Linking Soil and Watershed Health to In-field and Edge-of-Field Water Management

January 23-24, 2020

Erickson Alumni Center, West Virginia University

Rationale: Despite mounting urgency to promote regenerative agriculture and protect regional waters, research in field hydrology has declined; and linkages between agricultural water management and its effect on soil health, water supply, and regional water quality remain uncertain. Soil scientists increasingly understand ties between crop yields, soil carbon content, microbiota health, and soil moisture based on experimental plot studies, but they have had limited opportunity to explore how landscape setting and artificial drainage influence these interactions. At the same time, there is increasing awareness regarding impacts of artificial drainage on water supply, flood risk, and riverine water quality. Less is known, however, about how in-field and edge-of-field water management affects these broader concerns through deleterious effects to soil health. Shallow groundwater dynamics may impose significant constraints on biogeochemical processes within the soil-plant biome and the fate and transport of agrochemicals to downstream waters, suggesting that water table management presents an overlooked opportunity to meet multiple stakeholder concerns. *This forum will convene technical experts in agronomy, soil science, hydrology, and agricultural engineering to explore how in-field and edge-of-field water management can advance regenerative agriculture and watershed health*.

Key discussion questions:

- Is there need and capacity for "Precision Drainage"?
- What (and where) are most promising opportunities to promote soil and watershed health?
- Likelihood of creating a win-win: Can shallow groundwater management enhance soil and watershed health, help tackle climate change, AND maximize crop yields?
- What stakeholder concerns might influence the adoption of advanced water management best management practices?

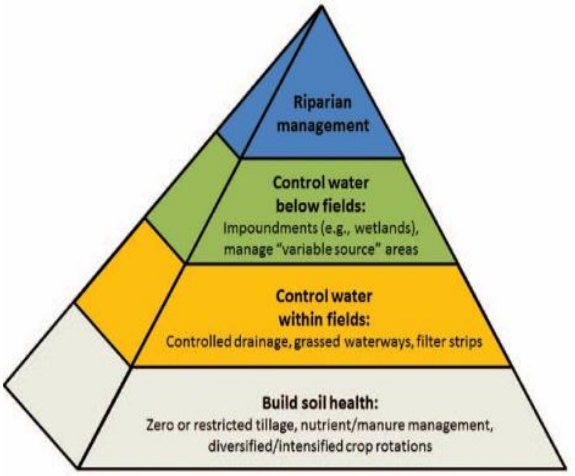

Figure 1. *From Tomer et al 2015: "Conservation practices in a watershed, conceptualized as a pyramid. Healthy agricultural soils will improve the effectiveness of practices placed within fields, below fields, and in riparian zones."* ***Soil health should form the base of watershed management. Understanding linkages across different spatial scales, from local fields to regional river systems, is critical to advancing soil health and watershed protection.***

Workshop Objectives:

- Facilitate cross-disciplinary discussions among researchers and field experts committed to advancing regenerative agriculture and water security.
- Identify critical information gaps that limit capacity to provide water management guidance across diverse landscapes and under changing climate conditions.
- Spark collaborations to address critical information gaps.

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DAY 1:

8:30 ***Pre-Meeting Breakfast Mixer*** *(optional)*

9:30 ***Introductions and Overview*** *Kathy Boomer (FFAR), Sally Rockey (FFAR)*

10:00 ***Plenaries:***
1) Overview of current research challenges in drainage management *Chandra Madramootoo (McGill);*
2) Soil health from a wetland biogeochemist's perspective *Christopher Craft (Indiana University)*

11:20 Break

11:30 PANEL I - Soil Heath State of the Science and Understanding
What is our current understanding of soil health, and what are current research priorities?
Facilitator: Matt Erhardt (Stroud Research Center)
Speakers: Rattan Lal (Ohio State), Ken Staver (University of Maryland), and Mark Tomer (USDA-ARS Ames, IA)

12:30 LUNCH (provided)

1:30 PANEL II - Soil Health, Soil Physics, and Hydrology in the Vadose Zone
How do vadose zone hydrodynamics influence soil moisture, biogeochemical processes, and microbial functions affecting soil health, nutrient cycling, and plant growth and what are the opportunities and challenges to model these relationships and interactions in a changing climate? How are biological processes related to soil health being characterized and how might these indicators vary based on hydrodynamic conditions across the landscape? How does agricultural management impact the soil environment in the vadose zone to influence nutrient use efficiency and other soil characteristics?
Facilitator: *Amy Collick (University Maryland Eastern Shore)*
Speakers: *Ryan Stewart (Virginia Tech), Brian Badgley (Virginia Tech), Michael Castellano (Iowa State University), Sotirios Archontoulis (Iowa State University), and Ray Bryant (USDA-ARS, State College, PA)*

3:00 BREAK

3:30 PANEL III – Impacts of Drainage Water on In-field Soil Conditions and Watershed Hydrology. *How has field water management influenced local water table dynamics and saturated flow, as well as hydrologic connectivity throughout a watershed? How does location and climate conditions affect interactions between water table management and field or watershed conditions?* ***Facilitator:*** *Amy Jacobs (The Nature Conservancy)*
Speakers: *Eileen Kladivko (Purdue University), Keith Schilling (University of Iowa), Laura Johnson (Heidelberg University), and Kathy Boomer (FFAR)*

4:45 ***Day's Wrap-Up and Preview for Day 2***

5:00 *Reception in the Kennedy Room*

7:00 *Group Dinner at The Wine Bar in Vintner Valley (*510 County Route 59/2, Burroughs Street, Morgantown, WV)

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DAY 2:

7:30 ***Breakfast Mixer*** *(provided)*

8:00 ***Introduction to Day 2*** *(Kathy Boomer, FFAR)*

8:05 ***Plenary and Discussion:*** **Agronomy-Watershed linkages, advancing our understanding of where management action has the highest potential to reduce ecosystem and human risks through innovative research**. *Donald Rosenberry (USGS, Lakewood, CO)*

9:00 ***PANEL IV: Innovative Drainage Practices to Manage Shallow Water Tables.*** *What innovative practices have emerged to manage the water table in artificially drained land? How effective are they at reducing nutrient loads and improving crop yields? How does raising the water table influence soil biogeochemistry and soil health? How can we address the complex interactions between shallow water tables and soil health?*

Facilitator: *Jason Hubbart (West Virginia University)*

Speakers: *Jane Frankenberger (Purdue University), Richard Cook (University of Illinois), François Birgand (North Carolina State), and Jeff Strock (University of Minnesota)*

10:15 BREAK

10:30 ***PANEL V: Understanding the Broader Range of Concerns Related to Drainage Water Management***

Facilitator: *Amy Jacobs (TNC)*

Speakers: *Steve Mirsky (USDA ARS, Beltsville MD), Samual Zipper (University of Kansas), Chandra Madramootoo (McGill University), and Genevieve Ali (University of Guelph).*

12:00 LUNCH (provided)

12:30 ***PANEL VI: Bridging the Sessions: Interactive Discussion to reflect upon the Need and Opportunities to Advance Field Water Management for Soil Health and Watershed Restoration.***

Facilitator: *Kathy Boomer (FFAR);* ***Panel Members:*** *Mark Tomer (USDA-ARS), Paul Wolfe (Walton Family Foundation), and Tom Bruulsema (IPNI, Canada)*

1:45 ***Workshop Summary, Outline of Next Steps***

2:00 ***Adjourn***

Thank you to our Sponsors & Steering Committee Members:

Steering Committee: *Kathy Boomer (FFAR), Chris Brosch (DE Department of Agriculture), Meg Cole (STAC CRC), Amy Collick (UMES); Matt Erhardt (Stroud Research Center), Jane Frankenberger (Purdue University), Annabelle Harvey (STAC CRC), Jason Hubbart (WVU); Amy Jacobs (TNC), and Lindsay Thompson (Executive Director of the MD Association of Soil Conservation Districts, Maryland Grain Producers).*