

Manual FruitCan 2.1

Francisco J. Villalobos, September 2021

This notes explain all those files that are not self-explanatory inside the files. See also **parameters_calibrated_FC.xlsx** for a description of cultivar parameters.

The control file (in the same folder as the exe file) is called

Input_options_run.txt

With 5 rows like:

```
species,xyz (where xyz = peach, apple,almond,pear or grape)
soil_file,INPUT_SOIL_LA_HARINA.DAT
weather_file,w_LAHARINA_date.csv
cultivar_name,arbequina
work_dir,laharina
run_name,pru1
```

The work directory (**work_dir**, to store inputs and outputs) is always in the **out** folder. The **run_name** is a string that will part of the names of output files.

1-Cultivar files

Inside the folder **CULTIVAR_PARAMETERS** we will find different folders each one corresponding to one species (e.g. peach) , and inside it, different cultivars (e.g. **babygold_9**). The cultivar parameters are included in 5 files which are described in **parameters_calibrated_FC.xlsx**.

2-Weather files

The model may use weather data at intervals of one day or less (e.g. hour, half-hour, 10 minutes). If daily data are used, the program will disaggregate to shorter intervals according to the value specified in the file **input_options_simulation.txt**.

Below we see an example of daily file, with solar radiation in MJ/m²/d and vapour pressure (vp) in kPa.

date	solrad	tmax	tmin	rain	wind	vp
01/01/2010	10	15.1	6.5	0.1	1.9	1.1422

Below we see an example of 15-min file, with solar radiation in W/m² and vapour pressure (vp) in kPa. If we only have one mean value of temperature for each period then we will assign it to both tmax and tmin.

date	solrad	tmax	tmin	rain	wind	vp
01/01/2008						
00:15	0	3.37	3.37	0	0.78	0.725778

3-Soil file (inside folder SOILS)

Example:

```

45      La Harina clay, Cordoba, Spain
.18 8.00 .15 77.00 18.00 10.0 1.0 2.67E-03 58.0 6.68 .03 1.00 3.50
0.15 .210 .350 .470 8.00 1.20 100.0 100.0 512.0
0.15 .210 .350 .470 8.00 1.20 100.0 100.0 512.0
0.15 .210 .350 .470 8.00 1.20 100.0 100.0 512.0
0.15 .210 .350 .470 8.00 1.20 100.0 100.0 512.0

```

Line 1:

Soil number (not used)

Soil name (not used)

Line 2

Albedo (fraction) SALB

Evaporation limit (mm), U

Drainage rate, (fraction day-1) SWCON

Runoff curve number (Soil Conservation Service) CN2

Not used

Parameter soil evaporation, mm/d0.5. ALFAE

Lines 3 to NL+2 (NL : number of layers)

Depth of layer (m)

Lower limit, cm3 cm-3

Upper limit drained, cm3 cm-3

Saturation cm3 cm-3

pH

Bulk density (g/cm3)

Carbon (labile) g/m3

Carbon (resistant) g/m3

Carbon (stable) g/m3

4-Input files for the experiment (inside the OUT\xyz folder, where xyz is the name that we assign to the experiment)

input_harvest.txt

For each year it contains
Date, percent of fruits harvested

input_tillage.txt

For each operation it contains
Date, depth of tillage (cm)

input_thinning.txt

For each thinning operation it contains
Date, percent of fruits remaining after thinning

input_irrig_program.txt (if i_option_irrig = 2, irrigation program defined by the user)

For each irrigation event it contains
Date, amount (mm), percent of soil wetted

input_irrig_plan.txt (if i_option_irrig = 1, irrigation calculated by program)

i_option_sched = 1 (variable amounts according to ET)
i_option_sched = 2 (fixed rate during irrigation period)

input_pruning.txt

For each pruning operation it contains
Date, tree volume after pruning (m³), LAD after pruning (m²/m³), tree volume after pruning (%), LAD after pruning (%)

999: not used (the user selects using absolute or relative values to define pruning intensity)

input_grass_dates.txt

For each operation related to the grass cover it contains
Date, name of operation

input_soil_init.txt

For each layer it contains

depth, soil water content (m³/m³), root length density in non-wetted areas (m/m³), root length density in wetted areas (m/m³),

input_options_simulation.txt

Here the dates to start and end the simulation and the number of intervals per day are defined. The contents include also the following variables (keep the options below as they are, except for dynamic

if a constant orchard is to be simulated):

i_option_phenol= 0 (not simulated), 1(simulated)
i_option_dynamic= 0 (static tree, re-initialized every season), 1 (dynamic)
i_option_fruit=0 (n_fruit not simulated), 1(n_fruit simulated)
i_option_soil_evaporation= 0 (ritchie), 1 (hourly, based on resistance)
i_option_rlv= 0 (fixed rlv in 2 zones), 1 (dynamic simulation of root length)
i_option_carbon= 0 (full c balance not simulated), 1 (full c balance simulated)
i_option_drainage=1 (free drainage). 0=no drainage
i_option_co2=0 (use fit to hawaii), =1 (use value ca defined in orchard.dat)

input_options_management.txt

i_option_irrig=0 (rainfed), 1: irrigation calculated by program, 2: irrigation is input
i_option_burn (0=burned or exported), 1=incorporated)
i_option_tillage=0 (no till), 1 (tillage)
i_option_grass = 0 (no crop cover), 1 (crop cover

input_parameters_pollinator.txt

percent_pollination_level, 100.
t1_pollen, 10.
t2_pollen, 20.
t3_pollen, 35.
t4_pollen, 43.
wind_pollen, 6.7
RH_high_pollen, 75.
RH_low_pollen, 22.
cloud_pollen, 0.7

This file applies to insect pollination. Percent_pollination may be changed to force a reduction in the maximum number of flowers pollinated due to lack of insects. For the time being this is the only parameter that will affect fruit number.

The others are meant to indicate if pollination conditions were good or not, expressed as n_hours_pollination during the flowering period. These parameters are applied for each sub-day simulation interval (e.g. hour)

T1_pollen, t2_pollen, etc define the response curve to temperature

Wind_pollen is the threshold wind speed above which no insect activity occurs

RH_high_pollen and RH_low_pollen define the interval of RH when pollination can occur.

Cloud_pollen indicates the cloud fraction above which no insect activity occurs