Agricultural Water Innovations in the Tropics

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Water JPI
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MOTIVATION

State of the art and the relevance of AgWIT

- Sub-topic 1b of Challenge 1

  "Increasing the efficiency and resilience of water uses"

  - Investigate strategies to increase crop water use efficiency using biochar under rainfed conditions, and biochar effects under irrigation management strategies for irrigated systems
  - Evaluate soil and water management strategies via ecophysiological assessments of crops, also changes to water quality of soil leachate

MOTIVATION

State of the art and the relevance of AgWIT

- Sub-topic 3a of Challenge 1 *"new approaches and models for integrated management and governance of resources"*
  - Multi-faceted approach towards data fusion augmented by expert elicitations and stakeholder engagement to evaluate water use scenarios of interest to local communities, producer groups and water management agencies

OBJECTIVES

- (1) Identify improvements in resource use efficiencies and environmental performance of key crops produced via alternative water and soil management strategies under rainfed and irrigated conditions;
- (2) Determine crop physiological responses of biochar additions to soil using non-destructive optical and thermal sensing at multiple scales throughout > 20 agricultural crop development cycles;
- (3) Develop/apply crop ecophysiological, hydrological, and biogeochemical models to evaluate innovative soil and water management strategies in relation to the plant-soil-atmosphere system;
- (4) Evaluate and set priorities among strategies to increase water resilience through structured decision making workshops with local communities, producer groups and water management agencies.

CONSORTIUM DESCRIPTION

Investigator	Partner University	Funding Agency	Country
Mark S. Johnson (Coordinator)	University of British Columbia (UBC)	NSERC	Canada
Susan Trumbore	Max Planck Institute for Biogeochemistry	BMEL	Germany
Paulo Brando	Instituto de Pesquisa Ambiental da Amazônia	IDRC	Brazil
Andrea Suárez Serrano	Universidad Nacional de Costa Rica - HIDROCEC	IDRC	Costa Rica
Monica García	Technical University of Denmark (DTU)	IFD	Denmark
Steve Lyon	Stockholm University	FORMAS	Sweden
Chih-Hsin Cheng	National Taiwan University	MOST	Taiwan

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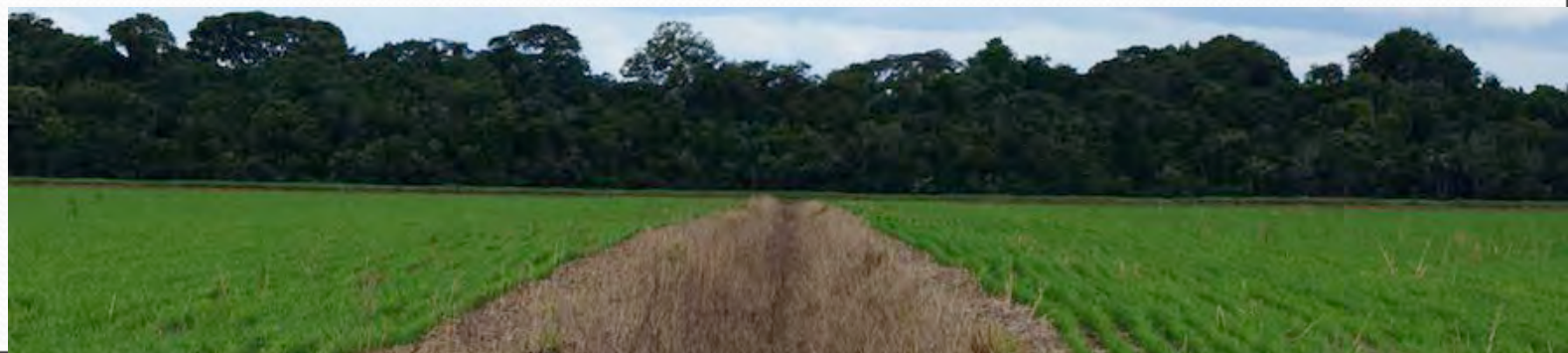
http://ecohydro.ires.ubc.ca/agwit

WP1.

Crop responses, water and carbon footprints in relation to biochar additions and water management strategies

- Annual volumetric water footprints (blue and green) for soy, corn, rice, melon, and sugarcane
  - Brazil: Johnson, Lathuillière UBC; Trumbore, MPI; Brando, IPAM
  - Costa Rica: Johnson, Morillas, UBC; Suárez, UNA
- Water use efficiencies by crops (see team members above)
- Assessment of crop phenology (Garcia, DTU), water and irrigation efficiencies (Johnson, UBC)
- Analysis of footprints as function of climatic conditions, crop, soil and water management (AgWIT team)



WP2.

Hydrology, isotopic measurements and modelling at nested scales

- Isotopic determination of plant water use, local water storage mixing and plot-specific recharge (Lyon, SU)
- Assessment of soil-plant-atmosphere water dynamics based on eco-evolutionary optimality (Manzoni, SU)
- Scenarios analysis of water allocation and biochar impacts at landscape scale (Lyon, SU; Cheng, NTU)

WP3.
Structured Decision Making Workshops and Knowledge Transfer

- Preference elicitation surveys followed by identification of scenarios and alternatives to clarify *which organizational, institutional and agricultural decisions* could be influenced by the findings of the research activities outlined in WP1 and WP2 (McDaniels, Morillas, UBC)
- Structured decision making workshops in relation to alternative soil and water management to (i) set priorities for action, (ii) identify mechanisms/agencies for implementation of decisions to shape water and biochar use in agriculture at watershed, ranch and small-holder scales, and (iii) understand the benefits of the water footprint measures for large-scale and small-holder producers (McDaniels, UBC; Wittman, UBC)

Expected Impact of the Project

The European Union currently outsources the majority of its land and water footprints through consumption of imported goods (Steen-Olsen *et al.*, 2012)

- AgWIT will develop more sustainable soil and water management strategies in tropical producing regions leading to improvements in resource use efficiencies (e.g., "more crop per drop")
- Reduce the impact of resource appropriations of EU's supply chains while improving agricultural resilience of tropical agricultural systems.
- Improving agricultural resilience can lead to further benefits through reduced land use pressures

Expected Impact of the Project

Improve "*Resilience to climatic variability*"

- Develop and assess strategies to improve agricultural resilience while reducing the water, carbon and other footprints of agricultural practices and improving freshwater security and environmental conditions.
- AgWIT will develop practicable strategies with end users and stakeholders for integrating novel approaches to soil and water management of agricultural systems

Project targets aims of WaterWorks call:

- AgWIT uses societally-engaged, interdisciplinary research…
  - …incorporating fundamental and applied approaches
- Mobility of Consortium researchers/trainees is paramount
  - MITACS and other funding mechanisms to support
- Collaborative research and innovation is foundational
  - Experimental Ecohydrology
  - Isotopic Modeling
  - Stakeholder Engagement