CLM5 Crop Model

Danica Lombardozzi
Impact of Simulated Managed Crops
(relative to simulating generic crops)

Change in Annual Maximum Gross Primary Productivity (g C m\(^{-2}\) day\(^{-1}\))

1991-2010 Average

Lombardozzi et al., in review
Impact of Simulated Managed Crops
(relative to simulating generic crops)

Annual Monthly Maximum

1991-2010 Average

Change in Latent Heat Flux (W m⁻²)

Lombardozzi et al., in review
Impact of Simulated Managed Crops
(relative to simulating generic crops)

Annual Monthly Maximum

Annual Average

Change in Latent Heat Flux (W m\(^{-2}\))

Lombardozzi et al., in review
Active Crop Types

Corn*

Wheat

Sugarcane

Soy*

Cotton

Rice

* Temperate and tropical varieties
Additional Crops: Placeholders

barley
winter barley
rye
winter rye
cassava
citrus
cocoa
coffee
date palm
fodder grass
grapes
groundnuts
millet
oil palm
potatoes
pulses
rapeseed
sorghum
sugarbeet
sunflower
miscanthus
switchgrass

The surface dataset includes distributions for these crops, but we do not have the required parameters to represent them.
Crop Distributions

1991-2010 Crop Area
1) Plant

2) Leaf Emergence

3) Grain Fill

4) Harvest

Phenology
Management

Fertilization

Irrigation
Future Plans
Tillage

Global Total Soil Carbon (Pg C) ~10 Pg C difference in 2000

No-Till

Tillage

Global Total Soil Carbon (Pg C)

Year

1850 1900 1950 2000

Michael Graham, in prep
Adding APSIM Phenological Phases to CLM

(Agricultural Production Systems sIMulator)

Peng et al. 2018
Mead, NE

Simulated yield (kg/ha)

Observed yield (kg/ha)

y = 0.80 x - 2153.99, R²=0.42
y = 0.91 x - 435.46, R²=0.57
New Irrigation Capabilities

Annual irrigation
Northern India

Irrigation Demand
Added Groundwater Irrigation
Current Irrigation Capabilities

Introduce groundwater pumping

Also Coming Soon: Drip, Sprinkler, Reservoirs
Other ongoing or planned development activities

- Cover crops
- Manure application & N\textsubscript{2}O emissions
- Spatially expect planting windows
- Shifting cultivation
- Additional crop types (switchgrass, oil palm, winter wheat)
- Managed pasture
- Managed trees/timber
New: CTSM Agriculture Working Group

To facilitate development and application of CTSM-Crop

Interested in joining? Contact me (dll@ucar.edu)
C₄ Crops
1991-2010

FAO - EarthStat

CLM5

Corn

Sugarcane

Annual Grain Yield (tonnes ha⁻¹)