

## **Co-Products/By-Products:**

### *In General:*

- 1) In the past, energy was a sub-component, but it has recently been elevated to a higher priority level.
- 2) What do we people mean by bio-energy? Need clarification of/establish a definition of bioenergy. (e.g. Energy from biomass)
- 3) Should have integrated systems that reflect synergistic ecosystem services
- 4) On site utilization of power is important
- 5) Manure=energy
  - Anaerobic digesters—what is the next step?
    - Viewed as mature, but design options may evolve
    - Generate hydrogen for microbes and microbial fuel cells energy.
    - Ethanol production by-products
    - Hybrid, wind, solar, control systems
    - Bio energy from manure waste: Hydrogen and electricity
    - Energy recovery from biofuels

### *Problem Statement:*

- 1) Energy: Develop technologies to recover energy from manure and to conserve energy.
- 2) Develop beneficial uses from bioenergy residue.
- 3) Develop protocols to quantify environmental credits.
- 4) Risk assessment: Establishing risk based limits on by-products on beneficial use of MIA byproducts.
- 5) By product utilization technologies: What are the rates that we need? Where, when, what, how? Establishing beneficial uses of municipal/industrial/agricultural by-products.

### *Objective Statements, Organized by Problem Statement:*

- 1) *Energy*, identify:
  - A. Microbial sources
  - B. Thermochemical systems
  - C. Integrated systems
  - D. System energy conservation and transfer systems

## **Pathogen and PACs Breakout Session**

- 1) Kimberly Cook – Co-Chair (KY – MSA)
  - a) Fate Transport Pathogens
  - b) Odors
  - c) Swine/Chicken
- 2) Cliff Rice – Co-Chair (Beltsville)
  - a) PACs
- 3) Rob Dungan (ID – NW)
  - a) Bioaerosols
  - b) Dairy/Cattle
- 4) Michael Jenkins (GA – S)
  - a) Fate Transport Pathogens
  - b) Chickens/Dairy
- 5) Mark Ibekewe (CA – W)
  - a) Fate Transport Pathogens
  - b) MST
  - c) Dairy
- 6) John Brooks (MS – MSA)
  - a) Fate Transport Pathogens
  - b) Chickens/Swine
- 7) Carl R.
- 8) Tom Moorman (IA)
  - a) Fate Transport Pathogens
  - b) Swine

### Research Problem Area & Subsets

- 1) Pathogens
  - a) Fate and Transport
    - i) Microbial Ecology
  - b) Bioaerosols
    - i) Endotoxin
    - ii)  $\beta$  Glucans
  - c) Microbial Source Tracking
  - d) Best Management Plan/Technologies
  - e) Quantitative Microbial Risk Assessment
- 2) PACs
  - a) Environmental Frequency
  - b) Fate and Transport
  - c) Source
  - d) BMP & Mitigation Technology
- 3) Antibiotic Resistant Bacteria
  - a) Environmental Frequency
  - b) Fate and Transport
  - c) Source

4) Holistic treatment technologies (group integration)

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## Breakout Session 4- Andy Cole/Karamat Sistani

### Component: Nutrient Management

- **Problem Area 1: Animal Feeding and Management**  
**Balanced diets for nutrient management**
- **Problem Area 2: ~~Innovative Technologies for collection, storage, and treatment~~ Collection, Storage, Treatment, and Utilization**  
**Separation/Extraction of nutrients**  
**Volume reduction & storage**  
**Microbial mechanisms from excretion to application**
- **Problem Area 3: ~~Management tools for indexing and evaluating nutrient fate and transport~~ – Nutrient Fate and Transport**  
**Nutrient management for water quality**  
**Better methods for nutrient measurements**
- **Problem Area 4: ~~Farming systems and practices for efficient and balanced manure nutrient management~~ Farming Systems and practices for efficient and balanced nutrient management**  
**Application technologies**

## **Component: Nutrient Management, Preservation, and Enhancement of Manure Resources**

- **Problem Area 1: Animal Feeding and Management**

- **Problem Area 2: Collection, Storage, Treatment, and Utilization**

Develop protocols to quantify for environmental credits

- **Problem Area 3: Nutrient Fate and Transport**

Biological, chemical, and physical mechanisms affecting nutrient availability and loss

- **Problem Area 4. Farming Systems and practices for efficient and balanced nutrient management**

- **Problem Area 5. Develop technologies to recover and conserve energy from animal production**

## **Component: Management, Enhancement, and Utilization of Manure Resources**

**Problem Area 1. Animal Nutrition, and Management**

**Problem Area 2. Collection, Storage, Treatment, and Utilization of manure**

**Problem Area 3. Utilization of manure in an integrated farming system to improve soil, water, and air quality.**

**Problem Area 4. Manure as a renewable energy resource.**