Scheduling field operations in SWAT

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Weather forecast

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95° 97°	96°	94°	93°	89°	85°	81*
Thu		10		95	66	
Fri		10		90	63	
Sat		10		85	59	
Sun		10		83	59	

labor, and equipment

resources











Current SWAT Scheduling



Objectives

- Implement code into SWAT to schedule operations using heat units, soil moisture, and available resources.
- Evaluate the ability of the model to simulate correct planting dates.
- Identify remaining limitations and next steps.

Outline



Algorithm for soil moisture

- Field operation occurs when
 - Heat unit index is high enough:
 - Current HUI ≥ Operation HUI
 - Soil moisture in correct range
 - Moisture (L2) ≤ Moisture factor * field capacity (L2)
 - Moisture (L2) ≥ Drought factor * wilting point (L2)

Quantification of resources

• Calculate total work area:

- Any non urban HRU with at least one operation

Maximum daily worked area: maximum daily resources

– Total work area / 14



Final checks

- If dormant period starts, operation occurs
- If end of year happens, operation occurs

Study area



Missouri

Goodwater Creek Experimental Watershed

Claypan Area MLRA 113

Available Data: MO crop reporting districts



- Planting
- Silking
- Harvesting

Corn planting dates in North East Missouri district



Corn planting results by year



Soybean planting results by year



Simulated planting dates compared to planting record for corn



Simulated planting dates compared to planting record for soybeans



Limitations

- For effective spatio-temporal distribution of field operations, HRUs need to be small enough.
- The moisture threshold is a global parameter: same for all crops of the watershed.
- HRUs are processed from the smallest to largest HRU ID: same HRUs are always planted first.

Future steps

- Additional testing throughout the world, especially for too dry or too wet conditions.
- Randomization of HRU processing.
- Abandon planting plans when conditions are not good for too long. Should we consider switching to other crops?
- Soil moisture as a function of the crop growing or to be planted.