

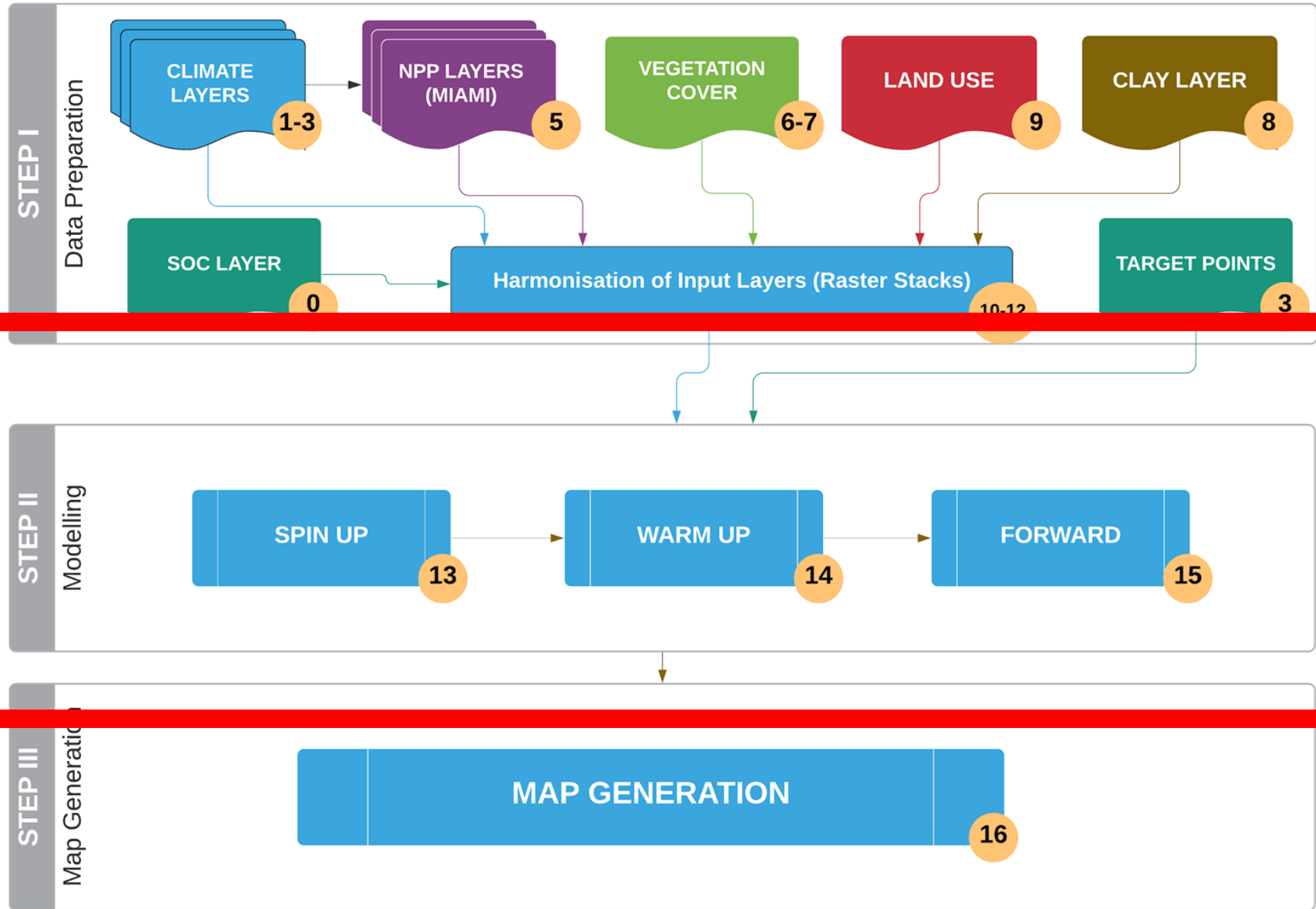


Food and Agriculture
Organization of the
United Nations

Global Soil Organic Carbon Sequestration Potential Map

GSOCseq | Running RothC in R
Isabel Luotto





SOC dynamics in RothC

The amount of SOC of each pool (Y) decomposes following an exponential decay function:

$$Y \cdot e^{-kt}$$

k = annual decomposition constant
 t = time, months $1/12$ (0,083)



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Decomposition rates

- **Constants (k)**, in years^{-1} , different for each pool:
- DPM (decomposable plant mat): **10.0** 0.1 years
- RPM (resistant plant material): **0.3**3.3 years
- BIO (microbial biomass): **0.66** 1.5 years
- HUM (Humified organic C) : **0.02** 50 years
- IOM (Inert)0.000000 α

SOC dynamics in RothC

... These **k** are affected by different factors:

$$Y \cdot e^{-kt} \quad \longrightarrow \quad Y \cdot e^{-k \cdot a \cdot b \cdot c \cdot t}$$

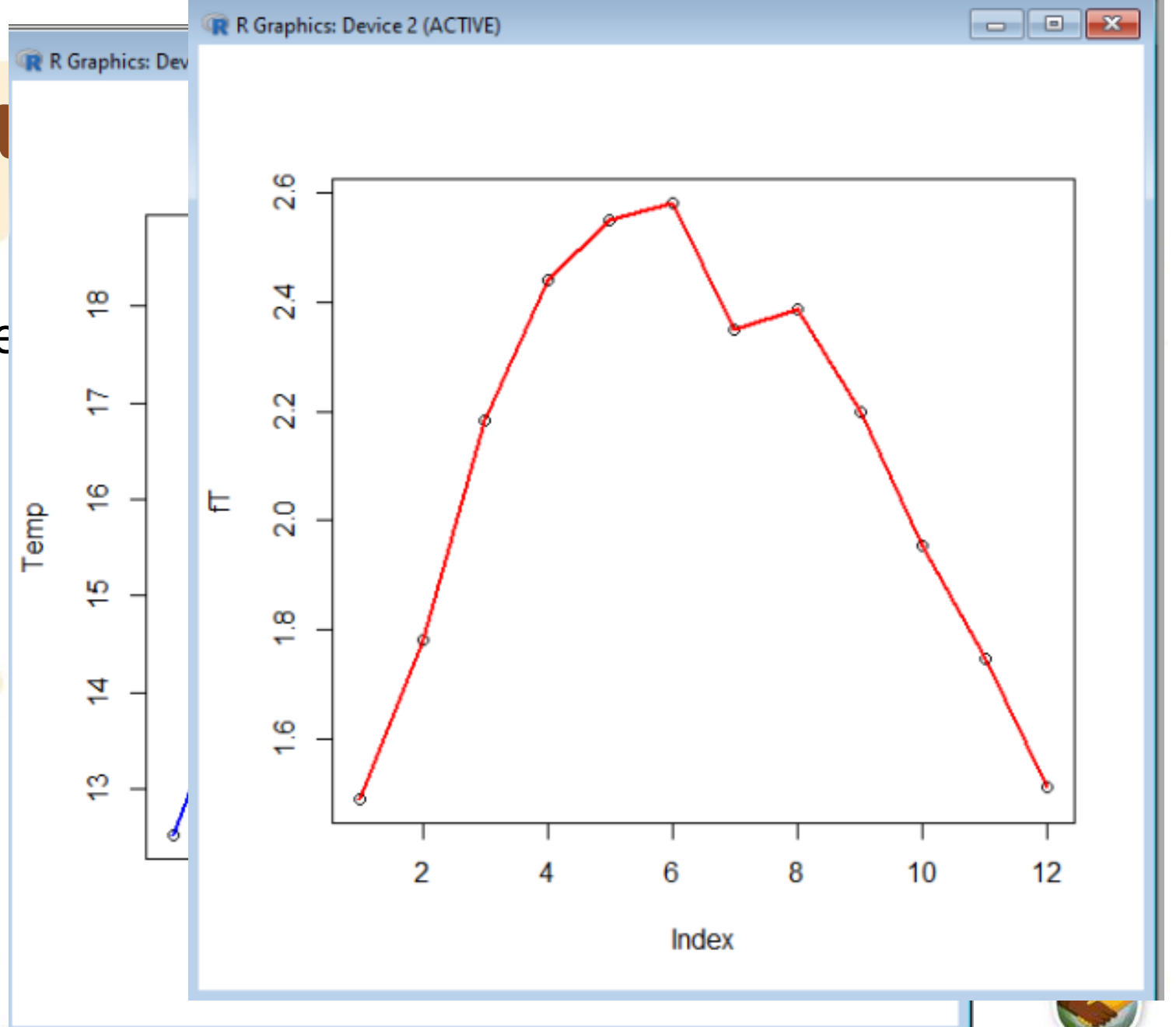
a= temperature factor

b= soil moisture factor

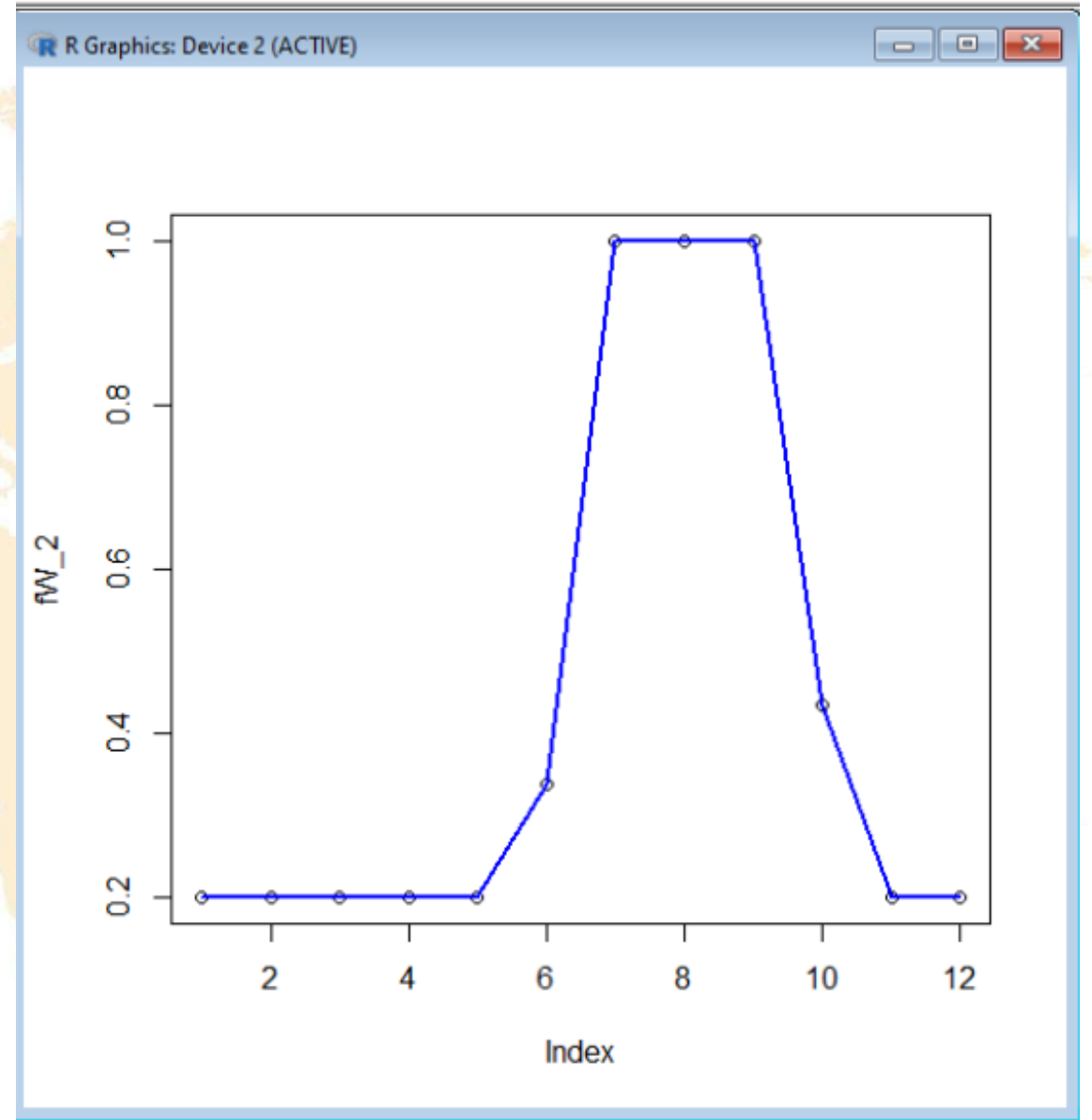
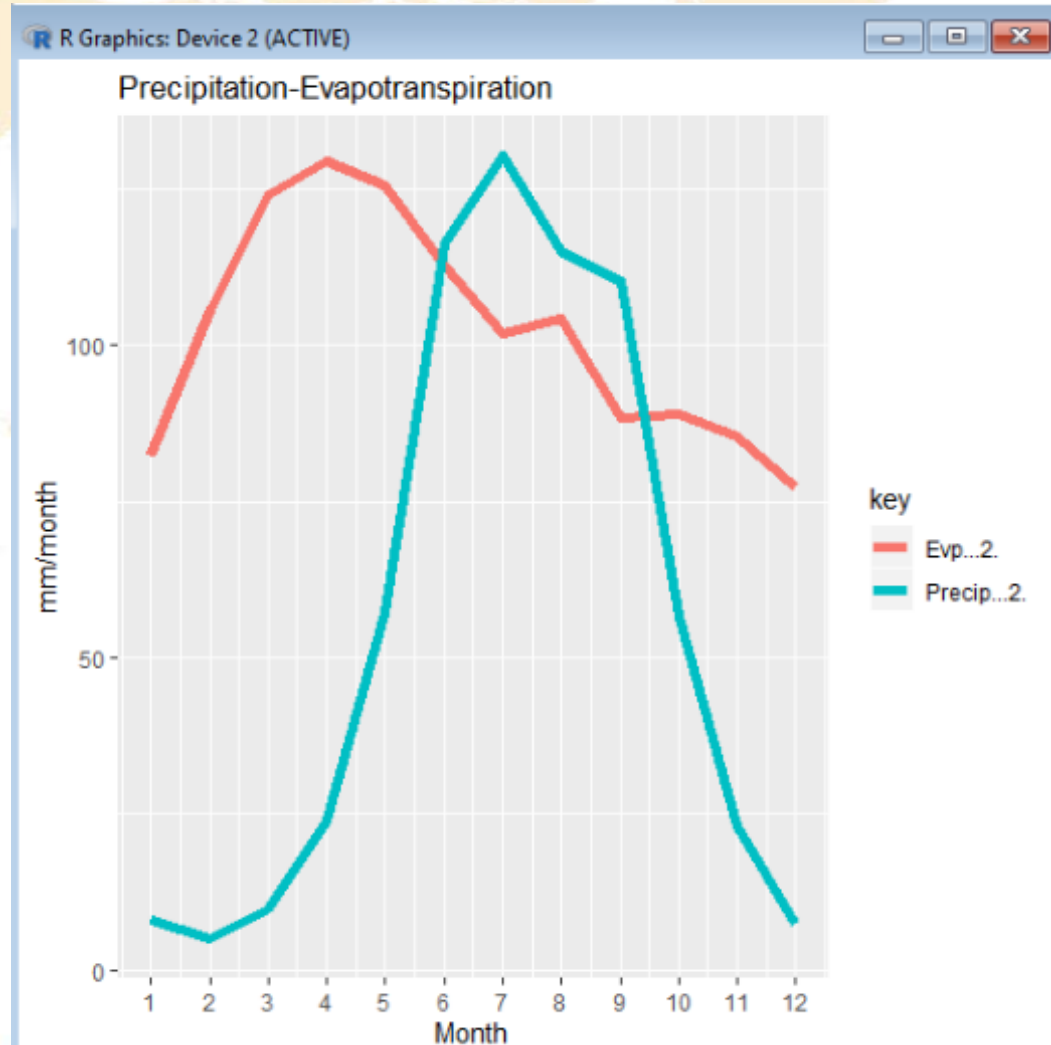
c= soil cover factor

Temperature fact

- #Temperature effects pe
- $fT = fT.RothC(Temp[,2])$

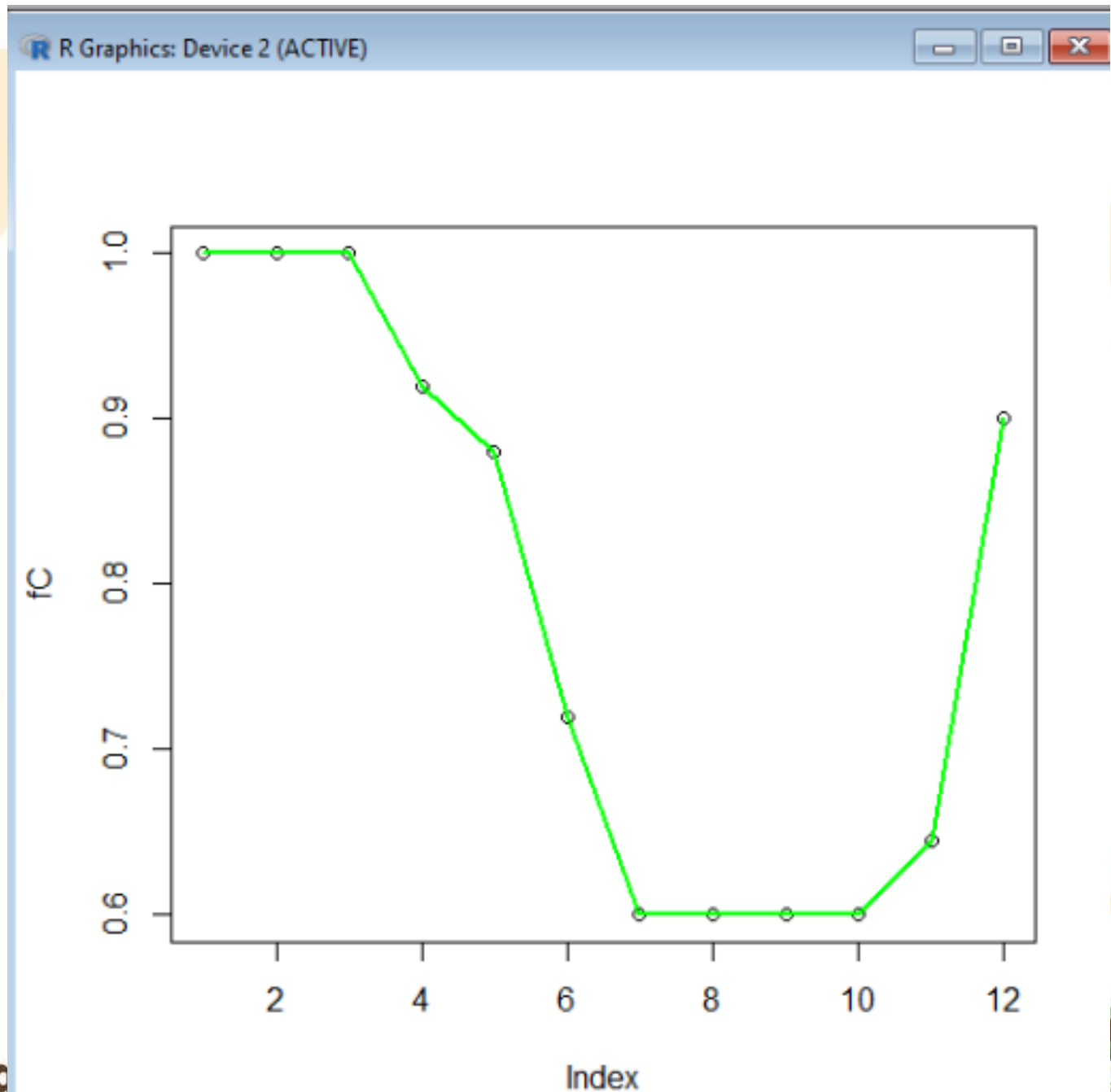


Moisture factor



Soil cover factor

Global Soil Organic Carbon Sec



SCRIPT NUMBER 13. ROTH C SPIN UP

Inputs:

Point vector with the locations to run the model. (empty vector, should come from the SOC MAP FAO, one point per pixel) (from QGIS PROCEDURE number 1)

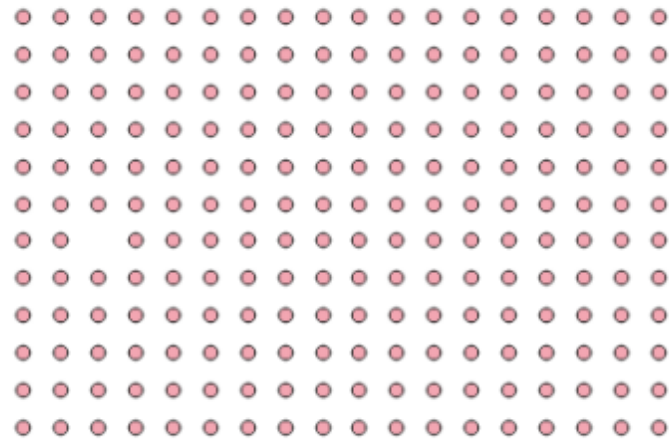
STACK LAYER (from script number 10) :

Stack_Set_SPIN_UP_[country_code].tif

Outputs :

C_INPUT_EQ.shp (contains the output of the model and the pedotransfer functions)

SPIN UP OUTPUTS:



1.2	2	Cnpt_EQ
1.2	3	SOC_pdt
1.2	4	DPM_pdt
1.2	5	RPM_pdt
1.2	6	BIO_pdt
1.2	7	HUM_pdt
1.2	8	IOM_pdt

1.2	9	Clnq_mn
1.2	10	Clnq_mx
1.2	11	SOC_min
1.2	12	DPM_min
1.2	13	RPM_min
1.2	14	BIO_min
1.2	15	HUM_min
1.2	16	IOM_min
1.2	17	SOC_max
1.2	18	DPM_max
1.2	19	RPM_max
1.2	20	BIO_max
1.2	21	HUM_max
1.2	22	IOM_max

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SCRIPT NUMBER 14. ROTH C WARM UP

Inputs:

Point vector with the locations to run the model. (empty vector, should come from the SOC MAP FAO, one point per pixel) (from QGIS PROCEDURE number 1)

C_INPUT_EQ.shp (from script number 13)

STACK LAYER (from script number 11) :
Stack_Set_WARM_UP_[country_code].tif

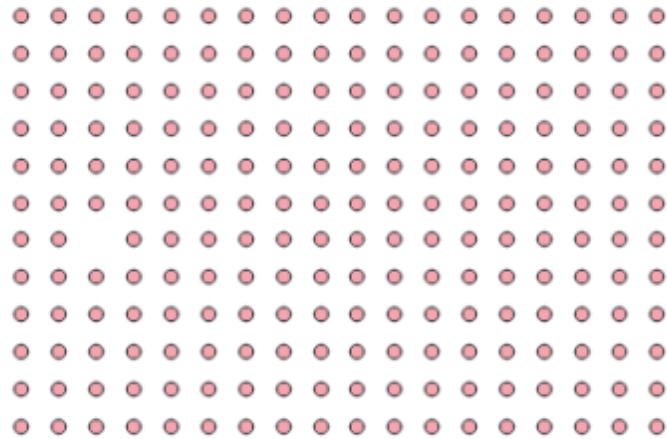
NPP LAYER(from script number 5):
NPP_MIAMI_MEAN_81-00_[country_code].tif

CRU LAYERS (from script number 2):
Prec_Stack_216_01-18_CRU.tif
Prec_Stack_216_01-18_CRU.tif
Prec_Stack_216_01-18_CRU.tif

Outputs :

WARM_UP.shp (contains the output of the model from 2000 to 2018)

WARM UP OUTPUT



1.2 3	SOC_T0
1.2 4	DPM_w_up
1.2 5	RPM_w_up
1.2 6	BIO_w_up
1.2 7	HUM_w_up
1.2 8	IOM_w_up
1.2 9	Cin_mean

1.2 10	SOC_18min
1.2 11	DPM_w_min
1.2 12	RPM_w_min
1.2 13	BIO_w_min
1.2 14	HUM_w_min
1.2 15	IOM_w_min
1.2 16	SOC_18max
1.2 17	DPM_w_max
1.2 18	RPM_w_max
1.2 19	BIO_w_max
1.2 20	HUM_w_max
1.2 21	IOM_w_max
1.2 22	Cin_min
1.2 23	Cin_max

Global Soil Organic Carbon Sequestration Potential Map



SCRIPT NUMBER 15. ROTH C FORWARD

Inputs:

Point vector with the locations to run the model. (empty vector, should come from the SOC MAP FAO, one point per pixel) (from QGIS PROCEDURE number 1)

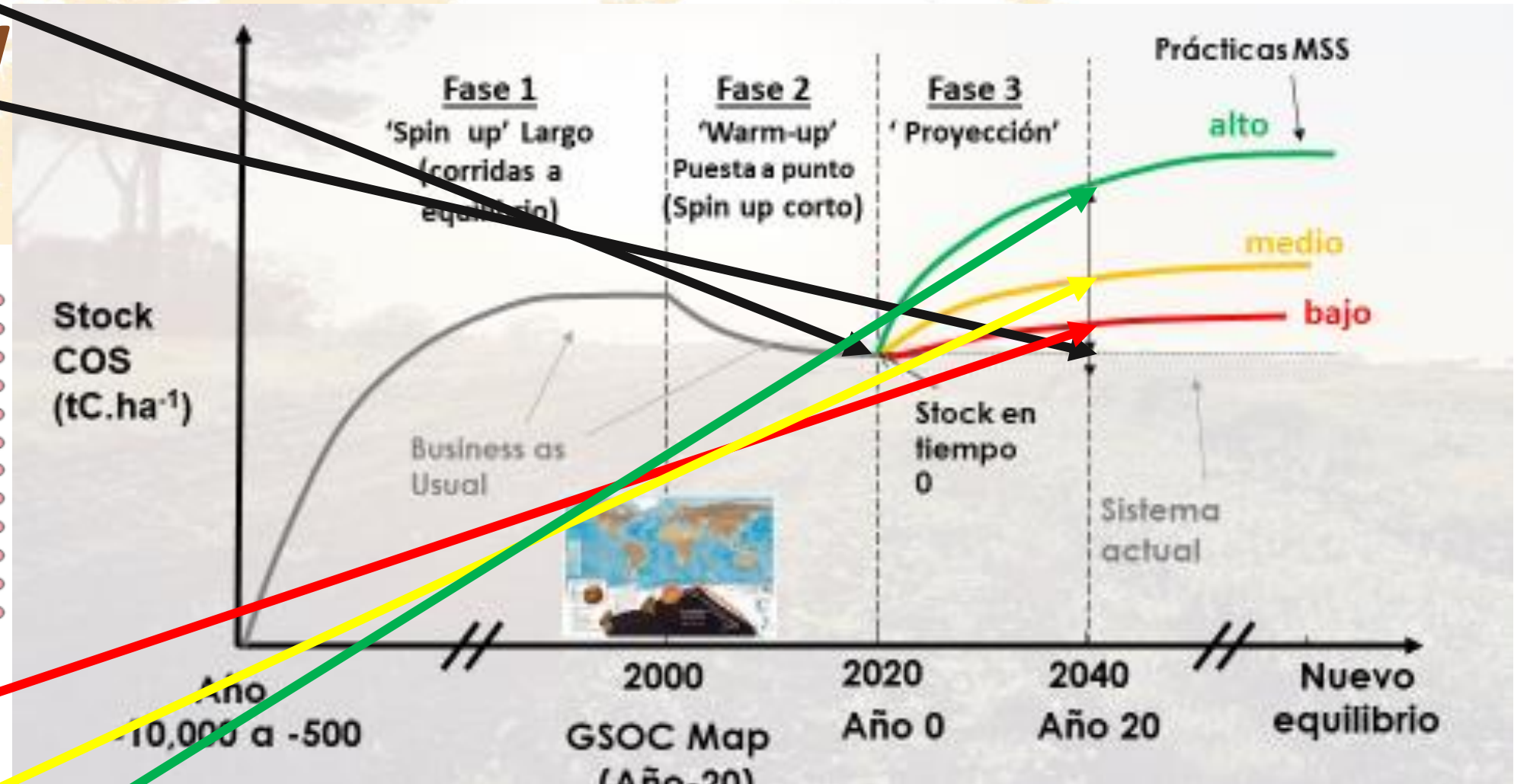
WARM_UP.shp (from script number 14)

STACK LAYER (from script number 12) :
Stack_Set_FOWARD_[country_code].tif

Outputs :

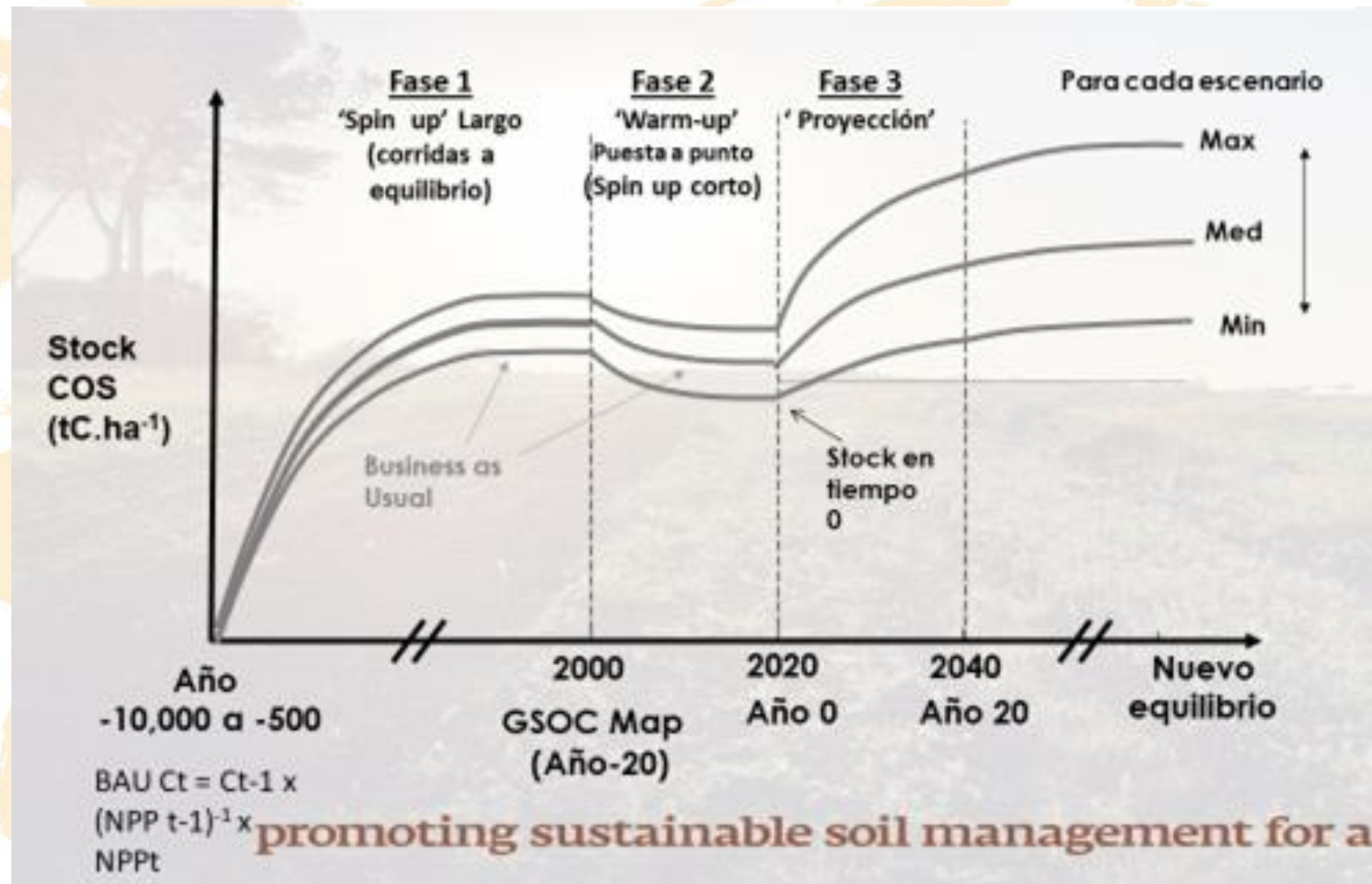
FOWARD_BAU_3E_20YEARS_[code country].shp
(contains the output of the model for Business as usual, and three future scenarios based on a carbon input improvement)

1.2 1	SOC	T0
1.2 2	SOC_BAU_20	
1.2 3	DPM_B	
1.2 4	RPM_B	
1.2 5	BIO_B	
1.2 6	HUM_B	
1.2 7	IOM_B	
1.2 8	LndUs	
1.2 9	Lw_Sc	
1.2 10	Md_Sc	
1.2 11	Hgh_S	



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1.2	12	SOC_BAU_	MIN
1.2	13	SOC_BAU_	MAX
1.2	14	Md_Scn_	MIN
1.2	15	Md_Scn_	MAX
1.2	16	SOC_2018_	MIN
1.2	17	SOC_2018_	MAX
1.2	18	UNC_B	
1.2	19	UNC_2	
1.2	20	UNC_S	



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