Evaluating groundwater management options in a semi-arid and rapidly urbanizing area using a socio-hydrological model

J. Wegmann

Introduction
- Water resources under stress due to climate change, population growth, changing consumption patterns
- User behavior key driver of stressed water resources
- User behavior often neglected in water resources model
- Incorporation of actual user behavior into models can improve management

Data
- Official groundwater levels at district level (pre-monsoon) 2011-2018
- Reported groundwater level 2018 (pre-monsoon)
- Rainfall and temperature at district level for 2011 – 2017
- Soil characteristics for 6 sites in two districts
- Daily meteorological data for 6 sites
- Socio-economic characteristics of 412 farmers in two districts
- Groundwater user behavior of a common pool resources experiment

Preliminary results
- Large discrepancy btw. official and reported data
- Modeled groundwater level has a clear upwards trend
- Irrigation driven by increased revenues

Outlook
- Refine economic model by including behavioral factors
  - Risk attitudes
  - Time preferences
  - Strategic behavior
- Policy scenario analysis
  - Quotas
  - Monitoring
  - Water saving technologies
- Evaluate changing climate conditions

The model

Decision making processes

Schedueld Irrigation?
Yes
No

Can water table be reached?
Yes
No

Irrigation
No Irrigation

Savings allow drilling a new well?
Yes
No

Well deepening
No well deepening

Model Components

Hydrological model
Change in groundwater as function of soil water balance and irrigation demand

Crop model
Crop yield as function of irrigation and rainfall

Economic Model
Income function of crop yield and expenditures

Graphs and images showing groundwater level changes and crops.