ENGINEERING STRATEGIES FOR A SUSTAINABLE FOOD SUPPLY CHAIN WORKSHOP

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Acknowledgment

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Welcome!

- 50 registrants
- Universities, Institutes, Research organizations, Manufacturing, Agriculture, Government, Environmental action groups, NGOs, …
- Engineers, scientists, economists, sociologists, etc.
- All engineering disciplines
- U.S.A., Canada, Australia, …
- Students… to professionals … to retired.

The scale of the problem

- Estimated 32% of all food is lost or wasted. In America … food waste is equivalent to $165 billion /year. (WRI, 2013)
- Vast unconsumed food … and yet, food needs are not met.
  - In the U.S. … reducing food losses by just 15% could feed more than 25 million Americans, which is about half the number who lack a secure supply of food. (NRDC, 2012)
- Environmental impacts are vast …
  - In the U.K. … if disposed food were removed from landfills, the reduction in CH4 emissions would be equivalent to GHG abatement of reducing vehicle emissions by 1/5. (WRAP, 2100)
- ***Inefficiencies are pervasive, occurring at every step in the supply chain, and in every country of the world.***

Contrasting developed and developing countries

- In developing countries food waste and losses occur mainly at early stages of the supply chain, and can be attributed to constraints in harvesting, storage, and cooling.
- In developed countries food is wasted and lost mainly at later stages in the supply chain. … "the behavior of consumers plays a huge part in industrialized countries."

Solutions ?

- For example … The U.S. Food Waste Challenge hopes to shift how we think about and manage food and food waste in this country. … Participants list the activities they will undertake to help reduce, recover, or recycle food waste in their operations in the United States.

➔ The need for *engineering* solutions.

The need for *engineering* solutions

- *New technological approaches are needed …*
  - *in growing crops & harvesting, handling & storage, processing & packaging, distribution & marketing, consumption and waste management.*
- *This is the only way to create new economic drivers, and for policy instruments to have impact.*
- ***Solutions will require engineers to play a lead role in advancing the technological breakthroughs.***

Workshop goals

- Identify technical challenges, gaps and barriers.
- Examine case studies of impactful, cost-effective, and efficient technologies.
- Determine the technical requirements that enable tailored engineering solutions.
- Propose custom technical solutions for steps in the supply chain and for different parts of the world at various stages of development.

Six focus areas

- Packaging
- Low Tech Food Storage
- Sensors Technology
- Waste to Energy
- Systems and LCA
- EWF Nexus

- Technologies aimed at food preservation.
- Technologies aimed at low-tech food storage in the developing world.
- Technologies aimed at sensing food spoilage and contamination.
- Technologies aimed at food waste management such as waste-to-energy biofuels.
- Systems-level analysis: such as Life Cycle Assessment
- The food supply chain in the Energy-Water-Food nexus.

Speakers

Packaging

Low Tech Food Storage

Sensors Technology

Waste to Energy

Systems and LCA

EWF Nexus

- Kit Keith L. Yam, Rutgers University
- Ramaswamy Nagarajan, University of Massachusetts Lowell
- Corinne Alexander, Purdue University
- Tim Fox, IMechE
- Carl A. Batt, Cornell University
- Suranjan Panigrahi, Purdue University
- Michelle O'Malley, University of California, Santa Barbara
- David Dayton, Research Triangle Institute (RTI)
- Jon Dettling, Quantis
- Bobby Renz, ICF International
- Kim Ogden, University of Arizona
- Darlene Schuster, AIChE
- Smitha Haneef, Campus Dining, Princeton University

Breakout Sessions: Discussion of cross cutting problems

- What are the technical challenges, gaps and barriers for an efficient and sustainable food supply chain?
- Are there any non-technical issues that supersede the technical challenges? What non-technical issues must be addressed in order for development and implementation of technical solutions to be impactful?
- What are the impacts of the food supply chains on energy, water and ecological systems?
- What technical requirements exist that present opportunities for collaboration with and between engineers and engineering societies? How do they differ by step in supply chain and stage of development of corresponding region?

Discussion Session: Food Preservation Technology

Packaging, Food Storage, Sensors

- What are the technical challenges, knowledge gaps and barriers?
- What are the technical requirements that enable engineering solutions?
- Which technical innovations are "low-hanging fruit"?
- Which technical innovations are potentially high-impact, but require long-term research investment?
- How should we customize the engineering solutions for each step in the supply chain and for different parts of the world at various stages of development?

Discussion Session: Food Supply Chain Impacts

Technology

- What are the current technological barriers for efficiently converting food waste to energy?
- What is the water footprint or life cycle impact of each of WTE technology? How are they different?
- What are the key differences in distributed vs. centralized WTE? Developing countries vs. developed countries?

Sustainability

- What are the main methodological challenges in current systems models (e.g., LCA, water footprinting, etc.) that limit the ability to generate decision-relevant findings?
- What are the key knowledge gaps in our ability to monitor, analyze, and mitigate environmental impacts across the food supply chain?