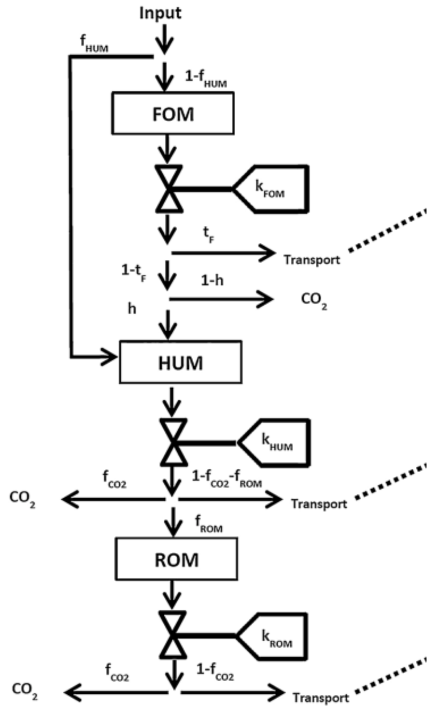
$$\frac{dx(t)}{dt} = \dot{x}(t) = I(t) \cdot b + x(t) \cdot re(t) \cdot A$$

Name

C-Tool 2.3 (Topsoil)



pool concept (topsoil) of C-Tool (from Taghizadeh-Toosi et al., 2014)

Important publications

(Taghizadeh-Toosi et al., 2014)

Special features

- FOM gets only discriminated between Crop derived and Manure alike
- The model has no water dependency
- Modelling of subsoil is possible.

Input distribution: b

Plant inputs enter completely into FOM. Manure (and other Amendments?) have a part that is directly put into HUM. b: $(1\text{-}fHUM, fHUM, 0)^T$

fHUM: 0.358 – h

h: $1/(1.67 \cdot (1.85 + 1.6 \cdot e^{-7.86*clay}) + 1)$

Initialisation: $x(t_0)$

Initial partition between HUM and ROM (top and sub soil) is set to HUM: 0.595, ROM: 0.405

Environmental response: re(t)

re(t) is only dependent on the monthly Temperature:

re(t) = $7.24 * e^{-3.432+0.168 \cdot \frac{1-0.5*T}{36.9}}$

Mass Flow Matrix: A

Flow rates are in [a^{-1}]. Rows are flows into each pool; columns are flows from each pool. Shown values are for pure sand.

For field experiments with no information about the subsoil, we assume the subsoil to be in steady-state, so that the flows into are the same as from it to CO_2. The amount and decay rates for the model pools are then the same, only the amount of CO_2 might deviate from a model run with subsoil.

	CO_2	FOM_top	HUM_top	ROM_top
CO_2		1.233*	1.897e-2	4.63e-4
FOM_top		**-1.44**		
HUM_top		0.207*	**1.92e-2**	
ROM_top			0.023e-2	**-4.63e-4**

*texture dependent

References

Taghizadeh-Toosi, A., Christensen, B.T., Hutchings, N.J., Vejlin, J., Kätterer, T., Glendining, M., Olesen, J.E., 2014. C-TOOL: A simple model for simulating whole-profile carbon storage in temperate agricultural soils. Ecol. Model. 292, 11–25. https://doi.org/10.1016/j.ecolmodel.2014.08.016

Additional info

For incubation-experiments, we argue that there is subsoil and so the flows to the subsoil are recycled:

	CO_2	FOM_top	HUM_top	ROM_top
CO_2		1.19*	1.206e-2	2.9e-4
FOM_top		**-1.397**[+]		
HUM_top		0.207*	**1.229e-2**	
ROM_top			0.023e-2	**-2.9e-4**

*texture dependent, [+]would probably be fitted

The whole pool structure would be:

	CO_2	FOM_top	HUM_top	ROM_top	FOM_sub	HUM_sub	ROM_sub
CO_2		k*0.97*(1-h)	k*fCO2	k*fCO2	k*0.97*(1-h)	k*fCO2	k*fCO2
FOM_top		**-1.44**					
HUM_top		k*(1-tf) *h	**-0.0192**				
ROM_top			k*fROM	**-4.63e-4**			
FOM_sub		k*tf			**-1.44 + k*tf**		
HUM_sub			k*1-fCO2-fROM)		k*(1-tf) *h	**-0.0192**	
ROM_sub				k*(1-fCO2)			**-4.63e-4** + k*(1-fCO2)

tf (transport factor): 0.03, fCO_2 (CO_2 factor for HUM and ROM): 0.628, fROM (transport from HUM to ROM): 0.012

h: partitioning of C from FOM to CO2 and HUM. Dependent on the clay content:

$$h = 1/ (1.67 (1.85 + 1.60 \exp(-0.0786 \%clay)) +1)$$

Then h is formed HUM and (1-h) becomes CO_2.