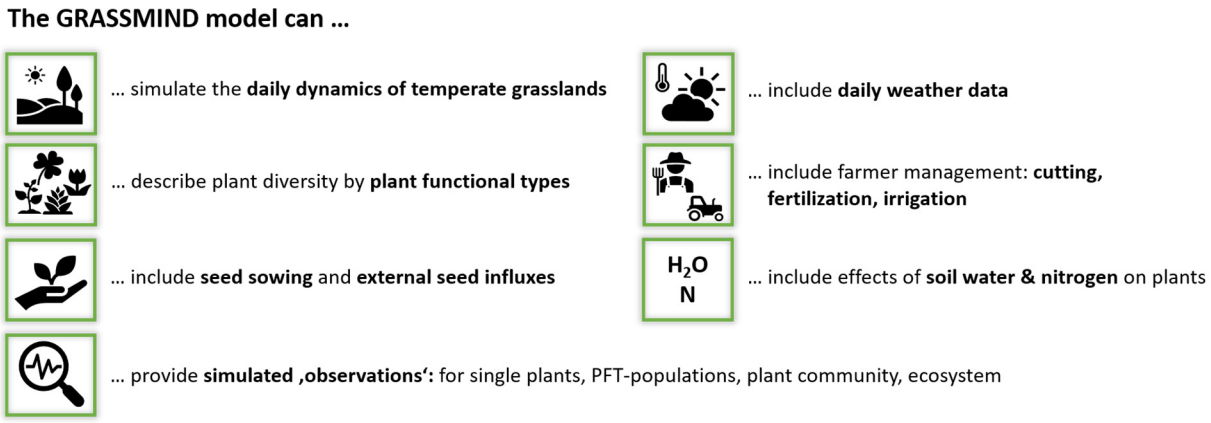
Guideline on how to provide data from a grassland site for simulations with the GRASSMIND model

1. What is the GRASSMIND model?

The GRASSMIND model is a **process-based simulation model** for temperate managed grasslands which represents a grassland plot by each single plant (in interaction with other plants). The model is designed as an **individual-based model** (means: it simulates the dynamics of each single plant) and implemented in a **modular way** (means: each step of dynamic processes in grasslands is computed separately and allows for modification or extension). Below you can find a **brief summary of the functionalities** that GRASSMIND can currently account for in simulations.



An important concept of GRASSMIND is the simulation of plant functional types (PFT) instead of single plant species. For an adequate comparison of simulations and observations as well as interpretation of simulation results, plant species occurring at a considered grassland site should be assigned to one of the following PFT[1]:

The GRASSMIND model is currently still at a development and testing stage and has previously been tested for various grassland field sites in Germany[2,3,4]. When testing the GRASSMIND model for new sites or under changing conditions, we do not expect that the model simulations will perfectly match your observations. However, we do hope that the combination of your expertise and field observations with process-based modelling will improve the accuracy, predictive capacity and applicability of the model. We therefore highly welcome feedback on potential extensions or modifications that could facilitate relevant applications.

[1] Small and tall herbs are differentiated by the maximum height, here 60 cm.

[2] Hetzer, J., Huth, A., Taubert, F., (2021): The importance of plant trait variability in grasslands: a modelling study. Ecol. Model. 453 , art. 109606.

[3] Schmid, J.S., Huth, A., Taubert, F., (2021): Influences of traits and processes on productivity and functional composition in grasslands: A modeling study. Ecol. Model. 440 , art. 109395.

[4] Taubert, F., Hetzer, J., Schmid, J.S., Huth, A., (2020): Confronting an individual-based simulation model with empirical community patterns of grasslands. PLOS One 15 (7), e0236546.

Potential extension in GRASSMIND in the future could be, e.g. …


… **trait variations** within plant functional types


… **flowering periods** of plants


… inclusion of **other trophic levels or organisms**

… **atmospheric CO_2 effects** on plants


… **grazing** as management practice[5]

… effects of **phosphor or potassium** on plants


… **trampling or other social activities** on grasslands


… **pesticide or herbicide impacts**

2. What data to bring for running GRASSMIND for your field site?

As basic information, details on your site and plot(s) location would be required as follows:

- DEIMS.iD
- Longitude and latitude of plot(s)
- Basic information of management actions (mowing, fertilization, grazing, irrigation) per plot

see section 3.1

Further, observation data from your site are required to compare model simulations with your measurements. Optionally, also environmental variables that were measured can be included to run GRASSMIND simulations with the site-specific environmental conditions.

Minimum data

Based on latitude and longitude of the plot(s), the required input files for your specific site to run GRASSMIND simulations will be automatically created (using open-source weather data and remote sensing maps). The minimum data (see table below) will then be used to compare the respective simulations of GRASSMIND with your observations.

Plant species composition  **Section 3.5.1**	**What exactly to provide?** • relative abundances (based on number of plants, biomass, cover, or other) • at minimum one date (ideally, several dates) • for each plant functional type (PFTs, see section 1)[6] **Used for comparison** of the simulation output with observations on your field site (via summary statistics, goodness-of-fit measures, visualizations)

[5] A modelling approach of grazing as management practice is currently being implemented in GRASSMIND and will be tested soon.

[6] Please contact us if you need support in assigning your recorded plant species to the four PFTs.

Optional data

If available, the following detailed data (see table below) can be used to prepare all GRASSMIND input files using predefined templates and formats.

Weather data How it looks like? Section 3.2	**What exactly to provide?** • precipitation • air temperature • photosynthetic photon flux density • potential evapotranspiration **Extent/resolution**: daily resolution for the entire envisaged simulation period **Used as input for model simulations** (plant photosynthesis and soil water dynamics)
Management data How it looks like? Section 3.4	**What exactly to provide?** • each date and cutting height of mowing events • each date and fertilizer amount of fertilization events • each date and water amount of irrigation events **Extent/resolution:** day-specific for all management events within the simulation period **Used as input for model simulations** (management activities)
Soil data How it looks like? Section 3.3	**What exactly to provide?** • soil texture (fractions of sand, silt, clay content) • field capacity (V%) • permanent wilting point (V%) • porosity (V%) • saturated hydraulic conductivity (V%) **Extent/resolution:** per 10 cm soil layer for a soil depth of 2 m (no temporal changes) **Used as input for model simulations** (dynamics of soil carbon, nitrogen and water)
Observation data How it looks like? Section 3.5	**What exactly to provide?** • Aboveground biomass in total and/or per PFT • Vegetation cover in total and/or per PFT • Yield • Leaf area index • Any other measurements (e.g. plant heights, number of plants) **Extent/resolution:** • at minimum one date (ideally, several dates) • for each of the four PFT[6] **Used for comparison** of various simulation outputs with observations on your field site

Any additional information is beneficial and can help to improve simulation results for your site and the accuracy of model predictions. These could be, for example:

I. **Site history**
- If sown experiment: amount of seeds sown for each PFT or species, sowing dates, any information on pre-treatments of the plot
- If established grassland: any information on the history of the plot

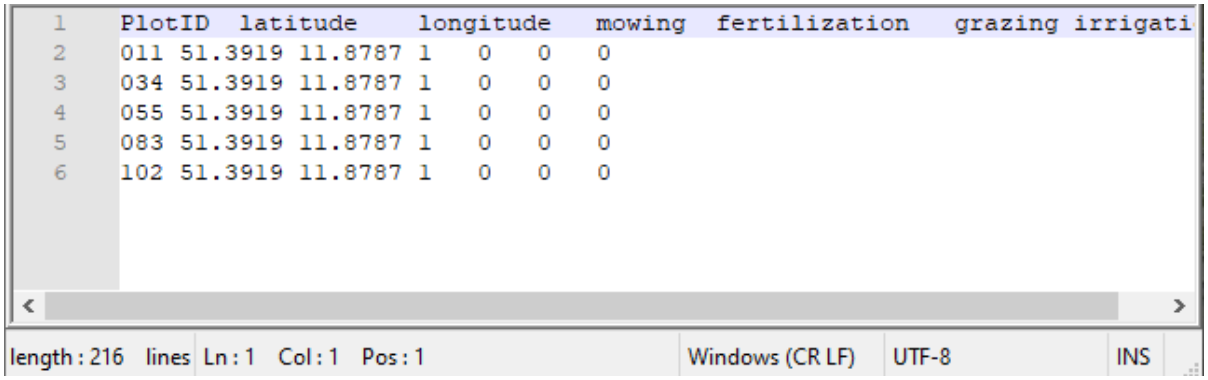
II. **Missing or site-specific aspects**
- Aspects so far not yet modelled or included in GRASSMIND. This could account for treatments like weeding or CO2 fertilization, or for site-specific attributes like slopes of alpine grasslands.

3. How to prepare your own data to be used for GRASSMIND?

In the following section, the file formats of relevant input files for GRASSMIND as well as the format of (required and possible additional) observation data from your grassland site are described.

3.1 Basic information

Basic information on your site and the respective plot(s) should be provided in a TXT-file (tab-separated) with the following format and specifications:



File Format: TXT
File name: DEIMS.iD_PlotInfo.txt,
e.g. 102ae489-04e3-481d-97df-45905837dc1a_PlotInfo.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: `PlotID latitude longitude mowing fertilization grazing irrigation`

Lines: each row below the header represents the basic information of each plot included for your specific site

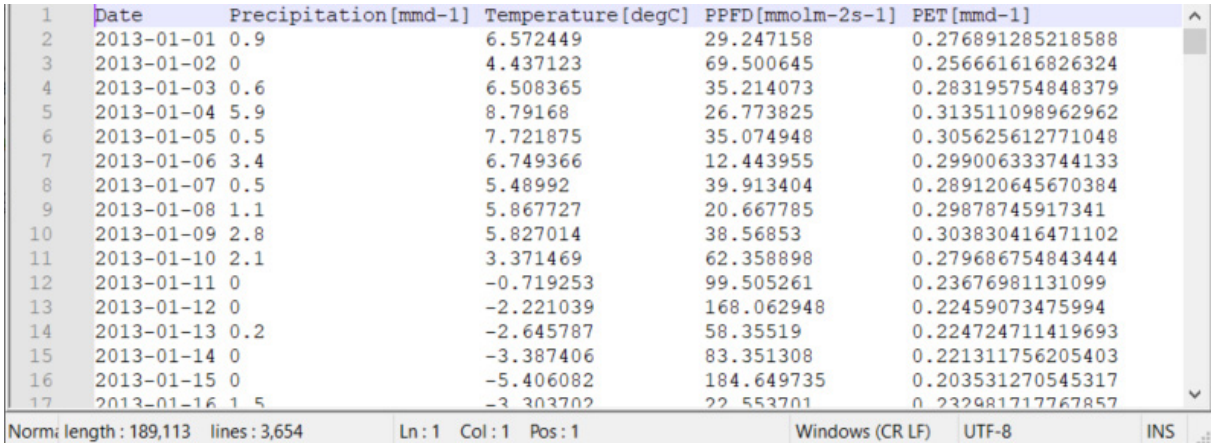
Columns: the following columns should include plot-specific information on
- *PlotID* = a unique identifier to differentiate the plots included for your site
- *latitude* = geographical latitude of the plot (decimal unit)
- *longitude* = geographical longitude of the plot (decimal unit)
- *mowing* = value of either 0 (no mowing) or 1 (mowing) as management action
- *fertilization* = value of either 0 (no fertilization) or 1 (fertilization) as management action
- *grazing* = value of either 0 (no grazing) or 1 (grazing) as management action

- *irrigation* = value of either 0 (no irrigation) or 1 (irrigation) as management action

Please use the DEIMS.iD of your site (cf. https://deims.org/) in the filename (cf. example above).

3.2 Weather data

Weather data are required as a TXT-file (tab-separated) with the following format and specifications:



	Date	Precipitation[mmd-1]	Temperature[degC]	PPFD[mmolm-2s-1]	PET[mmd-1]
2	2013-01-01	0.9	6.572449	29.247158	0.276891285218588
3	2013-01-02	0	4.437123	69.500645	0.256661616826324
4	2013-01-03	0.6	6.508365	35.214073	0.283195754848379
5	2013-01-04	5.9	8.79168	26.773825	0.313511098962962
6	2013-01-05	0.5	7.721875	35.074948	0.305625612771048
7	2013-01-06	3.4	6.749366	12.443955	0.299006333744133
8	2013-01-07	0.5	5.48992	39.913404	0.289120645670384
9	2013-01-08	1.1	5.867727	20.667785	0.29878745917341
10	2013-01-09	2.8	5.827014	38.56853	0.303830416471102
11	2013-01-10	2.1	3.371469	62.358898	0.279686754843444
12	2013-01-11	0	-0.719253	99.505261	0.23676981131099
13	2013-01-12	0	-2.221039	168.062948	0.22459073475994
14	2013-01-13	0.2	-2.645787	58.35519	0.224724711419693
15	2013-01-14	0	-3.387406	83.351308	0.221311756205403
16	2013-01-15	0	-5.406082	184.649735	0.203531270545317
17	2013-01-16	1.5	-3.303702	22.553701	0.232981717767857

Norma length : 189,113 lines : 3,654 Ln : 1 Col : 1 Pos : 1 Windows (CR LF) UTF-8 INS

File format: TXT
File name: DEIMS.iD_PlotID_Weather.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: `Date Precipitation[mmd-1] Temperature[degC] PPFD[mmolm-2s-1] PET[mmd-1]`

Lines: each row below the header represents the weather data of 1 day of model simulation
- first line below the header = 1st day of the envisaged simulation period
- last line in the file = last day of the envisaged simulation period
- leap years are included

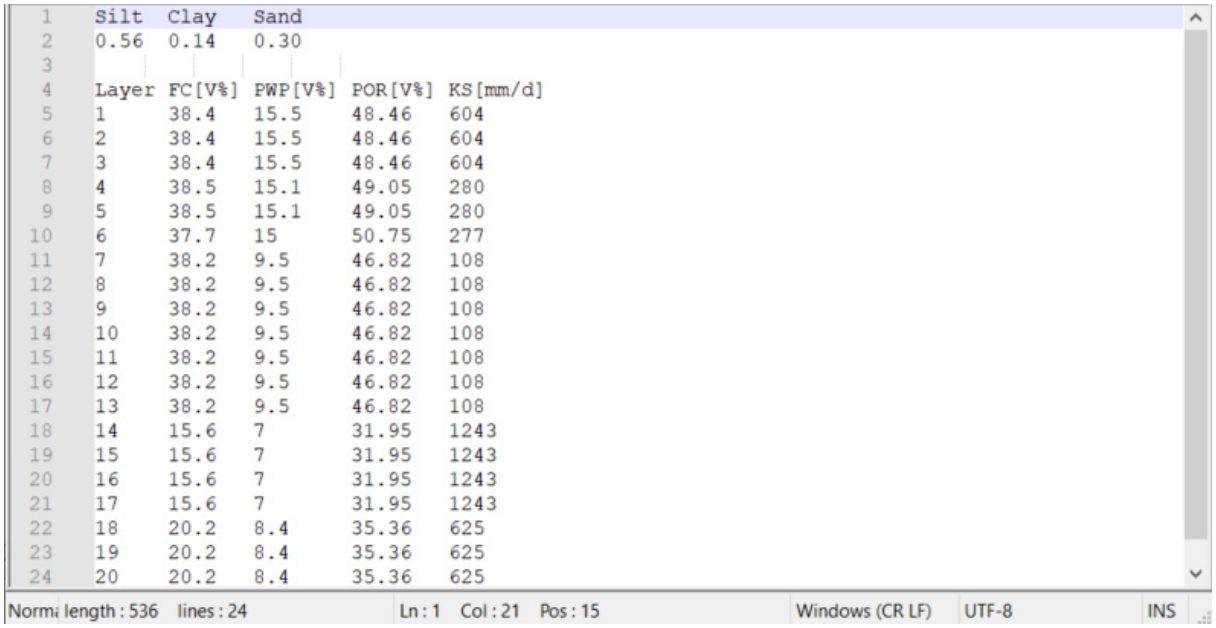
Columns: weather variables include the following columns
- *Date* = date of observed weather variables (format: yyyy-mm-dd)
- *Precipitation* = daily sum of rainfall (unit: mm per day)
- *Temperature* = daily mean air temperature (unit: C°), e.g. measured at about 1 m height
- *PPFD* = daily mean photosynthetic photon flux density (unit: μmol_{photon} per m^2 per s)
- *PET* = potential evapotranspiration (unit: mm per day)

Calculations of the daily mean or sum of weather variables consider the full day of 24 hours.

You can contact us for support on *PET* calculation from other weather variables or for unit conversion to *PPFD*.

3.3 Soil data

Soil data are required as a TXT-file (tab-separated) with the following format and specifications:



	Silt	Clay	Sand		
2	0.56	0.14	0.30		
3					
4	Layer	FC[V%]	PWP[V%]	POR[V%]	KS[mm/d]
5	1	38.4	15.5	48.46	604
6	2	38.4	15.5	48.46	604
7	3	38.4	15.5	48.46	604
8	4	38.5	15.1	49.05	280
9	5	38.5	15.1	49.05	280
10	6	37.7	15	50.75	277
11	7	38.2	9.5	46.82	108
12	8	38.2	9.5	46.82	108
13	9	38.2	9.5	46.82	108
14	10	38.2	9.5	46.82	108
15	11	38.2	9.5	46.82	108
16	12	38.2	9.5	46.82	108
17	13	38.2	9.5	46.82	108
18	14	15.6	7	31.95	1243
19	15	15.6	7	31.95	1243
20	16	15.6	7	31.95	1243
21	17	15.6	7	31.95	1243
22	18	20.2	8.4	35.36	625
23	19	20.2	8.4	35.36	625
24	20	20.2	8.4	35.36	625

Norma length : 536 lines : 24 Ln : 1 Col : 21 Pos : 15 Windows (CR LF) UTF-8 INS

File format: TXT
File name: DEIMS.iD_PlotID_Soil.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: 1st line: `Silt Clay Sand`
4th line: `Layer FC[V%] PWP[V%] POR[V%] KS[mm/d]`

Lines: each row provides static soil properties in total (2nd line) or for each soil layer (5th – 24th lines)

- 2nd line: fractions of silt, clay and sand (should sum to 1)
- 5th – 24th line: properties for the respective soil layers of 10 cm depth, starting from the top (0-10 cm, 5th line) to the bottom soil layer (190 – 200 cm, 24th line)

Columns: soil variables include the following columns

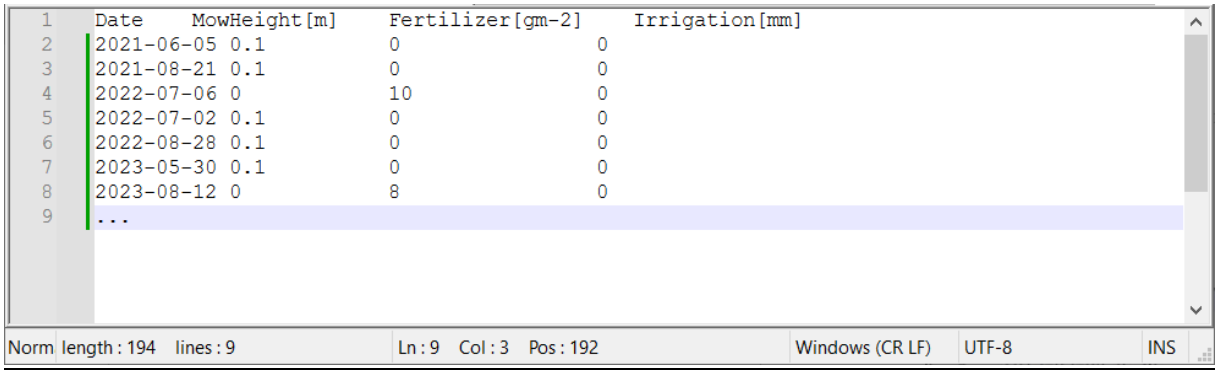
- *Layer* = soil layer number (numbered from top to bottom), in total 20 layers each 10 cm deep (all following variables given for each layer)
- *FC* = field capacity (unit: V% of the soil volume)
- *PWP* = permanent wilting point (unit: V% of the soil volume)
- *POR* = soil porosity, i.e. pore volume (unit: V% of the soil volume)
- *KS* = saturated hydraulic conductivity (unit: mm per day)

Note that soil texture refers to the entire soil volume of 2 m depth and fractions of sand, silt and clay should sum up to one. All other properties are required for each soil layer. If this information is not available per soil layer but for the total soil volume, the same values can be entered for each soil layer.

You can contact us for support on estimations of soil properties based on soil texture for specific soil layers.

3.4 Management data

Management information is required as a TXT-file (tab-separated) with the following format and specifications:



Date	MowHeight[m]	Fertilizer[gm-2]	Irrigation[mm]
2021-06-05	0.1	0	0
2021-08-21	0.1	0	0
2022-07-06	0	10	0
2022-07-02	0.1	0	0
2022-08-28	0.1	0	0
2023-05-30	0.1	0	0
2023-08-12	0	8	0
...			

Norm length : 194 lines : 9 | Ln : 9 Col : 3 Pos : 192 | Windows (CR LF) | UTF-8 | INS

File format: TXT
File name: DEIMS.iD_PlotID_Management.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: `Date MowHeight[m] Fertilizer[gm-2] Irrigation[mm]`

Lines: each row below the header represents one day-specific event of a respective management action (in temporal order of occurrence within the simulation period)

Columns: management variables include the following columns

- *Date* = date of the respective management action (format: yyyy-mm-dd)
- *MowHeight* = height to which the grassland is cut down (unit: m) (> 0 if mowing is done, = 0 for no mowing on this day)
- *Fertilizer* = added amount of nitrogen to the topsoil layer (unit: g/m²) (> 0 if fertilization is done, = 0 for no fertilization on this day)
- *Irrigation* = added water to the topsoil layer (unit: mm) (> 0 if irrigation is done, = 0 for no irrigation on this day)

You may either use separate lines if more than one management action on the same day are planned (e.g. on 2015-06-22 in the screenshot above) or also combine several management actions on the same day in one line.

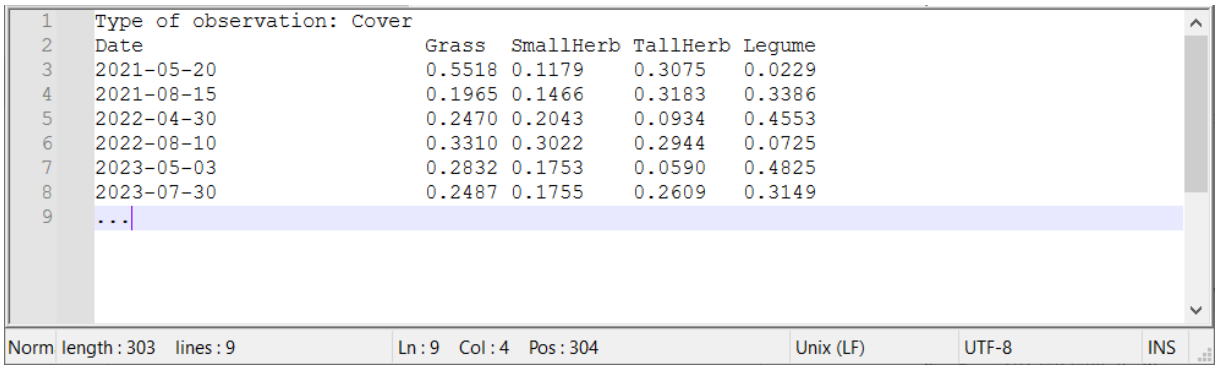
3.5 Grassland observation data

In the following subsections, different characteristics of grasslands are described that may have been measured. For your site, please go to the respective subsection for instructions on how to prepare the data files for comparison with model simulation results:

- **Plant species composition (*required)**: subsection 3.5.1
- **Vegetation cover**: subsection 3.5.2
- **Aboveground biomass**: subsection 3.5.3
- **Yield**: subsection 3.5.4
- **Leaf area index**: subsection 3.5.5
- **Any other measure**: subsection 3.5.6

3.5.1 Plant species composition

Plant species composition should be provided as **relative abundances of each PFT for at minimum one date (ideally, several dates)**. The data file should be provided as a TXT-file (tab-separated) with the following format and specifications:



```
1  Type of observation: Cover
2  Date                    Grass   SmallHerb TallHerb Legume
3  2021-05-20              0.5518  0.1179    0.3075   0.0229
4  2021-08-15              0.1965  0.1466    0.3183   0.3386
5  2022-04-30              0.2470  0.2043    0.0934   0.4553
6  2022-08-10              0.3310  0.3022    0.2944   0.0725
7  2023-05-03              0.2832  0.1753    0.0590   0.4825
8  2023-07-30              0.2487  0.1755    0.2609   0.3149
9  ...
```

Norm length : 303 lines : 9 | Ln : 9 Col : 4 Pos : 304 | Unix (LF) | UTF-8 | INS

File format: TXT
File name: DEIMS.iD_PlotID_RelativeAbundance.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: 1st line: `Type of observation:`
2nd line: `Date Grass SmallHerb TallHerb Legumes`

Lines: each row below the header represents one day-specific event of a measurements in the field referring to the observations (in a temporal order of its occurrence within the simulation period).

Columns:

- *Date* = date of the respective measurement (format: yyyy-mm-dd)
- *Grass* = relative abundance of all plant species assigned to PFT *Grasses* (unit: -)
- *SmallHerb* = relative abundance of all plant species assigned to PFT *SmallHerbs* (unit: -)
- *TallHerb* = relative abundance of all plant species assigned to PFT *TallHerbs* (unit: -)
- *Legume* = relative abundance of all plant species assigned to PFT *Legumes* (unit: -)

If relative abundances are recorded for each plant species, we can support you in grouping them into plant functional types (PFTs) based on their scientific Latin names. Relative abundance can be calculated based on different measurements (e.g. number of plants, biomass, cover, or other), so please also provide this information to us in order to do a correct comparison with the model simulations (type after colon in first header line *Type of observation*).

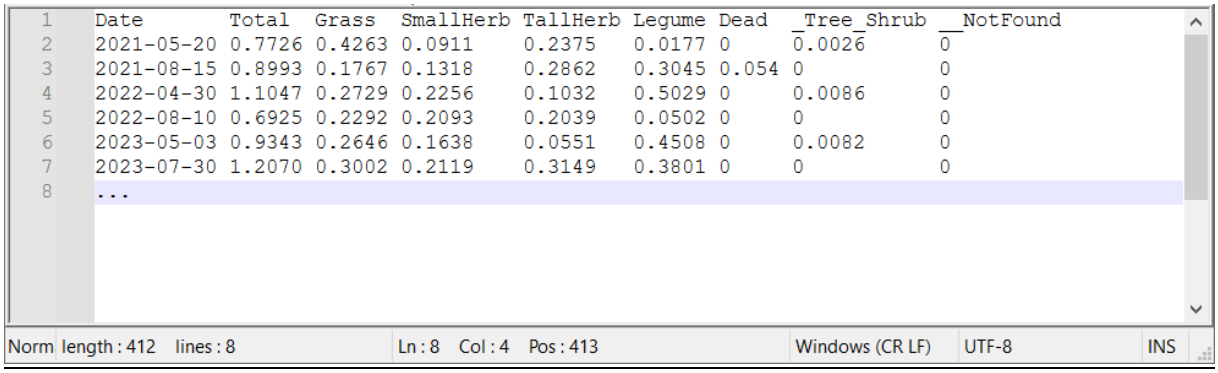
In the example above, we used the vegetation cover as observation type for the calculation of relative abundance of each PFT as follows:

$$RelativeAbundance_{PFT} = \frac{Cover(PFT)}{\sum_{all\ PFTs} Cover(PFT)}$$

Note that relative abundances of the four PFTs per observation date should sum up to 1. Missing values should be set to NaN.

3.5.2 Vegetation cover

Information can be provided as a TXT-file (tab-separated) with the following format and specifications:



Date	Total	Grass	SmallHerb	TallHerb	Legume	Dead	_Tree_Shrub	__NotFound
2021-05-20	0.7726	0.4263	0.0911	0.2375	0.0177	0	0.0026	0
2021-08-15	0.8993	0.1767	0.1318	0.2862	0.3045	0.054	0	0
2022-04-30	1.1047	0.2729	0.2256	0.1032	0.5029	0	0.0086	0
2022-08-10	0.6925	0.2292	0.2093	0.2039	0.0502	0	0	0
2023-05-03	0.9343	0.2646	0.1638	0.0551	0.4508	0	0.0082	0
2023-07-30	1.2070	0.3002	0.2119	0.3149	0.3801	0	0	0
...								

File format: TXT
File name: DEIMS.iD_PlotID_Cover.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: `Date Total Grass SmallHerb TallHerb Legume Dead _Tree_Shrub __NotFound`

Lines: each row below the header represents one day of the respective observation (in temporal order of occurrence within the simulation period)

Columns: observation variables include the following columns

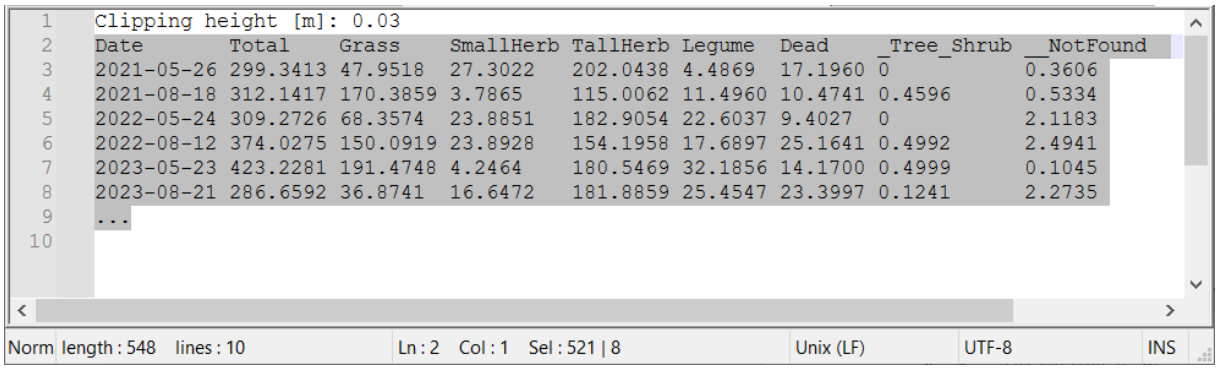
- *Date* = date of the respective observation (format: yyyy-mm-dd)
- *Total* = cover of vegetation (unit: -)
- *Grass* = cover of vegetation assigned to PFT *Grasses* only (unit: -)
- *SmallHerb* = cover of vegetation assigned to PFT *SmallHerbs* only (unit: -)
- *TallHerb* = cover of vegetation assigned to PFT TallHerbs only (unit: -)
- *Legume* = cover of vegetation assigned to PFT *Legumes* only (unit: -)
- *Dead* = cover of dead vegetation (irrespective of PFTs) (unit: -)
- *_Tree_Shrub* = cover of any woody vegetation (e.g. trees or shrubs) (unit: -)
- *__NotFound* = cover of any non-woody vegetation that could not be assigned to the respective four PFTs (e.g. mosses) (unit: -)

Note that the *Total* cover need not equal the sum of cover of the four PFTs per observation date as they may have been measured independently. All values for cover should relate to the ground area considered. If you have measured only parts of the variables, please add NaN for those not measured. Missing values should also be set to NaN.

The measurements of *Grass*, *SmallHerb*, *TallHerb* and *Legume* can be used for deriving the relative abundances of PFTs (see subsection 3.5.1 on plant species composition; *Type of observation*: Cover).

3.5.3 Aboveground biomass

Information can be provided as a TXT-file (tab-separated) with the following format and specifications:



```
Clipping height [m]: 0.03
Date       Total    Grass    SmallHerb TallHerb Legume  Dead     _Tree_Shrub __NotFound
2021-05-26 299.3413 47.9518  27.3022   202.0438 4.4869  17.1960  0           0.3606
2021-08-18 312.1417 170.3859 3.7865    115.0062 11.4960 10.4741  0.4596      0.5334
2022-05-24 309.2726 68.3574  23.8851   182.9054 22.6037 9.4027   0           2.1183
2022-08-12 374.0275 150.0919 23.8928   154.1958 17.6897 25.1641  0.4992      2.4941
2023-05-23 423.2281 191.4748 4.2464    180.5469 32.1856 14.1700  0.4999      0.1045
2023-08-21 286.6592 36.8741  16.6472   181.8859 25.4547 23.3997  0.1241      2.2735
...
```

Norm length : 548 lines : 10 | Ln : 2 Col : 1 Sel : 521 | 8 | Unix (LF) | UTF-8 | INS

File format: TXT
File name: DEIMS.iD_PlotID_Biomass.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: 1st line: `Clipping height [cm]:`
2nd line: `Date Total Grass SmallHerb TallHerb Legume Dead _Tree_Shrub __NotFound`

Lines: each row below the header represents one day of the respective observation (in temporal order of occurrence within the simulation period)

Columns: observation variables include the following columns

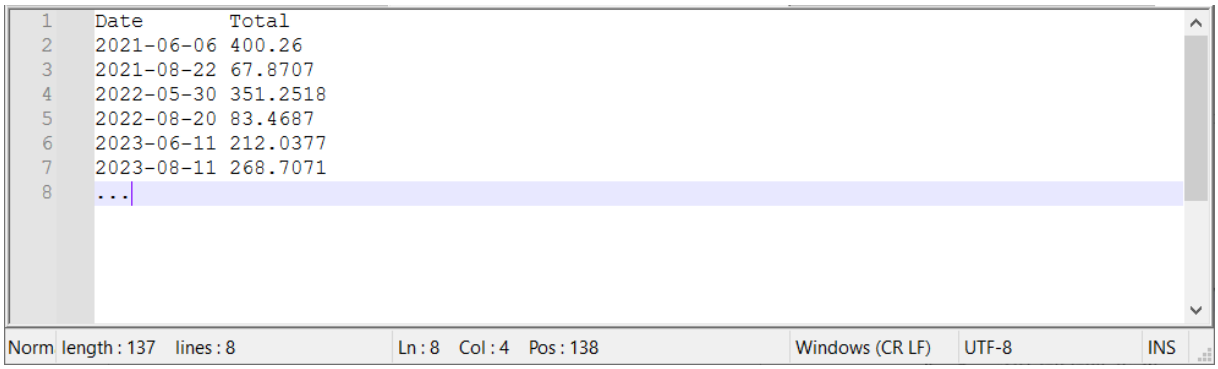
- *Date* = date of the respective observation (format: yyyy-mm-dd)
- *Total* = total aboveground biomass of vegetation (unit: g_{ODM} per m^2)
- *Grass* = aboveground biomass of vegetation assigned to PFT *Grasses* only (unit: g_{ODM} per m^2)
- *SmallHerb* = aboveground biomass of vegetation assigned to PFT *SmallHerbs* only (unit: g_{ODM} per m^2)
- *TallHerb* = aboveground biomass of vegetation assigned to PFT *TallHerbs* only (unit: g_{ODM} per m^2)
- *Legume* = aboveground biomass of vegetation assigned to PFT *Legumes* only (unit: g_{ODM} per m^2)
- *Dead* = aboveground biomass of dead vegetation (irrespective of PFTs) (unit: g_{ODM} per m^2)
- *_Tree_Shrub* = aboveground biomass of any woody vegetation (e.g. trees or shrubs) (unit: g_{ODM} per m^2)
- *__NotFound* = aboveground biomass of any non-woody vegetation that could not be assigned to the respective four PFTs (e.g. mosses) (unit: g_{ODM} per m^2)

Note that the sum of aboveground biomass of the four PFTs and the *Dead* biomass per observation date should equal the *Total* aboveground biomass. If present, additional biomass from species assigned to *_Tree_Shrub* or *__NotFound* should NOT be included in the *Total* aboveground biomass. Please also add the information at which height biomass was clipped for measurements (add after colon in first header line *Clipping height*). If you have measured only parts of the variables, please add NaN for those not measured. Missing values should also be set to NaN.

The measurements of *Grass*, *SmallHerb*, *TallHerb* and *Legume* can be used for deriving the relative abundances of PFTs (see subsection 3.5.1 on plant species composition; *Type of observation*: Biomass).

3.5.4 Yield

Information can be provided as a TXT-file (tab-separated) with the following format and specifications:



File format: TXT
File name: DEIMS.iD_PlotID_Yield.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: `Date Total`

Lines: each row below the header represents one day of the respective observation (in temporal order of occurrence within the simulation period)

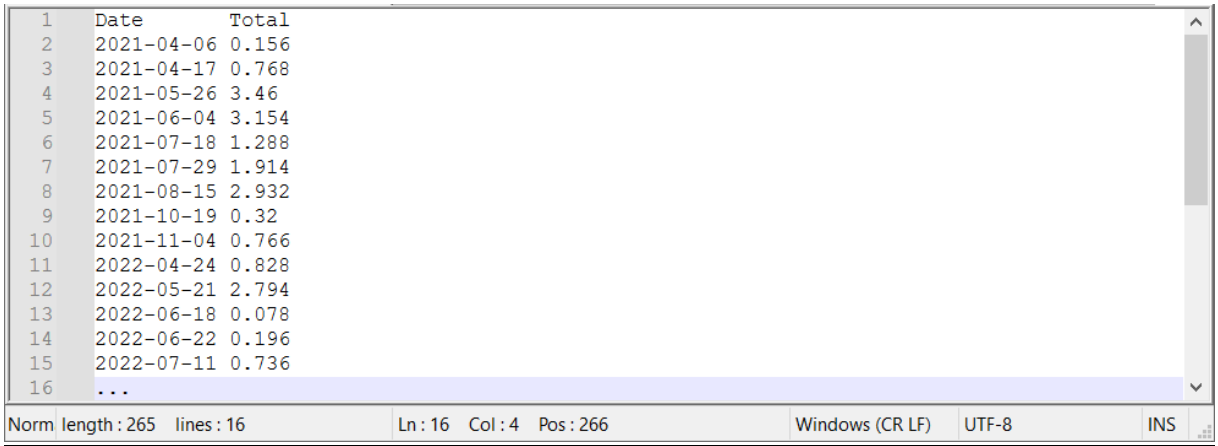
Columns: observation variables include the following columns

- *Date* = date of the respective observation (format: yyyy-mm-dd)
- *Total* = total yield (or mown aboveground biomass) of vegetation (unit: g_{ODM} per m^2)

Note that yield (or mown aboveground biomass) refers to the cutting height defined in the management file (section 3.4).Missing values should be set to NaN.

3.5.5 Leaf area index

Information can be provided as a TXT-file (tab-separated) with the following format and specifications:



File format: TXT
File name: DEIMS.iD_PlotID_LAI.txt
Separator: \t (tab)
Decimal representation: . (dot)
Header: `Date Total`

Lines: each row below the header represents one day of the respective observation (in temporal order of occurrence within the simulation period)

Columns: observation variables include the following columns

- *Date* = date of the respective observation (format: yyyy-mm-dd)
- *Total* = leaf area index of vegetation (unit: m² per m²)

Missing values should be set to NaN.

3.5.6 Any other observations of grassland vegetation

Additional measurements might encompass the number of plants (individuals), vegetation height or any other observation not listed above. If you would like to add such information for the comparison of model simulations with your data, please contact us. You may also prepare already own TXT-files (tab-separated) with a file structure comparable to the files described above (with one TXT-file for each additional type of observation).

3.5.7 Additional plot or site information

Please add any additional information on specific characteristics, treatments or history of your site or plots into a plain TXT-file. This could be, for example, details on whether the plot has been sown at a specific date, weeded, or fertilized with CO2, or any site-specific characteristics that might influence plant growth (located on a slope, located nearby agricultural fields sprayed with pesticides, …).

3.6 Examples and templates

You can find exemplary TXT-files (of the above presented screenshots) as well as templates for preparing your own data in the following cloud folder:

cloud link and password available upon request

4. Where can you upload your data?

Please zip the prepared files of your own data (including the DEIMS.iD also in the zip-file name) and upload it to the following cloud folder:

cloud link and password available upon request

5. Where can you get support?

In order to get support, please contact the developer team via mail.

Franziska.taubert@ufz.de (https://www.ufz.de/index.php?en=36648)
Thomas.banitz@ufz.de (https://www.ufz.de/index.php?de=36586)

More information (model description, exemplary simulation studies and open source code) can be downloaded at: https://www.ufz.de/index.php?en=48444

Please note, as GRASSMIND is currently in a development stage, the source code, model description and exemplary simulation projects get updated regularly. If downloaded once, you will get notified by mail every time a new update is available.