Dairy Waste Management: Today and Tomorrow

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Production Model

MAKE Babies

GROW Crops

PRODUCE Milk

MANAGE Waste
- Manure
- Milk House Wastewater
- Silage Leachate

How do we change the Perception of Waste?
Changing the Perception of Waste:

1. Understand Benefits
2. Identify Value
3. Determine Cost
4. Define Options

**OPTIMIZE** the system to insure that it works **FOR** you
Management Model(s)

Production → Collection

Collection → Treatment

Treatment → Storage

Storage → Application

Application → Exportation

Exportation → Utilization

OPTIMIZE Individually or Systematically
Management Matrix

OBJECTIVE PRIORITIZATION

- Nutrient Utilization
- Handling and Transportation Efficacy
- Animals per Acre
- Air Emissions Mitigation
- Odor Control
- Value Added Byproducts
- Nutrient Fate

OBJECTIVE

- Value
- Add
- Byproducts

OBJECTIVE PRIORITIZATION
A Closer Look at Nitrogen

N as excreted
N out of barn
N out of storage
N applied to field
N used by crop

What would you do if 50% was lost between milking and the CHECK?
Production

- Manure
  - Feed Rations and Nutrients
  - Bedding Reclamation or Reduction

- Milk House Wastewater
  - Treatment and Reuse → Large
  - Dedicated Spray Fields → Small-Medium
  - Vegetative Treatment Areas → Small-Medium
Collection – Manure Tubes

- 2” Slot Above ~18” Tube
- Liquids Drain Freely
- Solids Forced by Scraper
Project of the Future

Urine-Feces Isolation

Back to the Barn Floor Basics

→ Limit Liquid and Fiber Mixing

- Liquid System
  - Limited Fiber
  - Nitrogen as Urea
  - Low $P$ (Feces contains all $P$)

- Fiber System
  - Lower Moisture
  - Organic Nitrogen
  - Majority of $P$

- Possibly Reduce Ammonia Emissions
Traditional Treatment Systems

- Manure Solids Separation
  - Compost
  - Bedding
  - Volume Reduction
  - Nutrient Neutral

- Anaerobic Digestion
  - Energy Production
  - Odor Control
  - Nutrient Neutral
Advance Treatment Principle

Concentrate or Partition Nutrients into a Small Package

Traditional Treatment

Concentrate | Liquids

Advanced Treatment

Concentrate | Liquids
Advance Treatment Systems
Promising Systems

- Chemically Aided
  - Mechanical Separation
  - Dissolved Air Flotation
  - Passive Separation

- When Optimized
  - 80% to 95% P in Fiber Fraction
  - 30% to 40% Nitrogen in Fiber Fraction
  - Low Nutrients and Solids in Liquid Fraction
Advance Treatment Systems
Promising Systems

- Sequenced Mechanical Separation
  - End Goal → Membrane Separation
  - Limits Chemical Requirement
  - Significant Pre-Treatment
Manure Storage

Compost Barn

- Fits Small Dairies
- Limits External Manure Storage
- Excellent Cow Comfort
- High Bedding Management
- High Bedding Demand
  - Dry Sawdust
  - Finely Chopped Wheat Straw?
Manure Storage

**Impermeable Covers**
- Odor Control
- Air Emissions Mitigation
- Nutrient Retention
- Rainwater Avoidance
- Biogas Collection

**Permeable Covers**
- Odor Control
- Air Emissions Mitigation
- Nutrient Retention
Covers for Manure Storages

- Fact Sheet Series
  - Introduction
  - Economics

- Design
- Gas Handling
- Manure Handling

Available on-line at: www.manuremanagement.cornell.edu
Covers for Manure Storages

- Monitoring Installed Covers
  - On-farm Management
    - Nutrient Impact
    - Solids Fate
  - Gas Production
    - Quantity/Quality
    - Trends
    - Utilization
Land Application

Take a Page from Analyzing Milking Systems

- Labor Efficiency
- Capital Efficacy
- Quality Control
- Impacts on Exterior Operations
Land Application

**Figure 2.** Commercial broadcast cost for drag hose application (Puck, 2008).
Questions

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