

# LONG-TERM FORECASTING OF WATER DEMAND AND SUPPLY - CROPSYST

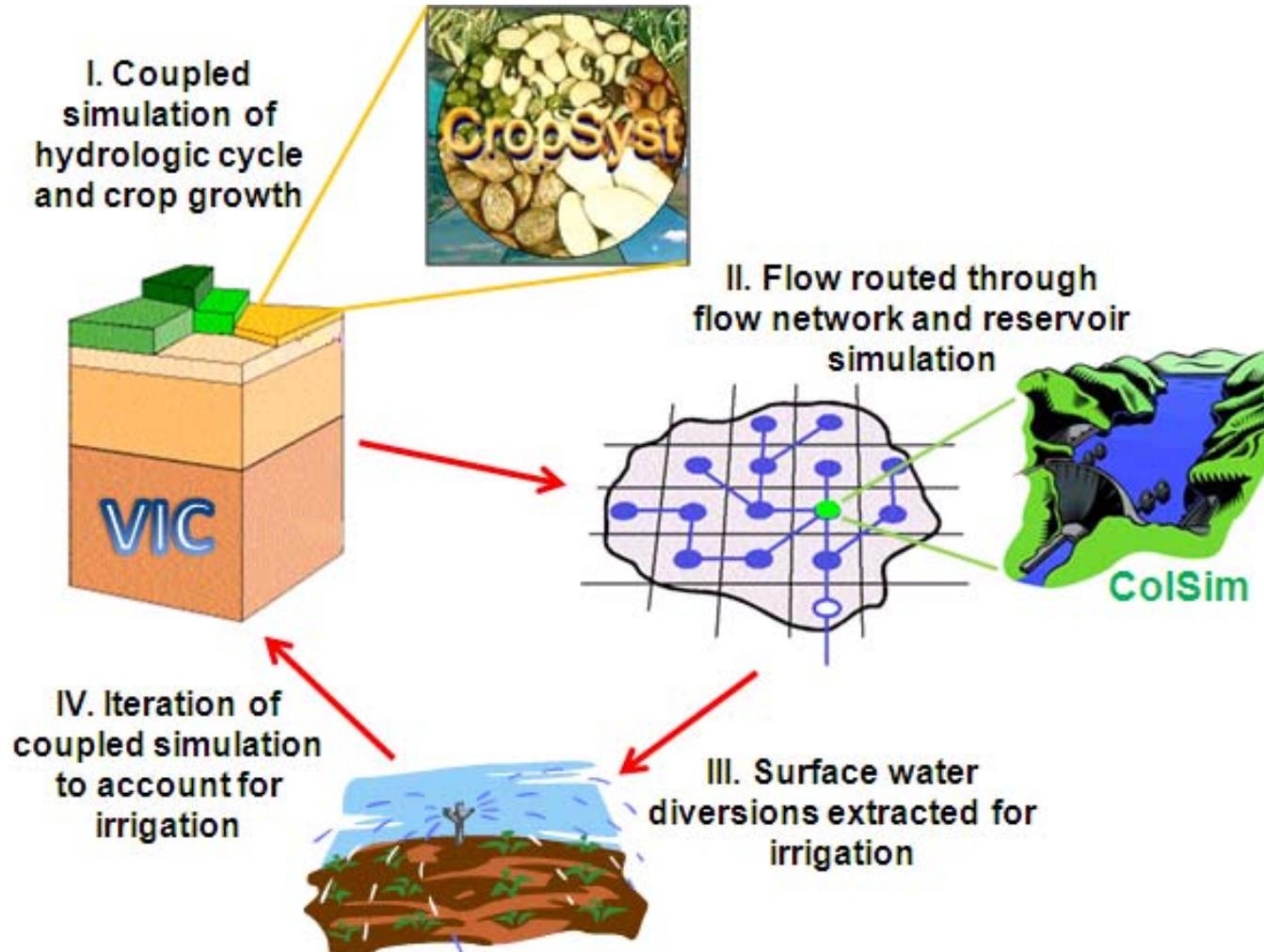
CRPAG Meeting, November 12, 2009

# CropSyst

The screenshot displays the CropSyst Suite website. The main header features the text "CropSyst Suite" in a large, white, serif font against a green background. To the left of the header is a navigation menu with several categories: "Information" (with sub-items: Abstract, Description, Specifications, Features, Links), "Documentation" (with sub-items: Manual, Lecture notes, Tutorial, How to use), and "Support" (with sub-items: FAQ, Registration, Listserv, Contact, Installation, History, Help). The central content area is a collage of agricultural images, including a river, a field of corn, a field of soybeans, a field of wheat, and a field of rice. A circular logo in the center of the collage contains the text "CropSyst" in a stylized, colorful font. The Washington State University logo is visible in the top right corner of the page.

□ <http://www.bsyse.wsu.edu/cropsyst>

# Model Integration



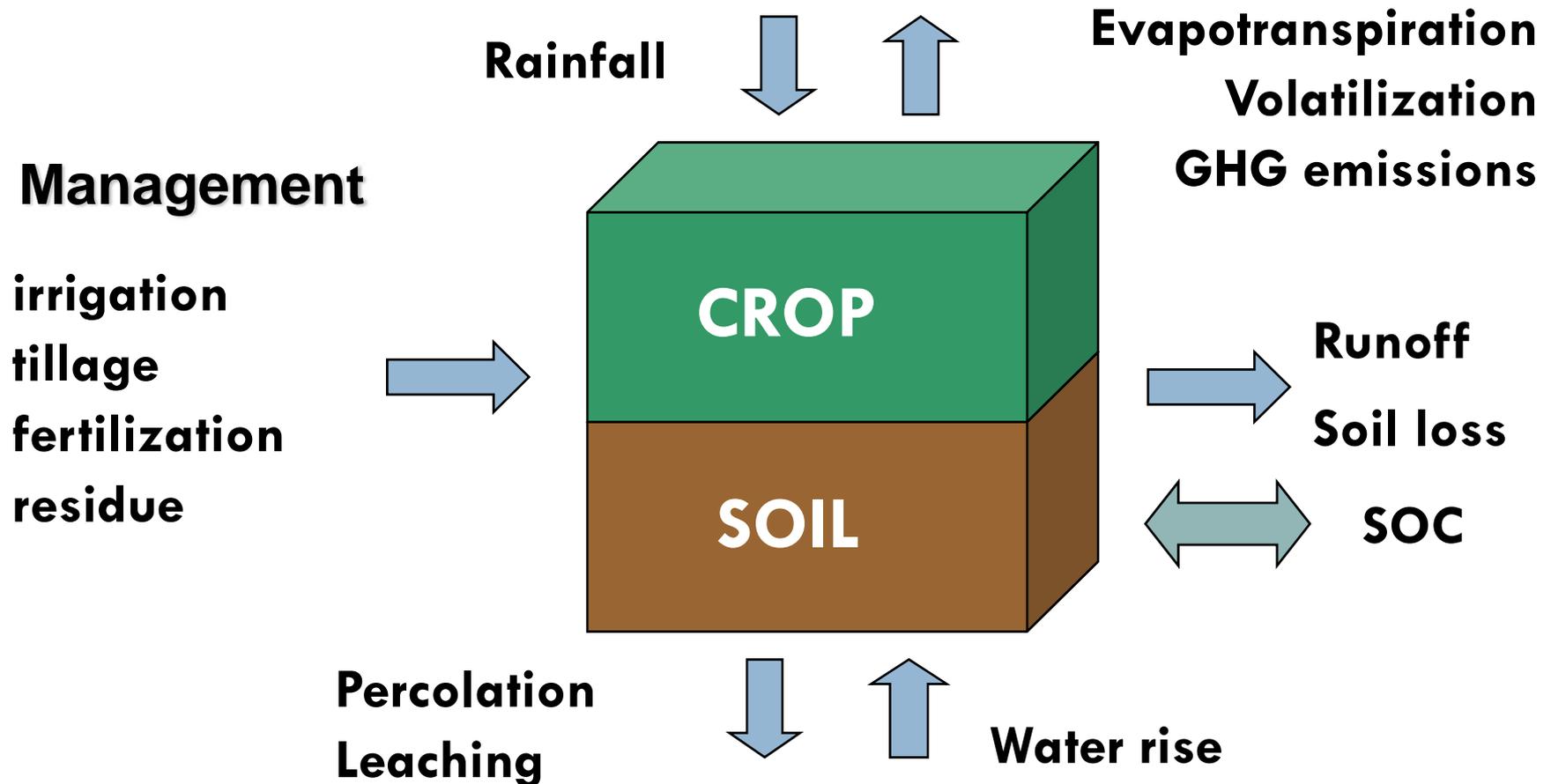
# CropSyst Description

- Developed by Dr. Claudio Stockle at WSU
- Multiyear, multicrop, daily time-step crop simulation model
- Technically sound, packaged in a user-friendly interface
- Available for Windows, Unix, Linux
- Accessible via Internet:
  - ▣ manuals, programs, documentation
  - ▣ listserver
  - ▣ related programs

# CropSyst Development

- CropSyst has been developed as a management-oriented tool, not as a basic research tool
- Intended use is applied research:
  - ▣ scenario analysis of productivity and environmental impact of cropping systems and their management
  - ▣ climate change impact on cropping systems and alleviation management strategies
  - ▣ Crop water use and water productivity

# Input and Output Fluxes of CropSyst



# Inputs required

- Meteorological data: daily air Tmax, Tmin, Rainfall, SolarRad\*, humidity\*, and Wind\*
- Soil parameters, by horizon: Texture, Organic Carbon, Soil Water Holding Capacity\*, BulkDensity\*
- Crop: species, duration of the biological cycle\*, efficiency parameters
- Management: date of application, amount

\* ***Can be estimated***

# CropSyst includes the simulation of:

- Crop development and growth (unstressed or stressed)
- Simulation of growth under increased atmospheric CO<sub>2</sub> concentration
- Water and nitrogen balance
- Salinity
- Residue fate
- Soil erosion by water
- Carbon sequestration
- Greenhouse gas emissions (CO<sub>2</sub> and N<sub>2</sub>O)

# Crop processes in CropSyst

- development
- growth
- light interception
- net photosynthesis
- biomass partitioning
- Canopy expansion
- root deepening
- senescence
- water uptake
- nitrogen uptake
- water stress
- nitrogen stress
- temperature stress

# Soil Processes in CropSyst

- water infiltration
- water redistribution
- runoff
- evaporation
- percolation
- solutes transport
- salinization
- nitrogen fixation
- residues fate
- O.M. mineralization
- nitrogen transformations
- soil erosion
- ammonia volatilization
- N<sub>2</sub>O emission

# Potential Evapotranspiration

- Potential evapotranspiration is estimated using two methods:

## data needed

- |                      |                                               |
|----------------------|-----------------------------------------------|
| □ Penman-Monteith    | $T_x, T_n, \text{Rad}, \text{Wind}, H_x, H_n$ |
| □ Priestley-Taylor * | $T_x, T_n, \text{Rad}$                        |

\* according to Steiner *et al.*

# Crop Categories

- Alfalfa
  - Apples
  - Cherries
  - Other fruit trees (apricots, peaches, pears, prunes)
  - Corn (sweet corn, silage corn, grain or seed corn)
  - Dry peas, dry beans, and lentils
  - Grass hay (uses significantly less water than alfalfa)
  - Juice grapes (irrigated differently than wine grapes)
  - Onions and other vegetables
  - Pasture grass
  - Potatoes
  - Spring Wheat
  - Winter Wheat
  - Other cereals (barley, oats, rye)
  - Wine grapes
- ### Biofuel Crops
- Canola
  - Sorghum
  - Switchgrass

**Questions??**