

# Customer Questionnaires

- Please provide a brief description of your organization.
- Is ARS an important resource to you and/or your organization? Can you describe an example of an ARS research accomplishment that helped you with decision-making or resulted in improvements to your organization?
- Relative to *Manure and Byproduct Utilization* issues, what do you foresee as your top problems during the next 5 to 10 years?
- In *Manure and Byproduct Utilization* research what should be the 4 or 5 top research priorities during the next five years research?
- Which of these priorities do you believe ARS scientists are well-positioned to address?
- Where should the ARS *Manure and Byproduct Utilization* National Program be the next 5-10 years in terms of focus and capacity?
- How would you describe an ideal relationship with ARS and what are some ways to achieve this? How should this relationship interface with extension, university researchers, commercial service providers and consultants?

# By-Product Utilization (3)

- **Main Problem:** The difficulty in increasing the agricultural beneficial use of industrial byproducts is the top problem from our perspective.
- **Examples of byproduct utilization** include (1) Using Waste Foundry Sand for Agricultural and Horticultural Applications, (2) flue gas desulfurization (FGD) gypsum in Agriculture, and (3) Impact of Using Paper Mill Sludge for Surface-Mine Reclamation on Runoff Water Quality and Plant Growth.

# By-Product Utilization (3)

## ■ **Specific Problems Areas:**

- Science-based environmental risk assessment guidelines
- Phytoavailability and Bioavailability of Nutrients including trace elements and xenobiotics in byproducts considered for beneficial use
- Protocols and methodology standards for examination and approval of byproducts for beneficial uses in agriculture and horticulture
- Byproduct utilization technologies (BMPs)—also extend beyond existing byproducts.
- Evaluate environmental risks
- Develop acceptable application rates
- Preparing appropriate guidelines for use
- Demonstrate use of byproducts in agricultural systems
- Work with the agriculture to gain acceptance of appropriate uses
- Ways to handle large byproduct quantities and limited storage space at production facilities
- Need for reasonable environmental regulations regarding storage and use
- Need for environmental risk assessment guidelines which encourage safe use of these materials
- Financial incentives to encourage byproduct utilization
- Better technology transfer

# Manure Nutrient Management

- Phosphorous loading in soils and utilization (3)
- Proper nutrient balance when applying manure as a fertilizer
- Proper use of use of manure to improve soil quality—are we spreading the manure too thin (for nutrient management) to get organic matter soil quality benefits
- Manure nutrient availability, especially for N, based on time and method of application, for manure from various animal species and regions of the country.
- Potential for deep plowing or other cultivation practices to dilute phosphorus build up
- Technologies for separating phosphorus and other non-desirable elements from manure

# Manure Air Quality

- Process based model of emissions encountered on animal feeding operations based on more accurate assessments of actual emissions from different types of structures.
- Reduce atmospheric emissions of ammonia, greenhouse gases, and odors.
- Odor control (2)
- Ammonia emission reduction
- Identification and quantification of air emissions from CAFOs (2)
- Livestock feed management to limit methane production
- Effectiveness and long term potential of vegetative treatment area to attenuate nutrients in run-off from livestock facilities
- Identification and mitigation of pathogens and pathogen drift
- Inform producers and animal industry reps on mitigation methods for reducing odor and other key air emissions from animal production systems on neighbors and local stakeholders.

# Manure Pathogens

- Reduce pathogen dissemination through manure
- Information on fate and transport of pathogens in the soil including quantifying populations associated with animal agriculture (2)
- Feed management to limit pathogen production
- Pathogen survival and propagation in soils to which manure has been applied
- The ability of bacteria and other pathogens from manure run-off to survive or propagate in stream or lake sediments
- Effectiveness and long term potential of vegetative treatment area to attenuate pathogens in run-off from livestock facilities
- Mitigation practices and strategies



# Manure Pharmaceuticals

- Reduce antibiotic dissemination through manure



# Manure Energy

- Economic evaluation of manure to energy solutions in the Southwest; anaerobic digestion, gasification, centralized processing, etc. of large clusters of dairies in the Southwest
- Marketable byproducts to improve farm economics (energy and more)
- Energy production including economically feasible energy sources for poultry houses and other animal systems (2)
- Potential for energy generation and use by animal agriculture and how it can be part of a more sustainable or green revolution in agriculture
- Increase energy self-sufficiency of operations through conservation and energy recovery from byproducts



# Manure Regulatory Driven Practices and Systems

- -Ensure that the waste utilization process increases not decreases productivity of the operation it supports.
- BMPs and other innovations based on sound science to comply with new regulations.
- Compliance strategies that do not affect profitability
- For nonpoint source pollution, effectively managing run-off from small unregulated livestock facilities and from land-applied manure in a cost-effective way
- Factual information in regards to manure production, nutrient content, and energy potential for dry-lot dairies in the Southwest
- Scientific information on fate of nutrients in the environment – soil, water, air.
- Integrated, closed loop systems for clusters of dairies that address water treatment and conservation, nutrient utilization, energy production and optimization, application practices of tail-end products.
- How carbon trading can be implemented and assist animal production in the US.
- Impact of animal production on Climate Change (methods for GHG emissions measurements and control).
- Communicate to key policy makers, stakeholders and the general public the sustainability features of animal production with crop and other agricultural systems in the US
- Explain and demonstrate how nutrient management plans and the high value of animal manure prevent excessive use of manure for land application on crops and maintains surface and ground water quality.
- Urban sprawl (2)

# Manure Transportation and Facilities

- Alternative manure handling and storage technologies including alternative technologies to bio-digesters
- Design liquid wastes facilities that are economical, practical and environmentally friendly
- Alternative poultry litter management including alternative bedding materials
- How to economically close old lagoons and waste storage facilities
- Cost-effective storage, transportation and application of manure as a crop nutrient source (2)
- Economic transportation of manure and nutrients, such as phosphorus, out of animal intensified areas such as the Magic Valley of Idaho
- Ways to compact litter or be able to remove the nutrients to make a more economical way to transport the manure.

# Manure Management Systems

System approach for animal and crop production that creates a more sustainable agricultural industry in the US, that includes all facets of production including organic, ecological, and commercial operations. The creation of “Greener” production systems for both animal and related industries.

- Increase recycling of byproduct nutrients and organic matter through crop and pasture systems.
- Energy costs in relation to profitability through Life-cycle analysis
- Develop conceptual models and accounting frameworks to support environmental life-cycle analyses within the dairy industry.

# Manure Tech Transfer and Education

- Ensure the healthy and well-being of human and domestic animal populations.
- Increase energy self-sufficiency of operations through conservation and energy recovery from byproducts
- Ensure no duplication of research from one university to another (or between ARS and universities).
- Applied Research/Extension: field-scale assessment of promising technologies.
- Extension: curriculum development and training
- Continued education: explore possibilities of expanding teaching consortium for continued education, train the trainer, etc.
- Certificate Program: survey to identify the producer & allied industry needs for a certificate program (1-2 year).
- Internship Program: development of an internship program for the industry and the allied industry.
- Train environmental consultants with respect to frequency, quality assurance, and intensity of environmental sampling activities (soil, water).
- Develop and package the tools, both scientific and technology transfer, to train and empower industry for advocacy in regulations, permitting, and enforcement.
- Train regulators with respect to the interpretation and use of laboratory analysis data.
- Convey principles and management practices to optimize biofuel value of dairy manure, wastewater and other waste streams.