

Impacts of increasing climate variability on vegetation in dryland ecosystems

Kelly Caylor

Faculty Research Speaker Series
ESM 510



Water, Vegetation, and Society

caylor.eri.ucsb.edu | @kcaylor | caylor@ucsb.edu

Water, Vegetation, and Society

How it started...

Three major research questions:

- How much water do ecosystems use?
- How do they respond to rainfall variability?
- How do these responses impact food security and ecosystem resilience?

Answers require new theory, new observations, and new methods

Improving seasonal forecasts for drought and crop production with real-time sensor networks

PULSE lab: Princeton University Low-cost Sensors for the Environment

Cost: <\$70

V1: T_{air} , T_{leaf} , RH, NDVI, SW_{in} , SW_{out} , Rainfall, Soil moisture

V2: Rainfall, Soil moisture

Real-time environmental data via cellular SMS. Designed to address lack of climate & crop data availability in remote areas

Integrating social and environmental aspects of hydrological change

Rainfall distribution, 1979-2008

Seasonal rainfall total (mm)	Southern Province (Relative Frequency)	Eastern Province (Relative Frequency)
100-200	~0.02	~0.01
200-300	~0.28	~0.02
300-400	~0.02	~0.32
400-500	~0.48	~0.02
500-600	~0.02	~0.02
600-700	~0.02	~0.02
700-800	~0.02	~0.45
800-900	~0.28	~0.45
900-1000	~0.02	~0.15
1000-1100	~0.02	~0.02
1100-1200	~0.12	~0.15
1200-1300	~0.02	~0.02
1300-1400	~0.02	~0.02
1400-1500	~0.02	~0.02

Distribution of reported drought coping strategies, 2008

Strategy	Southern Province (%)	Eastern Province (%)
Reduce # of Meals	~15	~10
Relief Food	~10	~5
"Food for work" program	~2	~1
Piecemeal	~5	~2
Work on farms of other smallholders	~35	~10

Hydrological dynamics and coping strategies are coupled for smallholder farmers in Zambia

1
Patterns & Processes
in Water-Limited
Ecosystems

2
Development of
Environmental
Sensor Systems

3
Coupled Natural-
Human Dynamics in
Dryland Agriculture