_bcs

Usage

```
ind_bcs(D_BCS)
```

Arguments

D_BCS	(numeric) The value of BCS calculated by calc_bcs

Value

The evaluated score for the Visual Soil Assessment. A numeric value between 0 and 50.

Examples

```
ind_bcs(D_BCS = 12)
ind_bcs(D_BCS = c(12,18,26,30))
```

ind_cec *Calculate the indicator for soil fertility given the CEC*

Description

This function estimate how much cations can be buffer by soil, being calculated by calc_cec

Usage

```
ind_cec(D_CEC)
```

Arguments

D_CEC	(numeric) The value of CEC calculated by calc_cec

Value

The evaluated score for the soil function to buffer cations. A numeric value between 0 and 1.

Examples

```
ind_cec(D_CEC = 85)
ind_cec(D_CEC = c(85,135,385))
```

---

ind_compaction — *Calculate indicator for subsoil compaction*

Description

This function calculates the indicator for the risk for soil compaction of the subsoil. derived from van den Akker et al. (2013) Risico op ondergrondverdichting in het landelijk gebied in kaart, Alterra-rapport 2409, Alterra, Wageningen University and Research Centre,

Usage

```
ind_compaction(B_SC_WENR)
```

Arguments

B_SC_WENR	(character) The risk for subsoil compaction as derived from risk assessment study of Van den Akker (2006)

Value

The evaluated score for the soil function for subsoil compaction. A numeric value between 0 and 1.

References

Akker et al. (2013) Risico op ondergrondverdichting in het landelijk gebied in kaart, Alterra-rapport 2409, Alterra, Wageningen University and Research Centre.

Examples

```
ind_compaction(B_SC_WENR = 'Zeer groot')
ind_compaction(B_SC_WENR = c('Zeer groot','Van nature dicht'))
```

ind_copper *Calculate the indicator for Cu-availability*

Description

This function calculates the indicator for the the Cu availability in soil by using the Cu-index as calculated by calc_copper_availability

Usage

```
ind_copper(D_CU, B_LU_BRP)
```

Arguments

D_CU	(numeric) The value of Cu-index calculated by calc_copper_availability
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP

Value

The evaluated score for the soil function to supply copper for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_copper(D_CU = 125, B_LU_BRP = 265)
ind_copper(D_CU = c(125,335), B_LU_BRP = c(1019,256))
```

ind_crumbleability *Calculate the indicator for crumbleability*

Description

This function calculates the indicator for crumbleability. The crumbleability is calculated by calc_crumbleability

Usage

```
ind_crumbleability(D_CR, B_LU_BRP)
```

Arguments

D_CR	(numeric) The value of crumbleability calculated by calc_crumbleability
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP

Value

The evaluated score for the soil function crumbleability. A numeric value between 0 and 1.

Examples

```
ind_crumbleability(D_CR = 3, B_LU_BRP = 1910)
ind_crumbleability(D_CR = c(2,6), B_LU_BRP = c(1910,1910))
```

---

ind_gw_recharge *Calculate groundwater recharge of a soil*

Description

This function calculates an index score for groundwater storage based on precipitation surplus, infiltration at saturation, sealing risk, drainage and subsoil compaction

Usage

```
ind_gw_recharge(B_LU_BRP, D_PSP, D_WRI_K, I_P_SE, I_P_CO, B_DRAIN, B_GWL_CLASS)
```

Arguments

B_LU_BRP	(numeric) The crop code from the BRP
D_PSP	(numeric) The precipitation surplus per crop calculated by calc_psp
D_WRI_K	(numeric) The value for top soil permeability (cm/d) as calculated by calc_permeability
I_P_SE	(numeric) The indicator value for soil sealing
I_P_CO	(numeric) The indicator value for occurrence of subsoil compaction
B_DRAIN	(boolean) Are drains installed to drain the field (options: yes or no)
B_GWL_CLASS	(character) The groundwater table class

Value

The evaluated score for the soil function to improve groundwater recharge. A numeric value between 0 and 1.

Examples

```
ind_gw_recharge(B_LU_BRP = 265,D_PSP = 200, D_WRI_K = 10, I_P_SE = 0.6, I_P_CO = 0.9,
B_DRAIN = FALSE, B_GWL_CLASS = 'GtV')
ind_gw_recharge(B_LU_BRP = 233, D_PSP = 400, D_WRI_K = 10, I_P_SE = 0.4, I_P_CO = 0.2,
B_DRAIN = TRUE, B_GWL_CLASS = 'GtII')
```

ind_magnesium *Calculate the indicator for Magnesium*

Description

This function calculates the indicator for the the Magnesium content of the soil by using the Mg-availability calculated by calc_magnesium_availability

Usage

```
ind_magnesium(D_MG, B_LU_BRP, B_SOILTYPE_AGR)
```

Arguments

D_MG	(numeric) The value of Mg calculated by calc_magnesium_availability
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_SOILTYPE_AGR	(character) The type of soil

Value

The evaluated score for the soil function to supply magnesium for crop uptake. A numeric value.

Examples

```
ind_magnesium(D_MG = 125, B_LU_BRP = 265, B_SOILTYPE_AGR = 'dekzand')
ind_magnesium(D_MG = c(125,35), B_LU_BRP = c(265,256), B_SOILTYPE_AGR = rep('dekzand',2))
```

ind_management *Calculate the indicator for sustainable management*

Description

This function calculates the the sustainability of strategic management options as calculated by calc_management The main source of this indicator is developed for Label Duurzaam Bodembeheer (Van der Wal, 2016)

Usage

```
ind_management(D_MAN, B_LU_BRP, B_SOILTYPE_AGR)
```

Arguments

D_MAN	(numeric) The value of Sustainable Management calculated by calc_management
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_SOILTYPE_AGR	(character) The type of soil

Details

The current function allows a maximum score of 18 points for arable systems, 12 for maize and 10 for grass (non-peat), 17 for grass on peat, and 4 for nature.

Value

The evaluated score for the evaluated soil management given the Label Sustainable Soil Management. A numeric value between 0 and 1.

Examples

```
ind_management(D_MAN = 15,B_LU_BRP = 1019, B_SOILTYPE_AGR = 'dekzand')
ind_management(D_MAN = c(2,6,15), B_LU_BRP = c(1019,256,1019),B_SOILTYPE_AGR = rep('dekzand',3))
```

---

ind_man_ess — *Calculate the indicator for sustainable management given a required ecoystem service*

Description

This function calculates the the sustainability of strategic management options for a given ecoystem service as calculated by calc_man_ess The main source of this indicator is developed for Label Duurzaam Bodembeheer (Van der Wal, 2016)

Usage

```
ind_man_ess(D_MAN, B_LU_BRP, B_SOILTYPE_AGR, type)
```

Arguments

D_MAN	(numeric) The value of Sustainable Management calculated by calc_man_ess
B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The type of soil
type	(character) type of ecosystem service to evaluate the impact of soil management. Options: I_M_SOILFERTILITY, I_M_CLIMATE, I_M_WATERQUALITY, and I_M_BIODIVERSITY

Value

The evaluated score for the evaluated soil management for a specific ecosystem service. A numeric value between 0 and 1. This is done for the following ESS: I_M_SOILFERTILITY, I_M_CLIMATE, I_M_WATERQUALITY and I_M_BIODIVERSITY.

Examples

```
ind_man_ess(D_MAN = 3.5,B_LU_BRP = 1019, B_SOILTYPE_AGR = 'dekzand',type = 'I_M_SOILFERTILITY')
ind_man_ess(D_MAN = c(2,6,15), B_LU_BRP = c(1019,256,1019),B_SOILTYPE_AGR = rep('dekzand',3),
type = 'I_M_SOILFERTILITY')
```

---

ind_nematodes — *Calculate indicator for plant parasitic nematodes*

Description

This function calculates the indicator for the presence of plant parasitic nematodes. If input values are not given, the number is assumed to be zero.

Usage

```
ind_nematodes(
  B_LU_BRP = B_LU_BRP,
  A_RLN_PR_TOT = 0,
  A_RLN_PR_CREN = 0,
  A_RLN_PR_NEG = 0,
  A_RLN_PR_PEN = 0,
  A_RLN_PR_PRA = 0,
  A_RLN_PR_THO = 0,
  A_RLN_PR_FLA = 0,
  A_RLN_PR_FAL = 0,
  A_RLN_PR_PIN = 0,
  A_RLN_PR_PSE = 0,
  A_RLN_PR_VUL = 0,
  A_RLN_PR_DUN = 0,
  A_RLN_PR_ZEA = 0,
  A_RKN_ME_TOT = 0,
  A_RKN_ME_HAP = 0,
  A_RKN_ME_CHIFAL = 0,
  A_RKN_ME_CHI = 0,
  A_RKN_ME_NAA = 0,
  A_RKN_ME_FAL = 0,
  A_RKN_ME_MIN = 0,
  A_RKN_ME_INC = 0,
  A_RKN_ME_JAV = 0,
  A_RKN_ME_ART = 0,
  A_RKN_ME_ARE = 0,
  A_RKN_ME_ARD = 0,
  A_DSN_TR_TOT = 0,
  A_DSN_TR_SIM = 0,
  A_DSN_TR_PRI = 0,
  A_DSN_TR_VIR = 0,
```

```
  A_DSN_TR_SPA = 0,
  A_DSN_TR_CYL = 0,
  A_DSN_TR_HOO = 0,
  A_DSN_PA_TER = 0,
  A_DSN_PA_PAC = 0,
  A_DSN_PA_ANE = 0,
  A_DSN_PA_NAN = 0,
  A_DSN_TY_TOT = 0,
  A_DSN_RO_TOT = 0,
  A_DSN_XI_TOT = 0,
  A_DSN_LO_TOT = 0,
  A_DSN_HEM_TOT = 0,
  A_DSN_HEL_TOT = 0,
  A_SN_DI_TOT = 0,
  A_SN_DI_DIP = 0,
  A_SN_DI_DES = 0,
  A_OPN_PA_TOT = 0,
  A_OPN_PA_BUK = 0,
  A_OPN_CY_TOT = 0,
  A_OPN_AP_TOT = 0,
  A_OPN_AP_FRA = 0,
  A_OPN_AP_RIT = 0,
  A_OPN_AP_SUB = 0,
  A_OPN_CR_TOT = 0,
  A_OPN_SU_TOT = 0,
  A_NPN_SA_TOT = 0
)
```

Arguments

B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
A_RLN_PR_TOT	(numeric) Number of pratylenchus spp. (n / 100g)
A_RLN_PR_CREN	(numeric) Number of pratylenchus crenatus (n / 100g)
A_RLN_PR_NEG	(numeric) Number of pratylenchus neglectus (n / 100g)
A_RLN_PR_PEN	(numeric) Number of pratylenchus penetrans (n / 100g)
A_RLN_PR_PRA	(numeric) Number of pratylenchus pratensis (n / 100g)
A_RLN_PR_THO	(numeric) Number of pratylenchus thornei (n / 100g)
A_RLN_PR_FLA	(numeric) Number of pratylenchus flakkensis (n / 100g)
A_RLN_PR_FAL	(numeric) Number of pratylenchus fallax (n / 100g)
A_RLN_PR_PIN	(numeric) Number of pratylenchus pinguicaudatus (n / 100g)
A_RLN_PR_PSE	(numeric) Number of pratylenchus pseudopratensis (n / 100g)
A_RLN_PR_VUL	(numeric) Number of pratylenchus vulnus (n / 100g)
A_RLN_PR_DUN	(numeric) Number of pratylenchus dunensis (n / 100g)
A_RLN_PR_ZEA	(numeric) Number of pratylenchus zeae (n / 100g)
A_RKN_ME_TOT	(numeric) Number of meloidogyne spp. (n / 100g)

A_RKN_ME_HAP (numeric) Number of meloidogyne hapla (n / 100g)
A_RKN_ME_CHIFAL
(numeric) Number of meloidogyne chitwoodi/fallax (n / 100g)
A_RKN_ME_CHI (numeric) Number of meloidogyne chitwoodi (n / 100g)
A_RKN_ME_NAA (numeric) Number of meloidogyne naasi (n / 100g)
A_RKN_ME_FAL (numeric) Number of meloidogyne fallax (n / 100g)
A_RKN_ME_MIN (numeric) Number of meloidogyne minor (n / 100g)
A_RKN_ME_INC (numeric) Number of meloidogyne incognita (n / 100g)
A_RKN_ME_JAV (numeric) Number of meloidogyne javanica (n / 100g)
A_RKN_ME_ART (numeric) Number of meloidogyne artiellia (n / 100g)
A_RKN_ME_ARE (numeric) Number of meloidogyne arenaria (n / 100g)
A_RKN_ME_ARD (numeric) Number of meloidogyne ardenensis (n / 100g)
A_DSN_TR_TOT (numeric) Number of trichodoridae spp. (n / 100g)
A_DSN_TR_SIM (numeric) Number of trichodorus similis (n / 100g)
A_DSN_TR_PRI (numeric) Number of trichodorus primitivus (n / 100g)
A_DSN_TR_VIR (numeric) Number of trichodorus viruliferus (n / 100g)
A_DSN_TR_SPA (numeric) Number of trichodorus sparsus (n / 100g)
A_DSN_TR_CYL (numeric) Number of trichodorus cylindricus (n / 100g)
A_DSN_TR_HOO (numeric) Number of trichodorus hooperi (n / 100g)
A_DSN_PA_TER (numeric) Number of paratrichodorus teres (n / 100g)
A_DSN_PA_PAC (numeric) Number of paratrichodorus pachydermus (n / 100g)
A_DSN_PA_ANE (numeric) Number of paratrichodorus anemones (n / 100g)
A_DSN_PA_NAN (numeric) Number of paratrichodorus nanus (n / 100g)
A_DSN_TY_TOT (numeric) Number of tylenchorhynchus spp. (n / 100g)
A_DSN_RO_TOT (numeric) Number of rotylenchus spp. (n / 100g)
A_DSN_XI_TOT (numeric) Number of xiphinema spp. (n / 100g)
A_DSN_LO_TOT (numeric) Number of longidorus spp. (n / 100g)
A_DSN_HEM_TOT (numeric) Number of hemicycliophora spp. (n / 100g)
A_DSN_HEL_TOT (numeric) Number of helicotylenchus spp. (n / 100g)
A_SN_DI_TOT (numeric) Number of ditylenchus spp. (n / 100g)
A_SN_DI_DIP (numeric) Number of ditylenchus dipsaci (n / 100g)
A_SN_DI_DES (numeric) Number of ditylenchus destructor (n / 100g)
A_OPN_PA_TOT (numeric) Number of paratylenchus spp. (n / 100g)
A_OPN_PA_BUK (numeric) Number of paratylenchus bukowinensis (n / 100g)
A_OPN_CY_TOT (numeric) Number of cysteaaltjes (n / 100g)
A_OPN_AP_TOT (numeric) Number of aphelenchoides spp. (n / 100g)
A_OPN_AP_FRA (numeric) Number of aphelenchoides fragariae (n / 100g)
A_OPN_AP_RIT (numeric) Number of aphelenchoides ritzemabosi (n / 100g)
A_OPN_AP_SUB (numeric) Number of aphelenchoides subtenuis (n / 100g)
A_OPN_CR_TOT (numeric) Number of criconematidae spp. (n / 100g)
A_OPN_SU_TOT (numeric) Number of subanguina spp. (n / 100g)
A_NPN_SA_TOT (numeric) Number of saprofage en overige (n / 100g)

Value

The evaluated score for the soil function for nematode community. A numeric value between 0 and 1.

Examples

```
ind_nematodes(B_LU_BRP = 1019)
ind_nematodes(B_LU_BRP = 1019,A_RLN_PR_TOT = 250,A_RLN_PR_ZEA = 400,A_SN_DI_DIP = 5)
```

---

ind_nematodes_list *Calculate indicator for plant parasitic nematodes*

Description

This function calculates the indicator for the presence of plant parasitic nematodes. All nematodes present in a sample are used. A subset of nematodes is weighted in the set regardless of their presence.

Usage

```
ind_nematodes_list(A_NEMA)
```

Arguments

A_NEMA	(data.table) Long data table with the counted nematodes of a parcel.

Value

The evaluated score for the soil function for nematode community. A numeric value between 0 and 1.

Examples

```
## Not run:
ind_nematodes_list(data.table(species = 'Cysteaaltjes',count = 200))
ind_nematodes_list(data.table(species = c('Cysteaaltjes','Ditylenchus dipsaci'),
count = c(200,7)))

## End(Not run)
```

ind_nitrogen — *Calculate the indicator for NLV*

Description

This function calculates the indicator for the the nitrogen content of the soil by using the NLV calculated by calc_nlv

Usage

```
ind_nitrogen(D_NLV, B_LU_BRP)
```

Arguments

D_NLV	(numeric) The value of NLV calculated by calc_nlv
B_LU_BRP	(numeric) The crop code from the BRP

Value

The evaluated score for the soil function to supply nitrogen for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_nitrogen(D_NLV = 85,B_LU_BRP = 256)
ind_nitrogen(D_NLV = c(150,65,35),B_LU_BRP = c(256,1019,1019))
```

ind_nretention — *Calculate the indicator for N retention for groundwater or surface water*

Description

This function calculates the indicator for the N retention of the soil by using the N leaching to groundwater or surface water calculated by calc_nleach

Usage

```
ind_nretention(D_NW, leaching_to)
```

Arguments

D_NW	(numeric) The value of N leaching calculated by calc_nleach
leaching_to	(character) whether it evaluates N leaching to groundwater ("gw") or to surface water ("ow")

Value

The evaluated score for the soil function to supply nitrogen for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_nretention(D_NW = 15,leaching_to = 'gw')
ind_nretention(D_NW = c(.2,5.6,15.6),leaching_to = 'ow')
```

---

ind_n_efficiency — *Calculate an indicator value for nitrogen use efficiency and leaching based on N surplus*

Description

This function gives an indicator value for nitrogen use efficiency calculated by calc_n_efficiency, this function makes use of ind_nretention

Usage

```
ind_n_efficiency(D_NLEACH, leaching_to = "gw")
```

Arguments

D_NLEACH	(numeric) The value of N leaching calculated by calc_n_efficiency
leaching_to	(character) whether it evaluates N leaching to groundwater ("gw") or to surface water ("sw")

Value

The evaluated score for the soil function to enhance the nitrogen use efficiency. A numeric value between 0 and 1.

Examples

```
ind_n_efficiency(D_NLEACH = 50, leaching_to = 'gw')
ind_n_efficiency(D_NLEACH = c(5,15,25,75), leaching_to = 'sw')
```

ind_permeability — *Calculate the indicator score for the permeability of the top soil*

Description

This function calculates the indicator score for the permeability of the top soil

Usage

```
ind_permeability(D_WRI_K)
```

Arguments

D_WRI_K	(numeric) The value for top soil permeability (cm/d) as calculated by calc_permeability

ind_pesticide_leaching — *Calculate an indicator score for pesticide leaching*

Description

This function calculates the indicator value for pesticide leaching from a soil

Usage

```
ind_pesticide_leaching(D_PESTICIDE)
```

Arguments

D_PESTICIDE	The fraction of pesticide leached compared to the worst case scenario

Value

The evaluated score for the soil function to minimize pesticide leaching. A numeric value between 0 and 1.

Examples

```
ind_pesticide_leaching(D_PESTICIDE = 0.7)
ind_pesticide_leaching(D_PESTICIDE  = c(0.4,0.6,0.8,1))
```

ind_ph *Calculate the indicator for pH*

Description

This function calculates the indicator for the pH of the soil by the difference with the optimum pH. This is calculated in calc_ph_delta.

Usage

```
ind_ph(D_PH_DELTA)
```

Arguments

D_PH_DELTA	(numeric) The pH difference with the optimal pH.

Value

The evaluated score for the soil function to buffer pH within optimum range for crop growth. A numeric value between 0 and 1.

Examples

```
ind_ph(D_PH_DELTA = 0.8)
ind_ph(D_PH_DELTA = c(0.2,0.6,0.8,1.5))
```

ind_phosphate_availability *Calculate the indicator for the the phosphate availability*

Description

This function calculates the indicator for the phosphate availability calculated by calc_phosphate_availability

Usage

```
ind_phosphate_availability(D_PBI)
```

Arguments

D_PBI	(numeric) The value of phosphate availability calculated by calc_phosphate_availability

Value

The evaluated score for the soil function to supply and buffer phosphorus for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_phosphate_availability(D_PBI = 3.5)
ind_phosphate_availability(D_PBI = c(0.5,0.8,2.5,5,15,35,75))
```

---

ind_pmn *Calculate the indicator for microbial biological activity*

Description

This function calculates the indicator that assess the microbial biological activity of the soil by using the PMN calculated by calc_pmn

Usage

```
ind_pmn(D_PMN)
```

Arguments

D_PMN	(numeric) The value of PMN calculated by calc_pmn

Value

The evaluated score for the soil function reflecting the microbial activity of a soil (specifically the potentially mineralizable N rate). A numeric value between 0 and 1.

Examples

```
ind_pmn(D_PMN = 24)
ind_pmn(D_PMN = c(54,265))
```

---

ind_potassium *Calculate the indicator for Potassium Availability*

Description

This function calculates the indicator for the the Potassium Availability of the soil by using the K-availability calculated by calc_potassium_availability

Usage

```
ind_potassium(D_K, B_LU_BRP, B_SOILTYPE_AGR, A_SOM_LOI)
```

Arguments

D_K	(numeric) The value of K-index calculated by calc_potassium_availability
B_LU_BRP	(numeric) The crop code from the BRP
B_SOILTYPE_AGR	(character) The agricultural type of soil
A_SOM_LOI	(numeric) The organic matter content of the soil (%)

Value

The evaluated score for the soil function to supply potassium for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_potassium(D_K = 4.5,B_LU_BRP = 256,B_SOILTYPE_AGR='dekzand',A_SOM_LOI=4)
ind_potassium(c(2.5,3.5,6.5),c(256,1019,1019),rep('dekzand',3),c(3.5,4.5,7.5))
```

---

ind_psp *Calculate indicator for precipitation surplus*

Description

This function calculates the indicator value for precipitation surplus

Usage

```
ind_psp(D_PSP, B_LU_BRP)
```

Arguments

D_PSP	(numeric) The precipitation surplus per crop calculated by calc_psp
B_LU_BRP	(numeric) The crop code from the BRP

ind_resistance *Calculate indicator for soil resistance*

Description

This function calculates the indicator for the resistance of the soil against diseases and is indicated by the amount of soil life.

Usage

```
ind_resistance(A_SOM_LOI)
```

Arguments

A_SOM_LOI	(numeric) The organic matter content of the soil in percentage

Value

The evaluated score for the soil function to resist diseases. A numeric value between 0 and 1.

Examples

```
ind_resistance(A_SOM_LOI = 3.5)
ind_resistance(A_SOM_LOI = c(3.5,5.5,15,25))
```

ind_sealing *Calculate the soil sealing indicator*

Description

This function calculates the indicator for the soil sealing calculated by calc_sealing_risk

Usage

```
ind_sealing(D_SE, B_LU_BRP)
```

Arguments

D_SE	(numeric) The value of soil sealing calculated by calc_sealing_risk
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP

Value

The evaluated score for the soil function to avoid crop damage due to sealing of surface. A numeric value between 0 and 1.

Examples

```
ind_sealing(D_SE = 15,B_LU_BRP = 256)
ind_sealing(D_SE = c(5,15,35),B_LU_BRP = c(1019,1019,1019))
```

---

ind_sulfur *Calculate the indicator for SLV*

Description

This function calculates the indicator for the the S-index by using the SLV calculated by calc_slv

Usage

```
ind_sulfur(D_SLV, B_LU_BRP, B_SOILTYPE_AGR, B_AER_CBS)
```

Arguments

D_SLV	(numeric) The value of SLV calculated by calc_slv
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_SOILTYPE_AGR	(character) The type of soil
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)

Value

The evaluated score for the soil function to supply sulfur for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_sulfur(D_SLV = 15,B_LU_BRP = 256,B_SOILTYPE_AGR = 'dekzand',B_AER_CBS = 'Rivierengebied')
ind_sulfur(c(10,15,35),c(256,1019,1019),rep('rivierklei',3),rep('Rivierengebied',3))
```

---

ind_sulpher *Calculate the indicator for SLV (deprecated)*

Description

This function calculates the indicator for the the S-index by using the SLV calculated by calc_slv

Usage

```
ind_sulpher(D_SLV, B_LU_BRP, B_SOILTYPE_AGR, B_AER_CBS)
```

Arguments

D_SLV	(numeric) The value of SLV calculated by calc_slv
B_LU_BRP	(numeric) The crop code (gewascode) from the BRP
B_SOILTYPE_AGR	(character) The type of soil
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)

Details

Pl

Value

The evaluated score for the soil function to supply sulfur for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_sulpher(D_SLV = 15,B_LU_BRP = 256,B_SOILTYPE_AGR = 'dekzand',
B_AER_CBS = 'Rivierengebied')
ind_sulpher(c(10,15,35),c(256,1019,1019),rep('rivierklei',3),rep('Rivierengebied',3))
```

---

ind_waterretention *Calculate indicator for Water Retention index*

Description

This function evaluates different Water Retention Indices. These include : 'wilting point','field capacity','water holding capacity','plant available water' and 'Ksat'

Usage

```
ind_waterretention(D_P_WRI, type = "plant available water")
```

Arguments

D_P_WRI	(numeric) The value for Water Retention index (WRI) as calculated by calc_waterretention
type	(character) The type of water retention index. Options include c('wilting point','field capacity','water holding capacity','plant available water','Ksat')

Value

The evaluated score for the soil function to retain and buffer water. Depending on the "type" chosen, the soil is evaluated for 'wilting point','field capacity','water holding capacity','plant available water' or 'Ksat'. Output is a numeric value varying between 0 and 1.

Examples

```
ind_waterretention(D_P_WRI = 75)
ind_waterretention(D_P_WRI = c(15,50,75,150))
ind_waterretention(D_P_WRI = c(0.1,0.2,0.5,0.8), type = 'water holding capacity')
```

---

ind_waterstressindex *Calculate the Water Stress Index*

Description

This function calculates the risk for yield depression due to drought, an excess of water or a combination of both. The WSI is calculated by calc_waterstressindex

Usage

```
ind_waterstressindex(D_WSI)
```

Arguments

D_WSI	(numeric) The value of WSI calculated by calc_waterstressindex

Value

The evaluated score for the soil function to resist drought or wetness stress by crops. A numeric value between 0 and 1.

Examples

```
ind_waterstressindex(D_WSI = 45)
ind_waterstressindex(D_WSI = c(5,15,25,35))
```

---

ind_winderodibility *Calculate indicator for wind erodibility*

Description

This function calculates the indicator for the resistance of the soil against wind erosion.

Usage

```
ind_winderodibility(D_P_DU)
```

Arguments

D_P_DU	(numeric) The value for wind erodibility factor (WEF) as calculated by calc_winderodibility

Value

The evaluated score for the soil function to avoid soil damage due to wind erosion. A numeric value between 0 and 1.

Examples

```
ind_winderodibility(D_P_DU = 0.85)
ind_winderodibility(D_P_DU = c(0.15,0.6,0.9))
```

---

ind_workability *Calculate indicator for workability*

Description

This function calculates the indicator for the workability of the soil expressed as the period in which the soil can be worked without inflicting structural damage that cannot be restored by the regular management on the farm.

Usage

```
ind_workability(D_WO, B_LU_BRP)
```

Arguments

D_WO	(numeric) The value of the relative (workable) season length calculated by calc_workability
B_LU_BRP	(numeric) The crop code from the BRP

Value

The evaluated score for the soil function to allow the soil to be managed by agricultural activities. A numeric value between 0 and 1.

Examples

```
ind_workability(D_WO = 0.85,B_LU_BRP = 256)
ind_workability(D_WO = c(0.15,0.6,0.9),B_LU_BRP = c(256,1019,1019))
```

ind_zinc — *Calculate the indicator for Zn-availability*

Description

This function calculates the indicator for the the Zn availability in soil by using the Zn-index as calculated by `calc_zinc_availability`

Usage

```
ind_zinc(D_ZN)
```

Arguments

`D_ZN`	(numeric) The value of Zn-index calculated by `calc_zinc_availability`

Value

The evaluated score for the soil function to supply zinc for crop uptake. A numeric value between 0 and 1.

Examples

```
ind_zinc(D_ZN = 45)
ind_zinc(D_ZN = c(12.5,35,65))
```

management.obic — *Relational table linking soil management measures to ecosystem services*

Description

This table assigns which measures positively contribute to the ecosystem services included

Usage

```
management.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 15 rows and 6 columns.

Details

measure The name of measure

I_M_SOILFERTILITY integrated soil management indicator for soil fertility

I_M_CLIMATE integrated soil management indicator for soil carbon sequestration

I_M_WATERQUALITY integrated soil management indicator for water quality

I_M_BIODIVERSITY Integrated soil management indicator for soil biodiversity

---

nema.crop.rot.obic — *Damage and reproduction of soil-borne pathogens and pests on crops*

Description

This table includes information from aaltjesschema (April 2021), a website where information is collected on the vulnerability of crops to plant parasitic nematodes and diseases that use nematodes as vector.

Usage

```
nema.crop.rot.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 7059 rows and 21 columns.

Details

crop crop as called in aaltjesschema

name_scientific scientific name of nematode

propagation how easily a nematode can propagate on a crop given as strings with 5 classes

damage strings indicating how much damage a nematode can inflict on a crop, with 5 classes

cultivar_dependent boolean whether there are differences in propgation between cultivars of the crop

serotype_dependant boolean whether there are differences in propagation between serotypes of the pathogen

dalgrond boolean whether information is valid for soiltype 'dalgrond'

klei boolean whether information is valid for soiltype 'klei'

loess boolean whether information is valid for soiltype 'loess'

zand boolean whether information is valid for soiltype 'zand'

zavel boolean whether information is valid for soiltype 'zavel'

info string whether there is information on propgation, differentiating between none, yes, and some

name_common string, common name of pathogen in Dutch, if no common name is available, scientific name is given

nema_name string, full name of pathogen in aaltjesschema, includes common and scientific name

grondsoort string with letters indicating for which soil the information is valid

groen_br boolean indicating that the crop is a green manure on fallow

groen_vs boolean indicating that the crop is a green manure in early stubble

groen_od boolean indicating that the crop is a green manure beneath cover crop

groen_ls boolean indicating that the crop is a green manure in late stubble

groen_st boolean indicating that the crop is a green manure as drifting deck

crop_name_scientific string, scientific name of crop species or genus

---

`nema.obic` *Nematode table*

Description

This table contains information uses for calculations on nematode species counts

Usage

```
nema.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 78 rows and 7 columns.

Details

geel The intermediate infestation severity count

rood The count at which a severe infestation is present

species The species or sometimes genera of the plant parasitic nematode

standard A boolean indicating whether the species should always be used in calculating the indicator score, regardless of the number of nematodes

b Growth rate (b) for the evaluate_logistics function

v v for the evaluate_logistics function, affects the growth rate near the maximum `nleach_table` *Table with fractions of excess N which runs off to groundwater and surface water*

Description

This table contains the fractions of N overshot which runs off to groundwater / surface water, per soil type, crop type, and groundwater table

Usage

```
nleach_table
```

Format

An object of class `data.table` (inherits from `data.frame`) with 198 rows and 7 columns.

Details

gewas crop type

bodem soil type

ghg Lower value for groundwater table (cm-mv)

glg Upper value for groundwater table (cm-mv)

B_GT grondwatertrap

nf Original values of N run-off fraction to surface water (kg N drain/ha/year per kg N overschot/ha/year) or groundwater (mg NO3/L per kg N overschot/ha/year)

leaching_to-set Tells if leaching to ground water or surface water)

`obic_evalmeasure` *Evaluate effects of measures*

Description

This function quantifies the effects of 11 soil measures on the OBI score

Usage

```
obic_evalmeasure(dt.score, extensive = FALSE)
```

Arguments

`dt.score`	(data.table) containing all indicators and scores of a single field
`extensive`	(boolean) whether the output table includes evaluation scores of each measures (TRUE)

obic_farm *Calculate the Open Bodem Index score for a series of fields belonging to a farm*

Description

This functions wraps the functions of the OBIC into one main function to calculate the score for Open Bodem Index (OBI). In contrast to obic_field, this wrapper uses a data.table as input.

Usage

```
obic_farm(dt)
```

Arguments

dt	(data.table) A data.table containing the data of the fields to calculate the OBI

Details

The data.table should contain all required inputs for soil properties needed to calculate OBI score. Management information is optional as well as the observations from the visual soil assessment. The threshold values per category of soil functions need to have an equal length, with fractions defining the class boundaries in increasing order. The lowest boundary value (zero) is not needed.

Value

The output of the Open Bodem Index Calculator for a series of agricultural fields belonging to a single farm. Depending on the output type, different output objects can be returned. These include the estimated OBI scores (both total and aggregated subscores), the value of the underling indicators as well the possible recommendations to improve the soil quality. The output is a list with field properties as well as aggregated farm properties

Examples

```
## Not run:
obic_farm(dt = data.table(B_SOILTYPE_AGR = 'rivierklei',B_GWL_CLASS = "II",
B_GWL_GLG = 75,B_GWL_GHG = 10,
B_GWL_ZCRIT = 50,B_SC_WENR = '2',B_HELP_WENR = "MOb72",B_AER_CBS = 'LG01',
B_LU_BRP = c( 1010, 1010,263,263, 263,265,265,265),A_SOM_LOI = 3.91,A_SAND_MI = 66.3,
A_SILT_MI = 22.8,A_CLAY_MI = 7.8,A_PH_CC = 5.4,A_N_RT = 1528.33,A_CN_FR = 13.02,
A_S_RT = 321.26,A_N_PMN = 63.3,A_P_AL = 50.2,A_P_CC = 2.9,A_P_WA = 50.5,
A_CEC_CO = 56.9,A_CA_CO_PO = 66.87,A_MG_CO_PO = 13.97,A_K_CO_PO = 3.06,
A_K_CC = 58.6,A_MG_CC = 77.53,A_MN_CC = 7586.61,A_ZN_CC = 726.2,A_CU_CC = 68.8,
A_C_BCS = 1,A_CC_BCS = 1,A_GS_BCS = 1,A_P_BCS = 1,A_RD_BCS = 1,A_EW_BCS = 1,
A_SS_BCS = 1,A_RT_BCS = 1,A_SC_BCS = 1,M_COMPOST = 0,M_GREEN = FALSE,M_NONBARE =FALSE,
M_EARLYCROP = FALSE,M_SLEEPHOSE = FALSE,M_DRAIN = FALSE,M_DITCH = FALSE,
M_UNDERSEED = FALSE,M_LIME = FALSE,M_MECHWEEDS = FALSE,M_NONINVTILL = FALSE,
M_PESTICIDES_DST = FALSE,M_SOLIDMANURE = FALSE,M_SSPM = FALSE,M_STRAWRESIDUE = FALSE))
```

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

---

obic_field *Calculate the Open Bodem Index score for one field*

Description

This functions wraps the functions of the OBIC into one main function to calculate the score for Open Bodem Index (OBI) for a single field.

Usage

```
obic_field(
  B_SOILTYPE_AGR,
  B_GWL_CLASS,
  B_SC_WENR,
  B_HELP_WENR,
  B_AER_CBS,
  B_GWL_GLG,
  B_GWL_GHG,
  B_GWL_ZCRIT,
  B_LU_BRP,
  A_SOM_LOI,
  A_SAND_MI,
  A_SILT_MI,
  A_CLAY_MI,
  A_PH_CC,
  A_N_RT,
  A_CN_FR,
  A_S_RT,
  A_N_PMN,
  A_P_AL,
  A_P_CC,
  A_P_WA,
  A_CEC_CO,
  A_CA_CO_PO,
  A_MG_CO_PO,
  A_K_CO_PO,
  A_K_CC,
  A_MG_CC,
  A_MN_CC,
  A_ZN_CC,
  A_CU_CC,
  A_C_BCS = NA,
  A_CC_BCS = NA,
  A_GS_BCS = NA,
```

```
  A_P_BCS = NA,
  A_RD_BCS = NA,
  A_EW_BCS = NA,
  A_SS_BCS = NA,
  A_RT_BCS = NA,
  A_SC_BCS = NA,
  B_DRAIN = FALSE,
  B_FERT_NORM_FR = 1,
  M_COMPOST = NA_real_,
  M_GREEN = NA,
  M_NONBARE = NA,
  M_EARLYCROP = NA,
  M_SLEEPHOSE = NA,
  M_DRAIN = NA,
  M_DITCH = NA,
  M_UNDERSEED = NA,
  M_LIME = NA,
  M_NONINVTILL = NA,
  M_SSPM = NA,
  M_SOLIDMANURE = NA,
  M_STRAWRESIDUE = NA,
  M_MECHWEEDS = NA,
  M_PESTICIDES_DST = NA,
  ID = 1,
  output = "all"
)
```

Arguments

B_SOILTYPE_AGR	(character) The agricultural type of soil
B_GWL_CLASS	(character) The groundwater table class
B_SC_WENR	(character) The risk for subsoil compaction as derived from risk assessment study of Van den Akker (2006).
B_HELP_WENR	(character) The soil type abbreviation, derived from 1:50.000 soil map
B_AER_CBS	(character) The agricultural economic region in the Netherlands (CBS, 2016)
B_GWL_GLG	(numeric) The lowest groundwater level averaged over the most dry periods in 8 years in cm below ground level
B_GWL_GHG	(numeric) The highest groundwater level averaged over the most wet periods in 8 years in cm below ground level
B_GWL_ZCRIT	(numeric) The distance between ground level and groundwater level at which the groundwater can supply the soil surface with 2mm water per day (in cm)
B_LU_BRP	(numeric) a series with crop codes given the crop rotation plan (source: the BRP)
A_SOM_LOI	(numeric) The percentage organic matter in the soil (%)
A_SAND_MI	(numeric) The sand content of the soil (%)
A_SILT_MI	(numeric) The silt content of the soil (%)

A_CLAY_MI	(numeric) The clay content of the soil (%)
A_PH_CC	(numeric) The acidity of the soil, measured in 0.01M CaCl2 (-)
A_N_RT	(numeric) The organic nitrogen content of the soil in mg N / kg
A_CN_FR	(numeric) The carbon to nitrogen ratio (-)
A_S_RT	(numeric) The total Sulfur content of the soil (in mg S per kg)
A_N_PMN	(numeric) The potentially mineralizable N pool (mg N / kg soil)
A_P_AL	(numeric) The P-AL content of the soil
A_P_CC	(numeric) The plant available P content, extracted with 0.01M CaCl2 (mg / kg)
A_P_WA	(numeric) The P-content of the soil extracted with water (mg P2O5 / 100 ml soil)
A_CEC_CO	(numeric) The cation exchange capacity of the soil (mmol+ / kg), analyzed via Cobalt-hexamine extraction
A_CA_CO_PO	(numeric) The The occupation of the CEC with Ca (%)
A_MG_CO_PO	(numeric) The The occupation of the CEC with Mg (%)
A_K_CO_PO	(numeric) The occupation of the CEC with K (%)
A_K_CC	(numeric) The plant available K content, extracted with 0.01M CaCl2 (mg / kg)
A_MG_CC	(numeric) The plant available Mg content, extracted with 0.01M CaCl2 (ug / kg)
A_MN_CC	(numeric) The plant available Mn content, extracted with 0.01M CaCl2 (ug / kg)
A_ZN_CC	(numeric) The plant available Zn content, extracted with 0.01M CaCl2 (ug / kg)
A_CU_CC	(numeric) The plant available Cu content, extracted with 0.01M CaCl2 (ug / kg)
A_C_BCS	(numeric) The presence of visible cracks in the top layer (optional, score 0-1-2)
A_CC_BCS	(integer) The crop cover on the surface (optional, score 0-1-2)
A_GS_BCS	(numeric) The presence of waterlogged conditions, gley spots (optional, score 0-1-2)
A_P_BCS	(numeric) The presence / occurrence of water puddles on the land, ponding (optional, score 0-1-2)
A_RD_BCS	(integer) The rooting depth (optional, score 0-1-2)
A_EW_BCS	(numeric) The presence of earth worms (optional, score 0-1-2)
A_SS_BCS	(integer) The soil structure (optional, score 0-1-2)
A_RT_BCS	(numeric) The presence of visible tracks / rutting or trampling on the land (optional, score 0-1-2)
A_SC_BCS	(numeric) The presence of compaction of subsoil (optional, score 0-1-2)
B_DRAIN	(boolean) Are drains installed to drain the field (options: yes or no)
B_FERT_NORM_FR	(numeric) The fraction of the application norm utilized
M_COMPOST	(numeric) The frequency that compost is applied (optional, every x years)
M_GREEN	(boolean) A soil measure. Are catch crops sown after main crop (optional, option: yes or no)
M_NONBARE	(boolean) A soil measure. Is parcel for 80 percent of the year cultivated and 'green' (optional, option: yes or no)

M_EARLYCROP (boolean) A soil measure. Use of early crop varieties to avoid late harvesting (optional, option: yes or no)

M_SLEEPHOSE (boolean) A soil measure. Is sleephose used for slurry application (optional, option: yes or no)

M_DRAIN (boolean) A soil measure. Are under water drains installed in peaty soils (optional, option: yes or no)

M_DITCH (boolean) A soil measure. Are ditched maintained carefully and slib applied on the land (optional, option: yes or no)

M_UNDERSEED (boolean) A soil measure. Is grass used as second crop in between maize rows (optional, option: yes or no)

M_LIME (boolean) measure. Has field been limed in last three years (option: yes or no)

M_NONINVTILL (boolean) measure. Non inversion tillage (option: yes or no)

M_SSPM (boolean) measure. Soil Structure Protection Measures, such as fixed driving lines, low pressure tires, and light weighted machinery (option: yes or no)

M_SOLIDMANURE (boolean) measure. Use of solid manure (option: yes or no)

M_STRAWRESIDUE (boolean) measure. Application of straw residues (option: yes or no)

M_MECHWEEDS (boolean) measure. Use of mechanical weed protection (option: yes or no)

M_PESTICIDES_DST (boolean) measure. Use of DST for pesticides (option: yes or no)

ID (character) A field id

output (character) An optional argument to select output: obic_score, scores, indicators, recommendations, or all. (default = all)

Details

It is assumed that the crop series is a continuous series in decreasing order of years. So most recent year first, oldest year last.

Value

The output of the Open Bodem Index Calculator for a specific agricultural field. Depending on the output type, different output objects can be returned. These include the estimated OBI scores (both total and aggregated subscores), the value of the underling indicators as well the possible recommendations to improve the soil quality. The output is always a data.table.

Examples

```
## Not run:
obic_field( B_SOILTYPE_AGR = 'rivierklei',B_GWL_CLASS = "II",B_GWL_GLG = 75,B_GWL_GHG = 10,
B_GWL_ZCRIT = 50,B_SC_WENR = '2',B_HELP_WENR = "MOb72",B_AER_CBS = 'LG01',
B_LU_BRP = c( 1010, 1010,263,263, 263,265,265,265),A_SOM_LOI = 3.91,A_SAND_MI = 66.3,
A_SILT_MI = 22.8,A_CLAY_MI = 7.8,A_PH_CC = 5.4,A_N_RT = 1528.33,A_CN_FR = 13.02,
A_S_RT = 321.26,A_N_PMN = 63.3,A_P_AL = 50.2,A_P_CC = 2.9,A_P_WA = 50.5,
A_CEC_CO = 56.9,A_CA_CO_PO = 66.87,A_MG_CO_PO = 13.97,A_K_CO_PO = 3.06,
A_K_CC = 58.6,A_MG_CC = 77.53,A_MN_CC = 7586.61,A_ZN_CC = 726.2,A_CU_CC = 68.8,
A_C_BCS = 1,A_CC_BCS = 1,A_GS_BCS = 1,A_P_BCS = 1,A_RD_BCS = 1,A_EW_BCS = 1,
```

```
A_SS_BCS = 1,A_RT_BCS = 1,A_SC_BCS = 1,M_COMPOST = 0,M_GREEN = FALSE,M_NONBARE =FALSE,
M_EARLYCROP = FALSE,M_SLEEPHOSE = FALSE,M_DRAIN = FALSE,M_DITCH = FALSE,
M_UNDERSEED = FALSE,M_LIME = FALSE,M_MECHWEEDS = FALSE,M_NONINVTILL = FALSE,
M_PESTICIDES_DST = FALSE,M_SOLIDMANURE = FALSE,M_SSPM = FALSE,M_STRAWRESIDUE = FALSE)

## End(Not run)
```

---

obic_field_dt *Calculate the Open Bodem Index score for a data table*

Description

This functions wraps the functions of the OBIC into one main function to calculate the score for Open Bodem Index (OBI). In contrast to obic_field, this wrapper can handle a data.table as input. Multiple sites (distinguished in the column 'ID') can be simulated simultaneously.

Usage

```
obic_field_dt(dt, output = "all")
```

Arguments

dt	(data.table) A data.table containing the data of the fields to calculate the OBI
output	(character) An optional argument to select output: obic_score, scores, indicators, recommendations, or all. (default = all)

Value

The output of the Open Bodem Index Calculator for a specific agricultural field. Depending on the output type, different output objects can be returned. These include the estimated OBI scores (both total and aggregated subscores), the value of the underling indicators as well the possible recommendations to improve the soil quality. The output is always a data.table.

Examples

```
## Not run:
obic_field_dt(data.table(B_SOILTYPE_AGR = 'rivierklei',B_GWL_CLASS = "II",
B_GWL_GLG = 75,B_GWL_GHG = 10,
B_GWL_ZCRIT = 50,B_SC_WENR = '2',B_HELP_WENR = "MOb72",B_AER_CBS = 'LG01',
B_LU_BRP = c( 1010, 1010,263,263, 263,265,265,265),A_SOM_LOI = 3.91,A_SAND_MI = 66.3,
A_SILT_MI = 22.8,A_CLAY_MI = 7.8,A_PH_CC = 5.4,A_N_RT = 1528.33,A_CN_FR = 13.02,
A_S_RT = 321.26,A_N_PMN = 63.3,A_P_AL = 50.2,A_P_CC = 2.9,A_P_WA = 50.5,
A_CEC_CO = 56.9,A_CA_CO_PO = 66.87,A_MG_CO_PO = 13.97,A_K_CO_PO = 3.06,
A_K_CC = 58.6,A_MG_CC = 77.53,A_MN_CC = 7586.61,A_ZN_CC = 726.2,A_CU_CC = 68.8,
A_C_BCS = 1,A_CC_BCS = 1,A_GS_BCS = 1,A_P_BCS = 1,A_RD_BCS = 1,A_EW_BCS = 1,
A_SS_BCS = 1,A_RT_BCS = 1,A_SC_BCS = 1,M_COMPOST = 0,M_GREEN = FALSE,M_NONBARE =FALSE,
M_EARLYCROP = FALSE,M_SLEEPHOSE = FALSE,M_DRAIN = FALSE,M_DITCH = FALSE,
M_UNDERSEED = FALSE,M_LIME = FALSE,M_MECHWEEDS = FALSE,M_NONINVTILL = FALSE,
```

```
M_PESTICIDES_DST = FALSE,M_SOLIDMANURE = FALSE,M_SSPM = FALSE,M_STRAWRESIDUE = FALSE))

## End(Not run)
```

obic_recommendations *Recommend measurements for better soil management*

Description

This function gives recommendations better soil management based on the OBI score

Usage

```
obic_recommendations(dt.recom)
```

Arguments

dt.recom	(data.table) The results from obic_evalmeasure

obic_recommendations_bkp *Recommend measurements for better soil management*

Description

This function returns a list of management recommendations based on OBI scores as part of BodemKwaliteitsPlan.

Usage

```
obic_recommendations_bkp(dt.score, B_LU_BRP, B_SOILTYPE_AGR)
```

Arguments

dt.score	(data.table) containing all OBI indicators and scores of a single field
B_LU_BRP	(numeric) Cultivation code according to BRP
B_SOILTYPE_AGR	(character) Agricultural soil type

`pFpara_class` *Parameter estimation based on class of Staringreeks (Tabel 3, Wosten 2001)*

Description

Parameter estimation based on class of Staringreeks (Tabel 3, Wosten 2001)

Usage

```
pFpara_class(Pklei, Pleem, Psom, M50)
```

Arguments

`Pklei`	(numeric) The clay (<2um) content of the soil (%)
`Pleem`	(numeric) The loam (<50um) content of the soil (%) Pleem > 0
`Psom`	(numeric) The organic matter content of the soil (%) Psom > 0
`M50`	(numeric)size of sand fraction (um)

Value

a table with the following columns: ThetaR (numeric) residual water content (cm3/cm3) ThetaS (numeric) saturated water content (cm3/cm3) alfa (numeric) related to the inverse of the air entry suction, alfa > 0 (1/cm) n (numeric) a measure of the pore-size distribution, n>1, dimensionless ksat (numeric) saturated hydraulic conductivity (cm/d)

Examples

```
pFpara_class(Pklei = 25, Pleem = 15, Psom = 4.5,M50 = 150)
pFpara_class(Pklei = 45, Pleem = 3, Psom = 4.5,M50 = 150)
```

`pFpara_ptf_Wosten1999` *Estimate water retention curve parameters based on Wosten 1999*

Description

This function estimates water retention curve parameters using Pedo transfer function of Wosten (1999) based on HYPRES

Usage

```
pFpara_ptf_Wosten1999(Pklei, Psilt, Psom, Bovengrond)
```

Arguments

`Pklei`	(numeric) The clay content of the soil (%) within soil mineral part. Pklei > 0
`Psilt`	(numeric) The silt content of the soil (%) within soil mineral part. Psilt > 0
`Psom`	(numeric) The organic matter content of the soil (%). Psom > 0
`Bovengrond`	(boolean) whether topsoil (1) or not (0)

Value

a table with the following columns:

Dichtheid (numeric) soil bulk density (g/cm3) ThetaR (numeric) residual water content (cm3/cm3) ThetaS (numeric) saturated water content (cm3/cm3) alfa (numeric) related to the inverse of the air entry suction, alfa > 0 (1/cm) n (numeric) a measure of the pore-size distribution, n>1, dimensionless ksat (numeric) saturated hydraulic conductivity (cm/d)

References

Wösten, J.H.M , Lilly, A., Nemes, A., Le Bas, C. (1999) Development and use of a database of hydraulic properties of European soils. Geoderma 90 (3-4): 169-185.

Examples

```
pFpara_ptf_Wosten1999(Pklei = 25, Psilt = 15, Psom = 4.5, Bovengrond = 1)
pFpara_ptf_Wosten1999(Pklei = 45, Psilt = 3, Psom = 4.5, Bovengrond = 1)
```

`pFpara_ptf_Wosten2001` *Estimate water retention curve parameters based on Wosten 2001*

Description

This function estimates water retention curve parameters using Pedo transfer function of Wosten (2001)

Usage

```
pFpara_ptf_Wosten2001(Pklei, Pleem, Psom, M50, Bovengrond)
```

Arguments

`Pklei`	(numeric) The clay (<2um) content of the soil (%)
`Pleem`	(numeric) The loam (<50um) content of the soil (%) Pleem > 0
`Psom`	(numeric) The organic matter content of the soil (%) Psom > 0
`M50`	(numeric)size of sand fraction (um)
`Bovengrond`	(boolean) whether topsoil (1) or not (0)

Value

a table with the following columns: Dichtheid (numeric) soil bulk density (g/cm3) ThetaR (numeric) residual water content (cm3/cm3) ThetaS (numeric) saturated water content (cm3/cm3) alfa (numeric) related to the inverse of the air entry suction, alfa > 0 (1/cm) n (numeric) a measure of the pore-size distribution, n>1, dimensionless ksat (numeric) saturated hydraulic conductivity (cm/d) l (numeric) dimension parameter

References

Wösten, J. H. M., Veerman, G. ., de Groot, W. J., & Stolte, J. (2001). Waterretentie en doorlatendheidskarakteristieken van boven- en ondergronden in Nederland: de Staringreeks. Alterra Rapport, 153, 86. https://doi.org/153

Examples

```
pFpara_ptf_Wosten2001(Pklei = 25, Pleem = 15, Psom = 4.5,M50 = 150, Bovengrond = 1)
pFpara_ptf_Wosten2001(Pklei = 45, Pleem = 3, Psom = 4.5,M50 = 150,Bovengrond = 1)
```

---

pF_curve *Water retention curve*

Description

This function compute water content at given pressure head, using Van Genuchten water retention curve

Usage

```
pF_curve(head, thetaR, thetaS, alfa, n)
```

Arguments

head	(numeric) suction pressure ([L] or cm of water)
thetaR	(numeric) residual water content (cm3/cm3)
thetaS	(numeric) saturated water content (cm3/cm3)
alfa	(numeric) related to the inverse of the air entry suction, alfa > 0 (1/cm)
n	(numeric) a measure of the pore-size distribution, n>1, dimensionless

Value

theta (numeric) water content (cm3/cm3)

The moisture content of a soil given a certain pressure head. A numeric value.

Examples

```
pF_curve(head = 2.2, thetaR = 0.01, thetaS = 0.35, alfa = 0.3,n = 1.6)
pF_curve(head = 4.2, thetaR = 0.01, thetaS = 0.35, alfa = 0.3,n = 1.6)
```

---

recom.obic — *Applicability range of measures, including literature based estimates, of effects on soil indicators*

Description

This table defines the effects of 11 measures on soil indicators. This table is used internally in obic_evalmeasure

This table defines the effects of 11 measures on soil indicators

Usage

```
recom.obic

recom.obic
```

Format

An object of class data.table (inherits from data.frame) with 4048 rows and 11 columns.

An object of class data.table (inherits from data.frame) with 4048 rows and 11 columns.

Details

m_nr The ID number of measure

m_description The description of measure

m_prio weighing factor for measure. This is not used in the script.

m_treshold Threshold value of the indicator value. This is not used in the script.

m_order Order of measures. When scores are tie, the measure with a smaller number is chosen.

m_soilfunction description of the OBIC indicator variable

indicator Name of OBIC soil indicator variable

m_effect Effect of measure on soil indicator. 3/2/1/0/-1

m_sector type of agricultural sector: dairy/arable/vegetable/tree cultivation (in dutch)

m_soiltype type of soil: sand/clay/peat/loess (in dutch)

m_applicability is the measure applicable for combination of sector and soil (1/0)

recom.obic_bkp *Effects of measures on soil indicators*

Description

This table defines the effects of 22 measures on soil indicators

Usage

```
recom.obic_bkp
```

Format

A data.frame with 9152 rows and 11 columns:

m_nr The ID number of measure

m_description The description of measure

m_prio weighing factor for measure. This is not used in the script.

m_treshold Threshold value of the indicator value. This is not used in the script.

m_order Order of measures. When scores are tie, the measure with a smaller number is chosen.

m_soilfunction description of the OBIC indicator variable

indicator Name of OBIC soil indicator variable

m_effect Effect of measure on soil indicator. 3/2/1/0/-1

m_sector type of agricultural sector: dairy/arable/vegetable/tree cultivation (in dutch)

m_soiltype type of soil: sand/clay/peat/loess (in dutch)

m_applicability is the measure applicable for combination of sector and soil (1/0)

season.obic *Desired growing season period for maximum yield*

Description

This table gives the required number of days before and after August 15 required for optimal yield or usability and has categories to determine yield loss having a shorter workable growing season based on Tabel 2 and several formulas from Huinink (2018)

Usage

```
season.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 116 rows and 6 columns.

Details

landuse The name of the crop or landuse category, used to link to crops.obic$crop_season

req_days_pre_glg Required number of workable days before August 15 assuming this coincides with GLG, lowest groundwater

req_days_post_glg Required number of workable days after August 15 assuming this coincides with GLG, lowest groundwater

total_days Total number of days required for optimal growth or use

derving Category to determine yield loss due to having a sub-optimal relative growing season length or RLG

`soils.obic` *Linking table between soils and different functions in OBIC*

Description

This table helps to link the different crops in the OBIC functions with the crops selected by the user

Usage

```
soils.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 9 rows and 4 columns.

Details

soiltype The name of the soil type

soiltype.ph The category for this soil at pH

soiltype.n The category for this soil at nitrogen

`tbl.ph.delta` *Table with optimal pH for different crop plans*

Description

This table contains the optimal pH for different crop plans and soil types

Usage

```
tbl.ph.delta
```

Format

An object of class data.table (inherits from data.frame) with 136 rows and 10 columns.

Details

table The original table from Handboek Bodem en Bemesting

lutum.low Lower value for A_CLAY_MI

lutum.high Upper value for A_CLAY_MI

om.low Lower value for organic matter

om.high Upper value for organic matter

potato.low Lower value for fraction potatoes in crop plan

potato.high Upper value for fraction potatoes in crop plan

sugarbeet.low Lower value for fraction potatoes in crop plan

sugarbeet.high Upper value for fraction potatoes in crop plan

ph.optimum The optimal pH (pH_CaCl2) for this range

#' @references Handboek Bodem en Bemesting tabel 5.1, 5.2 en 5.3

---

waterstress.obic *Linking table between crops, soils, groundwater tables and water induced stresses in OBIC*

Description

This table helps to link the different crops in the OBIC functions with the crops selected by the user

Usage

```
waterstress.obic
```

Format

An object of class data.table (inherits from data.frame) with 393680 rows and 6 columns.

Details

cropname The name of the crop

soilunit The category for this soil, derived from 1:50.000 soil map

gt The class describing mean highest and lowest groundwater table, derived from 1:50.000 soil map

droughtstress The mean yield reduction due to drought (in percentage)

wetnessstress The mean yield reduction due to water surplus (in percentage)

waterstress The mean combined effect water stress (due to deficiency or excess of water)

weather.obic — *Weather table*

Description

This table contains the climatic weather data of the Netherlands for the period 1990-2020

Usage

```
weather.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 12 rows and 4 columns.

Details

month Month of the year

A_TEMP_MEAN Mean monthly temperature

A_PREC_MEAN Mean monthly precipitation

A_ET_MEAN Mean monthly evapo-transpiration

weight.obic — *Weight of indicators to calculate integrated scores*

Description

This table defines the weighting factors (ranging between 0 and 1) of indicator values to calculate integrated scores.

Usage

```
weight.obic
```

Format

An object of class `data.table` (inherits from `data.frame`) with 196 rows and 5 columns.

Details

var The name of the weight

weight weighing factor

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