VEGSYST-DSS to calculate N and irrigation requirements of greenhouse-grown vegetable crops

M. Gallardo, F. Arrabal, C. Giménez, F.M. Padilla,, R.B. Thompson

University of Almería (Spain)

Context of the work

- Almeria greenhouse system – limited water supply and nitrate contamination of aquifers
- N and irrigation management currently based on growers experience
- High tech. fertigation systems with drip – capacity for precise management
- Model-based DSSs can provide crop specific plans for N and irrigation based on crop requirements

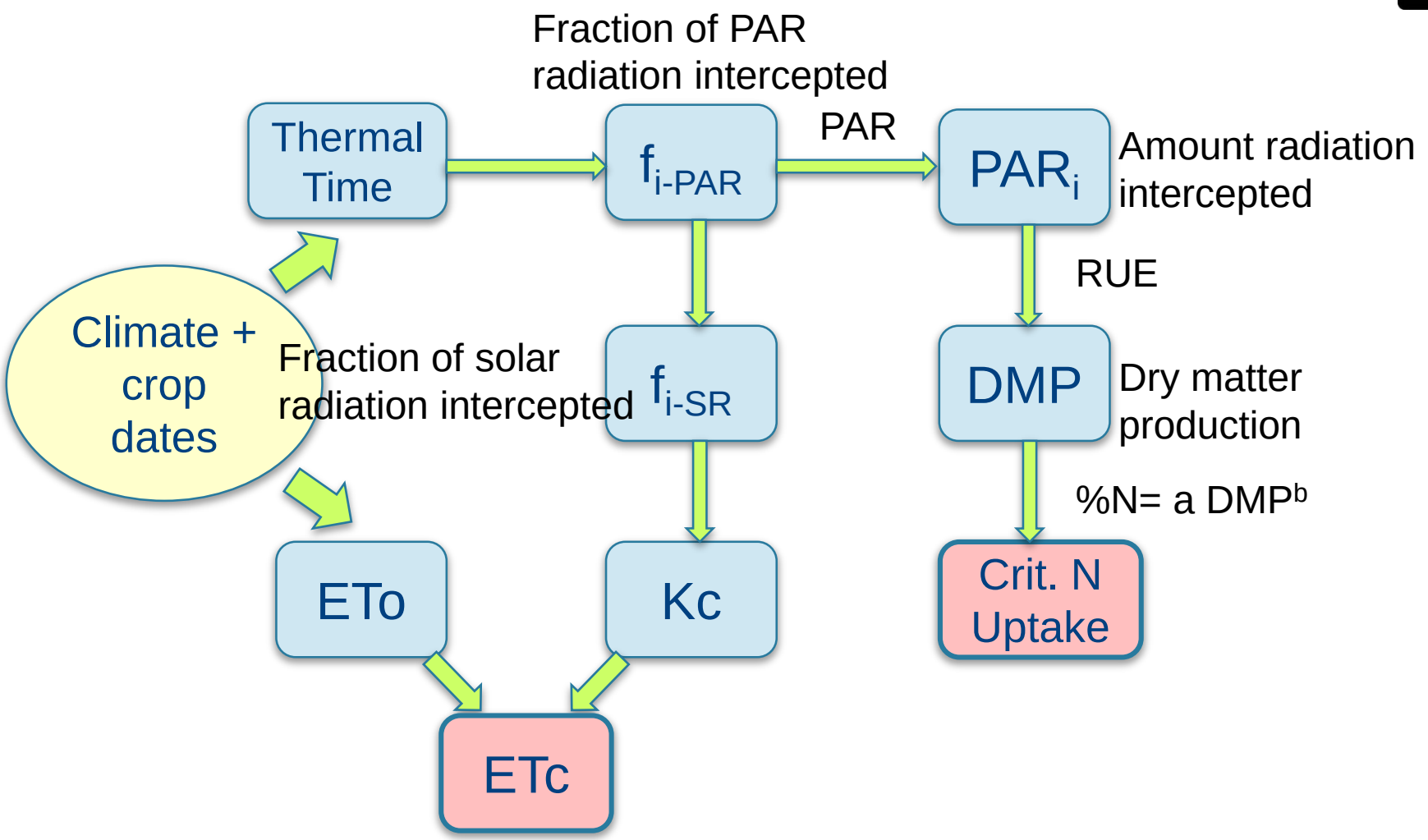
VegSyst-DSS

VegSyst-DSS

- VegSyst **D**ecision **S**upport **S**ystem – stand-alone Windows software
- Calculates **irrigation and N requirements**, and the **N concentration** of the nutrient solution for fertigated GH crops
- For major species grown in greenhouses in SE Spain: Tomato, pepper, muskmelon, cucumber, zucchini, eggplant, watermelon
- Soil and substrate
- Assumes water and N are not limiting
- Small number of inputs
- Designed to be intuitive for practical use by farmers and advisors

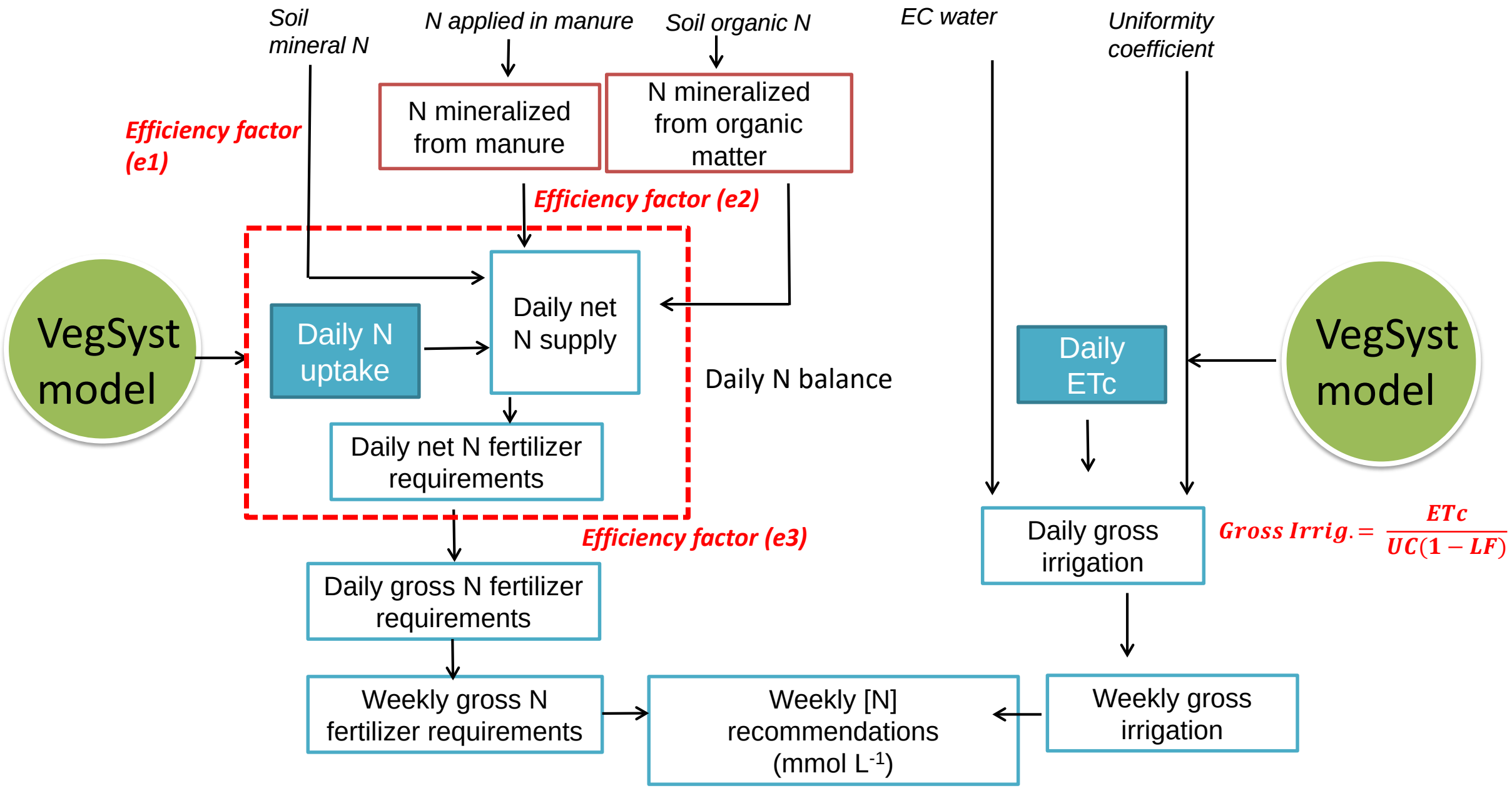
Structure of the VegSyst model

(Only considers the crop)



Critical N uptake ➡ minimum N to ensure DMP is not limited

VegSyst-DSS (Considers soil and irrigation system)



The VegSyst-DSS inputs

- **Climatic parameters**: daily maximum and minimum air temperatures (inside GH), solar radiation (outside GH) and roof transmissivity
  - an internal data base of long term average climate data for Almeria is provided
- **Soil characteristics**: Bulk density, rooting depth, soil organic N, soil mineral N at planting
- **Details of most recent manure application**: Rate and type
- **Irrigation**: dripper density and flow rate, water EC, uniformity coefficient

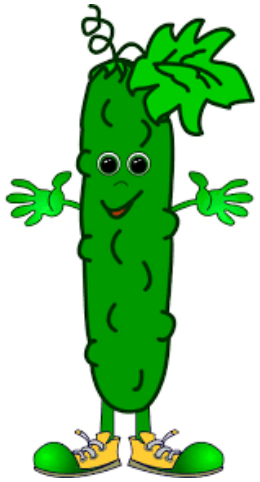
After using VegSyst-DSS

User will have for a given crop and greenhouse:

- daily plan of irrigation volume and times
- daily plan of fertilizer N to apply
- N concentration of the applied nutrient solution
- Additionally, if required, users can obtain detailed intermediate data

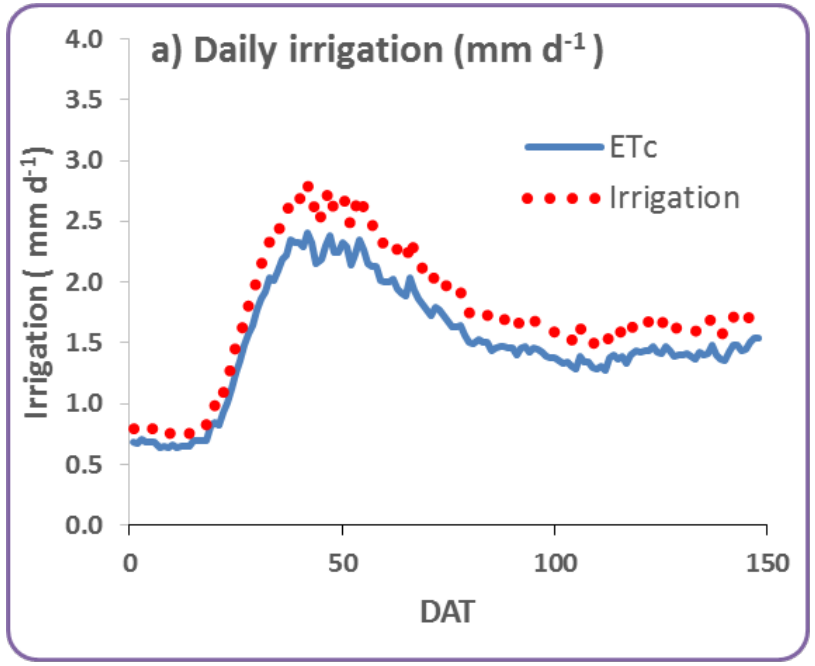
It is recommended that the VegSyst-DSS is used in combination with monitoring approaches to adjust the plans

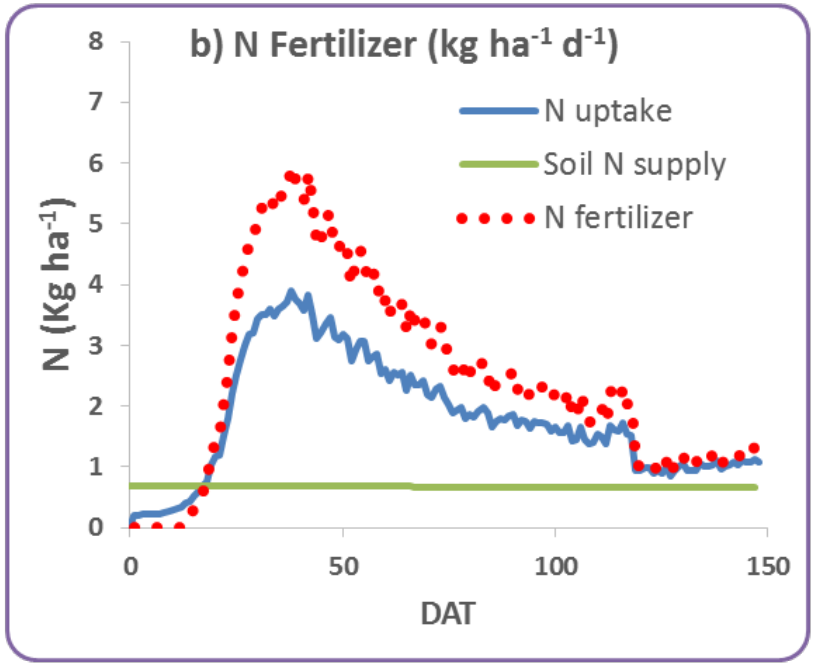
Example of the outputs of VegSyst-DSS

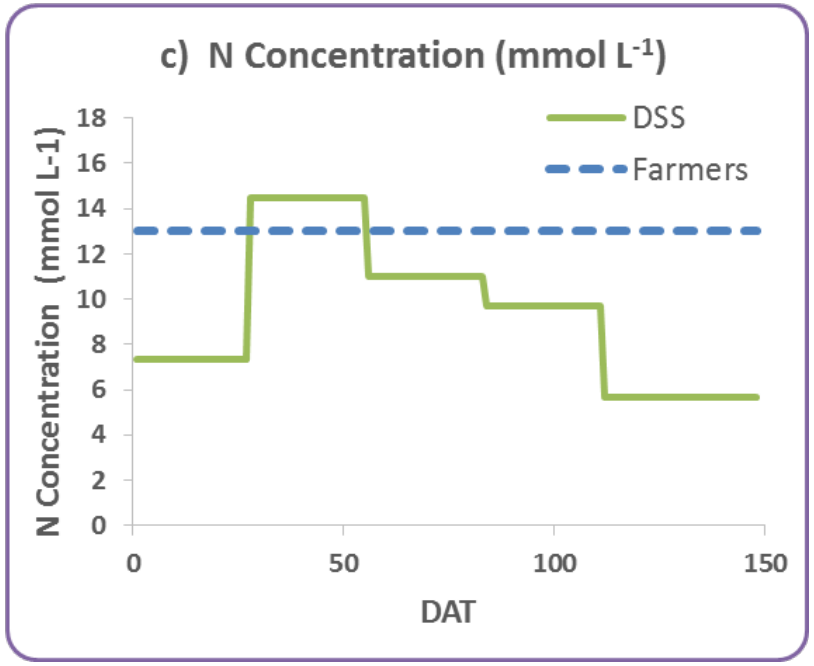


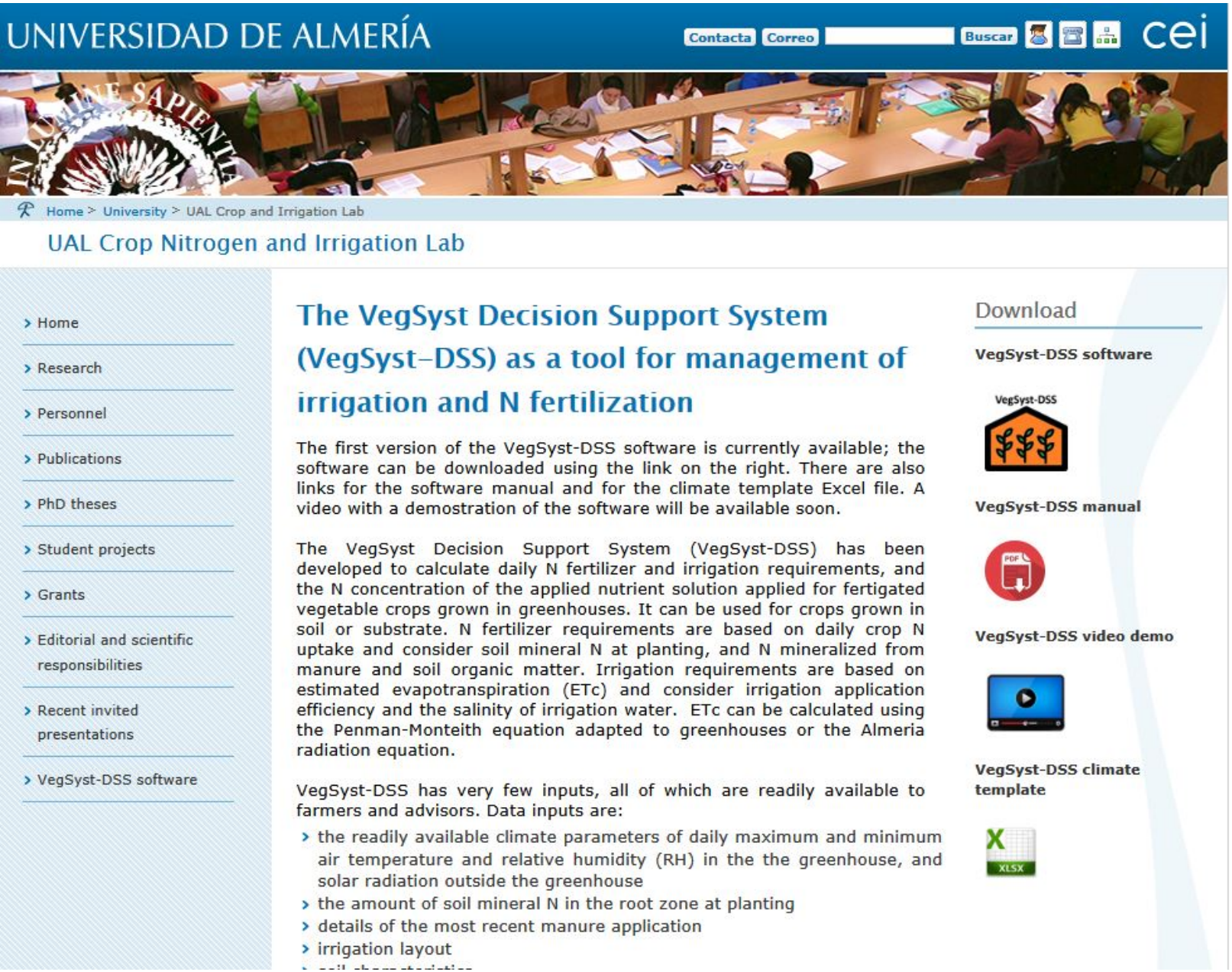
Cucumber

- 5 September to 1 February
- 80 kg N ha^{-1} in soil at planting
- 50 m^3 ha^{-1} of manure applied the previous year
- UC irrigation system: 0.95
- EC of water: 2 dS m^{-1}









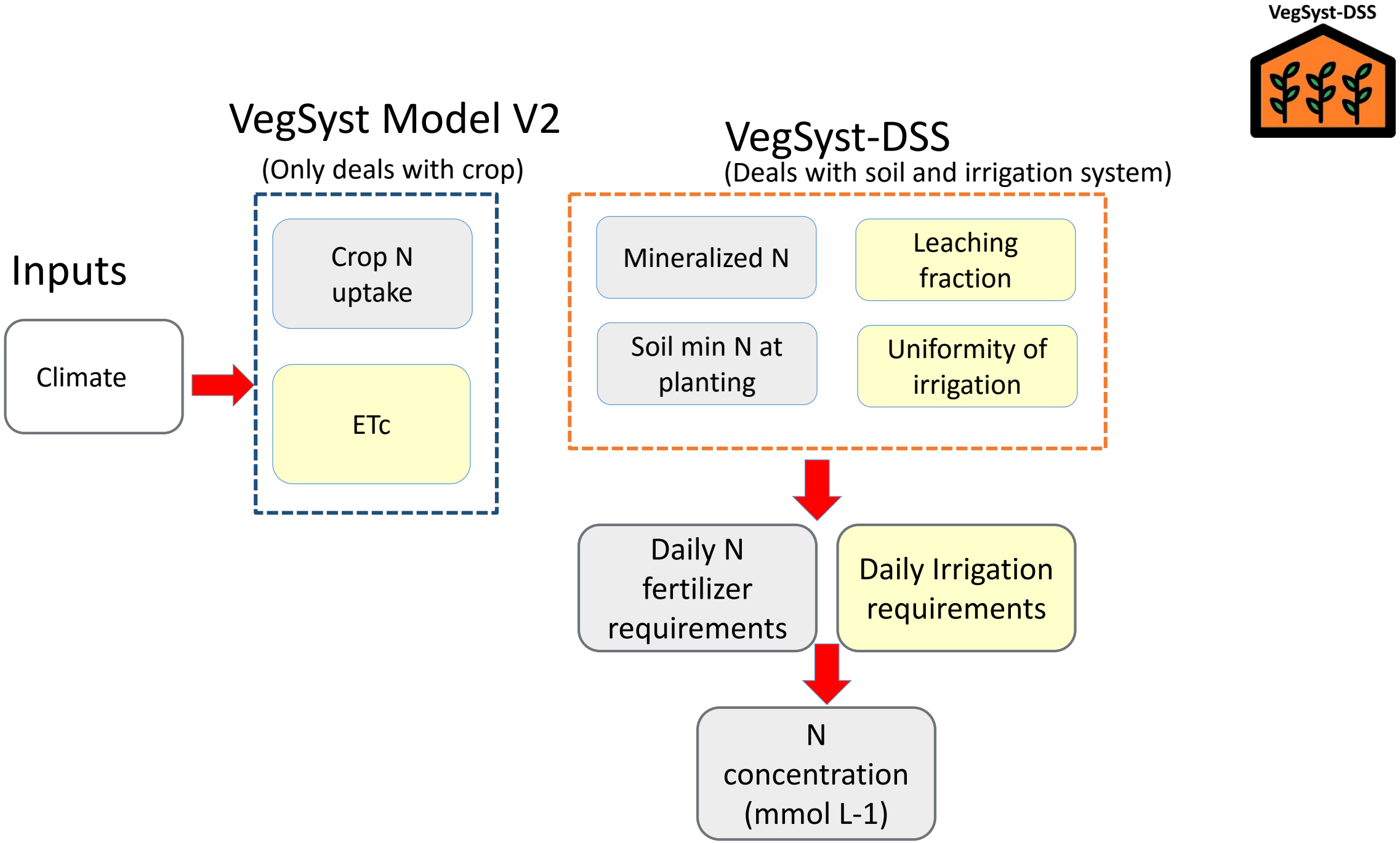
Further Information

The software and a manual can be freely downloaded at http://www.ual.es/GruposInv/nitrogeno/index.shtml

Additionally, a video demonstration is available on this web page

For information about this DSS, comments or help in using it, please contact M. Gallardo, Department of Agronomy, University of Almeria, 04120 Almeria, Spain **mgallard@ual**

Thanks !!


VegSyst-DSS
VegSyst Model V2
(Only deals with crop)
VegSyst-DSS
(Deals with soil and irrigation system)
Inputs
Climate
Crop N uptake
ETc
Mineralized N
Leaching fraction
Soil min N at planting
Uniformity of irrigation
Daily N fertilizer requirements
Daily Irrigation requirements
N concentration (mmol L-1)