

South Carolina

Nutrient Management Rules, Regulations, and Implementation Strategies



Jesse Adams, III
James J. Camberato
John P. Chastain
W. Bryan Smith



Gene Hardee
Stephen Henry



Leon Fulmer
Tonya O'Cain

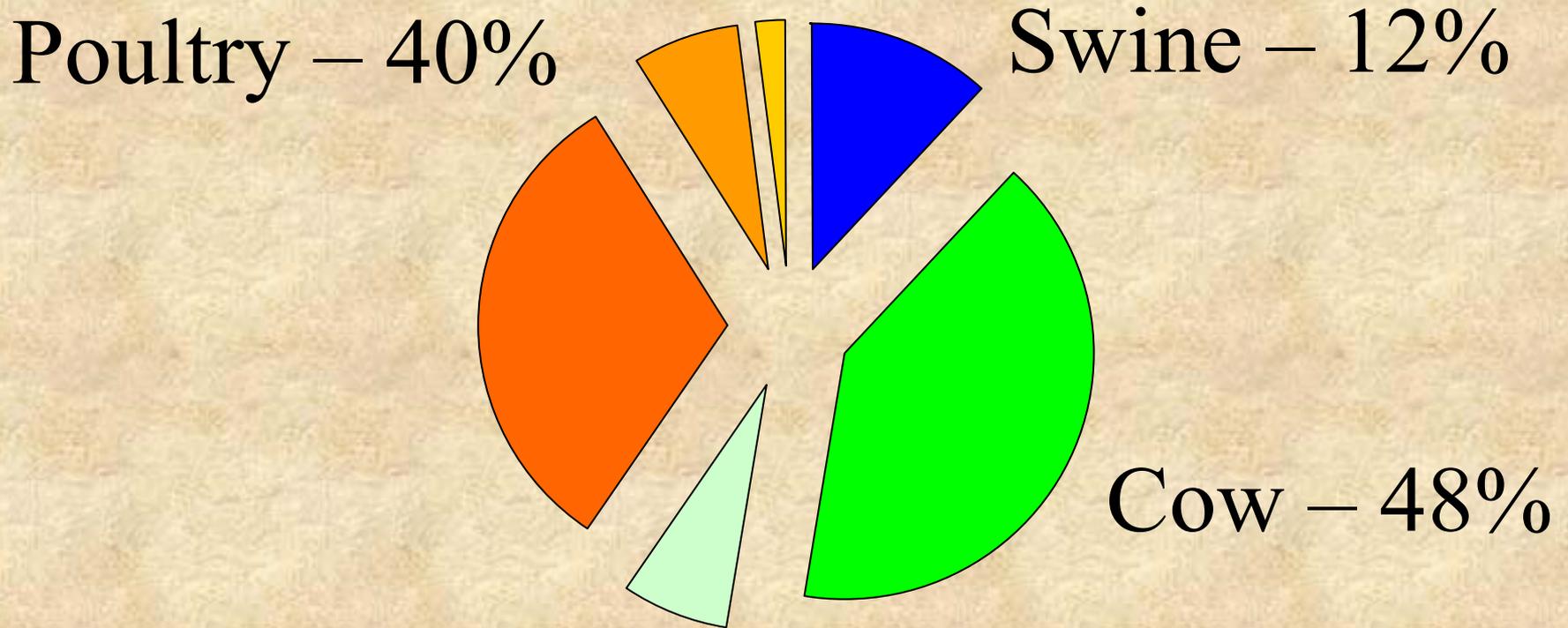
TMDL's

- Established on 33 water bodies at 70 stations
 - 52 fecal coliform
 - 17 dissolved oxygen
 - 1 phosphorus and pH (*96 acre DNR fishing lake fertilized with 39,000 lb P over 10-yr*)
- 130 in development

Confined Animals

- Approx. 1,100 total confined animal facilities
- 153 large CAFO's
 - 121 poultry
 - 31 swine
 - 1 dairy
- 566 medium CAFO's
 - 85% poultry
 - 8% swine
 - 6% dairy

Manure Production



Nutrient Management of Confined Animal Manures

- 1996 -- Law passed requiring regulation, training, and certification of swine producers
- 1998 -- SCDHEC regulations on same
- 2002 -- Revised regulations require training and certification of all confined animal producers prior to July 2004

Nutrient Management Requirements

- Requirements are generally more stringent for swine than for other animals
- Traditional soil and manure sampling each year
- N-based application rate in most cases, not to exceed recommended rate of N (Land-grant Univ. based)
- NRCS P index used to determine if need for P-based application rates on new fields/problems

SC P Index



EARTH SCIENCES AND
RESOURCES INSTITUTE
UNIVERSITY OF SOUTH CAROLINA

Copyright 2001 All Rights Reserved

Tract Number , Field Number

Phosphorus Source Factor

Soil Test P

[Help](#)

(lbs-P/acre)

x

0.10

=

P₂O₅ Application Rate

Application Method

+

=

(lbs-P/acre) x 0.25 x

=

Total SPF

Phosphorus Transport Factor

Soil Erosion

[Help](#)

0.05

+

Runoff Factor

0.1

+

Sub Surface Drainage

0.1

=

Total TPF

Buffer / Setback Zones

Distance to water (feet)

[Help](#)

0.4

+

Buffer Zone Runoff Class

0.4

=

Total B&S

Close

Application

Actual :

Recommended: 2*Phos.

P Index Rating

View Rating

=

P-based Management Options

- Low P index – N based
- Medium P index – twice crop removal of P
- High P index – crop removal of P
- Very high P index – no manure applied

Nutrient Management Requirements

- Timing -- No more than 30 days before planting or during dormant periods
- Monitoring -- Soil sampling to a depth of 18 inches in 6-inch increments for NO_3 and P may be required

Water, Environmental, and Setback Restrictions Requirements

NO APPLICATION

- *Directly in groundwater.*
- *Not when the vertical separation between the ground surface and the water table is less than 1.5 feet.*

Water, Environmental, and Setback Restrictions Requirements

Numerous

- *Manure shall not be spread in the floodplain if there is danger of a major runoff event, unless the manure is incorporated during application or immediately after application.*
- *ETC.*

Other requirement of regulations

- Record keeping
- Training/certification

Confined Animal Manure Management Certification Program



Program Intent

- Comply with the act as passed by the SC legislature
- Comply with SCDHEC regulation 61-43
- Address environmental issues
- Teach proven scientific principles of manure management

Program Elements

- ✓ Training manual
<http://www.clemson.edu/camm>
- ✓ 6.5 hour training class
- ✓ Examination
- ✓ Continuing Education



Certification Requirements

⚓ Attendance of training program for many producers

- ⚓ Some producers must pass an examination
- all swine growers
 - facilities with $> 500,000$ lb. avg. live weight
 - facilities permitted after June 28, 1998
 - manure brokers

NRCS -- Comprehensive Nutrient Management Planning

- 40 farms planned in 2003
- 22,254 acres with AFOProTM
- 26,563 acres non-AFOProTM

AFOPro™

Comprehensive Nutrient Management Software

- Developed by USDA-NRCS and University of South Carolina
- Uses Clemson fertility recommendations Linked to the SC CNMP Template
- Can be connected to:
 - GIS ArcView
 - NRCS's Animal Waste Management engineering software (v 2.1 or higher)

SC Manure Nutrient Management



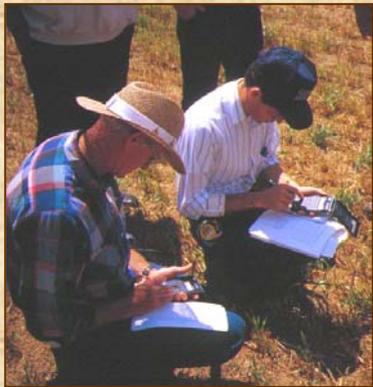
Certification Training Topics

- Impact of nutrients on water quality
- Nutrient content of animal manures
- Land application of animal manure as a plant nutrient source
- Calibration of application equipment



Certification Training Topics

- Manure handling, treatment, storage, and composting
- Dead animal disposal
- Odor control



- Vectors and vector abatement plans
- Record keeping and reporting
- Emergency action plans

Examination

- 10 true/false
- 10 multiple choice
- 5 multiple choice requiring mathematical calculations



70 is passing grade

90% pass rate

Continuing Education Credits

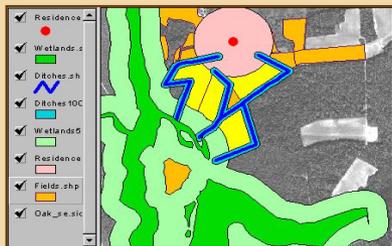
- 10 hours over a 5-year period is required to maintain certification

Seminars



Field days

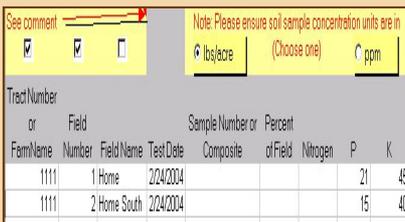
AFOPro™ Design



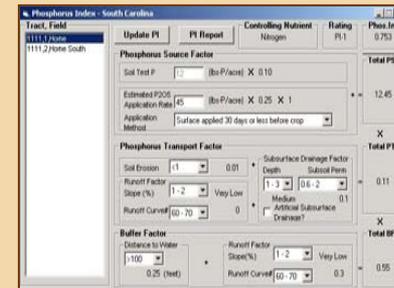
**Import Spatial Data
(AFOPro Spatial, CST, SNMP)**



**Download State-
Controlled Data**

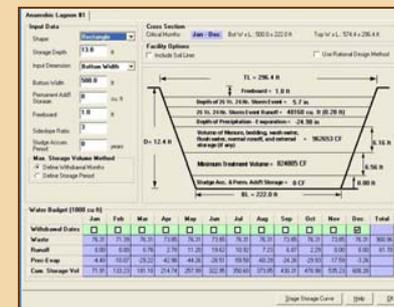


Import Soil Test Data

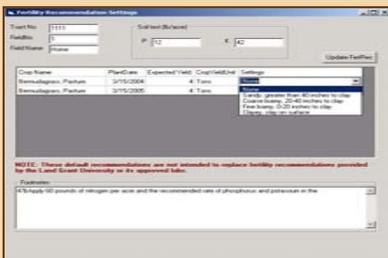


**Calculate and Import
Phosphorus Index Data**

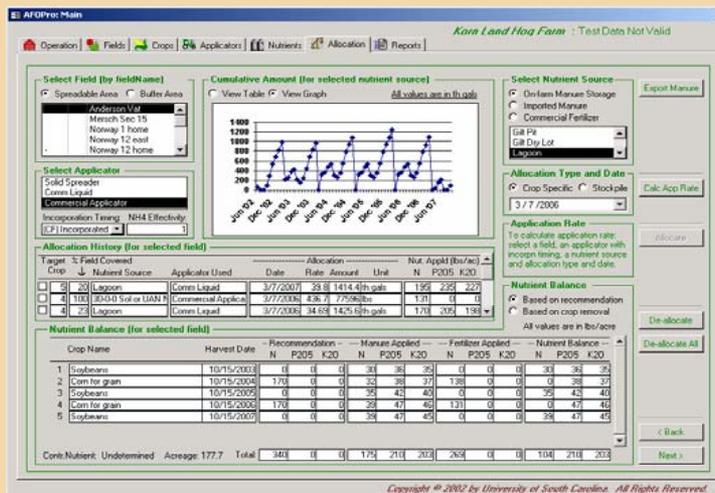
**AFOPro
Stand-Alone
Or
Use as the Core of
the System**



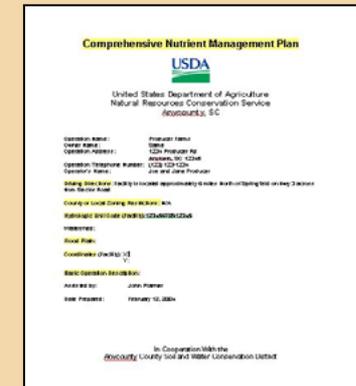
Import AWM Data



**Import Fertility
Recommendations**



**Create and Populate a
CNMP Document**



Comprehensive Nutrient Management Planning

Nutrient Needs

This screenshot displays the 'Field Details' and 'Crop Sequence and Nutrient Recommendations' sections. The 'Field Details' section includes fields for 'Field Name', 'Soil Type', 'Soil Depth', and 'Soil Texture'. The 'Crop Sequence' section shows a table of crop rotations with columns for 'Crop Name', 'Plant Date', 'Harvest Date', and 'Yield'. A red arrow points from the 'Nutrient Needs' text to the 'Field Details' section.

Maps/Soils Maps

Sensitive Areas

Soil Analyses

Crop Sequence (rotation)
Expected Yields

Nutrient Supply

This screenshot shows the 'Design Manure Storage Structure' and 'Manure Analysis' sections. The 'Design' section includes a diagram of a storage structure with dimensions and a table of 'Manure Analysis' results. The 'Manure Analysis' section includes a table of 'Nutrient Analysis' results. A red arrow points from the 'Nutrient Supply' text to the 'Design' section.

Quantify all
Nutrient Sources

Manure Analyses

Application
Source, Rate, Timing, Form, Method

Complete Nutrient Budget

This screenshot displays the 'Cumulative Annual' graph and the 'Nutrient Budget' table. The graph shows nutrient application over time. The 'Nutrient Budget' table includes columns for 'Crop Name', 'Harvest Date', 'Recommendation', 'Manure Applied', and 'Fertilizer Applied'. A red arrow points from the 'Application Source, Rate, Timing, Form, Method' text to the 'Cumulative Annual' graph.

Soil Testing and Nutrient Recommendations

AFDPro: Main Producer Farms : CNMP

Operation
 Fields
 Crops
 Applicators
 Nutrients
 Allocation
 Reports

All Fields

Spreadable Area
 Buffer Area

Tract or Farm	Field	Field Name
		Anderson Val
		Mersch Sec
		Norway 1 hor
		Norway 12 ex
		Norway 12 ht
		Norway 12 sv
		Norway 14
		Norway 24
		Norway 3
		Wright Sec 1

Soil Test Results (for selected field, display only)

Sample Number: Date:

NO3-N (lbs/ac) <input type="text" value="0"/>	Na (lbs/ac) <input type="text" value="0"/>	Fe (lbs/ac) <input type="text" value="0"/>
P (lbs/ac) <input type="text" value="40"/>	Ca (lbs/ac) <input type="text" value="0"/>	Mn (lbs/ac) <input type="text" value="0"/>
K (lbs/ac) <input type="text" value="180"/>	Mg (lbs/ac) <input type="text" value="400"/>	Zn (lbs/ac) <input type="text" value="0"/>
S (lbs/ac) <input type="text" value="0"/>	Soil pH <input type="text" value="6.7"/>	Cu (lbs/ac) <input type="text" value="0"/>
CEC (meq/100 g) ... <input type="text" value="23"/>	Buffer pH <input type="text" value="6.8"/>	O M (%) <input type="text" value="5.7"/>

Crop Sequence and Nutrient Recommendation (for selected field)

Crop Name	Plant Date	Harvest Date	Is the residue removed in grain crops?	Target Yield		--- Recommendation ---			--- Credits ---		
						N	P2O5	K2O	Legm.	Irrign.	Other
Soybeans	5/15/2003	10/15/2003	<input type="checkbox"/>	55 Bushels	0	0	0	0	0	0	
Corn for grain	5/15/2004	10/15/2004	<input type="checkbox"/>	180 Bushels	170	60	80	30	0	0	
Soybeans	5/15/2005	10/15/2005	<input type="checkbox"/>	55 Bushels	0	0	0	0	0	0	
Corn for grain	5/15/2006	10/15/2006	<input type="checkbox"/>	180 Bushels	180	0	0	30	0	0	
Soybeans	5/15/2007	10/15/2007	<input type="checkbox"/>	55 Bushels	0	0	0	0	0	0	

Help

Prev. Sample

Latest Sample

Crop Defaults

Hide Credit

Start Crp Seq

Copy Crp Seq

Paste Crp Seq

Delete Crp Seq

Delete Last Crp

< Back

Next >

Manure Nutrient Allocation and Storage Management

AFOPro: Main Producer Farms : CNMP

Operation Fields Crops Applicators Nutrients Allocation Reports

Select Field

Spreadable Area Buffer Area

- Anderson Vat
- Mersch Sec 15
- Norway 1 home
- Norway 12 east
- Norway 12 home

Cumulative Amount (for selected nutrient source)

View Table View Graph

All values are in th gals

Year	Month	Inflow	Outflow	Cumulative	Over
2003	January	137.15	0.00	606.48	
2003	February	173.13	0.00	779.61	
2003	March	314.95	1094.56	0.00	
2003	April	49.34	0.00	49.34	
2003	May	108.58	0.00	157.92	
2003	June	54.65	0.00	212.57	
2003	July	-217.25	0.00	-4.68	
2003	August	-54.33	0.00	-59.01	
2003	September	87.41	0.00	28.40	
2003	October	200.66	0.00	229.06	
2003	November	245.09	0.00	474.15	
2003	December	153.09	0.00	627.24	

Select Nutrient Source

On-farm Manure Storage

Imported Manure

Commercial Fertilizer

- Gilt Pit
- Gilt Dry Lot
- Lagoon

Export Manure

Select Applicator

- Solid Spreader
- Comm Liquid

Incorporation Timing:

Allocation Type and Date

Crop Specific Stockpile

Reset

Application Rate

Allocate

Allocation History (for selected field)

Target Crop	% Field Covered	Nutrient Source	Applicator Used	Date	Rate	Amount	Unit	Nut. Appld (lbs/ac)			
								N	P205	K20	
<input type="checkbox"/>	1	81	Lagoon	Comm Liquid	3/7/2003	7.63	1094.6	th gals	37	45	43

Nutrient B

Based on

Based on

All values

2.3	Min application rate of applicator
6.32	K20 removed by crop 2
10.17	P205 recommended for crop 2
10.68	P205 removed by crop 2
14.04	K20 recommended for crop 2
29.39	N removed by crop 2
34.69	N recommended for crop 2

Nutrient Balance (for selected field)

Crop Name	Harvest Date	Recommendation			Manure Applied			Fertilizer Applied			Nutrient Balance		
		N	P205	K20	N	P205	K20	N	P205	K20	N	P205	K20
1 Soybeans	10/15/2003	0	0	0	30	36	35	0	0	0	30	36	35
2 Corn for grain	10/15/2004	170	60	80	0	0	0	0	0	0	-170	-60	-80
3 Soybeans	10/15/2005	0	0	0	0	0	0	0	0	0	0	0	0
4 Corn for grain	10/15/2006	170	0	0	0	0	0	0	0	0	-170	0	0
5 Soybeans	10/15/2007	0	0	0	0	0	0	0	0	0	0	0	0

Contr.Nutrient: Undetermined Acreage: 177.7 Total:

340	60	80	30	36	35	0	0	0	-310	-24	-45
-----	----	----	----	----	----	---	---	---	------	-----	-----

De-allocate All

< Back

Next >

Water, Environmental, and Setback Restrictions Requirements

NO APPLICATION

- *Not to land that is saturated, frozen, or snow-covered.*
- *Not during inclement weather or when a significant rain event is forecasted to occur within 48 hours.*

Setbacks for land application areas

- Residences
- Occupied dwelling
- Property lines
- Real property
- Waters of the State and ditches and swales that drain directly into waters of the State
- Ephemeral and intermittent streams
- Public and private drinking water wells
- Others at the discretion of the department

Water, Environmental, and Setback Restrictions Requirements

- *Manure (solid or liquid) shall only be applied when weather and soil conditions are favorable and when prevailing winds are blowing away from nearby dwellings.*