Recommendations to Estimate Swine Nutrient Production in the Phase 6 Watershed Model

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Upcoming Conference of Interest…

April 18 - 21, 2017

Embassy Suites

Raleigh, North Carolina

3rd International Conference on Livestock & Poultry Environmental Quality

- Current science and outreach on animal agriculture and the environment
- Network of people that turn science to solutions
- Air, water, soil, climate

Areas of Emphasis

- Environmental quality
- Soil health
- Climate change
- Environmental planning
- Feed management
- Manure nutrient management
- Manure treatment technologies
- Pathogens
- Regulation
- Small farms & beginning farmers
- Mortality management
- Manure management
- Manure value & economics
- Case studies & on-farm experience
- Harnessing innovative delivery methods
- Responding to natural disasters
- Emerging contaminants & issues

Project Team

- Data collection
  - *Tim Sexton* – VA DCR, Division of Soil and Water Conservation
  - *Bobby Long* - VA DCR, Division of Soil and Water Conservation
  - *Jordan Kristoff* – Virginia Tech intern with VA DCR, Division of Soil and Water Conservation
- Report
  - *Robb Meinen* –Penn State Department of Animal Science
  - *Mark Estienne* - Virginia Tech Department of Animal and Poultry Sciences
  - *Tim Sexton*

Some flaws…

- Report and data analyses conducted in a relatively short timeframe
- Sample numbers are generally low with data in this report
- Data likely skewed toward integrators that cooperated within our short time frame
    - Country View Family Farms (PA)
    - Smithfield Hog Production Division (VA)

Future data collection should expand to further integrators/production systems.

Phases of Production & Industry Terms

- *Farrow* – sow giving birth to a litter
- *Sow Farm* – houses breeding, gestating, farrowing and nursing sows (and nursing litters)
    - Farrow-to-wean or Farrow-to-feeder
- *Wean Pig* – 3 wk old piglet removed from nursing sow
- *Nursery Farm* – houses Wean Pigs for 7 wks
- *Feeder Pig* – 10 wk old pig removed from Nursery
- *Finisher Farm* – houses Feeder Pigs until they reach Market Weight (16-18 wks), or are “finished”
- *Finish/Market Hog* – Hog removed from Finisher Farm to slaughter

Production Farms in this Report

1. *Sow Farms*
   - Includes gilts and boars
   - Gilt Isolation/Gilt Development and Boar-only Farms not considered at this time
2. *Nursery Farms*
3. *Finisher Farms*
   - Wean-to-Finish Farms not considered at this time (low farm numbers, lack of data)

Placeholders may be recommended for farm categories not considered in this report.

Phases of Production – Average Weights

Phase of Production	Average Animal Weight (lbs)	Typical Weight Range (lbs)
Sows (includes gilts and boars)	450	400-500
Nursery	34.99	13.30-56.68
Finisher	163.85	56.68-272.74

Manure Storage Definitions

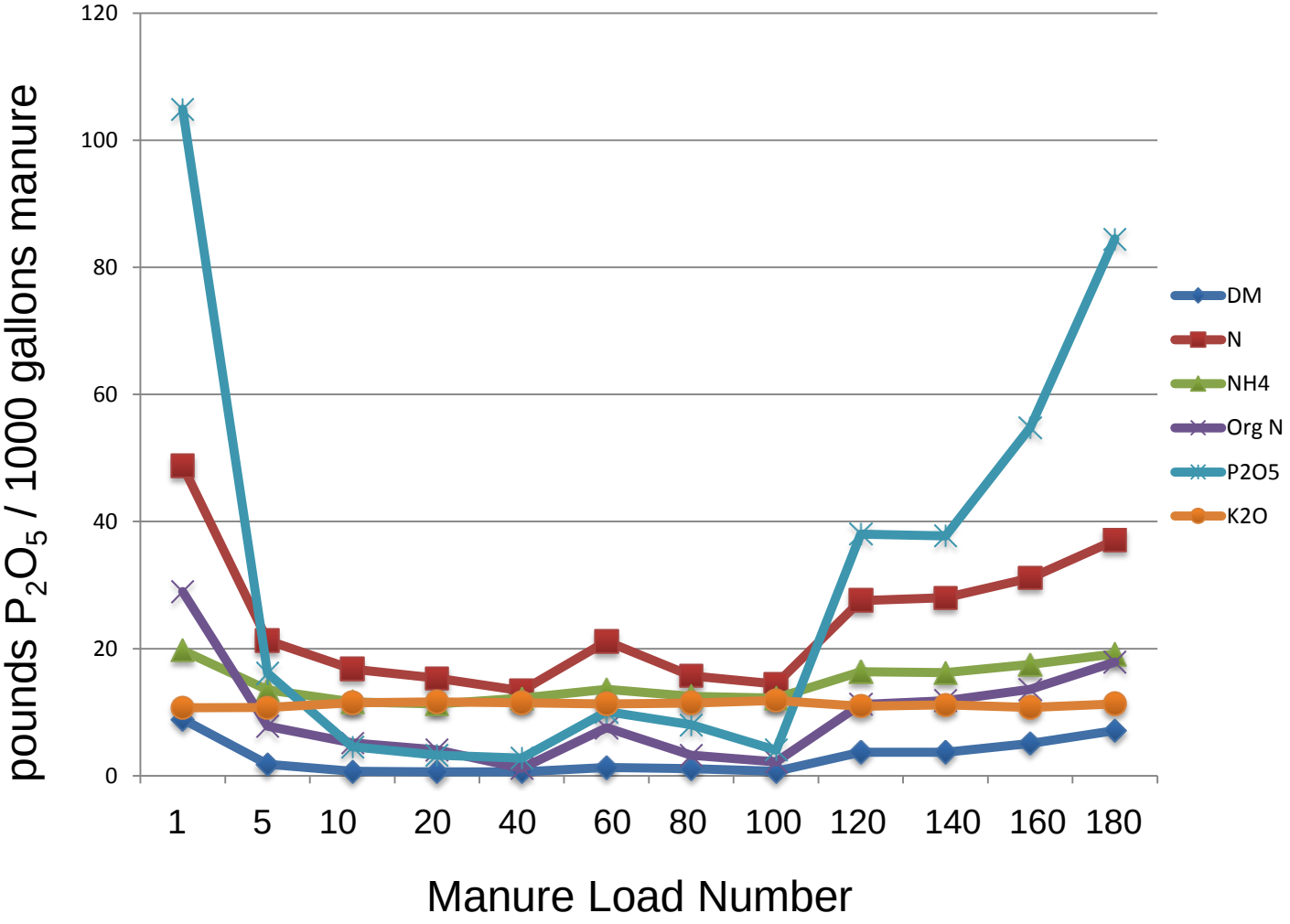
- *Deep Pit* – Manure held under the floor of a confinement building. Common for growing hogs and many sow farms.
- *Outdoor Storage* – Typically HDPE-lined earthen basins or concrete structure in northern area of the watershed (non-lagoon).
- *Lagoon Storage* – Often contain a Primary and Secondary Stage, which results in modified solid and nutrient contents. Only found in southern reaches of the watershed.

Manure Nutrient Content

Manure Storage Type	TKN (lbs/1000 gal)	P2O5 (lbs/1000 gal)	K2O (lbs/1000 gal)
Sow with Outdoor or Underfloor Storage (non-lagoon)	29.80	12.13	17.82
Nursery	14.34	18.72	8.85
Finisher	26.22	20.65	27.93
Growing Pig Lagoon Primary Storage (2.4% solids)	2.72	7.52	5.72
Growing Pig Lagoon Secondary Storage (0.19% solids)	0.43	1.71	0.57

Swine solids accumulate high nutrient content – especially P

Here routine samples were taken as sow farm manure basin was emptied. The manure was removed from the bottom of the storage.



This data is not presented in the current report.

Manure Sampling and Analysis is Important

Load Number	Dry Matter (%)	N (lbs/1000 gal)	P2O5 (lbs/1000 gal)	K2O (lbs/1000 gal)
1	8.9	48.76	104.91	10.72
5	1.8	21.29	16.13	10.73
10	0.7	16.79	4.55	11.48
20	0.6	15.35	3.22	11.61
40	0.6	13.37	2.79	11.47
60	1.3	21.14	10.08	11.30
80	1.1	15.73	8.02	11.45
100	0.7	14.41	4.04	11.87
120	3.7	27.58	38.04	10.94
140	3.7	28.01	37.76	11.15
160	5.1	31.12	54.79	10.75
180	7.1	37.06	84.50	11.31
Averages	2.94	24.22	30.74	11.23

Removing Loads 1-9 and 161-180 (Orange Cells) changes the averages quite a bit.

Averages	1.93	20.48	17.94	11.28

At this farm 37% of the P_2O_5 was in 16% of the manure.

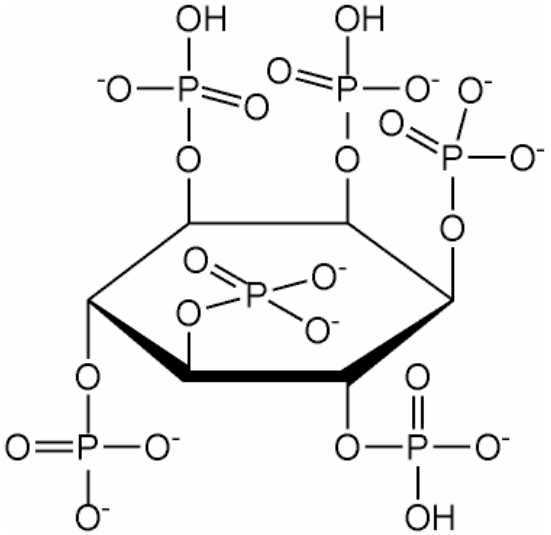
This data is not presented in the current report.

Historic Data

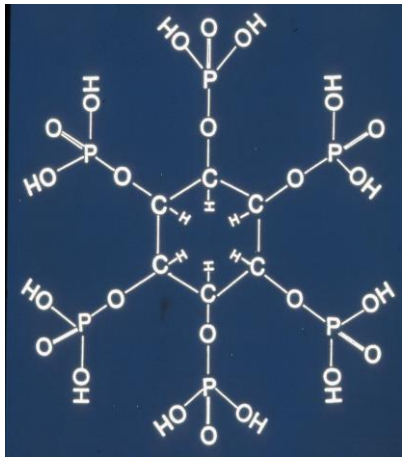
- Data from both VA and PA provided to give historic perspective
- Data gives some insight into changes of Phosphorus excretion associated with ***Phytase*** utilization

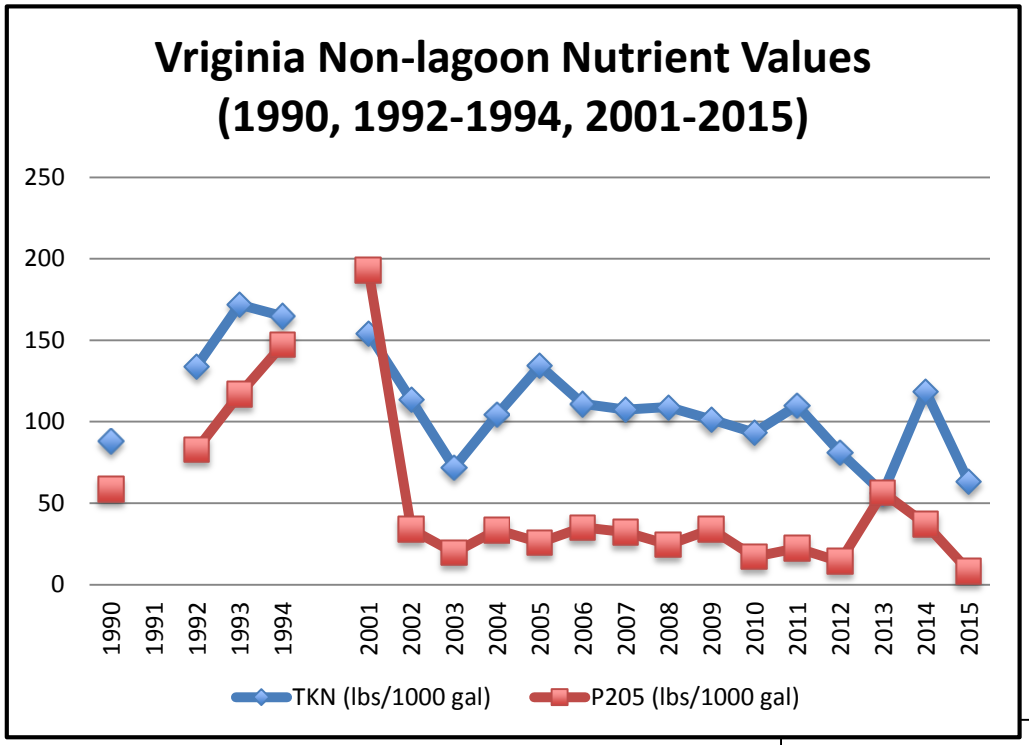
Phytase has a major effect on P availability.

- Plants contain a large portion of P in the form of **phytate**.
  - Monogastrics poorly digest **phytate**.
- **Phytase** can break down phytate, releasing the P.
  - Phytase is an enzyme used as a feed additive
  - The availability of P increases from 30% to 50% in typical diet.
  - Dietary P supplement need reduced/eliminated.
  - 20-30% reduction in P excretion.

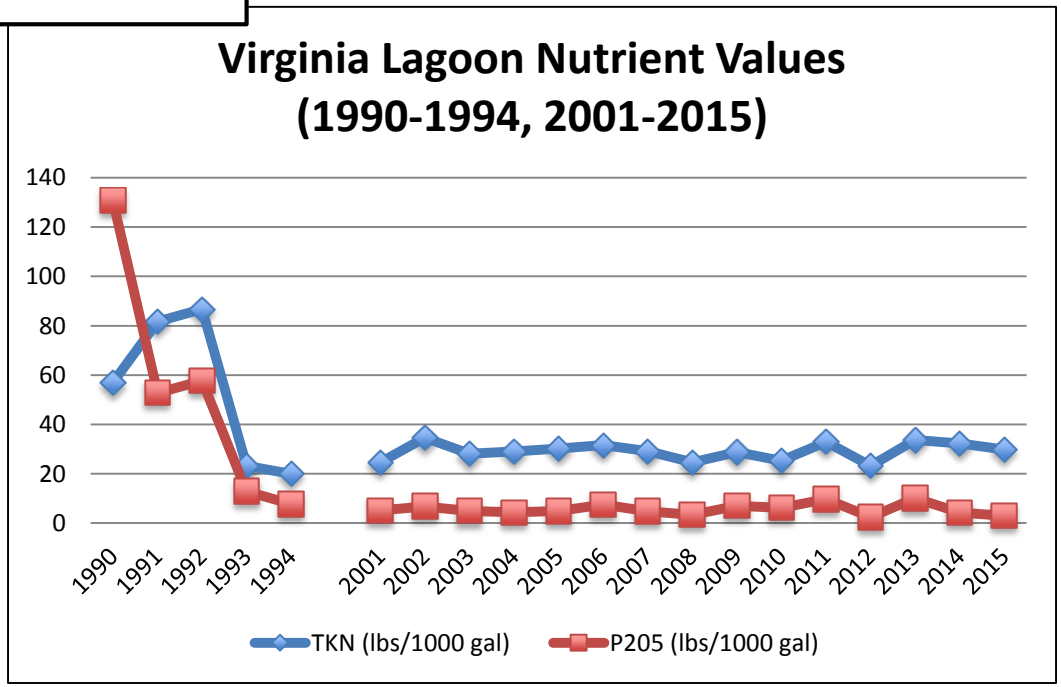


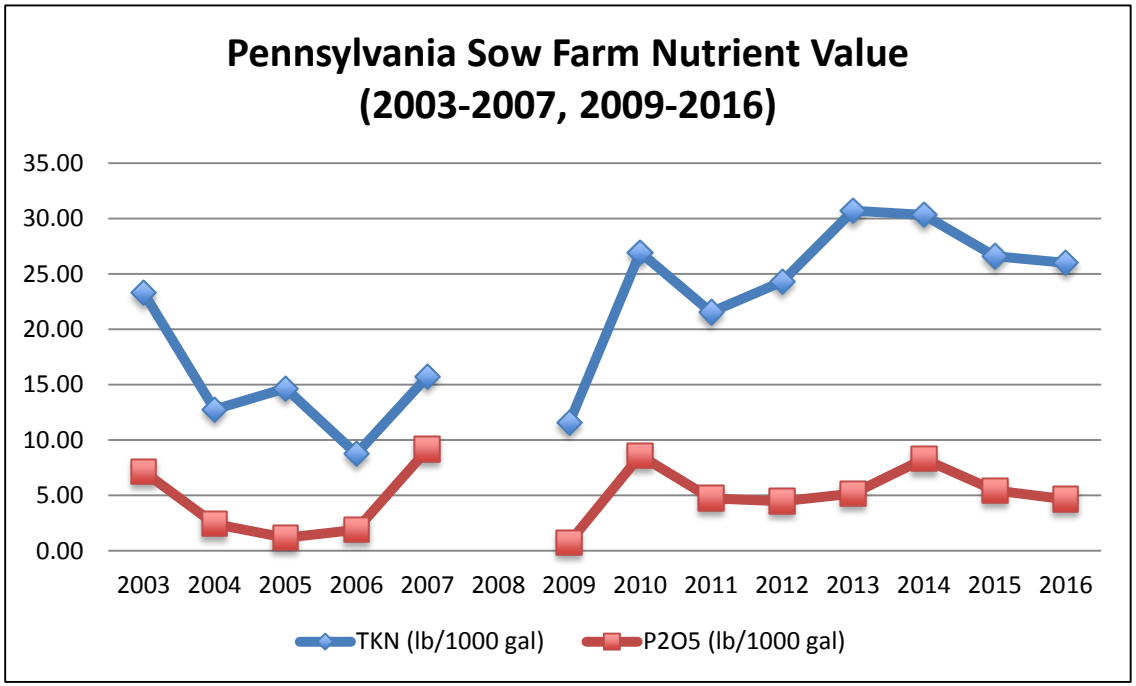
Phytic acid (phytate)



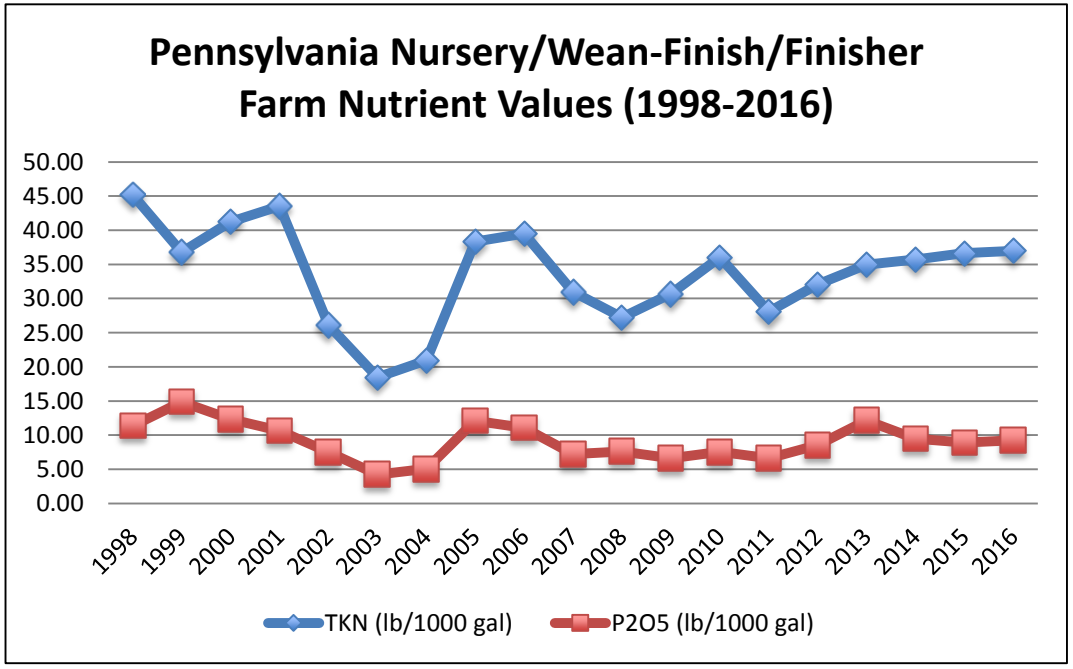


Graphs of Historic VA swine data





Graphs of Historic PA swine data



Questions?

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