GAS DIFFUSION

Carbon dioxide fertilisation of sport turf

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Gas Diffusie Modellen

1. Wij berekenen hoe snel zuurstof en koolzuurgas verplaatsts worden in bodem en water E N
2. Hoe dat te sturen is door water en luchtgehalte in te stellen.
3. Zodat: plotselinge tekorten (overmaat) vermeden worden.


Grolsch Grolsch

Table 10 The Millington formula for different AFP (as a measure for substrate air content).

Parameter	Value	Unit	Code	
A	-2		A	
B	3.3		B	
D0	1.76E-05	m2.s-1	C	
Max. day time O_2 use	1.34175	mg.h-1 gFW	D	
Oxygen outside*	300	g.m-3	E	
Oxygen inside	0	g.m-3	F	
Outside	0.05	m	G	
Inside	0	m	H	
Slab surface	0.3	m2	I	
Slab root FW	1000	g.m-2	J	

As the molar weight of oxygen is 32 g/mole, it follows there is 300 g oxygen per m3 air.

** t=TP^-2*AFP^3.3

Table 10 The Millington formula for different AFP (as a measure for substrate air content).

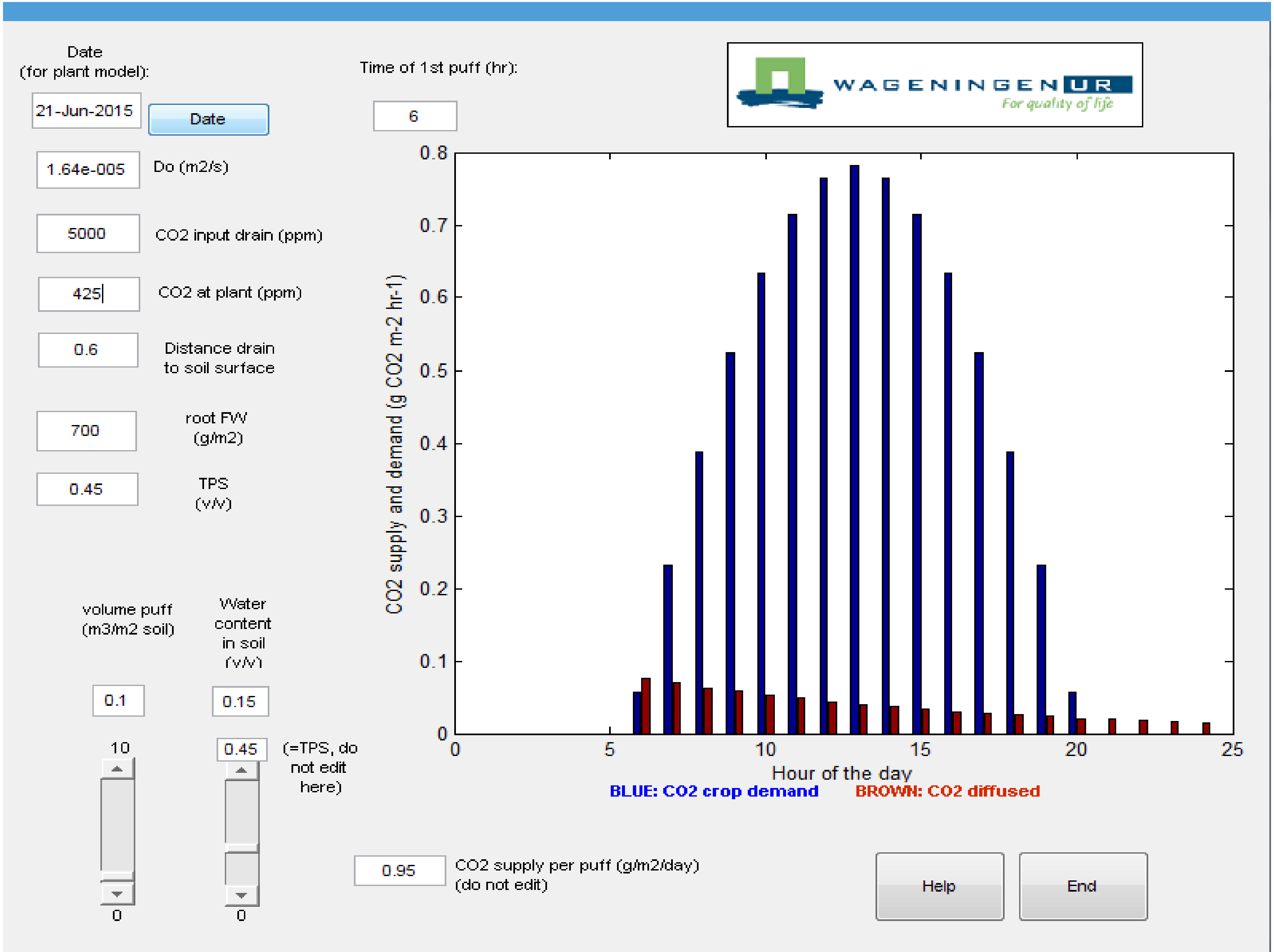
K	L	M	N	O	P	Q	R	S
		L^A*K^B	C*M	E-F	G-H	N*O/P	Q*3600*I	D*J/1000
AFP	TPS	t**	Dh	dC	dx	Flux	Flux slab	slab O2 use
v/v	v/v		m2.s-1	g.m−3	m	g.m-2.s-1	g.m-2.h-1	g.m-2.h-1
0.10	0.96	0.0005	1E-08	300	0.05	6E-05	0.06	1.34
0.20	0.96	0.0054	9E-08	300	0.05	6E-04	0.61	1.34
0.30	0.96	0.0204	4E-07	300	0.05	2E-03	2.33	1.34
0.40	0.96	0.0528	9E-07	300	0.05	6E-03	6.02	1.34
0.50	0.96	0.1102	2E-06	300	0.05	1E-02	12.56	1.34
0.60	0.96	0.2011	4E-06	300	0.05	2E-02	22.93	1.34
0.70	0.96	0.3344	6E-06	300	0.05	4E-02	38.14	1.34
0.80	0.96	0.5196	9E-06	300	0.05	5E-02	59.26	1.34
0.90	0.96	0.7664	1E-05	300	0.05	8E-02	87.41	1.34
0.95	0.96	0.9161	2E-05	300	0.05	1E-01	104.48	1.34

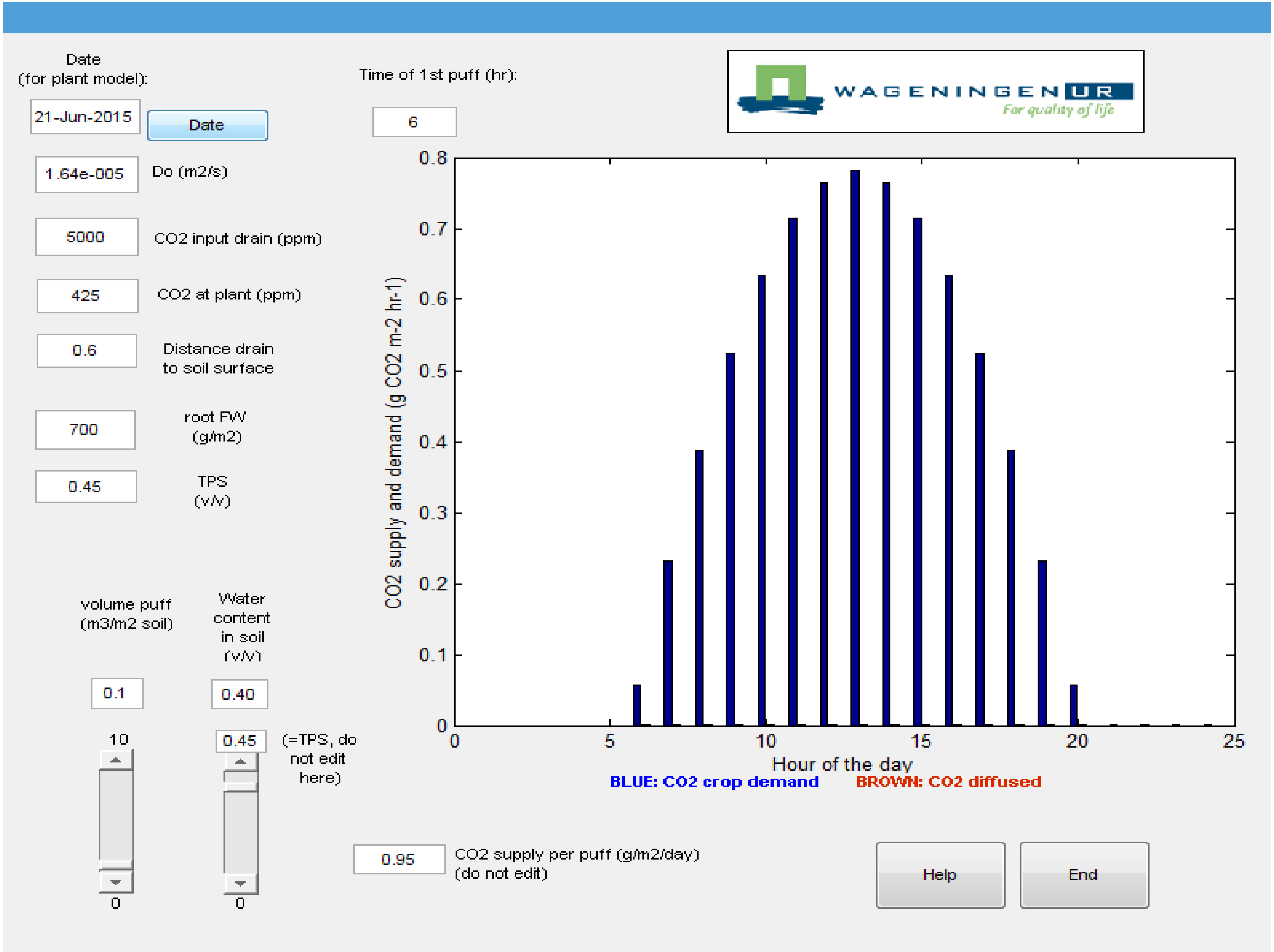
* There is 21% v/v oxygen in air, i.e. 210 L per m3. The molar volume is 22.4 L/mol. Thus there is 9.4 mole oxygen per m3 air.

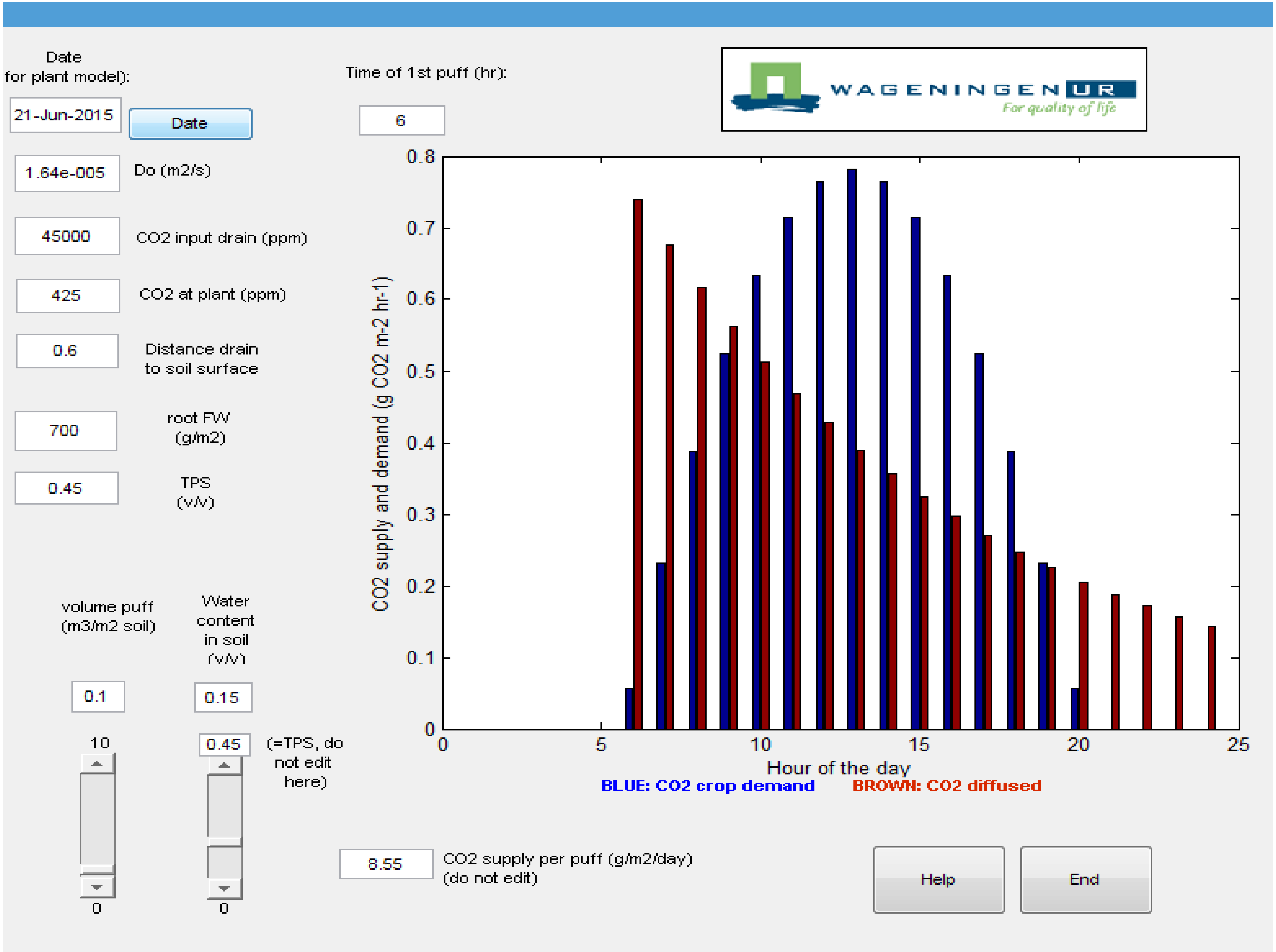
As the molar weight of oxygen is 32 g/mole, it follows there is 300 g oxygen per m3 air.

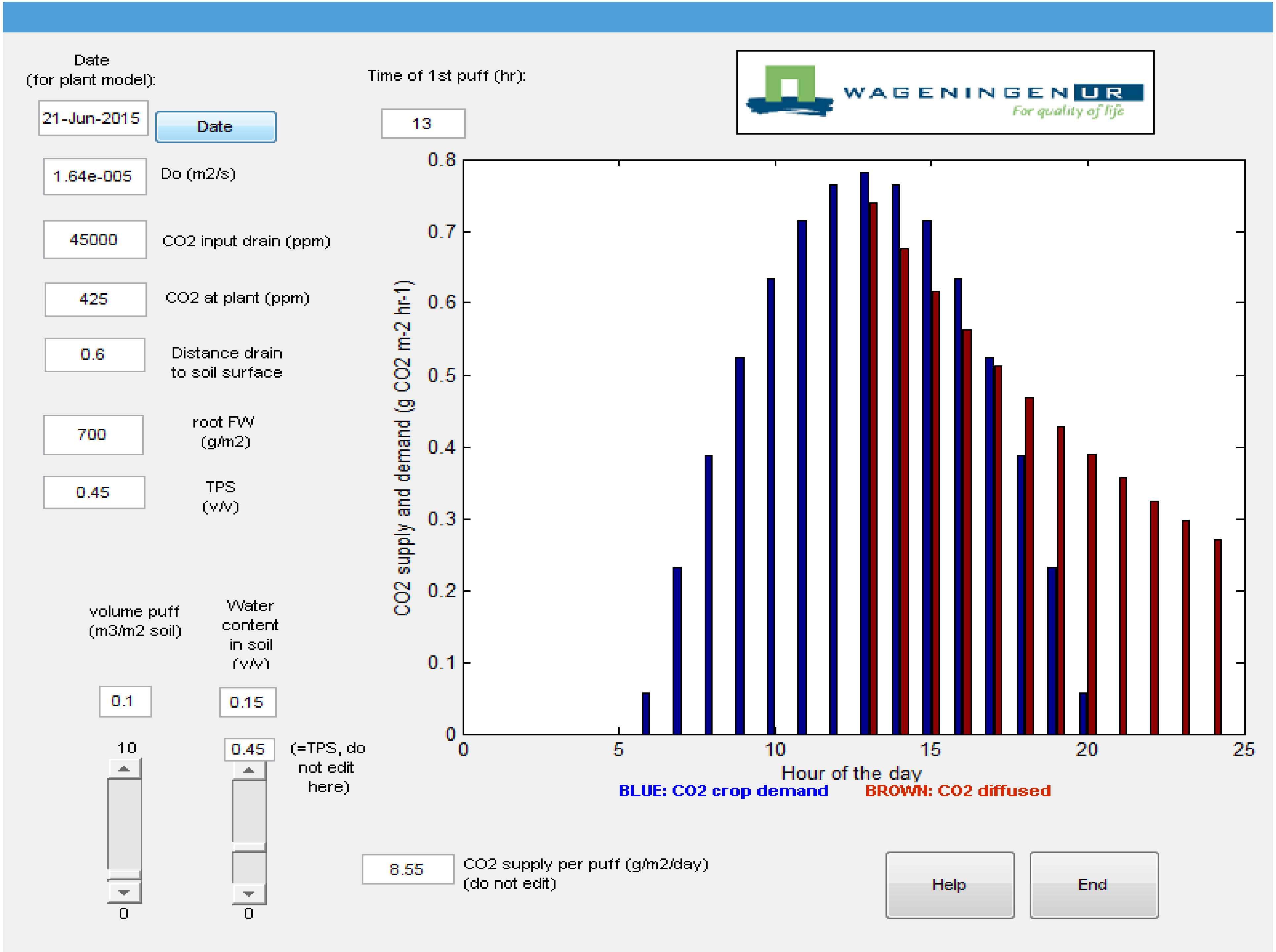
** t=TP^-2*AFP^3.3

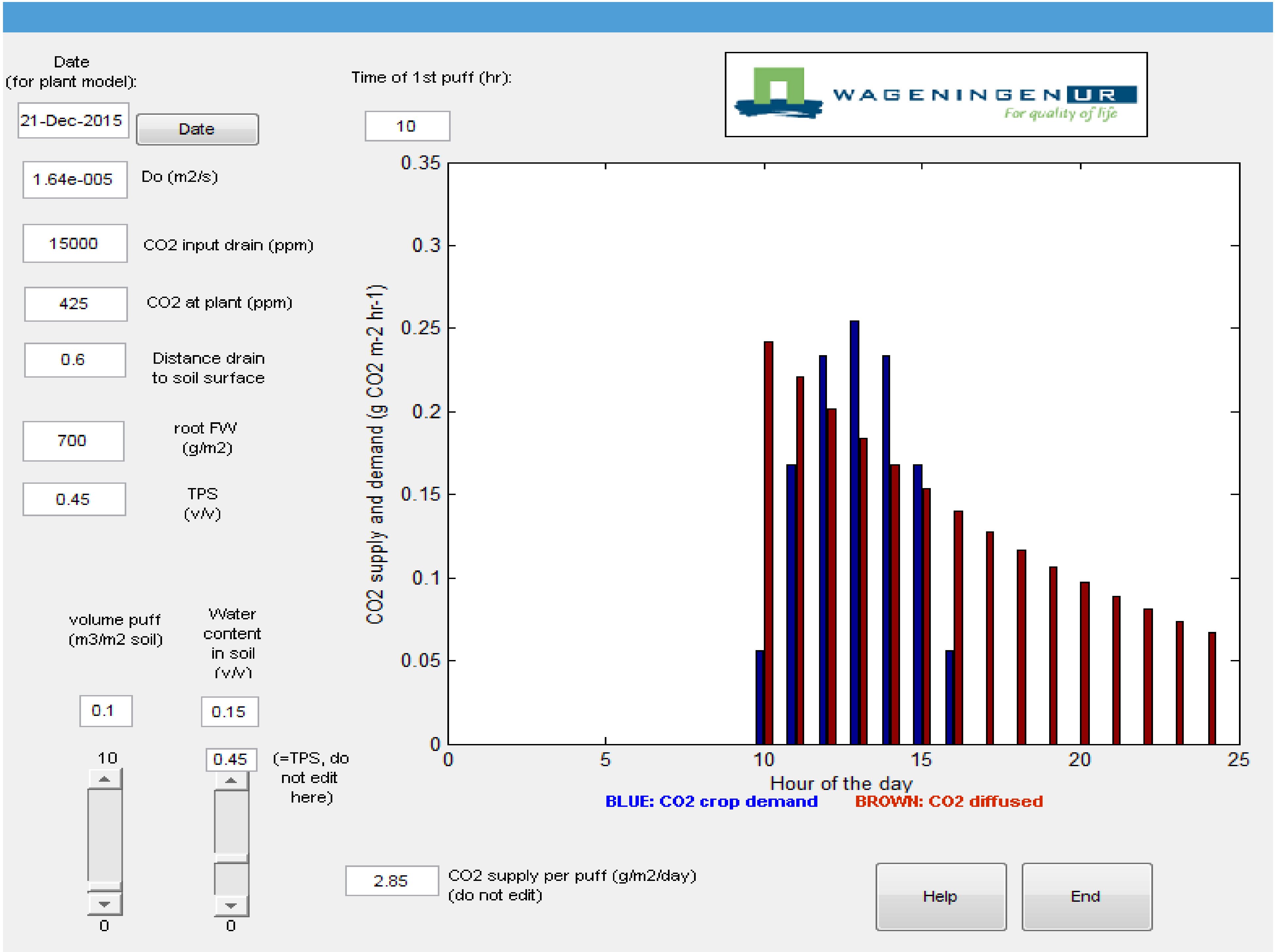
WAGENINGEN UR
For quality of life


Date
(for plant model):
21-Jun-2015
Date
Time of 1st puff (hr):
6
WAGENINGEN UR
For quality of life
1.64e-005
Do (m2/s)
5000
CO2 input drain (ppm)
425
CO2 at plant (ppm)
0.6
Distance drain
to soil surface
700
root FW
(g/m2)
0.45
TPS
(v/v)
volume puff
(m3/m2 soil)
Water
content
in soil
(v/v)
0.1
0.15
10
0
0.45
(=TPS, do
not edit
here)
0
0.95
CO2 supply per puff (g/m2/day)
(do not edit)
Help
End
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
CO2 supply and demand (g CO2 m-2 hr-1)
0
5
10
15
20
25
Hour of the day
BLUE: CO2 crop demand
BROWN: CO2 diffused


Date
(for plant model):
21-Jun-2015
Date
Time of 1st puff (hr):
6
WAGENINGEN UR
For quality of life
1.64e-005
Do (m2/s)
5000
CO2 input drain (ppm)
425
CO2 at plant (ppm)
0.6
Distance drain
to soil surface
700
root FW
(g/m2)
0.45
TPS
(v/v)
volume puff
(m3/m2 soil)
Water
content
in soil
(v/v)
0.1
0.40
10
0.45
(=TPS, do
not edit
here)
0
0
CO2 supply and demand (g CO2 m-2 hr-1)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
5
10
15
20
25
Hour of the day
BLUE: CO2 crop demand
BROWN: CO2 diffused
0.95
CO2 supply per puff (g/m2/day)
(do not edit)
Help
End


Date
for plant model):
21-Jun-2015
Date
Time of 1st puff (hr):
6
WAGENINGEN UR
For quality of life
1.64e-005
Do (m2/s)
45000
CO2 input drain (ppm)
425
CO2 at plant (ppm)
0.6
Distance drain
to soil surface
700
root FW
(g/m2)
0.45
TPS
(v/v)
volume puff
(m3/m2 soil)
Water
content
in soil
(v/v)
0.1
0.15
10
0.45
(=TPS, do
not edit
here)
0
0
CO2 supply and demand (g CO2 m-2 hr-1)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
5
10
15
20
25
Hour of the day
BLUE: CO2 crop demand
BROWN: CO2 diffused
8.55
CO2 supply per puff (g/m2/day)
(do not edit)
Help
End


Date
(for plant model):
21-Jun-2015
Date
Time of 1st puff (hr):
13
WAGENINGEN UR
For quality of life
1.64e-005
Do (m2/s)
45000
CO2 input drain (ppm)
425
CO2 at plant (ppm)
0.6
Distance drain
to soil surface
700
root FW
(g/m2)
0.45
TPS
(v/v)
volume puff
(m3/m2 soil)
Water
content
in soil
(v/v)
0.1
0.15
10
0.45
(=TPS, do
not edit
here)
0
0
8.55
CO2 supply per puff (g/m2/day)
(do not edit)
Help
End
CO2 supply and demand (g CO2 m-2 hr-1)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
5
10
15
20
25
Hour of the day
BLUE: CO2 crop demand
BROWN: CO2 diffused


Date
(for plant model):
21-Dec-2015
Date
Time of 1st puff (hr):
10
WAGENINGEN UR
For quality of life
1.64e-005
Do (m2/s)
15000
CO2 input drain (ppm)
425
CO2 at plant (ppm)
0.6
Distance drain
to soil surface
700
root FW
(g/m2)
0.45
TPS
(v/v)
volume puff
(m3/m2 soil)
Water
content
in soil
(v/v)
0.1
0.15
10
0.45
(=TPS, do
not edit
here)
0
0
CO2 supply and demand (g CO2 m-2 hr-1)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
15
20
25
Hour of the day
BLUE: CO2 crop demand
BROWN: CO2 diffused
2.85
CO2 supply per puff (g/m2/day)
(do not edit)
Help
End

Composting

Pressing

Why is it relevant?

End

Bedankt!