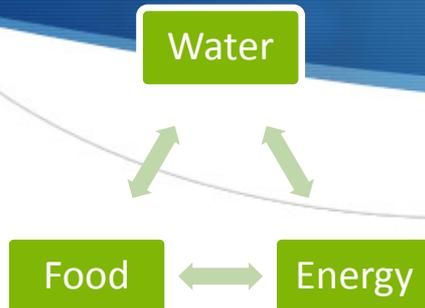




Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)

On behalf of the FEW Working Group





Food, Energy, and Water (FEW) Linkages

- **Energy –Water-Food**
 - 3-20% of US energy budget is used to pump, treat, transport, and heat water
 - Up to 90% of energy use on farms is associated with water (pumping, irrigation)
 - 10% of the US energy budget is associated with food production, processing, distribution, etc.
- **Water –Energy-Food**
 - 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



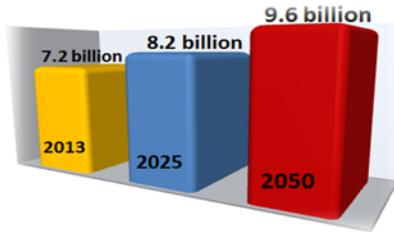


Food, Energy and Water System

THE 2050 PICTURE

WORLD'S POPULATION BOOMS

↑ **>9 BILLION by 2050**



Larger, more urban and richer population

Food production will need to **increase**

~60%



2010



2050

FOOD

Water demand will **increase**

~30%



2010



2050

WATER

Energy production will need to **increase**

~50%



2010



2050

ENERGY

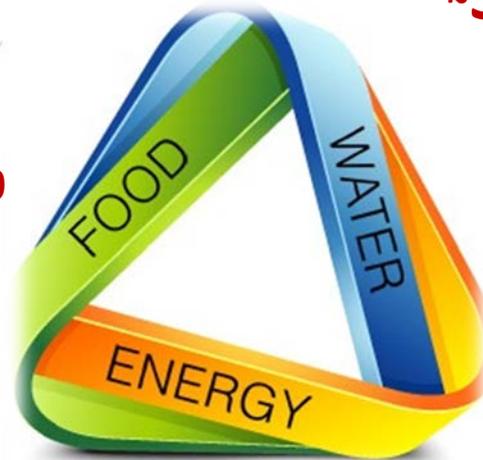
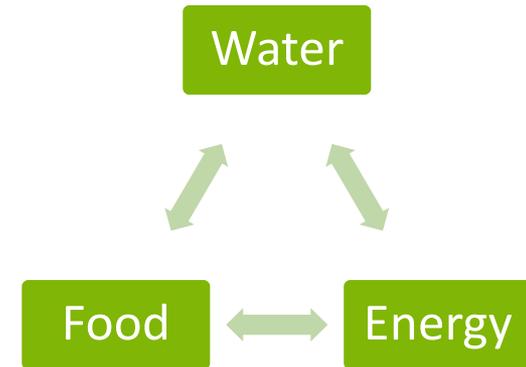


Image credit: <http://www.aquate.com>



Food, Energy, and Water Trilemma

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



... finding solutions to our global water, food, and energy security problems will require significant action, either through institutional and behavioral paths or technological and infrastructural paths.



Perrone and Hornberger, 2014



FEW Dear Colleague Letter (DCL) Feb 2015 (\$5.5M)*

- 1. Accelerate fundamental understanding and stimulate basic research on food systems and their couplings to energy and water systems**
- 2. Integrate Scientific Communities, including those at other federal agencies; enhance communication**
- 3. Define fundamental science and engineering research needs/questions in FEW Systems**



*in anticipation of INFEWS FY16



FEW DCL Timeline

- 🟢 **2 Feb: DCL issued**
- 🟢 **30 March: proposals submitted for consideration**
- 🟢 **Internal decisions mid-to-late May**
- 🟢 **August to Nov 2015 Workshops convene**
- 🟢 **31 Dec: Workshop white papers delivered**



INFEWS

FY16 – Planned ~\$75M

- 🟡 **Understanding the complex nature of the FEW system through integrated modeling**
- 🟡 **Methodologies for effective data integration/cyber elements at multiple temporal and spatial scales of terrestrial systems**
- 🟡 **Fundamental science and engineering to solve FEW challenges**
- 🟡 **Technology advances**
- 🟡 **Education and workforce development**



FEW Workgroup

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Questions?

Innovations at the Nexus of Food, Energy,
and Water Systems



\$75 million