National Centre for Livestock and the Environment (NCLE)

Agricultural By-Products Processing Facility: Contributions to Research, Training and Outreach for Composting in Manitoba
What does NCLE do?

Research... ...
Furthering the sustainability of the livestock industry on two fronts:
- economic
- environmental

Education and Outreach ...
- Graduate student training and education
- Industry extension/outreach programs

Through Partnerships...
Researchers, industry and government working together to build a strong science base for management and policy development decisions
NCLE Model: Capturing Synergies between Animal and Crop Production Systems

Water, Energy, Imported Feed → Human Consumption of Plant Products

Human Consumption of Animal Products → Water, Energy, Imported Fertilizers, Pesticides

Farm viability
Environmental stewardship
Food quality and safety
Animal health and welfare
Efficient energy and water use
NCLE’s Approach:
A Platform for Partnerships across Disciplines and Organizations

## Partnerships

**Research Institutions:** University of Manitoba, Agriculture and Agri-Food Canada Brandon Research Station, other universities (e.g., AB, SK, CA, Guelph)

**Industry:** Manitoba Pork Council, Manitoba Beef Producers, Dairy Farmers of Manitoba, Manitoba Egg Farmers, Manitoba Forage Council and their national counterparts

**Government:** MAFRI, AAFC Agri-Environment Services Branch ... and outside MB through project collaborations

**Strengthening partnerships in Manitoba and regionally**
Examples of Communication & Outreach

• NCLE Newsletter and website (umanitoba.ca/afs/ncle)
  • Highlights research, education and outreach activities

• Extension partnerships
  • Soil & manure management field day - 2010, 2011 (MAFRI)
  • On farm drainage management (AAFC-AESB)

• Tours and field days
Now open!

...from the farm to the kitchen table...and everywhere in between

Key messages:
• food comes from agriculture
• importance of science and technology in producing food
• farmers are environmentalists and providers of food
• there are many great careers in agriculture
NCLE Research Capabilities

NCLE’s state-of-the art research facilities and equipment:

- Conventional & alternative farrow-to-finish barns
- Offsite pig barn – all in/all out
- Cattle feeding/overwintering feedlot
- Feed processing mill
- Long term crop & manure management field lab
- TGAS MAN
Research: On-farm deadstock composting for control of Johne’s disease

Research Question: How suitable is a biosecure carcass composting system for destroying *Mycobacterium avium* subspecies *paratuberculosis* (Johne's disease)?

Why is this research important? A suitable means of disposing JD-infected animals is needed since infected animals cannot be sold into the food chain, and burial results in risk to ground water.

Findings: MAP was not destroyed using this composting system (although proven to be effective for destroying certain bacteria). Also, in the lab MAP persisted under long term exposure to temps. as high as 80°C.

Other alternatives for disposing JD-infected animals need to be investigated

Investigators: Denis Krause, Kim Ominski, Kees Plaizier (U of M); Katherine Buckley (AAFC-BRC), Glen Duizer (U of S)
Expanding our Research Capabilities

Agricultural by-products processing research and demonstration facility

Expanding current capacity for processing by-products, including manure:

• Liquid manure – solid/liquid separation
• Solid manure – composting, handling and application equipment
• Partnership with the Manitoba Pork Council, funded by Canada-Manitoba Economic Partnership Agreement (WD)
• Opportunities for partnerships in research, demonstration, training

Image source: Brown Bear Corp.

Image source: LEON manufacturing
DESIGN NOTES ON COLLECTION BASIN
STORAGE CAPACITY: 1705m³
COLLECTION AREA:
COMPOST PAD: 2400m²
DAIRY PEN: 4980m²
BEEF BARN B: 2050m²
BEEF FACILITY: 925m²
TOTAL COLLECTION AREA: 11580m²
HOLDING CAPACITY: 141m³ OF RUNOFF FROM COLLECTION AREA
NOTE: COLLECTION BASIN EROSION TO ACCOMMODATE RUNOFF FROM BEEF BARN B AND BEEF FACILITY IN THE NEAR FUTURE
Ag Byproducts Processing Facility
Research and Demonstration Potential

Role:

• Provide the capacity for education, training and technology transfer
• Improve environmental sustainability of livestock production
  • Address capacity for the livestock industry to achieve P balance
• Explore opportunities for creating value added products and services
  • Optimizing the value of processed material, expanding end-use options
  • Improving economic and agronomic value of manure and manure mngt. through treatment, processing and composting
  • Identifying additional agronomic benefits of compost (e.g. potential disease suppression, yield and quality gains)
Research: Utilization of processed manure

Investigators: Mario Tenuta, Don Flaten, Kim Ominski, Nazim Cicek

Funding: MRAC, MHPEC, MPC

1) Sustained Grassland Productivity and P Export using High N:P Hog Manure Effluent
   La Broquerie
   P drawdown on high STP soils

2) Solids Composting BMP Development
   NCLE
   Sources: solids separated from liquid manure

3) Field Crop Performance Evaluation of Liquid Effluent and Composted Product
   NCLE and Carman
   Applying manure separation products on field crop land

4) Potato Performance Evaluation of Composted Products
   Commercial Potato Fields and Demonstration Sites
   Applying composts on potato fields

5) Disseminate New Research Information to Manitoba Hog, Potato, Forage and Field Crop Producers
Research Objectives: *specific to compost*

1. Develop BMPs for composting separated solids from liquid manure

2. Agronomic performance (nutrient & non-nutrient benefits) of separation and composted products in perennial and annual crop rotations, and in potato production

3. Sharing of research outcomes through partnerships with CMCDC, NCLE and FFDC

4) Potato Performance Evaluation of Composted Products
   Commercial Potato Fields and Demonstration Sites
   Applying composts on potato fields

5) Disseminate New Research Information to Manitoba Hog, Potato, Forage and Field Crop Producers
1. Develop BMPs for composting separated solids from liquid manure regarding:
   - Suitable bulking agents and inclusion rates
   - Compost management – duration, moisture, frequency of turning, potential for winter composting
   - Nutrient profile and characteristics of composted products
   - Gaseous losses of N during composting and loss mitigation

2. Potato performance evaluation of composted products
   For 2 potato cultivars - Russet Burbank (processing) & IDA Rose (table):
   - Yield and quality response
   - Optimal application rate
   - Mechanisms by which compost improves marketable yields
     - improve crop fertility?
     - provide soil organisms to improve potato health?
Manure Treatment and Processing

Creating specialty fertilizers
- Reclaiming P from liquid manure as struvite ($\text{MgNH}_4\text{PO}_4$)
- Exploring agronomic capacity

Evaluation of manure separation technology
- Led by PAMI – s/l centrifuge, rotary press
- Sharing of equipment

In-field Manure Management
- Rate of nutrient release from different manures
- NCLE Long term soil & manure management field lab:
  - nutrient release
  - GHG emissions
  - weed dynamics
  - pathogen diversity & persistence
Agricultural by-products processing research and demonstration facility

Expanding current capacity for processing by-products, including manure

- **Looking for opportunities to build partnerships in research, demonstration, training**
Thank-you! ... ..

Questions?