Global Soil Organic Carbon Sequestration Potential Map

GSOCseq

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Technical Workshops. 2020

Soil Organic Carbon Sequestration Maps

Day 3. Running Roth C Model in three steps

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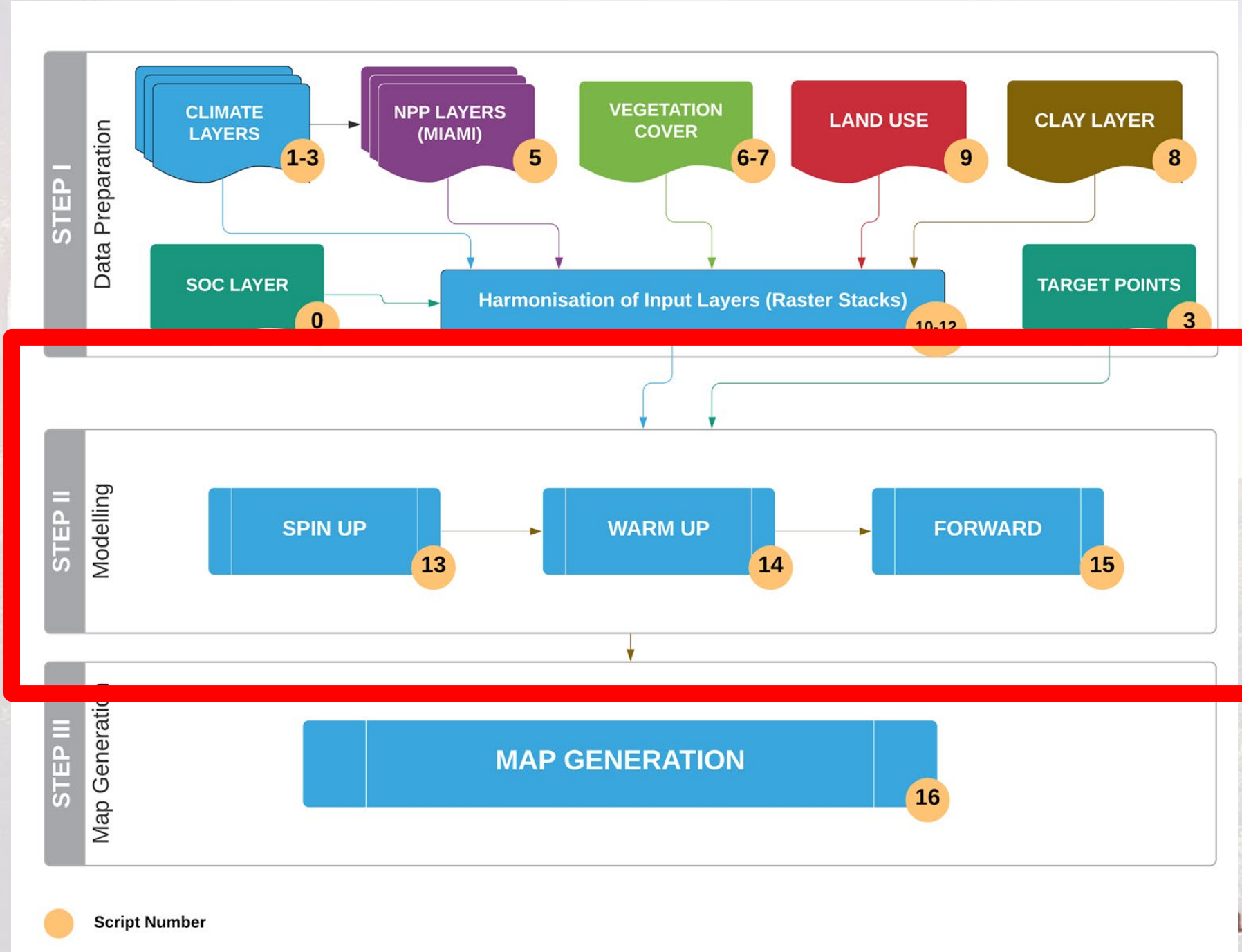
STEP I
Data Preparation
CLIMATE LAYERS
1-3
NPP LAYERS (MIAMI)
5
VEGETATION COVER
6-7
LAND USE
9
CLAY LAYER
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SOC LAYER
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Harmonisation of Input Layers (Raster Stacks)
10-12
TARGET POINTS
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STEP II
Modelling
SPIN UP
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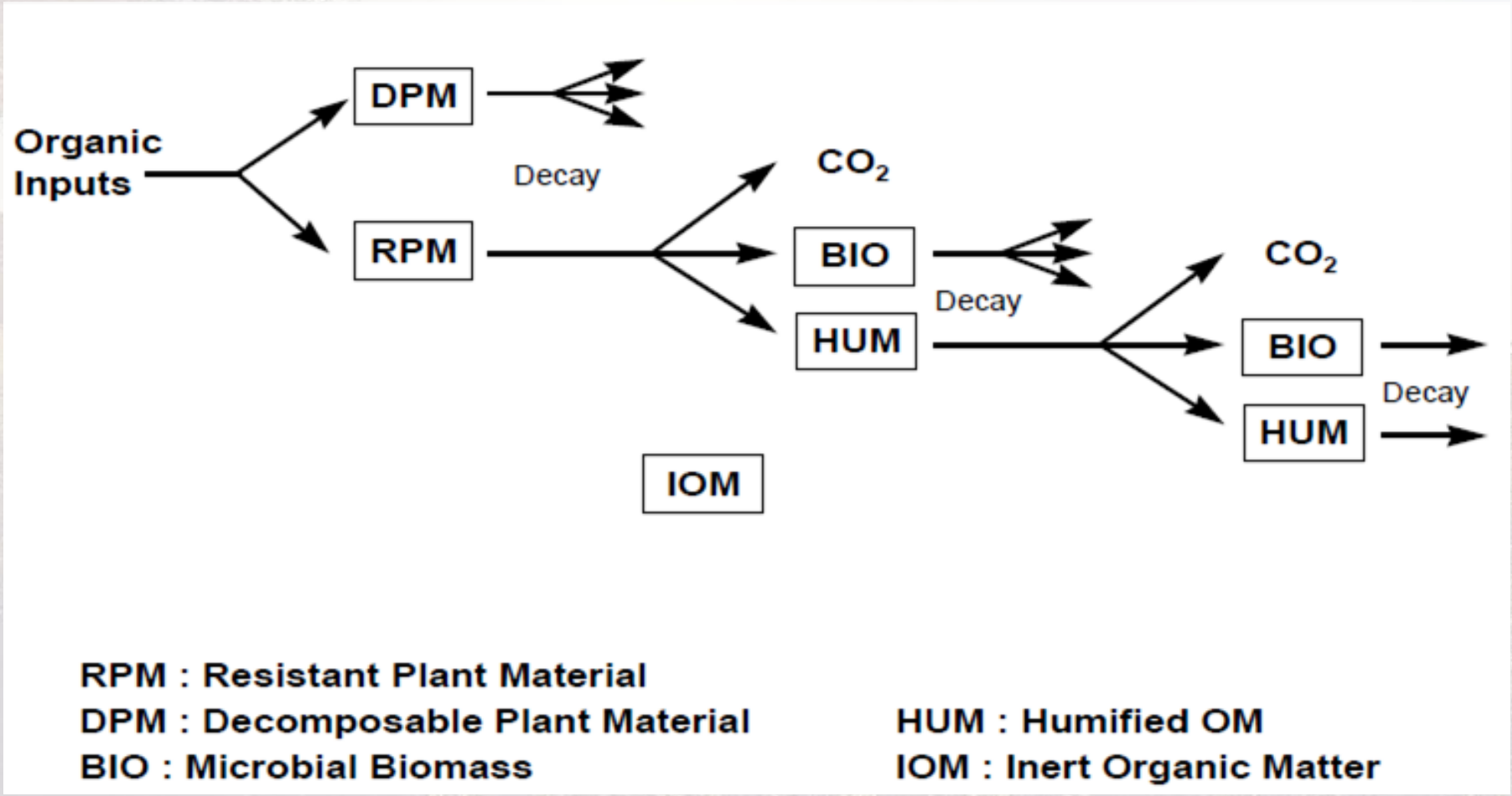
MAP GENERATION
16
Script Number

Model Structure



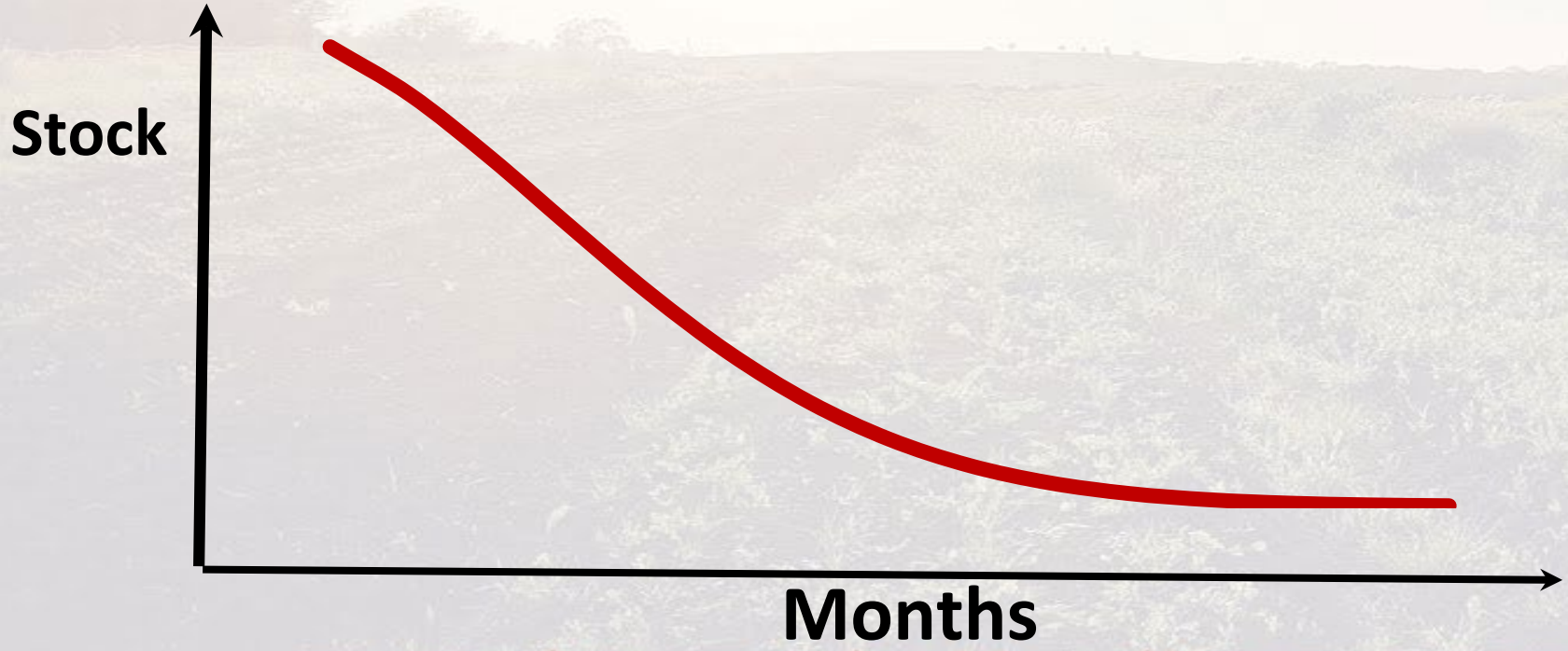
SOC dynamics in RothC

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)



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:

$$Y \cdot e^{-kt} \Rightarrow Y \cdot e^{-k.\,a.b.c.\,t}$$

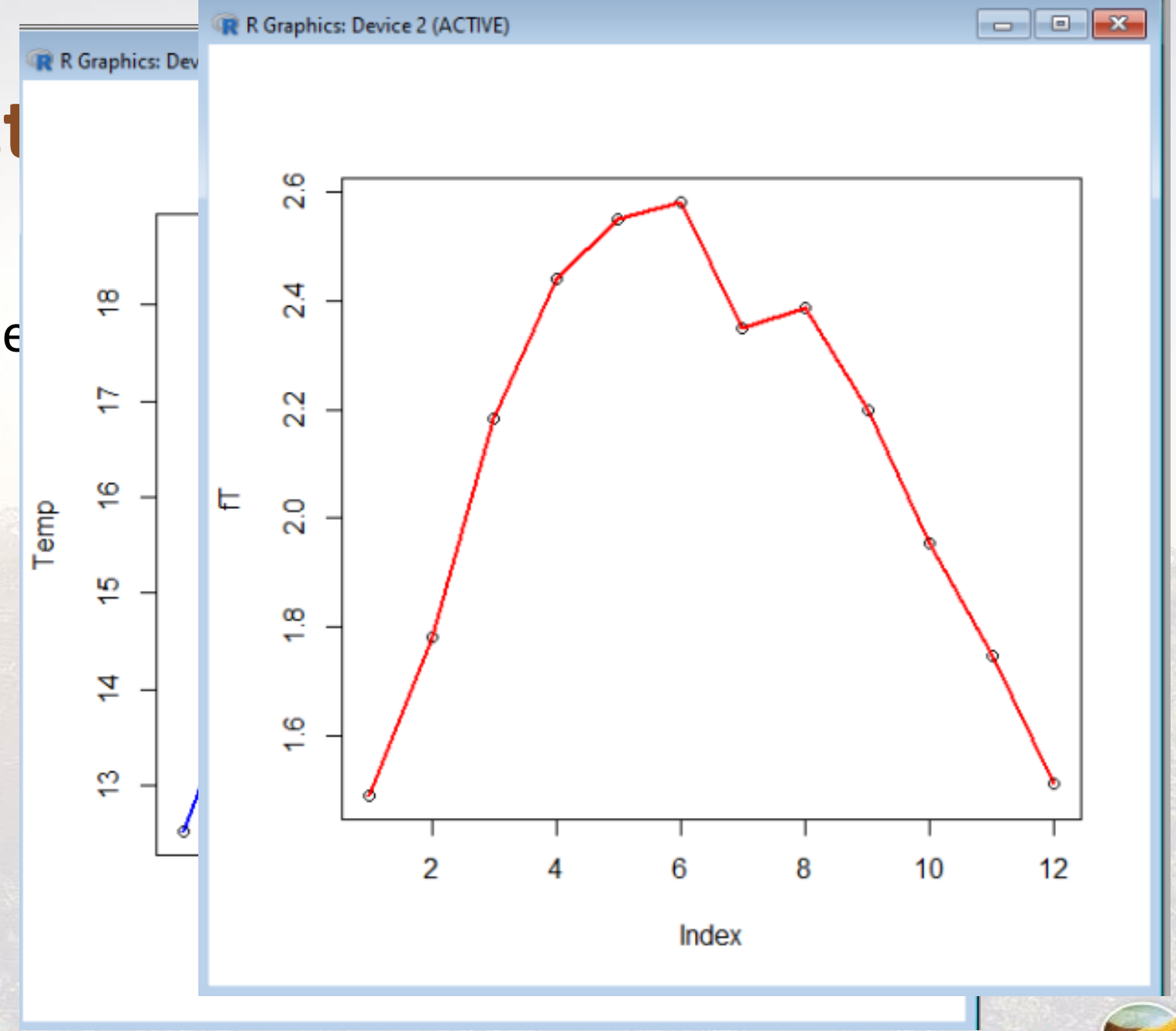
a= temperature factor

b= soil moisture factor

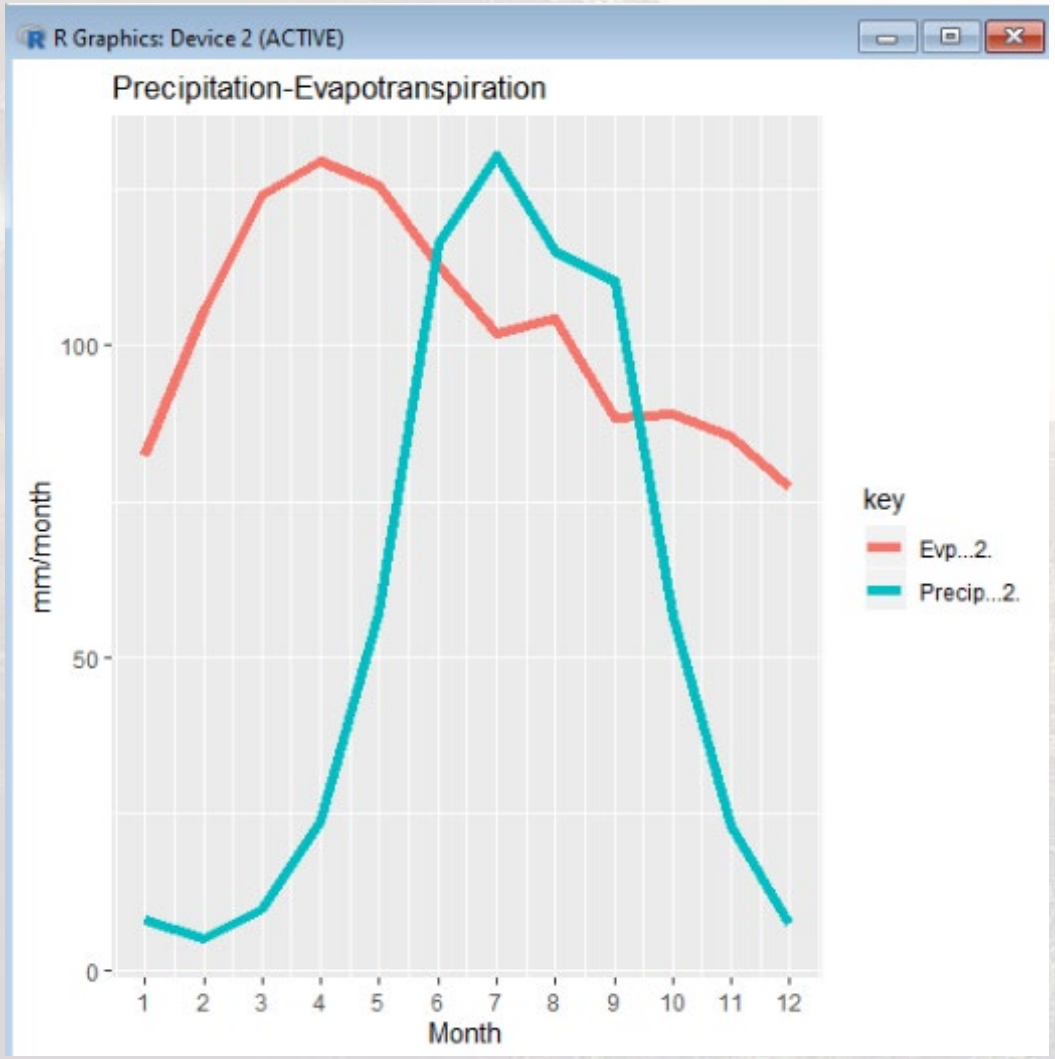
c= soil cover factor

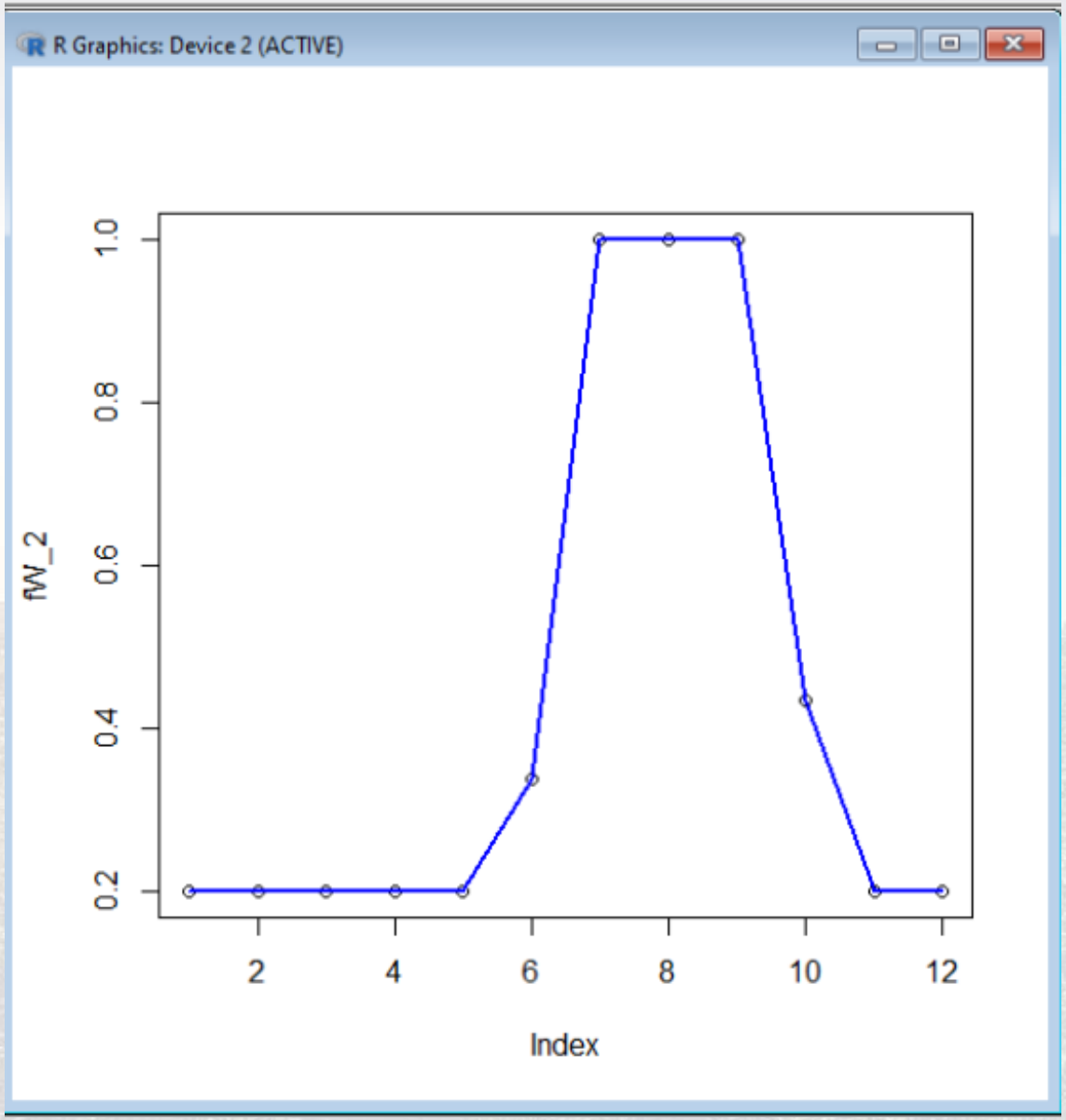
Temperature fact

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



Moisture factor





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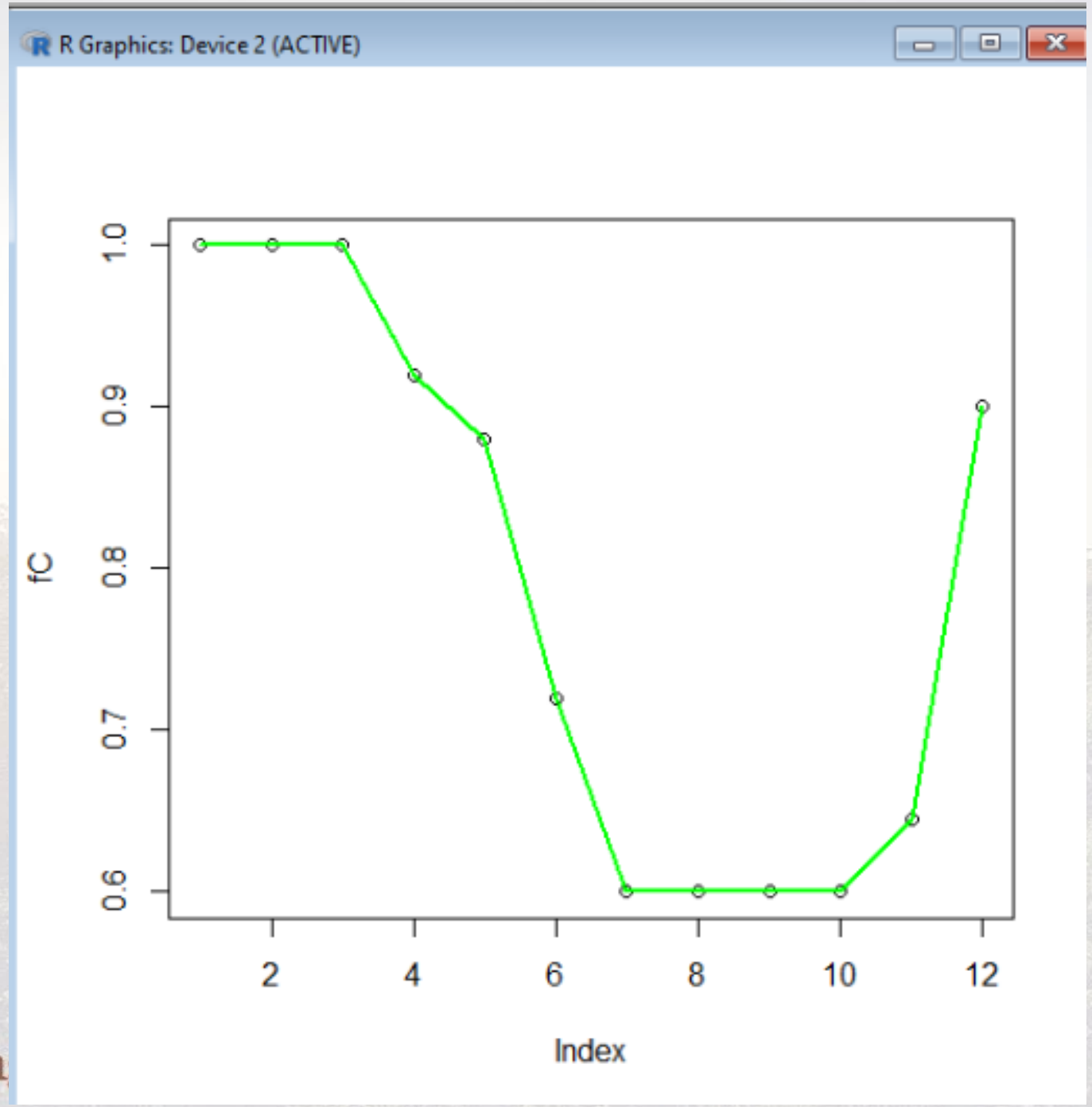
Soil cover factor



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SCRIPT NUMBER 13. ROTH C SPIN UP

Inputs:

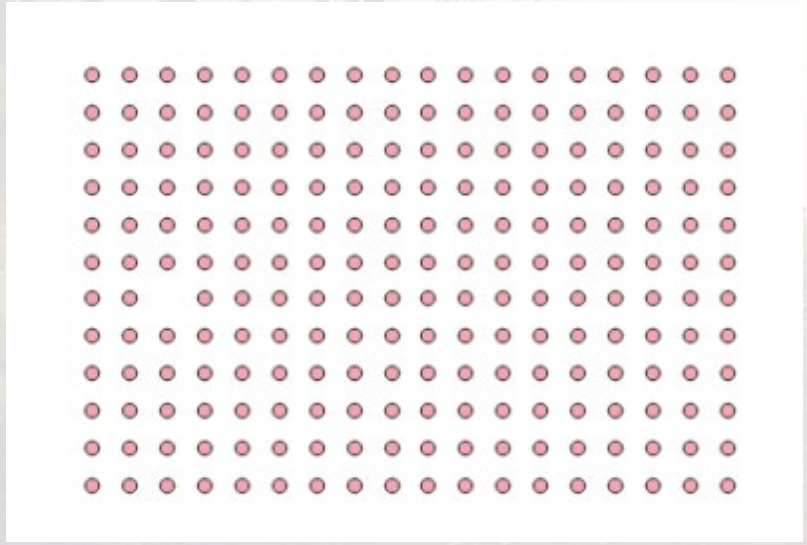
Point vector with the locations to run the model. (empty vector, should come from the SOC MAP FAO, one point per pixel) (from QGIS PROCEDURE number 1)

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

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

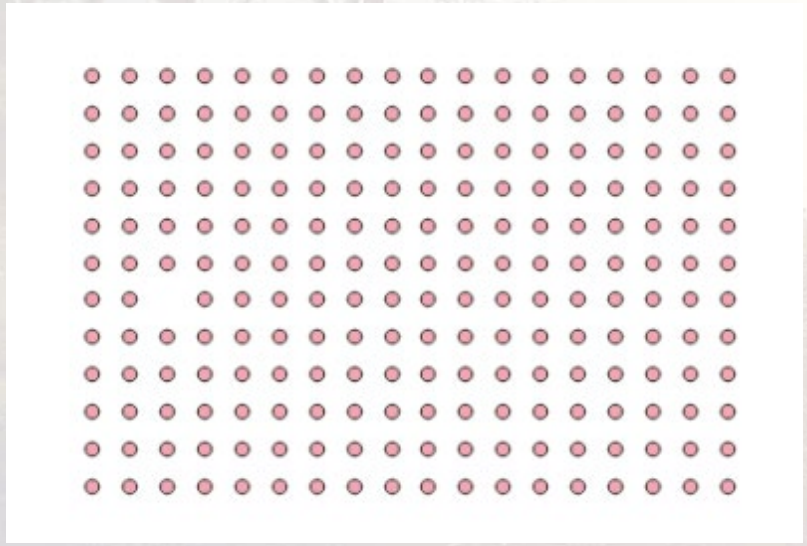
NPP LAYER(from script number 5):
NPP_MIAMI_MEAN_81-00_[country_code].tif

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 OUTPU



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

SCRIPT NUMBER 15. ROTH C FOWARD

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)

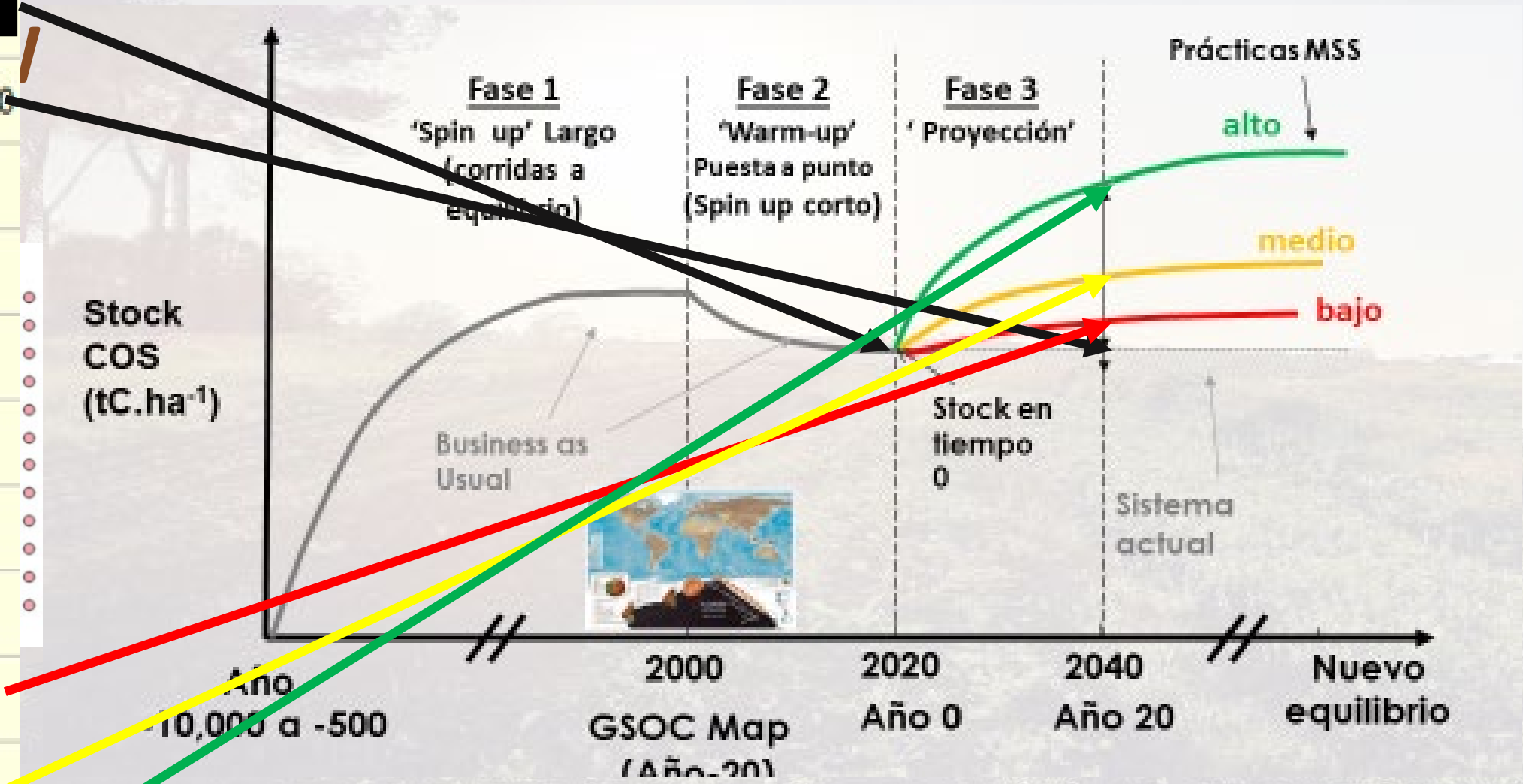
WARM_UP.shp (from script number 14)

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 Bussines as usual, and three future scenarios based on a carbon input improvement)

1.2	1	SOC_ T 0
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