



# Innovation at the Nexus of Food, Energy and Water

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On behalf of the NSF FEW Working Group





# INFEWS

**This is a dynamic, coupled system:**

- **3% of US electricity is used to pump, treat, & transport water**
  - **90% of the energy bill on some farms**
- **40-50% of water withdrawals in the US are for thermoelectric power plant cooling**
- **30-40% of water withdrawals in the US are for irrigating crops**
- **10% of the US energy budget is associated with food production, processing, distribution, etc.**





# INFEWS

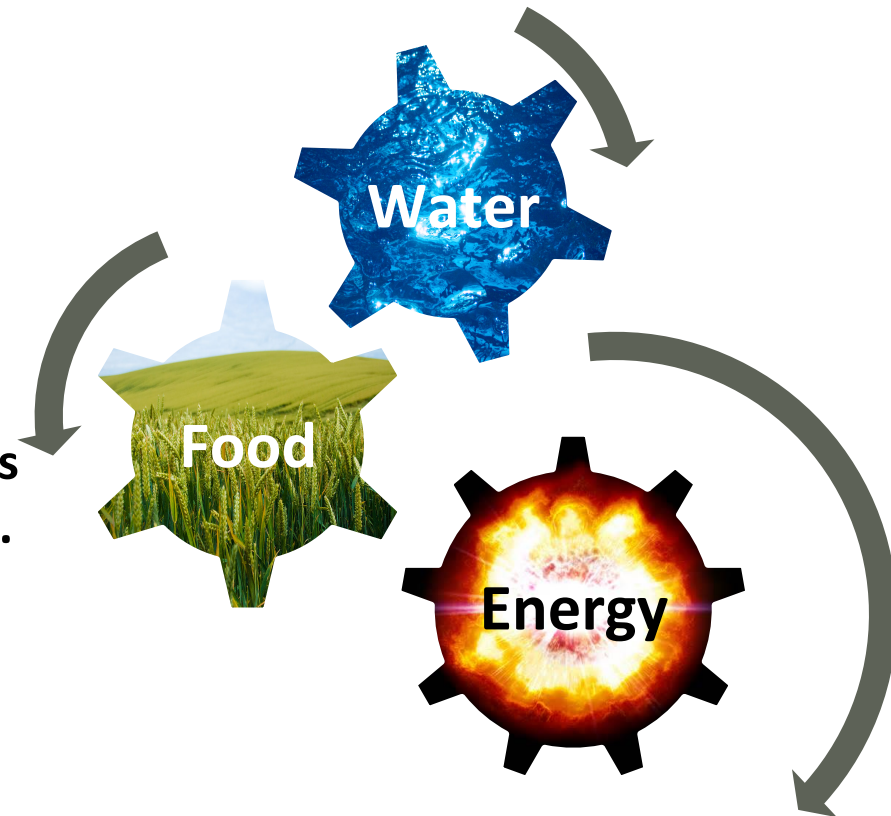
The water security, food security and energy security trilemma creates a multidimensional web that is a structurally complex network with dynamic links ...

Perrone and Hornberger, 2014

... will require significant action, either through institutional and behavioral paths or technological and infrastructural paths.

Perrone and Hornberger, 2014

**NSF: Basic Science is necessary to inform policy decisions ... and synergistic with “core”**

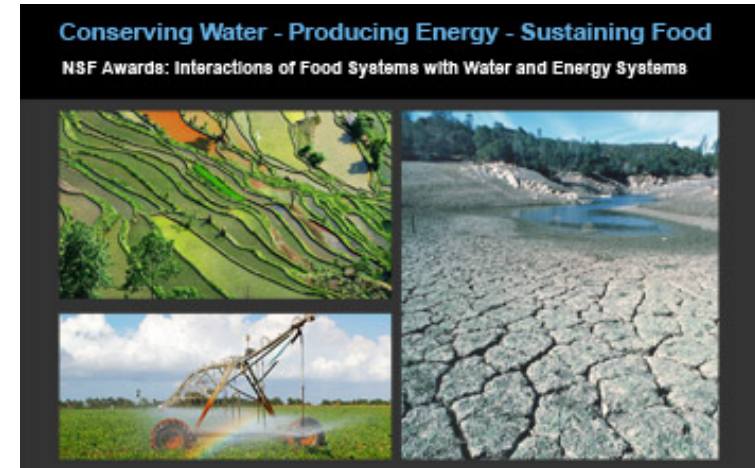




# INFEWS

- ◆ DCL issued 2 Feb '15: NSF 15-040 *SEES: Interactions of Food Systems with Water and Energy Systems*
- ◆ Webinar 25 Feb 2015; due date 30 March
- ◆ June 2015, 17 workshops and 27 supplements funded \$6.3M
- ◆ August 14, 2015, Press Release 15-090

**“New grants foster research on food, energy and water: a linked system “**







# INFEWS Goals FY16

- ◆ **Significantly advance our understanding of the food-energy-water system through quantitative and computational modeling, including support for relevant cyberinfrastructure;**
- ◆ **Develop real-time, cyber-enabled interfaces that improve understanding of the behavior of FEW systems and increase decision support capability;**
- ◆ **Enable research that will lead to innovative system and technological solutions to critical FEW problems; and**
- ◆ **Grow the scientific workforce capable of studying and managing the FEW system, through education and other professional development opportunities.**





# INFEWS FY16+

- Major scope is a solicitation (interdisciplinary with ‘fuzzy’ boundaries)
- Dear Colleague Letter: FY 2016 Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) Funding Opportunity on Nitrogen, Phosphorus, and Water ...August 12 2015; Chem and CBET
- EPSCoR Track 2 will have an INFEWS focus  
[http://nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=505263&org=NSF&sel\\_org=NSF&f](http://nsf.gov/funding/pgm_summ.jsp?pims_id=505263&org=NSF&sel_org=NSF&f)
- Renewing the MOU with USDA/NIFA
- Establishing an MOU with NOAA





# INFEWS

- 💧 The solicitation, DCL and companion calls establish **CONTEXT**:
  - 💧 an INFEWS context for research across NSF and “disciplines”
  - 💧 a focus for interaction with sister agencies
- 💧 The central solicitation will provide a **FOCUS** for new research
  - 💧 enable creative interdisciplinary research
  - 💧 “fuzzy” track boundaries focus research on major challenges but also represent Pasteur Quadrant opportunity
- 💧 Future... **CONTINUITY** to maintain interdisciplinary thinking, build new breed of scientists and interact with core programs
  - 💧 Strong links to the core sciences as exhibited in the DCLs



# INFEWS

A drama about food, energy and water ... where “innovation” means ‘repurposing’ \$700M of NASA equipment