Beef Manure Value in Deep Bedded Confinement

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Putting Value on Deep Bedded Beef Facility Manure

Why?

$$$$$$ value of N,P, and K

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Manure Characteristics

- **V**aria**B***d***l***it***y***
- Actual manure characteristics can vary

  + 30% as excreted
- From less than half to more than double as measured on the farm

Management Factors Influencing Nutrient Content of Manure

- Type of housing

Open Feed Lot

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Open Feed Lot Manure

A great deal of variability in the manure!

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Manure From Bedded Confinement

- Sampled hoops and monoslopes
  - Varied management
- 12 different operations- 82 samples
- Jan 08-Oct. 09
- Apron, Pack, Stockpile locations sampled separately- Deep Pack and Bedded pens

Analyzed for moisture, N, P, K, S some for ammonia

Bedded Confinement Manure Samples

- 5 operations using a deep pack
- 3 operations cleaning 3-6 weeks
- 4 operation cleaning 1-2 weeks
  - 16 apron samples
  - 21 deep pack samples
  - 28 bedded pen samples -17 from operations cleaning every 1-2 weeks
  - 17 stockpile samples

Manure from bedded confinement nutrient analysis

Location of sample

-Pack, Bedded pen apron and stockpile were all similar-CONSISTENT!!

By operation

- Operation did impact nutrient content but no trend related to pack management

Time

- Time of sampling did affect concentration

Calculated Nutrients in Manure From Deep Bedded Confinement

- Raw manure
  - Total lbs. per year per space 21000

N	P_2O_5	K_2O	S
122	76	88	16

  - Cornstalks – 5 lbs/hd/day added-

	N	P_2O_5	K_2O	S
	11.5	5.4	24	2
Total	133.5	81.4	112	18

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Manure From Different Beef Systems

Summary Nutrients retained per Space per year (lbs)

	N	P_2O_5	K_2O
Open lot	61	53	56
Bedded w/o bedding nutrients	85	72	88
Pit	98	69	86
Excreted	122	75	93

Management Factors Influencing Nutrient Content of Manure

- Type of housing
- Type of bedding

Type of Bedding

- Absorbency affects amount needed
  - Oat straw , corn stalks most absorbent 3x weight
  - Shredded paper 2x weight in water
  - Wood products 1x weight in water
- High Carbon to Nitrogen (C:N) ratios slow N availability
  - Wood products very high
  - Oat straw and corn stalks low.

Management Factors Influencing Nutrient Content of Manure

- Type of housing
- Type of bedding
- Pen Density

Pen Density

- Increasing pen density increases bedding frequency
- Wet pens tend to lose more nutrients
- ISU research shows cattle performance equal at 40,45 and 50 square feet per head.

  (Shouse, et.al)
  - At smaller areas, bedding pack and manure get harder to manage.

Management Factors Influencing Nutrient Content of Manure

- Type of housing
- Type of bedding
- Pen Density
- Season

Season

- Cold weather reduces mineralization and volatilization conserving nutrients
- Feed efficiency changes with the weather
- Diet changes due to feed availability or weather conditions

Seasonal Manure Variation

	Summer	Winter
Avg manure lbs/hd/ day	Avg 15 lbs	Avg 32 lbs
Yearly manure	1.4 ton/space/year	2.9 ton/space/year
N pounds per 6 months avg.	24	40
N pounds per ton	17	14
% N volatilized	69% avg	47 % avg

2006 Nebraska Beef Cattle Report Summary

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Management Factors Influencing Nutrient Content of Manure

- Type of housing
- Type of bedding
- Pen Density
- Season
- Feed and feed program

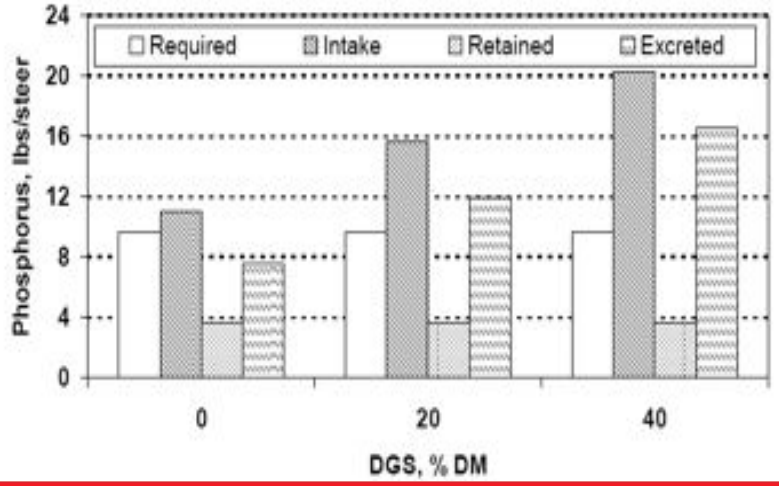
Feed and Feed Program

- Feed can vary in nutrients due to differences in growing conditions, storage conditions, and processing
- Palatability, digestibility, bunk space, and feeding frequency affect intake.
- Ingredients vary depending on availability, price, and preference.

What They Don't Use Gets Pooped!

- About 16 % of N fed in diet is retained in beef feedlot animal
- About 24% of P fed in diet is retained in beef feedlot animal
  - Varies with diet and animal – rest is excreted

Retained Nutrients



Management Factors Influencing Nutrient Content of Manure

- Type of housing
- Type of bedding
- Pen Density
- Season
- Feed and feed program
- Housekeeping

Housekeeping

- Cleaning frequency
- Bedding frequency
- Added soil

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Management Factors Influencing Nutrient Content of Manure

- Type of housing
- Type of bedding
- Pen Density
- Season
- Feed and feed program
- Housekeeping
- Manure storage

Manure Nutrient Losses

- To the air, but not to runoff in confinement
  - N (Urea) conversion to Ammonia
    - Happens fastest under warm, moist, aerated conditions
    - Control with frequent scraping, stockpiling, bedding, and incorporation at application

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Manure Characteristics

Test your manure!

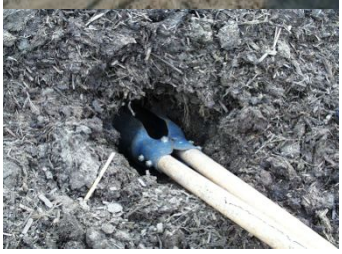
- Moisture, total N, P, K (around $30 test)
- Take good representative samples
- Make note of variability by source & season

Sampling Solid Manure From Lots and Buildings

- Scrape a line across a paved lot
- Collect several subsamples to make a composite sample
- Each composite sample should represent a different area of the lot/building
- Sample from the entire profile of dry stacks

Sampling Solid Manure



Sampling Solid Manure at the Field

- Spread sheet or pans to catch manure
- Apply manure with the spreader
- Mix the collected sample well
- Remove a small sub-sample to be sent to the lab

Manure from Beef Feedlots

- Raw manure varies with diet and cattle size but on average, per space per year:
  - 10 tons/1000 lb animal @92% moisture
    - 122 lbs N
    - 76 lbs P_2O_5
    - 88 lbs K_2O
      - » Asabe
- At \$.50/lb N, \$.60/lb P_2O_5, and \$.49/lb K_2O
  - \$150 in nutrients per space per year before losses

Nutrient Replacement Value

Not all land owners may be willing to pay for excess nutrients beyond next year's need

Also consider other impacts and application cost

- Organic matter value
- Compaction
- Timeliness
- Application cost (approx. \$1/T or \$20/A)

Manure Nutrient Utilization

Once applied to the field, does each plant have the same nutrients available?

Availability of manure N? P? K?

First year?

Following years?

Manure Nutrient Utilization

Some beef manure nutrients are tied up in organic forms not immediately available to plants.

- Assume 100% 1st year availability of K
- Assume 100% 1st year availability of P
- Assume 30-40% 1st year availability of N

Source: ISU publication PMR1003

Manure Nutrient Utilization

Some beef manure nutrients are tied up in organic forms not immediately available to plants.

- P and K not used is available in following years
- Assume 10% year 2 and 5% year 3 for N availability

Source: ISU publication PMR1003

Sample Manure Nutrient Analysis from Bedded Confinement

Total N	0.9%	18 lbs/ton
P_2O_5	0.5%	10 lbs/ton
K_2O	0.6%	12 lbs/ton

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Nutrient Replacement Value

Total nutrient value of manure (per ton)

Nitrogen $.50/lb x 18 lb/T* = $9.00

Phosphorus $60 x 10 lb/T* = $6.00

Potassium $.49 x 12 lb/T* = $6.00

Total value = $21 /Ton

Assumes all nutrients are <u>needed</u> and <u>available</u>

Nutrient Replacement Value

Available first year nutrient value of manure

Nitrogen $.50/lb x 6 lb/T* = $3.00

Phosphorus $.60 x 10 lb/T* = $6.00

Potassium $.49 x 12 lb/T* = $6.00

Total value = $15.00/Ton

*100% first year availability for P, K, and 33% N from ISU pub. PMR1003

Assumes all nutrients are <u>needed</u>

Nutrient Replacement Value

1st year Available	in 25T/A	Needed for 200 bu corn*
Nitrogen lb	150	170 (170)
P_2O_5 lb	250	110 (75)
K_2O lb	300	250 (60)

* Based on MRTN calculator with $1100/ton anhydrous and $4 corn, and low-optimum soil test for P and K from ISU publication Pm1688

Nutrient Replacement Value

Nutrients available/carryover from manure on silage corn

	Year 1(Used) Corn	Year 2 (Used) Corn	Year 3 (Used) Beans	Residual
N	150 lbs(170)	36 lbs(170)	18 lbs(0)	0
P_20_5	250 lbs(110)	140 lbs(110)	30 lbs(40)	0
K_20	300 lbs(250)	50 lbs(250)	0 lbs(75)	0

Nutrient Replacement Value

Nutrients available/carryover from manure on grain corn

	Year 1(Used)	Year2(Used)	Year3(Used)	Residual
	Corn	Corn	Beans	
N	120 lbs(170)	36 lbs	18 lbs	0
$P_2 0_5$	250 lbs(75)	175 lbs(75)	100 lbs(40)	60
$K_2 0$	300 lbs(60)	240 lbs(75)	165 lbs(75)	90

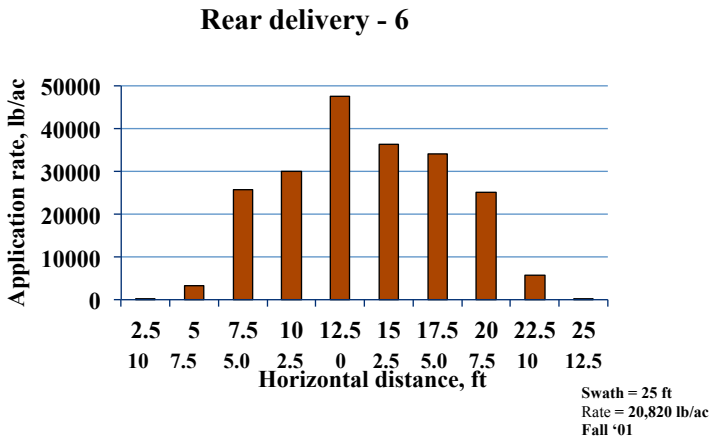
Manure Nutrient Utilization

Manure Nutrient Utilization

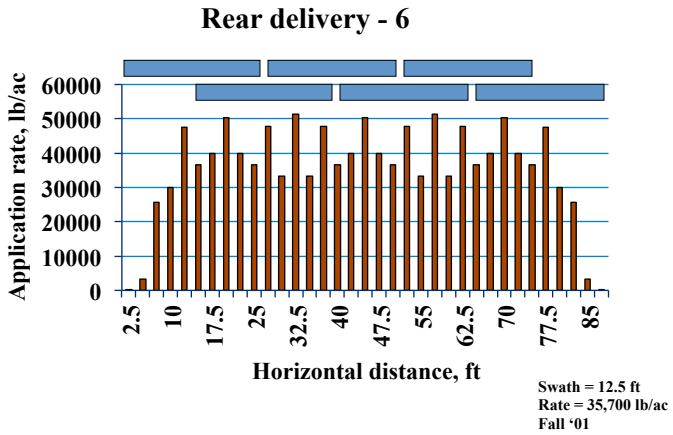
Once applied to the field, does each plant have the same nutrients available?

- Uniform spread?
- Across the pattern?
- Along the direction of travel?

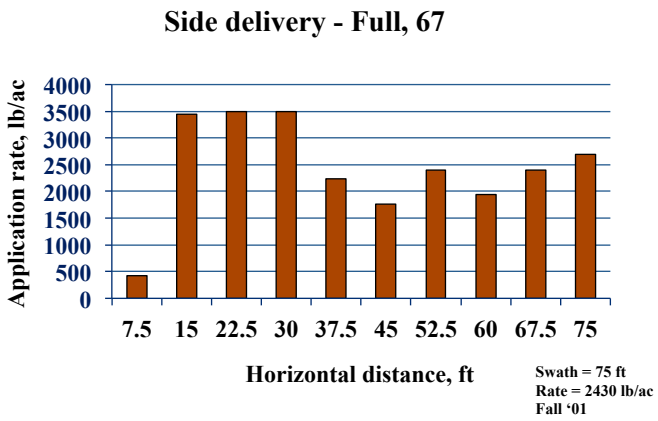
Manure Nutrient Utilization



Manure Nutrient Utilization



Manure Nutrient Utilization



Manure Nutrient Utilization

- Pay close attention to manure distribution patterns and changing load position
- Calibrate spreaders often
- Get the full value of your manure
- Incorporate your manure

A Word on Manure Law

All manure application must follow 200 foot separation distance from water sources (wells, lakes, streams) unless incorporated same date

Confinement beef operations over 500 head and total beef capacity over 1000 head are subject to other rules and regulations (Iowa Manure Management Plans, Iowa Manure Applicator Certification, Construction permits, NPDES permits, etc.) Consult Iowa DNR or other consultants for advice.

Plan for Success

- Know (test) your manure nutrient value
- Know (test) your soil and crop needs
- Harvest and store your manure to retain nutrients (value)
- Apply your manure to capture value
- Know and follow rules
- Use consultants when needed

Helpful Information

Available from ISU Extension and Outreach Website

- PM1867 Beef Feedlot Systems Manual
- PM1558 How to Sample Manure for Nutrient Analysis
- PM3014 How to Interpret Your Manure Analysis
- PM1941 Calibration and Uniformity of Solid Manure Spreaders
- PM1584 Cornstalk Testing to Evaluate Nitrogen Management