Fields of Opportunities

STATE OF IOWA

CHESTER J. CULVER, GOVERNOR
PATTY JUDGE, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
PATRICIA L. BODDY, INTERIM DIRECTOR

May 15, 2012

Prestage Farms of Iowa, LLC
1421 South Bell Avenue, Suite 107
Ames, IA 50010

SUBJECT: Confined Animal Feeding Operation Construction or Expansion Requirements
Prestage P 363 (67240), Section 10, Bristol Township, Greene County

Dear Mr. Pudenz:

It has come to the attention of the Iowa Department of Natural Resources (IDNR) that you will be constructing a new confined animal feeding operation or expanding your current facility. It is also our understanding that the capacity of the facility after construction or expansion will be greater than 500 animal units, but less than 1,000 animal units. The purpose of this letter is to inform you of the DNR requirements applicable to your project.

MMP

We received the Manure Management Plan (MMP) on April 30, 2012. It has been administratively reviewed and appears to be complete.

The annual due date for your MMP is **April 1**. Your annual MMP update will be due on this date every year. Please submit MMP updates NO MORE than 30 days before this date. A complete P-Index MMP (on DNR form 542-4000) will be due once every four years on this date, at a minimum. Please put these dates on your calendar for this year and future years. **You will be responsible for keeping track of the dates and submitting your MMP on time.** You can look up due dates for your facility using the DNR animal feeding operation database at https://programs.iowadnr.gov/animalfeedingoperations/.

You can find the complete MMP form (542-4000) or short MMP forms for annual reports (542-8162) at http://www.iowadnr.gov/Environment/LandStewardship/AnimalFeedingOperations/AFOResources/AFOForms.aspx.

Insufficient Soil Samples

Your original MMP used soil sampling data that does not meet the requirements of Subrule 567 IAC 65.17(16).

Paragraph 567 IAC 65.17(17) "e" states, "For an original manure management plan, previous soil sampling data that does not meet the requirements of 65.17(16) may be used in the phosphorus index if the data is four years old or less. In the case of fields for which soil sampling data is used that does not meet the requirements of 65.17(16), the fields must be soil-sampled according to the requirements of 65.17(16) no more than one year after the manure management plan is approved."

Subparagraph 567 IAC 65.17(17)"h"(1) provides, "When any inputs to the phosphorus index change, an operation shall recalculate the phosphorus index and adjust the application rates if necessary."

A corrected and complete MMP including the new soil samples, the recalculated RUSLE2 calculations, and the phosphorus index must be submitted to this office and the applicable counties **by June 3, 2012**.

If a complete MMP is not received by the deadline, an administrative order will be issued and a $3000 penalty will be assessed.

Construction Design Statement (CDS) or Professional Engineer Design Certification
You have submitted a Professional Engineer (PE) Design Certification. It was received on April 30, 2012 and appears to be complete.

Authorized Construction Date
You may begin construction no sooner than May 30, 2012. If you do not begin construction by April 30, 2013, you will need to submit a new MMP, CDS, and fees at least 30 days before beginning construction.

Concrete Inspections
Please call the local DNR Field Office at 712/243-1934 prior to the initial concrete pour for your manure pits.

Stormwater Permit
Subrule 567 IAC 64.3(1) requires any construction activity that disturbs one acre or more of soil to obtain a stormwater permit (National Pollutant Discharge Elimination System (NPDES), General Permit #2).

If you have questions regarding stormwater permit applications please contact Joe Griffin at (515) 281-7017 or see the IDNR website at http://www.iowadnr.gov/InsideDNR/RegulatoryWater/StormWater.aspx.

Separation Distances
Your proposed formed manure storage structure and confinement barn(s) must also meet minimum separation distance requirements from other structures and certain protected areas. Some of the minimum required separation distances are based on the date when the operation was first constructed.

Adjacency
If you have ownership or manage other confinement feeding operation(s) that are located within 2,500 feet, please contact your local IDNR field office. These operations might be considered one facility.

Application Records Required
You are required by law to maintain detailed records of manure applications and any day-to-day changes made to your MMP. These records must include any changes to the plan, and all data on the actual manure application. Records must be maintained for five years, or for the length of the crop rotation following the year of manure application, whichever is greater.

If you apply manure to fields that you do not own or rent you must obtain a Statement of Intent from each crop producer indicating how much commercial N or P fertilizer will be applied to manured fields, even if no commercial fertilizer will be applied. The signed statement must become part of your MMP and be kept with your MMP records.

Certified Applicator Required
Only a certified applicator, either a commercial or a confinement site applicator, is allowed to apply manure from your facility.

To find forms, fact sheets, mapping resources, or other relevant information, please go to http://www.iowadnr.gov/Environment/LandStewardship/AnimalFeedingOperations.aspx or contact me via e-mail at Dan.Olson@dnr.iowa.gov or by phone at (712) 243-1934.

Sincerely,

Dan Olson
Environmental Specialist Senior
Field Services and Compliance Bureau

DPO:dpo\cf\Jefferson051112.cf.Prestage P 363.construction letter.olson.doc

c: -G. Tinker, AFO, WQB, ESD, DNR, Des Moines **(BY EMAIL)**
-Brian Ritland, 620 Country Club Road, Iowa Falls, IA 50126 **(BY EMAIL)**
-Prestage P 363 (67240) Confinement File, Greene County

enc: -Minimum Required Separation Distance Table - for facilities
(http://www.iowadnr.gov/Portals/idnr/uploads/afo/fs_distreq_constrctn.pdf)
-Manure Management Plan Record Keeping Form
(http://www.iowadnr.gov/Portals/idnr/uploads/forms/5428002.pdf)
-Manure Applicators' Certification Fact Sheet
(http://www.iowadnr.gov/Portals/idnr/uploads/afo/fs_confmac.pdf)
-Statement of Intent for Commercial Fertilizer Application
(http://www.iowadnr.gov/Portals/idnr/uploads/forms/5428167.pdf)
-567 IAC 65.3(455B) Required and Recommended Practices for Manure Application
(http://www.legis.state.ia.us/aspx/ACODocs/DOCS/9-21-2011.567.65.3.pdf)
-Separation Distances for Land Application of Manure
(http://www.iowadnr.gov/Portals/idnr/uploads/afo/fs_sepdstb4.pdf)

Manure Management Plan Form

Animal Feeding Operation Information

Instructions: Complete this form for your animal feeding operation. Footnotes are provided on page 4.

The information within this form, and the attachments, describes my animal feeding operation, my manure storage and handling system, and my planned manure management system. I (we) will manage the manure, and the nutrients it contains, as described within this manure management plan (MMP) and any revisions of the plan, individual field information, and field summary sheet, and in accordance with current rules and regulations. Deviations permitted by Iowa law will be documented and maintained in my records.

Signed: Prestage Farms of IA, LLC (Signature) Lynn Probst (Print name) **Date:** 4/23/12

Name of operation: P 363 **Facility ID No.** N/A

Location of the operation: N/A J Ave (911 address)

Jefferson (Town) IA (State) 50129 (Zip)

SW (1/4 1/4) 1/4 of the NW (1/4) 1/4 of Sec 10 (Section) T 84 R 31 (Tier & Range) Bristol (Township Name) Greene (County)

Owner and contacts of the animal feeding operation:

Owner Prestage Farms of Iowa, LLC Phone 515-233-1813

Address 1421 S Bell Ave Ames, IA 50010

E-mail address (optional) _____ Cell phone (optional) _____

Contact person (if different than owner) Brian Ritland Phone 641-648-7300

Address 620 Country Club Rd Iowa Falls, IA 50126

E-mail address (optional) britland@pinnacleiowa.com Cell phone (optional) _____

Contract company (if applicable) _____ Phone _____

Address _____

This manure management plan is for: (check one)

___ existing operation, not expanding ___ existing operation, expanding ___ existing operation, new owner X new operation

Construction and Expansion Dates: _____ date of initial construction

_____ _____ _____ and all expansions

Table 1. Information about livestock production and manure management system

1	2	3	4	5	6	7	8
Animal type/ Production phase[a]	Max # of animals confined	Manure Storage Structure[b]	N[c]	P_2O_5[c]	gal/space/dy[d]	Days/yr Facility occupied	Annual Manure Produced[e]
Wean/ finish (wet/ dry)	2496	BBP	56	38	0.7	365	637,728
Select production phas			0	0	0.0		000
Select production phas			0	0	0.0		000
						Total Gallons	**637,728**

4,992 animals/year

Source of Manure Nutrient Content Data (standard tables, manure analysis, other): Tables

Manure Management Plan Form

Determining Maximum Allowable Manure Application Rates

Instructions: Complete a worksheet for each unique combination of the following factors (crop rotation, optimum crop yield, manure nutrient concentration, remaining crop N need, method of application) that occurs at this operation. Complete form by filling in blanks, yellow-colored cells, and drop down menus. Gray shaded cells will calculate automatically. Footnotes are given on pages 4, 5 and 6.

Management Identification (Mgt ID) [g] Corn-Corn (A)

Method to determine optimum crop yield [h] USDA Iowa Ag Statistics County yields

Timing of application Spring/Fall

Method of application [i] Knifed in or soil injection of liquid manure

Application loss factor 0.98

If spray irrigation is used, identify method

Table 2. Manure nutrient concentration

Manure Nutrient Content (lbs/1000gal or lbs/ton)					
Manure Storage Structure(s) [k]	BBP				
Total N [l]	56		P_2O_5	38	
%TN Available 1st year	90%	2nd year	0%	3rd year	0%
Available N 1st year [m]	49.4	2nd year [n]	0.0	3rd year [o]	0.0

Table 3. Crop usage rates [p]

lb/bu or lb/ton	N	P_2O_5
Corn	1.2	0.375
Soybean	3.8	0.8
Alfalfa	50	12.5
Other crop	0	0

*Use blank space above to add crop not listed.

Table 4. Calculations for rate based on nitrogen (always required)

1	Applying Manure For (crop to be grown) [q]		Corn	Corn	Corn	Corn
2	Optimum Crop Yield [h]	bu or ton/acre	190	190	190	190
3	P_2O_5 removed with crop by harvest [r]	lb/acre	71.3	71.3	71.3	71.3
4	Crop N utilization [s]	lb/acre	228	228	228	228
5a	Legume N credit [t]	lb/acre	0.00	0	0	0
5b	Commercial N planned [u]	lb/acre	0	0	0	0
5c	Manure N carryover credit [v]	lb/acre	0	0.0	0.0	0.0
6	Remaining crop N need [w]	lb/acre	228	228	228	228
7	Manure rate to supply remaining N	gal/acre	4616	4616	4616	4616
8	P_2O_5 applied with N-based rate [y]	lb/acre	175	175	175	175

Table 5. Calculations for rate based on phosphorus (fill out only if P-based rates are planned)

9	Commercial P_2O_5 planned	lb/acre	0	0	0	0
10	Manure rate to supply P removal [aa]	gal/acre	1875	1875	1875	1875
11	Manure rate for P based plan [bb]	gal/acre	1875	1875	1875	1875
12	Manure N applied with P-based plan [cc]	lb/acree	93	93	93	93

Table 6. Application rates that will be carried over to page 3

13	Planned manure application rate [dd]	gal/acre	4616	4616	4616	4616

When applicable, manure application rates must be based on the P index value as follows:
(0-2) N-based manure management.
(>2-5) N-based manure management but P application rate cannot exceed two times the P removal rate of the crop schedule.
(>5-10) Until December 31, 2008, P-based manure management while adopting practices to reduce P index to 5 or below.
(>10) No manure application until practices are adopted to reduce P index to 5 or below

37843110P2000; 12 (188.36 ac.)

Date: Apr 23, 2012
Field Name: 37843110P2000; 12
Location: Greene Co., Iowa, U.S.
Section 10, T84N, R31W
Farm Name: P 363
Client Name: P-Index
Total Acres: 188.36
Field Boundary Start Location:
Latitude: 42.10692494
Longitude: -94.45331045

pinnacle
620 Country Club Road
Iowa Falls, Iowa 50126
Office: 641.648.7300
Fax: 641.648.7310
www.pinnacleiowa.com

(188.4ac.)Field Boundary

Manure Management Plan Form

Year by Year Manure Management Plan Summary

Instructions: Complete this form for each of the next four growing seasons, to demonstrate sufficient land base to apply manure over multiple crop years. If this page is identical for multiple years (e.g. every other year), submit only once for the identical years, and indicate which years the form represents. Footnotes are given on page

Crop year(s): 2013, 2014, 2015, 2016

1	2	3	4	5	6	7	8	9	10	11
Field Designation [ee]	Field Location ___1/4 of the___ 1/4 Sec___ T___ R___ Townsip Name_______, County Name ______	Mgt Id [ff]	Planned Crop	Acres receiving manure[gg]	Own, rent, agreement (include length of agreement)[hh]	P index value [ii]	HEL (Y/N)[jj]	Planned Application gal/acre	Planned Application gal/field [kk]	Soil Test for P[ll] (Yes or No)
37843110P2000	NW, & NW,NE,10,84,31,Bristol,Greene	A	Corn	188.4	Agreement	0.37	N	4616	**869,654**	No
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	

Total acres available for manure application **188.4** **Total gallons that could be applied** **869,654**

NRCS

RUSLE2 Profile Erosion Calculation Record

Info: 37843110P2000

File: profiles\default

Inputs:
Location: Iowa\Greene County
Soil: 138B Clarion loam, 2 to 5 percent slopes\Clarion loam 85%
Slope length (horiz): 200 ft
Avg. slope steepness: 4.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records*CC North	Corn, grain	bushels	201.00

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
T value: 5.0 t/ac/yr
Soil loss erod. portion: 1.0 t/ac/yr
Detachment on slope: 1.0 t/ac/yr
Soil loss for cons. plan: 1.0 t/ac/yr
Sediment delivery: 1.0 t/ac/yr

Crit. slope length: -- ft
Surf. cover after planting: 65 %

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
11/1/0	Manure injector, liquid high disturb.30 inch		89
11/2/0	Chisel, st. pt.		67
4/12/1	Cultivator, field 6-12 in sweeps		62
4/15/1	Planter, double disk opnr	Corn, grain	65
10/20/1	Harvest, killing crop 50pct standing stubble		90

USDA NRCS

v. 7/1/2004

Iowa Phosphorous Index

Credits: Iowa State University
USDA National Soil Tilth Laboratory
USDA Natural Resource Conservation Service

Field Number	Erosion								+	Runoff					+	Tile / Subsurface Recharge			=	Overall
	Gross Erosion	x	Sediment Trap Factor	x	SDR	x	Buffer Factor	x	Enrichment Factor	x	STP Factor	= Erosion PI		RCN Factor	x (	STP Factor	+	P App Factor	) = Runoff PI		Flow Factor	x	STP Factor	= Tile/Sub PI		P Index
37843110P2000 --	1.00		1.00		0.07		1.00		1.10		0.74	0.06		1.32		0.10		0.09	0.24		1.00		0.07	0.07		0.37

Prestage Farms Manure Application Lease/Fertilizer Consent Form

I, **Louis Hahn** give Prestage Farms of Iowa, LLC permission to apply manure from
GRANTOR (Land Owner/Tenant

from **P363** during calendar year **2012**, and any succeeding year until cancelled
Site

by written notice, on the fields listed below:

Field Name	FSA#	ACRES	LEGAL DESCRIPTION
Louis Hahn		200	NW 1/4 and Nw 1/4 of the NW 1/4 of section 10 Bristol Twp Greene County

I agree to release any FSA or NRCS information needed to complete a Manure Management Plan (MMP) or Nutrient Management Plan (NMP) for the above listed field(s) to the site owner and/or nutrient plan writer.

Application Terms & Conditions:

Manure shall only be applied to above described property at such times that application does not interfere with Grantor's farming operation. Grantor agrees to pay the actual application costs for manure applied pursuant to this agreement. Further, Grantor shall pay other costs associated with application for regulatory compliance, recordkeeping associated with regulatory compliance, and costs incurred for soil tests. However, such additional costs shall not exceed $5.00 per acre over and above the actual application costs. This additional $5.00 per acre charge may be adjusted up or down after 5 years from the original date of this agreement to reflect changes in regulatory or compliance fees.

This manure application agreement shall remain in effect for calendar year ***2012***, and each succeeding year until amended or cancelled by written notice. Written notice for amendments or cancellation must be received by May 1.

Date: 4/17/12

Louis Hahn
Land Owner/Tenant Name

Louis C Hahn
Signed

Steve Crawford
Prestage Farms of Iowa Representative

Steve Crawford
Signed

	Corn			Soybeans		
County	5-yr. avg. yield (bu./a)	5-yr. ave. yield + 10% (bu./a)	Avg. yield of 4 highest (bu./a)	5-yr. avg. yield (bu./a)	5-yr. ave. yield + 10% (bu./a)	Avg. yield of 4 highest (bu./a)
Adair	163	179	169	50.0	55.0	51.1
Adams	153	168	156	46.9	51.6	48.9
Allamakee	172	189	173	47.4	52.1	48.8
Appanoose	131	145	145	40.9	45.0	43.4
Audubon	173	191	177	53.0	58.3	53.7
Benton	179	197	181	52.8	58.0	53.2
Black Hawk	174	192	177	51.2	56.3	52.1
Boone	173	191	176	49.4	54.3	50.7
Bremer	178	196	182	51.0	56.1	52.5
Buchanan	172	189	173	48.9	53.7	50.1
Buena Vista	171	188	178	51.0	56.1	51.8
Butler	178	196	179	50.8	55.9	51.7
Calhoun	173	191	175	48.7	53.6	49.6
Carroll	179	197	183	51.4	56.6	52.0
Cass	168	185	172	51.3	56.4	52.6
Cedar	183	201	185	51.7	56.9	52.5
Cerro Gordo	170	188	172	48.7	53.6	49.7
Cherokee	179	197	188	55.0	60.5	55.3
ıickasaw	171	188	174	49.2	54.1	50.2
Clarke	126	139	137	39.0	42.9	42.1
Clay	172	189	175	50.2	55.2	50.8
Clayton	174	191	174	52.4	57.6	53.4
Clinton	180	198	182	50.8	55.9	51.7
Crawford	176	194	186	52.8	58.1	53.5
Dallas	166	183	172	50.9	55.9	51.8
Davis	138	152	151	43.2	47.6	44.9
Decatur	133	146	143	42.7	47.0	45.5
Delaware	174	192	178	52.4	57.7	53.9
Des Moines	165	181	178	49.6	54.6	50.3
Dickinson	172	189	175	48.6	53.4	49.7
Dubuque	176	193	180	51.9	57.1	53.8
Emmet	177	194	179	49.8	54.7	51.0
Fayette	168	184	170	48.8	53.7	50.3
Floyd	172	189	173	49.5	54.5	50.8
Franklin	171	189	173	49.6	54.6	50.8
Fremont	157	173	160	48.8	53.7	50.6
Greene	173	190	177	49.8	54.8	50.6
Grundy	181	199	182	55.4	60.9	56.6
Guthrie	161	177	166	47.4	52.2	48.3
·'amilton	172	189	176	47.9	52.7	48.7
..ancock	176	194	178	50.9	56.0	51.1
Hardin	174	191	178	52.0	57.2	53.5

	Corn			Soybeans		
County	5-yr. avg. yield (bu./a)	5-yr. ave. yield + 10% (bu./a)	Avg. yield of 4 highest (bu./a)	5-yr. avg. yield (bu./a)	5-yr. ave. yield + 10% (bu./a)	Avg. yield of 4 highest (bu./a)
Harrison	167	184	174	46.7	51.4	48.4
Henry	159	175	171	50.0	55.0	50.5
Howard	172	190	174	47.8	52.5	48.8
Humboldt	175	193	181	50.7	55.7	51.8
Ida	178	196	191	51.0	56.1	52.1
Iowa	174	191	178	52.1	57.4	53.4
Jackson	167	183	169	50.9	56.0	52.1
Jasper	174	192	180	53.6	59.0	55.0
Jefferson	149	164	162	46.6	51.3	47.8
Johnson	167	184	171	48.9	53.8	49.7
Jones	177	194	179	50.8	55.9	51.9
Keokuk	156	171	167	48.7	53.6	49.6
Kossuth	181	199	183	51.8	57.0	52.8
Lee	153	169	166	46.7	51.4	47.8
Linn	177	195	179	50.3	55.4	51.2
Louisa	161	177	170	48.2	53.1	48.9
Lucas	121	133	133	39.0	42.9	41.7
[illegible]von	181	199	186	53.8	59.2	54.6
[illegible]adison	156	172	164	48.8	53.6	50.5
Mahaska	165	181	176	51.4	56.5	52.4
Marion	149	164	158	48.7	53.5	49.6
Marshall	183	201	183	55.7	61.2	56.8
Mills	163	180	167	49.8	54.8	51.9
Mitchell	177	195	179	50.1	55.2	51.4
Monona	160	176	173	48.3	53.1	49.3
Monroe	134	147	148	43.0	47.3	45.4
Montgomery	164	180	168	49.2	54.2	52.1
Muscatine	165	182	170	48.8	53.7	49.9
O Brien	184	202	188	54.3	59.8	54.7
Osceola	180	198	184	51.5	56.6	52.4
Page	151	166	155	47.6	52.4	50.2
Palo Alto	175	192	177	49.7	54.7	50.0
Plymouth	173	190	182	52.6	57.9	53.4
Pocahontas	175	193	177	50.3	55.4	51.2
Polk	164	181	171	49.2	54.1	50.4
Pottawattamie	174	192	177	50.4	55.5	52.7
Poweshiek	175	192	180	53.8	59.2	55.2
Ringgold	125	138	133	40.8	44.9	44.4
Sac	173	191	183	51.2	56.4	52.3
[illegible]tt	175	192	180	52.9	58.2	53.4
Shelby	181	199	184	52.8	58.1	53.9
Sioux	183	201	189	55.3	60.8	55.6

	Corn			Soybeans		
County	5-yr. avg. yield (bu./a)	5-yr. ave. yield + 10% (bu./a)	Avg. yield of 4 highest (bu./a)	5-yr. avg. yield (bu./a)	5-yr. ave. yield + 10% (bu./a)	Avg. yield of 4 highest (bu./a)
Story	173	190	176	50.6	55.6	51.6
Tama	177	195	178	53.9	59.3	55.0
Taylor	138	151	142	42.8	47.1	45.0
Union	145	159	153	47.1	51.8	49.4
Van Buren	142	156	155	45.6	50.1	46.7
Wapello	146	160	157	45.5	50.1	46.3
Warren	144	159	155	49.5	54.4	51.5
Washington	169	185	178	50.1	55.1	50.9
Wayne	123	135	136	39.7	43.7	42.0
Webster	174	191	176	48.3	53.1	49.0
Winnebago	180	198	182	51.2	56.3	52.4
Winneshiek	176	193	177	49.0	53.9	50.1
Woodbury	164	180	172	47.8	52.5	48.4
Worth	179	197	181	48.3	53.1	49.7
Wright	172	189	177	48.8	53.7	50.6

Using Manure Nutrients for Crop Production

Nutrients in Animal Manure

Manure can supply nutrients required by crops and replenish nutrients removed from soil by crop harvest. Since manure contains multiple nutrients, applications should consider not only what is needed for the crop to be grown but also how the ratio of nutrients in manure could affect soil test levels. This ensures adequate nutrient supply and reduces potential for over- or under-application and subsequent buildup or depletion in the soil. Good manure nutrient management should consider short-term and long-term impacts on crop nutrient supply and soil resources.

Manure has characteristics that make nutrient management different and sometimes more complicated than fertilizer. These include a mix of organic and inorganic nutrient forms; variation in nutrient concentration and forms; variation in dry matter and resultant handling as a liquid or solid; and relatively low nutrient concentration requiring large application volumes. Since manure nutrient composition can vary significantly, sampling and laboratory analysis are always needed, while with fertilizer nutrient concentrations are provided at a guaranteed analysis.

The manure nutrient concentration varies considerably between animal species; dietary options; animal genetics; animal performance; production management and facility type; and collection, bedding, storage, handling, and agitation for land application. Use of average or "book" nutrient values can be helpful for designing a new facility and creating manure management plans but is not very helpful in determining specific manure nutrient supply or application rates due to wide variation in nutrient concentrations between production facilities. For example, a recent sampling across swine finishing facilities found a range in total N from 32 to 79 lb N/1,000 gal, P from 17 to 54 lb P_2O_5/1,000 gal, and K from 23 to 48 lb K_2O/1,000 gal. A similar or larger range can be found with other manure types. Nutrient analyses often vary greatly as storage facilities are emptied or manure is stockpiled, and also among multiple samples collected from loads during land application. Therefore, collecting multiple manure samples and maintaining a history of analysis results will improve use of manure nutrients.

For determining manure application rates and equating to crop fertilization requirements, it is most helpful if manure analyses give N, P_2O_5, and K_2O based on an as-received or wet basis in lb per ton or lb per 1,000 gal units. It is beyond the scope of this publication to give detailed manure sampling and laboratory analysis

recommendations. Those can be found in the extension materials listed on page 7. If manure analyses are provided from the laboratory in other units, they must be converted to these units. See the ISU Extension manure sampling publication for appropriate conversion factors. If manure average nutrient values or methods to estimate manure nutrient concentrations based on excretion are of interest or needed for planning purposes, those can be found in the Midwest Plan Service bulletins listed on page 7.

Manure Nutrient Availability for Crops

Nutrient management guidelines use the words "manure nutrient availability" when suggesting manure applications to supply nutrients needed by crops. However, the meaning of "availability" for manure nutrients often is not clear or its use not consistent. Available is defined as present or ready for immediate use, or present in such chemical or physical form as to be usable (as by a plant). The main reasoning for using the term "available" in describing manure nutrients is that some portions are in forms that cannot be used by plants immediately upon application to soil and have to be converted to a form that plants can take up. The term "available" is not typically applied to fertilizers because most include chemical forms that plants can take up or are quickly converted upon application to soil. According to this definition, most inorganic fertilizers contain basically 100 percent crop-available nutrients. For example, anhydrous ammonia dissolves in water and rapidly changes to ammonium, urea hydrolyzes to ammonium within a few days, and ammonium is further transformed to nitrate by soil microorganisms. Monoammonium phosphate (MAP) and diammonium phosphate (DAP) are highly soluble in water and dissolve to ammonium and orthophosphate. Potassium chloride (KCl, potash), dissolves in water to potassium (K^+) and chloride (Cl^-) ions. Both orthophosphate and K ions are taken up by plants. Because all K contained in manure is in the K^+ ionic form, manure K is readily crop available in all manure sources.

For manure N and P, there is usually a mix of organic and inorganic materials that varies among manure sources, production systems, bedding, storage, and handling. This variety in forms of N and P in manure contributes to greater uncertainty in manure nutrient management compared with fertilizers. The ratio of inorganic (mainly ammonium) and organic N varies considerably with the manure source. This was shown, for example, by on-farm research that included manure sampling and analysis from swine and poultry operations. The fraction of total N as ammonium N was almost 100 percent for swine manure from the liquid portion of anaerobic lagoons, 65 to 100 percent (average 84 percent) for liquid swine manure from under-building pits or storage tanks, and 10 to 40 percent (average 20 percent) for solid poultry manure. The large ammonium-N concentration and organic-N fraction that is easily mineralized after applica-

tion to soil explain why N in liquid swine manure is considered "highly" crop available and almost comparable to fertilizer N. Other manures have lower ammonium-N concentrations and greater (and tougher to degrade) organic materials due to bedding and feed materials. Considerable P in swine manure is orthophosphate and calcium phosphate compounds (derived both from feed and mineral supplements added to rations) that are soluble or dissolve quickly once applied to soil. The rest is organic P, which varies greatly in complexity and reaction in soil. Testing manure for ammonium-N or water-soluble N can be a way of estimating immediately available N. Unfortunately, a similarly useful test does not exist for P. Therefore, the availability estimate for manure N and P can be, and often is, less than 100 percent of total N and P.

Manure Nutrient Supply

There is a clear difference between crop availability of nutrients in fertilizer or manure and season-long supply of nutrients. Significant amounts of plant usable forms of nutrients in both fertilizer and manure might be lost and became unavailable to crops after application. For example, N can be lost through processes such as leaching, volatilization, or denitrification while P can be lost through erosion and surface runoff. Also, these nutrients can be converted for short or long periods of time into forms not usable by plants through processes such as immobilization to organic materials for N and retention by soil mineral constituents for P. Nutrient loss issues are not as pertinent for P and K as for N in Iowa soils as long as there is little soil erosion and surface runoff.

The immediate or long-term fate of plant usable nutrients in soil can be similar for manure and fertilizer. However, variation in manure nutrient concentration, application rate, and application distribution affect nutrient supply and contribute to increased uncertainty with manure management. Application rate and distribution uncertainties affect all applied nutrient sources but are more difficult to manage with manure than with fertilizer. With careful manure sampling, pre-application nutrient analysis, study of nutrient analysis history, and calibration of application equipment, reasonable manure nutrient application rates can be achieved. Due to material characteristics, and sampling and analysis variability, field distribution and application rate variability often is greater for dry manure sources.

These supply issues can be important for N, P, and K, although typically are of greater concern with N. There are several reasons, including manure usually is applied for corn production where N supply is critical, many Iowa soils have optimum or higher P and K test levels where need for and response to P and K is much less than with N, and crop deficiency symptoms and yield loss resulting from nutrient supply problems are more obvious for N.

Manure nutrient loss, application rate, and distribution uncertainties usually are not included in crop nutrient availability estimates. Instead, they are handled by suggested management practices. Not all published guidelines are consistent in this regard and, therefore, suggested crop nutrient availabilities do vary between states and regions. In this publication, use of "availability" refers to manure nutrients potentially available for plant uptake (with no losses) by the first crop after application or beyond, and percent nutrient availability values provided correlate to those for commonly used fertilizers. The guidelines in this publication assume supply issues are handled in the best way possible as is done with fertilizers. It is important to understand that for successful manure nutrient management, in many instances supply issues are as, or more, critical than estimates of nutrient availability.

Improving crop nutrient supply with manure can be achieved by understanding the issues related to manure nutrient analysis, application rate, application distribution, and the benefits and risks related to management practices such as application timing and placement that influence potential losses. Additionally, use of available tools to determine initial soil nutrient levels and adjust application rates can help provide for adequate season-long nutrient supply when either manure or fertilizer is used. These tools include commonly used pre-plant soil testing for P and K, estimates of N application rate need based on response trial data (such as

the *Corn Nitrogen Rate Calculator*), and tools to help determine need for additional N after planting corn such as the late-spring soil nitrate test and in-season crop sensing for N stress.

Manure Nutrient Application Recommendations

To determine manure application rates, the following information is required: needed crop nutrient fertilization rate for N, P, K, or other deficient nutrients; manure type; nutrient analysis; nutrient crop availability; and method of application. Nutrient recommendations for crops are provided in other Iowa State University Extension publications and are not repeated here (see list on page 7).

Once the needed nutrient application rate is determined, the manure rate to supply crop available nutrients is calculated based on the specific manure source being used.

An additional consideration is what portion of the needed fertilization will be supplied from manure—to meet the full crop nutrient requirement, or a partial requirement from manure and the remaining from fertilizer. This is an important consideration because manure contains multiple nutrients and a manure rate to supply the most deficient nutrient can over-supply other nutrients. Also, manure application to meet the least deficient or most environmentally restrictive nutrient application can result in under-supply of other nutrients.

In these cases, use of fertilizers in addition to manure application is necessary to appropriately meet all nutrient application requirements.

Manure Nutrient Availability Values

Many of the manure N, P, and K crop availability estimates listed in Table 1 are derived from research trials conducted in Iowa. However, when local research is lacking, applicable information was taken from research conducted in other states. For manure sources not listed in the table, values based on manure with similar characteristics can provide a reasonable estimate.

First-Year Availability Estimates

Table 1. First-year nutrient availability for different animal manure sources.

Manure Source	Nitrogen[1]	Phosphorus[2]	Potassium[2]
	Percent of Total Nutrient Applied		
Beef cattle (solid or liquid)	30–40	60–100	90–100
Dairy (solid or liquid)	30–40	60–100	90–100
Liquid swine (anaerobic pit)	90–100	90–100	90–100
Liquid swine (anaerobic lagoon)	90–100[3]	90–100[3]	90–100
Poultry (all species)	50–60	90–100	90–100

[1]The estimates for N availability do not account for potential volatile N losses during and after land application. Correction factors for volatile loss are given in Table 2. The ranges are provided to account for variation in the proportion of ammonium N (and for poultry manure also uric acid), bedding type and amount, and both sampling and analysis.

[2]The ranges in P and K availability are provided to account for variation in sampling and analysis, and for needed P and K supply with different soil test levels. A small portion of manure P may not be available immediately after application, but all P is potentially available over time. Use lower P and K availability values for soils testing in the Very Low and Low soil test interpretation categories, where large yield loss could occur if insufficient P or K is applied and a reasonable buildup is desirable. Use 100% when manure is applied to maintain soil-test P and K in the Optimum soil test category, when the probability of a yield response is small.

[3]Values apply for the liquid portion of swine manure in lagoons; the N and P availability will be less and difficult to estimate with settled solids.

Second- and Third-Year Availability Estimates

While manure N may become crop available over multiple years for some sources, there should not be an expectation that all of the manure N will eventually become crop available. This happens because some of the N is in difficult to degrade organic forms (recalcitrant) and will become part of the soil organic matter. For some manure sources, such as with bedded systems, not all of the manure N should be accounted for in manure plans over multiple years and the first-, second-, or third-year availability may not add up to 100 percent.

Animal manure that has considerable organic material can have some residual-N availability in the second or third year after application. The second-year N availability estimate for beef cattle and dairy manure is 10 percent, and 5 percent for the third year. Other manures that have similar organic N and bedding could have similar second- and third-year N availability. Manure sources that have low organic N will not have second-year crop available N. These include liquid systems like swine manure stored in under-building pits and above-ground tanks, and anaerobic lagoons. Poultry manure, since it has considerable organic material, has some but low second-year (0–10 percent) availability and no third-year N availability.

The P and K contained in animal manure are estimated at 100 percent crop available over a long term. Residual effects of P and K not used in the year of application will be reflected in soil tests and crop use, just like fertilizer P and K applied for one year or for multiple years.

Adjusting for Manure Nitrogen Volatilization

The estimates for manure N availability in Table 1 do not consider potential volatile N losses during or after application. Losses are from various volatile N compounds in manure, such as ammonia, and ammonia that is produced when urea, uric acid, or other compounds convert to ammonium. These are similar losses that can occur from some N fertilizers such as anhydrous ammonia, urea, and urea-ammonium nitrate (UAN) solutions. If manure is left on the soil surface, losses may occur until N is moved into the soil with rainfall or incorporated with tillage. Many factors affect the rate and amount of volatile loss, such as temperature, humidity, rainfall, soil moisture, soil pH, surface residue cover, and days to incorporation. Volatile losses at or after application often are difficult to predict accurately. However, losses can be significant, and, therefore, it is important to make an adjustment for volatile N losses from applied manure and for manure management planning purposes. Values given in Table 2 provide guidance on potential volatile losses. The correction factors in Table 2 do not account for N losses during storage and handling (time from excretion to sampling for analysis) and assume a reasonable time period from sampling to land application so that the manure analysis represents the manure being applied. To estimate manure N remaining in soil after application, multiply the applied manure N rate by the appropriate correction factor.

Table 2. Correction factors to account for N volatilization losses during and after land application of animal manure.[1]

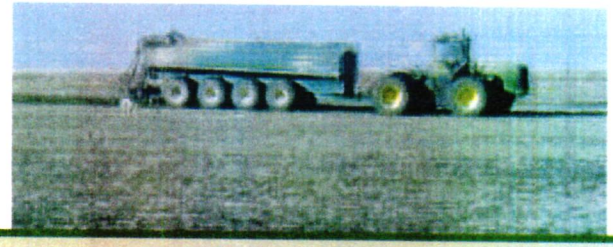
Application Method	Incorporation	Volatilization Correction Factor[2]
Direct injection	—	0.98–1.00
Broadcast (liquid/solid)	Immediate incorporation	0.95–0.99
Broadcast (liquid)	No incorporation	0.75–0.90
Broadcast (solid)	No incorporation	0.70–0.85
Irrigation	No incorporation	0.60–0.75

[1]Adapted from Midwest Plan Service MWPS-18, Third Edition. Nitrogen losses during and within four days of application.

[2]Multiply the manure total N rate applied times the volatilization correction factor to determine the portion of total manure N remaining.

Considerations for Time of Application

The time of application influences nutrient availability and potential manure and nutrient loss from soil. Fall applications allow more time for organic N and P portions of manure to mineralize so they are available for plant uptake the next crop season. This is more important for N in manures with high organic matter content, such as bedded systems. Iowa research has shown that fall versus springtime P and K application usually is not an agronomic issue for fertilizers or manure. The increased time for organic N mineralization with fall application also allows for nitrification of ammonium and therefore more potential nitrate loss through leaching or denitrification with excessively wet spring conditions. This is a more important issue for manure with large ammonium-N concentration, such as liquid swine manure. Coarse-textured soils, with high permeability, are the most likely to have leaching losses. Fine- and moderately fine-textured soils, prone to excess wetness, are most likely to have denitrification losses. Manure applied in the spring has less time for organic N and P mineralization before crop uptake. Delayed mineralization can be an important issue for manure with high organic matter content, especially in cold springs. With manure that contains a large portion of N as ammonium, spring application allows for better timing of nitrification to nitrate and subsequent crop use, and less chance of N loss.



As a general rule, do not apply manure in the fall unless the soil temperature is 50° F and cooling at the four-inch soil depth. This will slow the mineralization and nitrification processes and is an especially important consideration for manure containing a large portion of N as ammonium.

Broadcasting manure onto frozen, snow-covered, water-saturated soils increases the potential for nutrient losses with rainfall or snowmelt runoff to surface water systems. If manure must be applied in these conditions, it should be applied on relatively flat land, slopes less than 5 percent, and well away from streams and waterways (see Iowa Department of Natural Resources rules on setback distances).

Example Calculation of Manure Application Rates

Note: *The N, P, and K fertilization requirements in these examples are determined from appropriate extension publications and Web-based tools listed at the right.*

Example 1

- Manure source: liquid swine manure, finishing under-building pit.
- Manure analysis: 40 lb N/1,000 gal, 25 lb P_2O_5/1,000 gal, 35 lb K_2O/1,000 gal.
- Intended crop: corn in a corn-soybean rotation.
- Soil tests: 19 ppm Bray P-1 (Optimum), 165 ppm Ammonium Acetate K (Optimum).
- Crop yield and P and K removal for determining nutrient rates needed to maintain the Optimum soil test category: 200 bu/acre corn yield, 75 lb P_2O_5/acre and 60 lb K_2O removal.
- Manure rate: based on corn N fertilization requirement at 125 lb N/acre.
- Manure application: injected late fall.
- Manure nutrient availability: 100 percent for N, P, and K.
- Manure N volatilization correction factor: 0.98.
- Manure rate: 125 lb N/acre ÷ (40 lb N/1,000 gal × 0.98) = 3,200 gal/acre.
- Manure available P and K nutrients applied: 3,200 gal/acre × (25 lb P_2O_5/1,000 gal × 1.00) = 80 lb P_2O_5/acre; and 3,200 gal/acre × (35 lb K_2O/1,000 gal × 1.00) = 112 lb K_2O/acre.
- Phosphorus and K applied with the manure are adequate for P (slightly more than expected corn removal) and will supply more than needed K. The extra P and K can be used by the next crop and should be accounted for. However, additional P and K will need to be applied for the following soybean crop.

Example 2

- Manure source: solid layer manure.
- Manure analysis: 72 lb N/ton, 69 lb P_2O_5/ton, 54 lb K_2O/ton.
- Intended crop: corn-soybean rotation.
- Soil tests: 18 ppm Bray P-1 (Optimum), 120 ppm Ammonium Acetate K (Low).
- Manure rate: based on P requirement for the crop rotation at 120 lb P_2O_5/acre.
- Manure application: late fall, incorporated after four days.
- Manure nutrient availability: 55 percent for N, 100 percent for P and K.
- Manure N volatilization correction factor: 0.80.
- Manure rate: 120 lb P_2O_5/acre ÷ (69 lb P_2O_5/ton × 1.00) = 1.7 ton/acre.
- Manure available N and K nutrients applied: 1.7 ton/acre × (72 lb N/ton × 0.60 × 0.80) = 60 lb N/acre; and 1.7 ton/acre × (54 lb K_2O/ton × 1.00) = 92 lb K_2O/acre.
- Corn N fertilization need and K needed for the corn and soybean crops with a Low soil test category: 130 lb N/acre and 172 lb K_2O/acre.
- Crop available N and K applied with manure is not adequate for N, need additional 70 lb fertilizer N/acre (130 lb N/acre – 60 lb N/acre); and applied K is not adequate for the corn and soybean crops, need additional 80 lb K_2O/acre (172 – 92 lb K_2O/acre) from fertilizer.

Additional Resources

PM 1688 *A General Guide for Crop Nutrient and Limestone Recommendations in Iowa*

PM 287 *Take a Good Sample to Help Make Good Decisions*

PM 2015 *Concepts and Rationale for Regional Nitrogen Rate Guidelines for Corn*

PM 1714 *Nitrogen Fertilizer Recommendations for Corn in Iowa*

PM 2026 *Sensing Nitrogen Stress in Corn*

PM 1584 *Cornstalk Testing to Evaluate Nitrogen Management*

PM 1588 *How to Sample Manure for Nutrient Analysis*

A3769 *Recommended Methods of Manure Analysis* (University of Wisconsin)

MWPS-18-S1 *Manure Characteristics: Section 1* (Midwest Plan Service)

MWPS-18 *Livestock Waste Facilities Handbook, Third Edition* (Midwest Plan Service)

Corn Nitrogen Rate Calculator, **http://extension.agron.iastate.edu/soilfertility/nrate.aspx**

Summary

- Carefully manage the nutrients in animal manure as you would manage fertilizer.
- Have representative manure samples analyzed to determine nutrient concentration. At a minimum, samples should be analyzed for moisture (dry matter) and total N, P, and K. For additional information on N composition, samples can be analyzed for ammonium. Maintain a manure analysis history for production facilities.
- Set the manure application rate according to crop fertilization requirements and for the crop availability of manure N, P, and K.
- Adjust manure rates for estimated N volatilization.
- For manure application rates, consider the crop N, P, and K fertilization requirements and field P-Index ratings, but do not exceed the crop N fertilization need.
- Consider the nutrient needs of crop rotations rather than just individual crops, which is especially important for P and K management.
- Allocate manure to fields based on soil tests and crops to be grown.
- Fall applications of manure should not be made until the soil temperature is 50° F and cooling, especially for manure sources that have a large portion of N as ammonium.
- Do not apply manure to snow-covered, frozen, or water-saturated sloping ground to reduce risk of nutrient loss and water quality impairment.

Prepared by John E. Sawyer and Antonio P. Mallarino, professors of agronomy and extension soil fertility specialists, Iowa State University.

Expert Reviewed This publication was peer-reviewed by three independent reviewers using a double-blind process.

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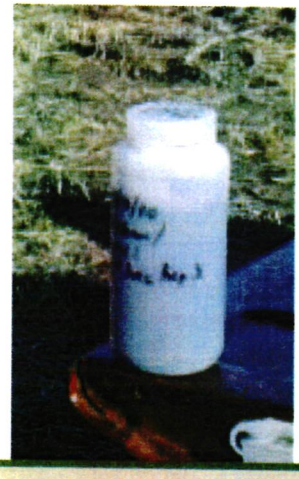


Verification of County Receipt
For Manure Management Plans & Plan Updates

This form is for non-permitted operations that are submitting an original manure management plan (MMP) and all confinement feeding operations that must submit an annual updated MMP. This form is not for confinement feeding operations that are applying for a construction permit. (See the Construction Permit Application package for the Verification of County Receipt form used with construction permit applications.)

It must be submitted to the appropriate Department of Natural Resources (DNR) field office to indicate that the county where the confinement feeding operation is located, or will be located, has received a copy of the MMP. If manure is to be applied in additional counties, you must also submit this form indicating that a complete MMP or MMP annual update has been delivered to each of the counties where manure will be applied.

For the confinement feeding operation:

NAME OF OPERATION: P 363

OWNER: PRESTAGE FARMS of IOWA, LLC

LOCATION: SW (¼ ¼) ¼ of the NW (¼) ¼ of Sec 10 (Section) T 84 (Tier) R 31 (Range) BRISTOL (Township Name) GREENE (County)

THIS SECTION IS TO BE COMPLETED BY THE COUNTY

COUNTY: Greene

NAME: Bruce A Kiers

TITLE: Deputy Auditor
(Member of the County Board of Supervisors or designated official/employee)

On _____, 20 _____, on behalf of the Board of Supervisors,

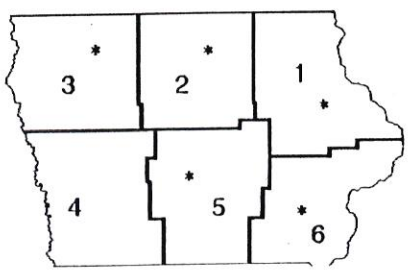
I received a complete copy of the:

☒ **Original manure management plan, OR**
☐ **Manure management plan annual update**

RECEIVED
APR 30 2012
IOWA DNR
FIELD OFFICE #4

2012 APR 26 AM 9:35
GREENE COUNTY AUDITOR

Please send this signed and dated receipt to the DNR Field Office where the operation is located:



Field Office #1
909 West Main, Suite 4
Manchester, IA 52057
563-927-2640

Field Office #2
2300 15th St SW
Mason City, IA 50401
641-424-4073

Field Office #3
1900 N. Grand Ave
Spencer, IA 51301
712-262-4177

Field Office #4
1401 Sunnyside Lane
Atlantic, IA 50022
712-243-1934

Field Office #5
401 SW 7th, Suite I
Des Moines, IA 50309
515-725-0268

Field Office #6
1023 W Madison
Washington, IA 52353
319-653-2135