Weather data

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection
Tout	Outside temperature	°C	5 min	Weather	Raw data	-	Whether station
Rhout	Outside relative humidity	%	5 min	Weather	Raw data	-	Whether station
Iglob	Solar Radiation	W/m²	5 min	Weather	Raw data	-	Whether station
Windsp	Wind speed	m/s	5 min	Weather	Raw data	-	Whether station
RadSum	Radiation sum	J/cm²	5 min	Weather	Raw data	-	Whether station
Winddir	Wind direction	Compass direction [0 to 128]	5 min	Weather	Raw data	-	Whether station
Rain	Rain (status 1=rain, 0=dry)	[1=rain, 0=dry]	5 min	Weather	Raw data	-	Whether station
PARout	PAR weather measurement	µmol/m² s	5 min	Weather	Raw data	-	Whether station
Pyrgeo	Heat emission: pyrgeometer	W/m²	5 min	Weather	Raw data	-	Whether station
AbsHumOut	Absolute humidity content of outside air	g/m³	5 min	Weather	Raw data	-	Whether station
	Time	Timestamps 5 min (Excel format)_		Weather			

Greenhouse climate

Indoor climate, status of actuators and irrigation

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection
Tair	Greenhouse Air temperature	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
Rhair	Greenhouse relative humidity	%	5 min	GreenhouseClimate	Raw data	-	Process Computer
CO2air	CO_2 greenhouse	ppm	5 min	GreenhouseClimate	Raw data	-	Process Computer
HumDef	Greenhouse humidity deficit	g/m³	5 min	GreenhouseClimate	Raw data	-	Process Computer
VentLee	Leeward vents opening	% [0 to 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
Ventwind	Windward vents opening	% [0 to 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
AssimLight	HPS lamps status (on-off)	% [0 or 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
EnScr	Energy curtain opening	% [0 to 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
BlackScr	Blackout curtain opening	% [0 to 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
PipeLow	Rail pipe Temperature (Lower circuit)	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
PipeGrow	Crop pipe Temperature (Growth circuit)	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
co2_dos	CO_2 dosing	kg/ha hour	5 min	GreenhouseClimate	Processed data	Computed CO_2 dosage and calibrated by monthly CO_2-meter readings.	
Tot_PAR	Total inside PAR (Sun + HPS + LED)	µmol/m² s	5 min	GreenhouseClimate	Processed data	Computed based on outdoor PAR, cover transmissivity (0.5), operation and transmissivity of energy (0.75) and blackout screens (0.02),	

							PAR from LED and HPS.	
Tot_PAR_Lamps	PAR sum from HPS and LED lamps	µmol/m² s	5 min	GreenhouseClimate	Processed data	Computed based on lamps' operation and measured PPFD contribution of HPS (100 µmol/m² s) and LED (Blue = 11, Red = 49, Farred = 0, White = 37 µmol/m² s) when set at maximum range of LED proportional control (=1000)	
PAR_LED	PAR from LED lamps	µmol/m² s	5 min	GreenhouseClimate	Processed data	Computed based on LED operation and PPFD contribution (as described above).	
EC_drain_PC	Drain EC	dS/m	5 min	GreenhouseClimate	Raw data	-	Process Computer
pH_drain_PC	Drain pH	[-]	5 min	GreenhouseClimate	Raw data	-	Process Computer
Water_sup	Cumulative number of minutes of irrigation in a day	minutes	5 min	GreenhouseClimate	Raw data	This cumulation is reset to 0 at midnight.	Process Computer
Cum_irr	Cumulative number of litres of irrigation in a day	L/m² day	5 min	GreenhouseClimate	Processed data	Conversion from minutes to liter. This cumulation is reset to 0 at midnight.	

Climate and irrigation setpoints

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection/source
co2_sp	CO_2 setpoint	ppm	5 min	GreenhouseClimate	Raw data	-	Process Computer
dx_sp	Humidity deficit setpoint	g/m³	5 min	GreenhouseClimate	Raw data	-	Process Computer
t_rail_min_sp	Rail pipe minimum temperature setpoint	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
t_grow_min_sp	Crop pipe minimum temperature setpoint	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
Assim_sp	Assimilation lighting setpoint (HPS lamp)	% [0 or 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
scr_enrg_sp	Energy curtain setpoint	% [0 to 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
scr_blck_sp	Blackout curtain setpoint	% [0 to 100]	5 min	GreenhouseClimate	Raw data	-	Process Computer
t_heat_sp	Heating temperature setpoint	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
t_vent_sp	Ventilation temperature setpoint (leeward vents)	°C	5 min	GreenhouseClimate	Raw data	-	Process Computer
window_pos_lee_sp	Lee side window position minimum setpoint (leeward vents)	%	5 min	GreenhouseClimate	Raw data	-	Process Computer
water_sup_int_sp_min	Water supply interval time setpoint	minutes	5 min	GreenhouseClimate	Raw data	Interval time between the last and next irrigation turn.	Process Computer
int_blue_sp	Intensity set of blue spectrum channel (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	LED light control was coupled with HPS control ,that is LED lamps can only be used when the HPS-lamps are switched on as well.	Heliospectra lamps
int_red_sp	Intensity set of red spectrum channel (LED lamps)	[0 to 1000] range of	5 min	GreenhouseClimate	Raw data	As above	Heliospectra lamps

		proportional control						
int_farred_sp	Intensity set of far-red spectrum channel (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	As above	Heliospectra lamps
int_white_sp	Intensity set of white spectrum channel (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	As above	Heliospectra lamps
Time	Timestamps 5 min (Excel format)			GreenhouseClimate			

VIP (realized setpoints)

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection/source
co2_vip	CO2 VIP	ppm	5 min	GreenhouseClimate	Raw data		Process Computer
dx_vip	Humidity deficit VIP	g/m³	5 min	GreenhouseClimate	Raw data		Process Computer
t_rail_min_vip	Rail pipe minimum temperature VIP	°C	5 min	GreenhouseClimate	Raw data		Process Computer
t_grow_min_vip	Crop pipe minimum temperature VIP	°C	5 min	GreenhouseClimate	Raw data		Process Computer
Assim_vip	Assimilation lighting VIP (HPS lamp)	% [0 or 100]	5 min	GreenhouseClimate	Raw data		Process Computer
scr_enrg_vip	Energy curtain VIP	% [0 or 100]	5 min	GreenhouseClimate	Raw data		Process Computer
scr_blck_vip	Blackout curtain VIP	% [0 or 100]	5 min	GreenhouseClimate	Raw data		Process Computer
t_heat_vip	Heating temperature VIP	°C	5 min	GreenhouseClimate	Raw data		Process Computer
t_ventlee_vip	Ventilation temperature VIP (leeward vents)	°C	5 min	GreenhouseClimate	Raw data		Process Computer
window_pos_lee_vip	Lee side window position minimum VIP (leeward vents)	%	5 min	GreenhouseClimate	Raw data		Process Computer
t_ventwind_vip	Ventilation temperature VIP (windward side)	°C	5 min	GreenhouseClimate	Raw data		Process Computer
water_sup_int_vip_min	Water supply interval time VIP	minutes	5 min	GreenhouseClimate	Raw data	Interval time between the last and next irrigation turn	Process Computer
int_blue_vip	Intensity set of blue spectrum channel VIP (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	LED light control was coupled with HPS control ,that is LED lamps can only be used when the HPS-lamps are switched on as well.	Heliospectra lamps

int_red_vip	Intensity set of red spectrum channel VIP (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	As above	Heliospectra lamps
int_farred_vip	Intensity set of far-red spectrum channel VIP (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	As above	Heliospectra lamps
int_white_vip	Intensity set of white spectrum channel VIP (LED lamps)	[0 to 1000] range of proportional control	5 min	GreenhouseClimate	Raw data	As above	Heliospectra lamps
Time	Timestamps 5 min (Excel format)			GreenhouseClimate			

Production

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection/source
ProdA	Total tomato Production quality class A	kg/m²	at date (harvest)	Production	Processed data	Conversion g to kg/m² (production area = 62.5 m²). The harvest was performed per truss. Class A means first quality trusses that can be commercially traded.	Manual registration
ProdB	Total tomato Production quality class B	kg/m²	at date (harvest)	Production	Processed data	Conversion g to kg/m² (production area = 62.5 m²). The harvest was performed per truss. Class B refers to trusses that cannot be commercially traded.	Manual registration
avg_nr_harvested_trusses	Number of harvested trusses (average)	Number/stem	at date (harvest)	Production	Processed data	This refers to 10 sample stems (average value)	Manual registration
Truss development time	Truss growing period from flowering to harvest	days	at date (harvest)	Production	Processed data	This refers to 10 sample stems (average value). The growing period of a truss is considered to start when at a particular "flowering" truss at least 5 flowers are set.	Manual registration
Nr_fruits_ClassA	Number of harvested fruits quality class A	Number	at date (harvest)	Production	Raw data	This refers to 10 sample stems (total value)	Manual registration
Weight_fruits_ClassA	Total weight harvested fruits quality class A	g	at date (harvest)	Production	Raw data	This refers to 10 sample stems (total value)	Manual registration
Nr_fruits_ClassB	Number of harvested fruits quality class B	Number	at date (harvest)	Production	Raw data	This refers to 10 sample stems (total value)	Manual registration
Weight_fruits_ClassB	Total weight harvested fruits quality class B	g	at date (harvest)	Production	Raw data	This refers to 10 sample stems (total value)	Manual registration
Time	Timestamp date (Excel format)						

Crop parameters

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection
Stem_elong	Stem growth per week	cm/week	weekly	Crop parameters	Raw data	This refers to 10 sample stems (average value). Data no later than 22 April (because tomato plants were topped).	Manual registration
Stem_thick	Stem thickness	mm	weekly	Crop parameters	Raw data	This refers to 10 sample stems (average value) Data no later than 22 April (because tomato plants were topped)	Manual registration
Cum_trusses	Cumulative number of new set trusses on the stem.	number/stem	weekly	Crop parameters	Raw data	This refers to 10 sample stems (average value). A truss is considered as "set"	Manual registration

						when at least 5 flowers are set.	
stem_dens	Stem density	Stems/m²	weekly	Crop parameters	Raw data		Teams' communication
Plant_dens	Plant density	Plants/m²	weekly	Crop parameters	Raw data		Teams' communication
Time	Timestamp date (Excel format)			Crop parameters			

Resources

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection/source
Heat_cons	Heating energy consumption (rail + crop pipes)	MJ/m² day	daily	Resources	Processed data	Computation based on the sum of heat release (W/m²) from heating pipes (when on): HeatPipe= (t_rail-tair)*2.1 + (t_grow-t_air)*0.62. Final conversion into MJ/day.	
ElecHigh	Electricity consumption (artificial light) during pick-hours (7.00 -23.00)	kWh/m2 day	daily	Resources	Processed data	Computation based on lamps' operation during pick-hours, measured electricity consumption of HPS (81 W/m2) and LED (Blue=7.27 ; Red= 25.3; Farred= 6.23; White=22.72 W/m²). Conversion into KWh.	
ElecLow	Electricity consumption (artificial light) during off-pick-hours	kWh/m² day	daily	Resources	Processed data	Computation based on lamps' operation during off-pick-hours, electricity consumption of HPS (81 W/m2) and LED (Blue=7.27 ; Red= 25.3;	

							Farred= 6.23; White=22.72 W/m²). Conversion into KWh.	
CO2_cons	CO2 consumption	kg/m² day	daily	Resources	Processed data		Computed based on CO_2 dosing (co2_dos). Conversion from g to kg.	
Irr	Irrigation water	L/m² day	daily	Resources	Processed data		Cumulative daily value of irrigation. This cumulation is reset to 0 at midnight.	
Drain	Drain water	L/m² day	daily	Resources	Processed data		Cumulative drain over a day. This cumulation is reset to 0 at midnight.	
Time	Timestamp date (Excel format)			Resources				

Tomato quality and Dry Matter Content

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection/source
Flavour	Flavour level	(0=dislike, 100=like)	Bi-weekly	TomQuality	Processed data	Calculated with Flavour Model Tomato version 2.1 (2011)	Smaaklab Wageningen University & Research
TSS	Total Soluble Solids	°Brix	Bi-weekly	TomQuality	Processed data		As above
Acid	Titratable acid	(Acid, mmol H3O+/100gr)	Bi-weekly	TomQuality	Processed data		As above
%Juice	Percentage juice pressed from the fruit wall of the tomato	%	Bi-weekly	TomQuality	Processed data		As above
Bite	Breaking force of the fruit wall	N	Bi-weekly	TomQuality	Processed data	It is an indicator of the perceived firmness during chewing.	As above
Weight	average fruit weight	g	Bi-weekly	TomQuality	Processed data		As above
DMC_fruit	Fruit dry matter content	%	Bi-weekly	TomQuality	Processed data		As above
time	Timestamp date (Excel format)			TomQuality			

Lab analysis

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection
irr_PH	pH of irrigation water	[-]	bi-weekly	LabAnalysis	Raw data	Analysis carried out on irrigation water sample	Laboratory analysis (Groen Agro Control)
irr_EC	EC of irrigation water	[dS/m]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_NH4	Ammonium concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_K	Potassium concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Na	Sodium concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Ca	Calcium concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Mg	Magnesium concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Si	Silicon concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_NO3	Nitrate concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Cl	Chlorine concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_SO4	Sulfate concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_HCO3	Bicarbonate Ion concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_PO4	Phosphate concentration in irrigation water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Fe	Iron concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Mn	Manganese concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Zn	Zinc concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_B	Boron concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Cu	Copper concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
irr_Mo	Molybdenum concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above

drain_PH	pH of drainage water	[-]	bi-weekly	LabAnalysis	Raw data	Analysis carried out on drainage water sample	As above
drain_EC	EC of drainage water	[dS/m]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_NH4	Ammonium concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_K	Potassium concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Na	Sodium concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Ca	Calcium concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Mg	Magnesium concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Si	Silicon concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_NO3	Nitrate concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Cl	Chlorine concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_SO4	Sulfate concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_HCO3	Bicarbonate Ion concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_PO4	Phosphate concentration in drainage water	[mmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Fe	Iron concentration in drainage water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Mn	Manganese concentration in drainage water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Zn	Zinc concentration in drainage water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_B	Boron concentration in drainage water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Cu	Copper concentration in irrigation water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
drain_Mo	Molybdenum concentration in drainage water	[µmol/l]	bi-weekly	LabAnalysis	Raw data	As above	As above
Time	Timestamp date (Excel format)			LabAnalysis			

Root zone data (Grodan sensors)

Column heading	Parameter description	Unit	Interval	Dataset name	Data Type	Comments	Data collection
EC_slab1	Electrical Conductivity (Grodan sensor 1)	dS/m	5 min	GrodanSens	Processed	From 3 min to 5 minute data for consistency with the indoor climate dataset. Data available until May 26.	Grodan "Grosens" sensors
EC_slab2	Electrical Conductivity (Grodan sensor 2)	dS/m	5 min	GrodanSens	Processed	As above	Grodan "Grosens" sensors
WC_slab1	Slab water content (Grodan sensor 1)	%	5 min	GrodanSens	Processed	As above	Grodan "Grosens" sensors
WC_slab2	Slab water content (Grodan sensor 2)	%	5 min	GrodanSens	Processed	As above	Grodan "Grosens" sensors
t_slab1	Slab temperature (Grodan sensor 1)	°C	5 min	GrodanSens	Processed	As above	Grodan "Grosens" sensors
t_slab2	Slab temperature (Grodan sensor 2)	°C	5 min	GrodanSens	Processed	As above	Grodan "Grosens" sensors
Time	Time	Time stamps 5 min (Excel format)_		GrodanSens			