

## Opportunities in the Food-Energy-Water Nexus – Special Session

ASABE Conference in Spokane, WA, July 17, 2017

### **Panelists:**

**Kenneth Quinn** – President, World Food Prize Foundation; former U.S. Ambassador

**Jim Jones** – Program Director, National Science Foundation (NSF) ENG Directorate, INFEWS; Distinguished Professor Emeritus, University of Florida

**John Verboncoeur** – Associate Dean for Research, College of Engineering, Michigan State University

**Hongda Chen** – National Program Leader, Bioprocess Engineering and Nanotechnology, USDA/NIFA

**Heriberto Cabezas** – Senior Science Advisor, Land Materials Management Division, US Environmental Protection Agency; Research Professor, Center for Process Systems Engineering and Sustainability, Pázmány Péter Catholic University; American Institute of Chemical Engineers

### **Moderator:**

Rabi H. Mohtar – Water-Energy-Food Nexus Initiative, Texas A&M University

### **Student assistants/contributors:**

Jordan Muell – MSc student, Civil Engineering, Texas A&M University

Sonja Loy – MSc student, Biological and Agricultural Engineering, Texas A&M University

Bassel Daher – Ph.D. student, Water Management and Hydrologic Sciences, Texas A&M University

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Mary Schweitzer – Water-Energy-Food Nexus Initiative, Texas A&M University

### **Key Messages from the Session:**

There is strong interest among the organizers to build a national community of science and practice in the Food, Energy and Water Nexus (FEWN) with contributions from public and private sectors. Additional national platforms are needed for multiple disciplines to come together to ensure broad science and engineering contributions to address the complex problems of FEWN systems and to continue to raise awareness and build momentum towards actualizing this community of science and practice. The organizers also believe that such a National Nexus Community should tie to Global Nexus efforts and link to global challenges which include, but are not limited to, Sustainable Development Goals.

### **Session Overview:**

The session, *Opportunities in the Food-Energy-Water Nexus*, was intended to build awareness of the FEW (Food, Energy, Water) Nexus and create dialogue around the establishment of a FEW Nexus community of science and practice by identifying areas of research and education. The session explored the current status and future trends of the interconnected resource gaps, the inequity of resource distribution, and the current and anticipated stresses relating to FEW. It also emphasized the FEW Nexus as a platform that builds on existing strengths in the FEW disciplines: it does not and will not replace these disciplines. The session further addressed the need to quantify the many interlinkages across tightly interconnected resource systems, to identify resource hotspots, and to develop the analytics necessary for catalyzing dialogue between stakeholders in order to promote better communication and bridge the science-policy gap. The ensuing panel discussion focused on ways in which the scientific community is moving forward to address Nexus challenges.

Panelists spoke of the need to move beyond the current organizational silos and noted the national investment in the Nexus around the country is supported with an NSF allocation of \$72 million and a USDA/NIFA allocation of \$5 million to INFEWS research projects. A panelist noted the plans of NSF and USDA to continue a similar level of support in the coming years, depending on the Federal Budget. A

panelist also addressed efforts to promote Nexus research and education, and highlighted specific initiatives including the Nanotechnology Signature Initiative (NSI) on Water Sustainability through Nanotechnology, which promotes increasing water availability, improving the efficiency of water delivery and use, and enabling next-generation water monitoring systems. The on-going efforts are recognized for promoting the use of membrane filtration for water as a means of reducing energy consumption. Other related initiatives discussed included finding additional opportunities to safely use non-traditional water sources.

**Key outcomes of the discussion:**

- (1) National institutions and funding platforms play a role in helping move beyond the silos of current organizational structure. NSF and USDA have funded 17 INFEWS related workshops around the USA, and allocated \$72 million for FEWS research, education, and outreach efforts, a level of support expected to continue in the coming years, if budgets permit. USDA-NIFA supports agricultural research, education and extension in the realm of FEW Nexus, including nanotechnologies for membrane filtration and opportunities for safe use of non-traditional water sources.
- (2) Because socio-political crises usually correlate with resource crises, social factors must be included in future conversations and collaborations regarding the FEW Nexus. The world-wide general public may be unaware of the impending problems regarding food, energy, and water. The FEW Nexus efforts are intended to support the population over the long-term. There has never before in the history of the earth been a need to provide for such a large population, such as the current and projected numbers of humans, and this challenge should not be underestimated. A key concept of FEW Nexus thinking is that there are no blanket solutions. Solving impending problems and crises demands consistent hard work and engineering solutions in collaboration with social science. Engineers and social scientists are encouraged to apply jointly for FEW Nexus research grants.
- (3) A primary challenge is improving the connection between science and policy by providing the decision-maker(s) with useful information and knowledge. This connection starts in the institutions and moves upstream where academia and industry must transfer their science into the media mainstream to make it known to the public, and helping to encourage the larger discussions within the political arenas. Creating the equivalent of a U.S. intelligence community for the FEW Nexus would bring together a dispassionate assessment that communicates to decision-makers and the public trend-lines, information, and implications for the future of sustainable FEW resources. Collaboration between U.S. and international research universities could produce such an assessment.
- (4) Encouraging collaboration among disciplinary silos in a practical manner is critical. Disciplines must converge, learn to speak one another's languages, and work across multiple scales (from local food production through the entire food chain). Encouraging more joint appointments on campuses between engineering and agriculture, social scientists, and natural sciences can help break down these silos. To facilitate collaboration, production and management resource values must be revisited. Global partnerships and communities should be formed around the FEW Nexus concept. ASABE and other professional societies have a critical role to play in this endeavor.

**Next Steps:**

The keen interest among the organizers to continue to build a National Nexus Community of science and practice should be used to move the dialogue to additional platforms and to continue to raise awareness and momentum towards actualizing this community of science and practice.

**Audience Questions:**

1. To what degree are social and environmental scientists a part of the FEW Nexus work? Panelists spoke about roads as a great tool for spreading the ideas and projects of engineers; at the same

time environmental scientists point out that roads are a major source of destruction, such as deforestation in the Amazon or plantations of oil palms in Malaysia. Both engineers and environmental scientists must join the discussion in order to identify the optimal trade-offs.

2. Does NIFA only consider Track 3 proposals? Do non-Track 3 proposals not get attention through NIFA?
3. Will there be a major national push to dramatically increase NIH funding in the FEW arena?
4. Is the NEXUS program achieving its goals? What have been the impacts so far?
5. How does IEEE become involved with INFEWS review panels? Does any portion of INFEWS funding come directly from IEEE? Should we contact IEEE program directors to share ideas?
6. Does EPA have any specific INFEWS program areas? Is there an identified collection of key areas for focus in future research opportunities, especially with regard to EPA?
7. What is the balance between energy and food production? How should we balance demands for dietary options, energy use for quality of life, and ultimately, land use choices and its impact on water quality?
8. Concerning sustainability in water use, what are the most critical or immediate needs and directions for research?
9. What might be the "best" way to unite countries in order to ensure food-energy security, given that people do not see what is coming on this issue, and it is not currently a critical point on several government agendas?
10. How do funding agencies assess the potential short-term, mid-term, long-term impact of research proposals? Should proposals be categorized on this basis?
11. How do we lead and implement global partnership teams on INFEWS, Climate Change, and Ecosystem Health? What role and resources should ASABE provide in forming these global teams?
12. What countries are making the most progress on water, food, or energy issues at this time? What success stories or hotbeds of innovation already exist?
13. Given the reality of constraints such as regulation, and the need to balance profitability sustainability, and Environmental stewardship, how can we engage farmers/producers in the FEW Nexus?
14. Please discuss a shift in ASABE standards to: (1) integrate these issues more cohesively and (2) establish something that approaches minimum & reach energy efficiency codes.

15. Effectively addressing Nexus issues requires collaboration between social science and engineering; thus, how do we overcome collaborations that don't work out, producing poor policies?
16. Ambassador Quinn spoke of "making decision makers care." Given the propensity of governments to respond to crisis rather than plan in advance, what strategies might highlight the resource conflicts?
  - a. How might we address large scale priorities when research is focused on local scales?
  - b. Farmer populations are 40-60 years of age, how can we drive change now to promote FEW Nexus solutions over the next 50 years?
17. How do we lead and implement global partnership teams on INFEWS, climate change, and ecosystem health? What roles and resources should ASABE put forth in forming those global partnerships?
18. Is not the USAID/NSF funded PEER program in developing countries playing a role to initiate or strengthen the FEWN international collaboration? Can ASABE play a role in the PEER program?
19. How does stakeholder input affect INFEWS? How are innovations bringing on-the-ground changes and going beyond "academic" exercise?