

# **Animal Residual Management Technologies and Processes for Sustainable Animal Agriculture into the Future**

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# **Introduction**

**Importance of animal agriculture to global food supply**

- \* 34% of food protein**
- \* 17% of food energy**
- \* Conversion of inedible to edible**

**Estimated meat demand global to increase 60% by 2020  
with majority in developing countries**

**Animal products will continue to be important but issues  
associated with their production will need to be  
addressed**

# **Why Concentrated Production Systems?**

**Expenditures for food as percentage of disposable income have declined about 50% in 50 years in developed countries.**

**Technology replaces labor for efficient production and cost control.**

**Reduced animal unit profitability and commodity nature of food production under “price-taker” (wholesale) conditions has led to specialization.**

# **Animal Agriculture in the US**

**With exception of milk and wool, no direct price supports to producers.**

**Competition within meat industry for market share.**

**Provides significant market and value-added component for many grain and other plant-based food by-products.**

**Efficiency of resource use is related to production level in most cases (often poorly understood).**

**Residuals are inevitable (no process 100% efficient).**

# **Residual Issues for Animal Agriculture**

**Traditional use of manure for crop production.**

**Importation of feed from distant production sites with specialization of production.**

**Production sites may not be in cropping areas.**

**Transportation costs to move residuals.**

**Public concerns relative to air and water quality, accumulation of minerals in soil and possible health issues.**

# **Specific Issues Associated with Swine Production**

**Production in confinement with slatted floors, high-volume liquid flush waste handling and anaerobic lagoon treatment with sprayfield land application of residuals.**

**Odors from production facilities.**

**Contribution to atmospheric nitrogen concentration (ammonia, NO<sub>2</sub>, etc.).**

**Groundwater and surface water quality.**

**Soil accumulation of minerals (phosphorus, heavy metals) from dietary sources.**

**Lagoon security.**

# **Industry Funded Search for Environmentally Superior Technologies**

**Animal and Poultry Waste Management Center  
(APWMC).**

**Support by Smithfield Foods and Premium Standard  
Farms.**

**Basics of program to identify Environmentally Superior  
Technologies (EVT) (parameters).**

**\$17.2M to be invested in EVT identification and  
performance evaluation, starting 2000.**

**Managed by APWMC.**

**Expected completion 2003+/-.**

## **Cont'd**

**18 proposals selected from 98 submitted (process and program organization).**

**Started with “initial 5” and added 13.**

**Most technologies are “farm-scale” and located on cooperator swine production facilities.**

**Some are located on university research sites.**

**Mixture of components in virtually every technology to achieve goals of evaluation.**

# Evaluation Criteria

- \*Eliminate discharge of animal waste to surface waters and groundwater through direct discharge, seepage or runoff.**
- \*Substantially eliminate atmospheric emissions of nitrogen.**
- \*Substantially eliminate emission of odor detectable beyond boundaries of parcel or tract of land on which swine farm is located.**
- \*Substantially eliminate release of disease-transmitting vectors and airborne pathogens;**
- \*Substantially eliminate nutrient and heavy metal contamination of soil and ground water.**
- \*Economic evaluation of each technology to be performed.**

# **Types of Technologies Under Consideration**

**(Specific listing found in proceedings and on our website: [www.cals.ncsu.edu/waste\\_mgt/](http://www.cals.ncsu.edu/waste_mgt/)).**

**(Most systems have combinations of components)**

- \*Anaerobic digestion with energy recovery (several designs and configurations).**
- \*Composting of solids for various products and uses.**
- \*Constructed wetlands.**
- \*Biofiltration.**
- \*Sequencing batch reactor for nitrogen management.**

## **Technologies cont'd**

- \*Gasification with energy recovery in liquid fuel or electricity.**
- \*Centralized treatments systems to recover fertilizer nutrients (N, P, K, metals, etc.)**
- \*Aeration with solids recovery.**
- \*Under-pen belt systems for solid/liquid separation and elimination of flushing.**
- \*High-pressure/temperature treatment (plasma resonance).**
- \*Fly larvae utilization of waste for animal nutrient production.**

# **Other Technologies and Processes**

**Many other technologies have been identified since Smithfield Foods/Premium Standard Farms program started.**

**APWMC working to help evaluation of performance according to criteria for 18 technologies.**

**Additional work by APWMC includes value added products from processing mortalities, dietary manipulation to reduce swine waste (CSREES Support), liquid/solid separator technology verification (NSF-ETV program), and anaerobic lagoon closure management (CSREES pending).**

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**Thank you!**