

## Important observations of grassland sites for simulations with the grassland model GRASSMIND

### Background information on the GRASSMIND model:

- the model simulates temperate grasslands
- species-richness is captured by plant functional types (PFT): grasses, small herbs, tall herbs, legumes (the distinction of small and tall herbs is made at about 60 cm maximum plant height)
- currently, cutting and fertilization are included as management regimes (model is flexible in defining frequency, timing, cutting height and amount of fertilizer)
- soil resource dynamics on soil water and nitrogen are included which may limit plant growth and establishment
- daily weather data comprise PAR, air temperature, precipitation
- typical output variables of GRASSMIND include: yield, PFT composition (in terms of biomass, cover or plant numbers), aboveground biomass, soil carbon sequestration, ... (at individual plant-level, at PFT population level and community level)

The model is implemented in a modular way, which allows to extend its functionality and processes according to site conditions or application needs, e.g.

- grazing and irrigation as management regimes
- CO<sub>2</sub> effects
- phosphor limitation
- ...

We highly welcome feedback on desired processes that could be included into the GRASSMIND model. We further highly welcome grassland sites that currently may not yet be able to provide the minimal required information (see page 2), but would be interested in combining measurements of a grassland site with GRASSMIND in the future.

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More information (incl. source code): <https://www.ufz.de/index.php?en=48444> (note: source code, model description and simulation projects will be updated soon).

## Required observations from grassland sites to do a first test run with the GRASSMIND model:

### Minimal information required:

- **PFT composition:**
  - e.g. in % based on biomass, plant numbers, or cover etc.
  - concerning the 4 PFTs: grasses, small herbs, tall herbs, legumes and
  - the **exact date of observation** (minimum 1 point in time, a longer time-series would be beneficial)

### Example

DATE	1 JUNE 2020	1 SEPTEMBER 202	1 JUNE 2021	...
GRASSES	50%	35%	63%	
SMALL HERBS	20%	20%	15%	
TALL HERBS	5%	10%	16%	
LEGUMES	5%	10%	6%	

- **Basic background information:**
  - History: is it a sown grassland experiment or an (already existing) observational site?
  - Basic category of management:
    - natural (e.g. no anthropogenic management),
    - extensive management (e.g. 1-2 cutting per year, no fertilizer),
    - intensive management (e.g. 4-6 cutting per year, fertilizer input)

### Information of additional benefit (for increasing the predictive capacity of the model):

- **Additional grassland observations (time-series with exact dates of measurements), e.g.:**
  - aboveground biomass (total or per PFT),
  - yield,
  - vegetation height,
  - absolute vegetation cover (total or per PFT),
  - leaf area index,
  - ...
- **Additional site information:** daily weather variables, explicit management information, soil attributes and/or variables
  - Weather: PAR, air temperature, precipitation
  - Management: cutting (exact dates and cutting height), fertilization (exact dates and fertilizer amount)
  - Soil: soil type, permanent wilting point, field capacity, porosity, optional (for validation): measurements of soil carbon, mineral nitrogen and soil water (exact dates and amount including soil horizon/depth)
- **Additional background information** (e.g. on known processes so far not yet modelled in GRASSMIND), e.g.:
  - Grazing, Irrigation, ...
  - Experimental designs (e.g. sowing details, ...)
  - Experimental manipulations (e.g. weeding, CO2 fertilization, ...)