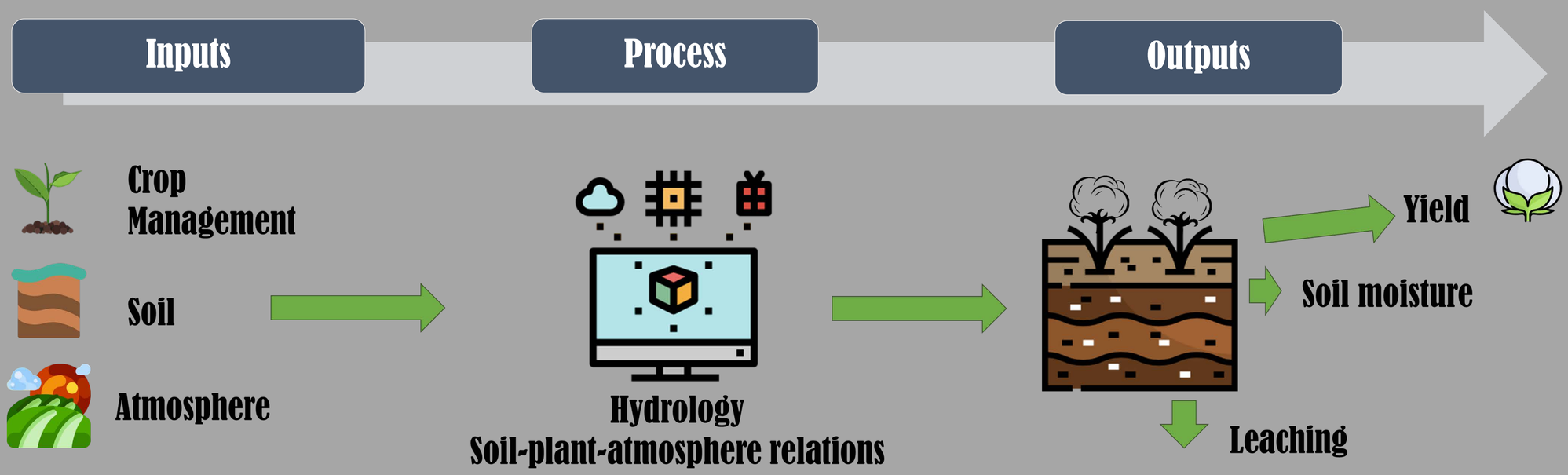
FACETS Project Update: Farm Scale Modeling in Southwest Georgia

Sandra M. Guzmán [1], Puneet Srivastava [1], Ritesh Karki [1] ,and David Bosch [2]

[1] Department of Biosystems Engineering, Auburn University, [2] USDA-ARS Southeast Watershed Research Laboratory, Tifton, Georgia.

1 Conceptual Framework



2 Work in Progress

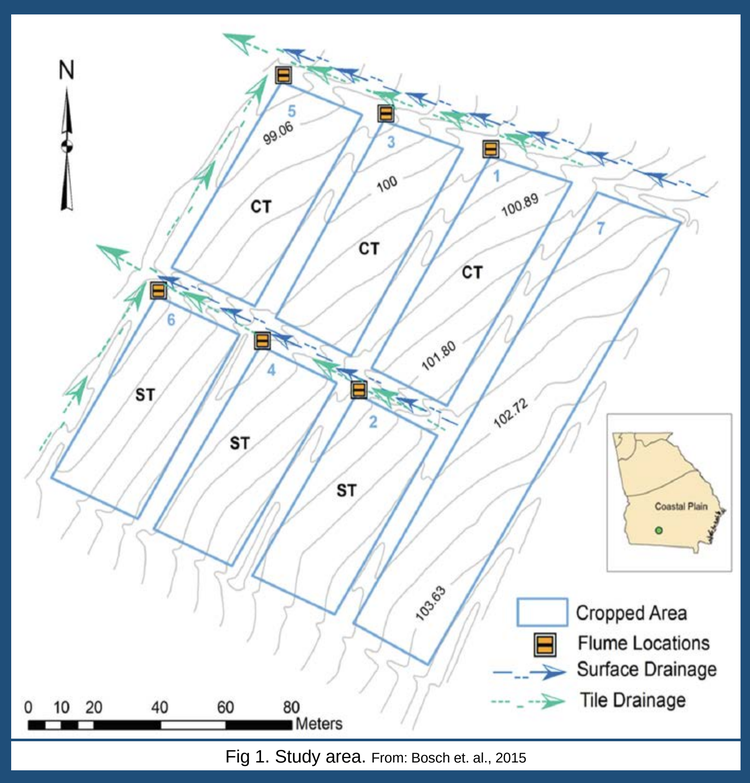


Fig 1. Study area. From: Bosch et. al., 2015

Goal and Site description:

- **Study area**: 4.6 acres
- **Goal:** evaluate impacts of strip-tillage and conventional tillage on water quality and crop grow processes.
- **Crops:** Cotton, planted in 1999, 2000, and 2001 with ryegrass as cover crop in the fall.
- **Fertilizer and crop management:** based on UGA recommendations

Measurements:

- Metal runoff flumes with automatic water sample collectors and flow monitoring devices.
- Soil moisture sensors at 2,5, and 12 in depth, both b/w cotton rows in March 2000- 30 min measurements.
- Tile drain with flumes to measure flow and manual water sampling.

How to choose the best model ?

- User friendly
- Requires minimum inputs
- Reproducible
- Compatible with other models
- Efficient in the prediction of hydrological processes
- Efficient in the prediction of crop-growth processes
- Provide outputs that contribute to the decision making.

What processes are modeled? how?

Soil-Water Relations:

- Cascade Approach, assumes water uniformly distributed in the soil layer.
- More emphasis on soil-atmosphere water movement.
- Connectivity to hydrological processes.

Runoff

- SCS curve number
- Green & Ampt

Root Water Uptake

- Parametrization
- EPIC model

Nutrient Transport:

Leaching

- Based on water available per soil layer (surface runoff + lateral flow + percolation)

Mineralization/Immobilization

- Exponential function based on water and T° factors
- PAPRAN model
- Predicts both N and P transport

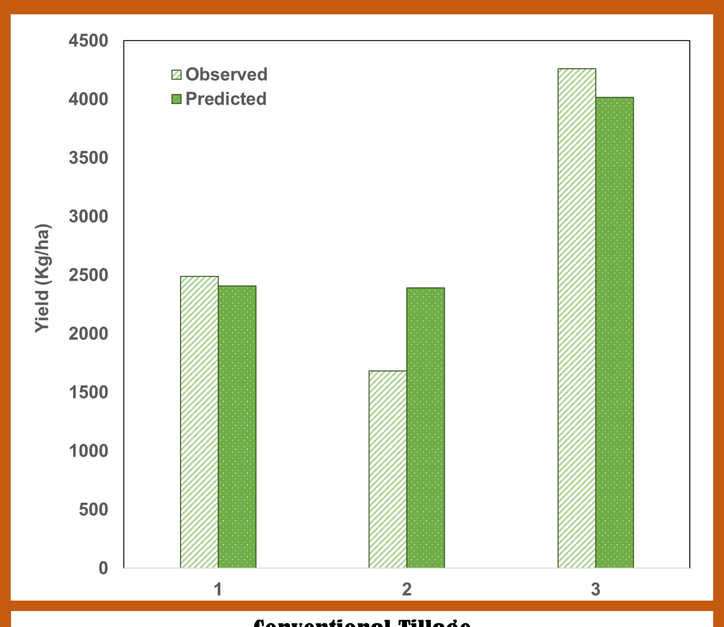
Nitrification

- Exponential function based on soil water content, soil PH and, T°

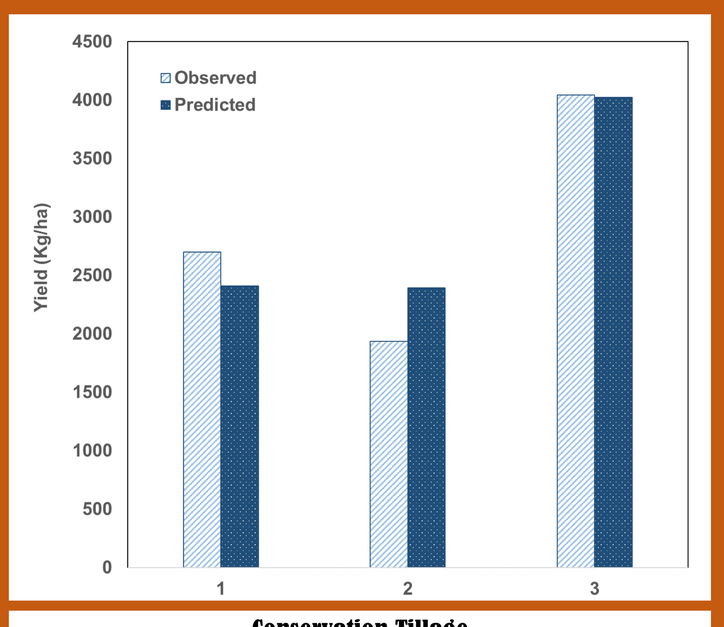
Month	Crop Planted	Management Practice
December	Rye	Planted and Fertilized 10%N/10%P/10%K
April		Killed and tillage
April		Fertilized- chicken litter
May	cotton	Planted (555 BG/RR)
May		Cultivated
June		Cultivated
June		Fertilizer 28-0-0-5 11 lb./gallon
September		Machine harvested
November	Rye	Planted

Month	Crop Planted	Management Practice
December	Rye	Planted
April		Fertilized- chicken litter
April		Killed Rye
May	Peanut	Planted (GA _green)
May		Cultivated
September		Machine harvested
October	Rye	Disk Harrow
November		Planted

3 Preliminary Results and Future Work



Conventional Tillage



Conservation Tillage

Future Work

1. Model set-up and calibration for peanut
2. Finish calibration of the crop rotations for the 7 years of data
3. SWAT Model set-up and calibration
4. Simulation of water and nutrient balances for cotton and peanut
5. Simulation of options for conservation scenarios

References:

1. Bosch D.D., Potter T.L., Truman C.C., Bednarz C., Strickland T.C. 2005. Surface runoff and lateral subsurface flow as a response to conservation tillage and soil-water conditions. Transactions of the ASABE.
2. Bosch D.D., Truman C.C., Potter T.L., West L.T., Strickland T.C., Hubbard R.K. 2012. Tillage and slope position impact on field-scale hydrologic processes in the South Atlantic Coastal Plain. Ag Water Management 111:40-52.
3. B. Ortiz, G. Hoogenboom, G. Vellidis, K. Boote, R. Davis, C. Perry.2009. Adapting the CROPGRO-Cotton model to simulate cotton biomass and yield under southern root-knot nematode parasitism. Transactions of the ASABE.

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