|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Module** | **Parameter** | **Argument** | **Unit** | **Default** |
| Time period define\_timeperiod() | Starting year1 | yr\_start |  |  |
| Ending year1 | yr\_end |  |  |
|  |  |  |  |  |
| Management management\_config() | Monthly distribution of plant C inputs2 | plant\_mth\_alloc | ‰ |  |
| Monthly distribution of manure inputs2 | manure\_mth\_alloc | ‰ |  |
| Fraction of manure to HUM3 | f\_man\_hum | ‰ | 0.192 |
|  |  |  |  |  |
| C inputs  define\_Cinputs() | From plants in the topsoil4 | Cin\_top | Mg/ha yr |  |
|  | From plants in the subpsoil4 | Cin\_sub | Mg/ha yr |  |
|  | From manure4 | Cin\_man | Mg/ha yr |  |
|  |  |  |  |  |
| Temperature prepare\_temperature() | Average monthly daily air temperature | Tave\_col | ◦C |  |
| Average monthly daily air amplitude | Trange\_col | ◦C |  |
|  |  |  |  |  |
| Soil  soil\_config() | Clay content in the topsoil6 | clay\_top, | ‰ |  |
| Clay content in the subsoil6 | clay\_sub | ‰ |  |
| Thermal diffusivity coefficient7 | phi | m2/day | 0.035 |
| Initial SOC content6 | Csoil\_init | Mg/ha |  |
| Proportion of C in topsoil8 | Cproptop | ‰ | 0.47 |
| Decomposition rate9,10,11 | k\_fom | Mg/mth | 0.12 |
| k\_hum | Mg/mth | 0.028 |
| k\_rom | Mg/mth | 3.86E-05 |
| Fraction of HUM to ROM12 | f\_romi | ‰ | 0.012 |
| Respiration fraction13 | f\_co2 | ‰ | 0.62 |
| Transport fraction14 | ftr | ‰ | 0.0025 |
|  |  |  | ‰ |  |
| Initial pool distribution initialize\_soil\_pools() | Pool initial distribution15 | f\_hum\_top | ‰ | 0.533 |
| f\_rom\_top | ‰ | 0.405 |
| f\_hum\_sub | ‰ | 0.387 |
| f\_rom\_sub | ‰ | 0.610 |
| Initial C/N | cn |  | 10 |
| 1The period is defined for the start and end year of the simulation, this multiplied by 12 to give the number of steps in the simulation correctly. | | | | | |
| 2As the C inputs are calculated annually; this vector determines the proportion of the annual estimate in each month. For grass crops, the distribution can be changed to a smoother one. Cereals = c(0,0,0,8,12,16,64,0,0,0,0,0,0)/100; Grass = c(1,1,2,7,12,15,17,16,14,9,5,1)/100; Manure = c(0,0,100,0,0,0,0,0,0,0,0,0,0,0,0)/100. | | | | | |
| 3The proportion of C in the organic fertiliser can be modified according to the origin of the material. Based on Thomsen et al. 2013: Feaces=0.1; Digested Feaces=0.63 and Digested Feed=0.39. | | | | | |
| 4Derived from allometric calculations, see equations 6 to 9. | | | | | |
| 5C inputs from organic fertilisation can be determined depending on the origin of the manure; see the farm manure report. | | | | | |
| 6If not counted with precise data in can be derived from soil type or taxonomy. | | | | | |
| 7 The diffusivity coefficient is the same for the complete simulation period. This parameter can vary with soil moisture and therefore soil texture. For Danish soil types, reference can be made to Schjønning (2021) and additional pedometric functions can be used following Arkhangelskaya and Lukyashchenko (2018). | | | | | |
| 8Proportion of C content in the first 25 cm depth, i.e. topsoil. | | | | | |
| 9The decay rate of FOM is based on research by Petersen (2003) who reported annual rates of 1.44 y-1. | | | | | |
| 10The decay rate of HUM was defined by calibration to the north-west European context by Petersen (2005). | | | | | |
| 11The decay rate of the ROM topsoil pool was calibrated to copy the 14C age of Askov soils "pre-bomb" measurements, Petersen (2003). | | | | | |
| 12The fraction of HUM going to ROM was determined so that under 'steady state' the proportion of C in the topsoil ROM is constant at 0.405. | | | | | |
| 13This was set as the 'romification' fraction in a steady state condition after a calibration excerpt in Petersen et al. 2005. | | | | | |
| 14The fraction of C that moves to the subsoil has been roughly estimated, inspired by a study by Sørensen (1987), where they used C-labelled barley straw to follow its decomposition in the soil and found 9-10% of the labelled C in the subsoil after 8 years. Then a value of 0.03 in annual basis was calculated. | | | | | |
| 15The proportion of the initial distribution of C in each of the pools is crucial. The default parameterisation responds to the same calibration exercise for the Danish condition from Petersen 2010. As the fractions in each depth layer are compositionally variable, only the major pools (HUM and ROM) should be parameterised. These can be modified by C/N content or use a default parameterisation from equation 11. Or they can be taken as a reference from the Danish conditions. | | | | | |