IEEE SmartAg Initiative:

Technology applied to the food supply chain
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IEEE SmartAg Initiative

Smart Technologies and Innovations Applied to the Food Supply Chain, From Soil to Table

- Application of technology to production, processing, packaging, and delivery of food – system approach
- From soil to table – full food supply chain
- Engages many IEEE technologies
- Fits IEEE mission of advancing technology for humanity
- Impact: Energy/water/fertilizer/pesticide efficient, safe food production and delivery can impact billions of people
- A partnership with non-IEEE entities
Motivation

The Challenge: Today’s Water Allocation Model and our Interconnected Primary Resources

- **WATER demand**: +55% by 2050
- **ENERGY demand**: +80% by 2050
- **FOOD demand**: +60% by 2050

- 9 billion human beings by 2050
- 80% of freshwater is used by agriculture sector
- 30% of world energy is consumed by food sector
- 10-30% less precipitation than 1980-1999 in most sub-tropical regions (IPCC)
- 15% of global freshwater withdrawals are for energy production

From Rabi Mohtat, ASABE 2017
What is the IEEE?

*Formerly: Institute of Electrical and Electronics Engineers*

- over 420,000 members in over 160 countries
- 46 Technical Societies and Councils, plus Local Geographic groups, Standards, Education Activities
- Over 1800 conferences per year
- Over 200 journals and magazines
- 4M document library, with over 8M downloads/month
- 1300 active standards, 500 in development
- Partners with more than 1300 non-IEEE entities
SmartAg Vision

Update currently in progress ...

To be an international community for promoting smart technologies and innovations for enhancing global agro-food systems across the food supply chain.
SmartAg Mission

Update currently in progress ...

To create a platform that connects researchers, practitioners, and policy makers to facilitate the development and application of existing and emerging smart technologies to enhance global agro-food systems.

It’s ripe, Jim!
SmartAg Initiative

Outcomes

- Engage S/C and other OUs and non-IEEE domain specialists with global impact
- Engage Young Professionals
- S/C contests for best application of S/C technology
- Innovation seed funding to develop technologies
- Smart Village opportunities
- Engage agrarian regions
- Engage practitioners – agro-technologists who deploy (e.g. extension agents, consultants, NGOs)
- Engage entrepreneurs
- New Conference(s) and Publication(s)
- Community Engagement through social media, instructional videos and materials
- Design Council structure with TC for membership
- Complementary to existing conference and publications for stakeholders
What are SmartAg technologies?

- Multi/hyperspectral visual, lidar, and microwave sensing
- Data analytics and visualization: machine vision/deep learning
- Sensors for volatile organics, lab on a chip
- Autonomous farmbots and UAVs
- Phenomics to genomics
- Plasma seed treatment
- Communications, antennas, signals
- Data science, regional view of plant stresses
- Animal health monitoring
- Sustainability, optimization
- Food sterilization (UV, plasma)
- Smart packaging: functionalized thin films, 2D printed labels with
- Food supply chain authenticity, traceability via blockchain
- Ethics, policy, standards

These ARE the droids you are looking for!
IOT in the Agrofood Supply Chain

Smart Packaging: Food Waste Reduction

Total waste along the value chain

Most wasted food groups (Retail and consumer level):

- Largest component of landfills
- Third largest source of methane in the US.

Adapted from Amanpreet Kaur, Axia Institute, Michigan State University
Application of Smart Packaging in Food

- Food safety
- Brand Protection
- Freshness Indicator
- Shelf Life extension-Special coating
- Self Heating Meals
- Food waste reduction

Adapted from Amanpreet Kaur, Axia Institute, Michigan State University
2017 SmartAg Symposium Summary

- Venue: 03-06 Dec 2017, at Kellogg Center, East Lansing, MI, USA
- Goal: define the scope of convergent, sustainable activities in SmartAg
- Outcomes: plans for:
  - International conference/journal/magazine series, jointly sponsored by IEEE and Ag and other food supply chain societies
  - Engaging practitioners
  - Library of videos, educational materials
- ~120 attendees from 10 countries, by invitation, 2.5 days
- General Chair: Renfu Lu (USDA-ARS; ASABE member): Execute symposium, oversee local organizing committee
- Technical Program Chair: Ajit Srivastava (Biosystems and Ag Engineering, MSU, ASABE member): Develop and manage technical program
- Advisory Committee Chair: Norman Scott (Cornell) Organize support, key agencies and government officials
- Executive Committee Chair: John Verboncoeur (IEEE/MSU): synthesize Symposium discussions into blueprint for sustainable activities
Next Steps

Get involved

- Engage: Work with IEEE S/C, Geo units to build a SmartAg track in to major conferences – tap ingenuity of members
  - Special sessions
  - Panels
    - SmartAg Committee members can provide keynotes
- Plan: Executive Committee developing a blueprint for sustainable activities
- SmartAg development workshop will be held following ASABE Annual International Meeting (following slide)
- Educational Activities
- Standards
**Strategic Plan 1**

*Near term*

- Develop broad community support
  - Define scope and partners
  - IEEE Societies: many holding conference special sessions, keynotes
  - Non-IEEE Societies: engaging boards, conference activities
  - Publications discussions not yet started

- Developing 2019 Joint International SmartAg Conference
  - Vision and planning meeting: 01-02Aug2018 at ASABE Annual International Meeting
    - Organizer: Larry Walker (Cornell)
    - Will include corporate vision talks, conference organization meeting
  - Form joint steering committee
  - Develop 2019 Conference MOU – build partnership
SmartAg Workshop at ASABE AIM

http://www.asabemeetings.org/
SmartAg Workshop at ASABE

01-02 Aug 2018, Detroit, MI, USA

- SmartAg Executive Committee to present blueprint to
  - SmartAg Advisory Committee
  - ASABE Board
  - IEEE SmartAg Ad Hoc
  - Tri-Societies
  - International Food Technology Society
  - Other societies

- Work out details for a joint 2019 SmartAg Conference and associated publication(s)
  - IEEE Society/Council and non-IEEE Society Co-Sponsorship
  - MOUs defining interaction
Strategic Plan 2

Beyond first engagement

- IEEE Membership model: options?
  - Technical Community Model?
  - Modified Council Model?
  - Associate Membership?

- Develop Long Term Conference MOU
  - Need to learn from first joint meeting
  - Must clearly define roles and responsibilities
  - Joint Steering Committee to oversee conference series
  - Bylaws, joint operating manual
  - Need prenuptial agreement?
  - Learn from other IEEE joint conferences – recommendations?

- Develop joint publication model
  - Need defining documents
Strategic Plan 3

Other activities

- Geographic presence – MGA help?
  - Section-like meetings
    - Enable global participation
    - Incorporate regional issues

- Educational videos

- Speakers bureau

- Industry engagement
  - Entrepreneurship
  - Exhibitors
  - Practitioners, continuing education
  - Knowledge and solution exchange
  - Career support

- Specialty meetings and publications?
Discussion

Join us!

- Work with your Society/Council to implement engagement strategy at conferences:
  - Panels
  - Special sessions
  - Keynotes

- Help reach out to Chapters/Sections to build the geographic component

- Standards
- Education
- Entrepreneurship

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