


**Application of Manure to Growing Crops:**  
 Extending the Application Season and Capturing Nutrients

---

**Glen Arnold, Professor & Field Specialist**  
 Manure Application Management  
 Ohio State University Extension  
 Arnold.2@osu.edu

**CFAES** 

---

---

---

---

---

---

---

---

1

**The situation:**

Wetter rainfall patterns in past 20+ years.  
 Fewer days to apply manure in the spring and fall.  
 Commercial manure applicators get behind on their schedules.

More manure per site.  
 Added a 2<sup>nd</sup> hog building. Double-wide to Quad sized buildings  
 Dairy farms add additional manure storage.

Manure has an amazing amount of nutrients.  
 Need to look at in-season application to capture nutrients & add more days in the year to apply manure.

**CFAES**

---

---

---

---

---

---

---

---

2




---

---

---

---

---

---

---


---

3

**CFAES**

### Companies with NIR Manure Sensors

- John Deere
- TopCon
- CNHi
- Zunhammer



Commercially being used in Europe with companies beginning limited commercial use/testing here in North America; focused on calibrating for US livestock production.

THE OHIO STATE UNIVERSITY COLLEGE of FOOD, AGRICULTURAL, and ENVIRONMENTAL SCIENCES

---

---

---

---

---

---

---

---

4



5

---

---

---

---

---

---

---

---



6

---

---

---

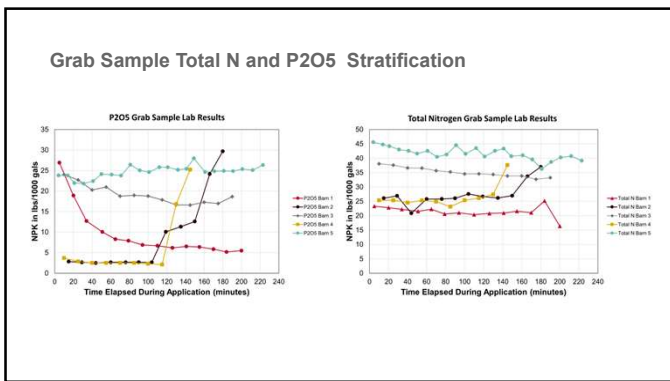
---

---

---

---

---



---

---

---

---

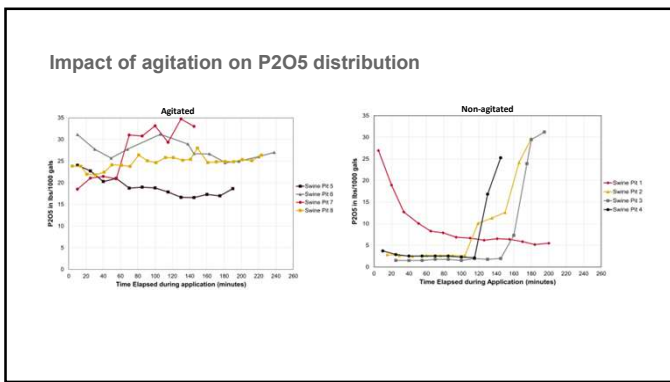
---

---

---

---

7



---

---

---

---

---

---

---

---

8



---

---

---

---

---

---

---

---

9



10

---

---

---

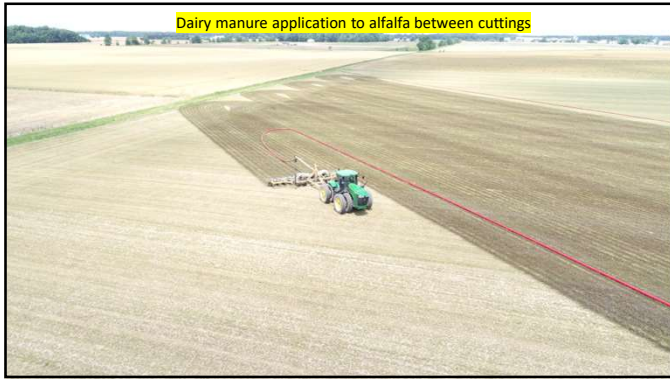
---

---

---

---

---



11

---

---

---

---

---

---

---

---



12

---

---

---

---

---

---

---

---



13

---

---

---

---

---

---

---

---



14

---

---

---

---

---

---

---

---



15

---

---

---

---

---

---

---

---



16

---

---

---

---

---

---

---

---



17

---

---

---

---

---

---

---

---



18

---

---

---

---

---

---

---

---



19

---

---

---

---

---

---

---

---



20

---

---

---

---

---

---

---

---

Ohio Agricultural Research and Development Center Drag Hose Corn Plots 2014-2018						
	2014	2015	2016	2017	218	Average
Corn Stage	Yield in Bushels per Acre					
No Drag Hose	145.1	167.2	145.1	164.5	217.8	169.7
V1	154.3	166.1	149.5	161.5	218.0	169.9
V2	157.9	165.3	141.2	159.6	217.7	168.3
V3	153.9	172.3	144.4	172.1	215.6	171.9
V4	149.7	165.1	152.1	166.5	201.9	167.1
V5	109.8	123.5	126.3	122.2	132.8	122.9

21

---

---

---

---

---

---

---

---



22

---

---

---

---

---

---

---

---



23

---

---

---

---

---

---

---

---



24

---

---

---

---

---

---

---

---



25

---

---

---

---

---

---

---

---



26

---

---

---

---

---

---

---

---



27

---

---

---

---

---

---

---

---

Plant Analysis Nutrient Sufficiency Range			
Nutrient	Average of four dairy manure fields	Normal Range	Rating
Nitrogen	3.31%	2.8 to 4.0%	Sufficient
Phosphorus	0.31%	0.25 to .050%	Sufficient
Potassium	2.23%	1.8% to 3.0%	Sufficient

Nutrient	Average of two swine manure fields	Normal Range	Rating
Nitrogen	3.54%	2.8 to 4.0%	Sufficient
Phosphorus	0.47%	0.25 to .050%	Sufficient
Potassium	2.42%	1.8% to 3.0%	Sufficient

---

---

---

---

---

---

---

---

28



---

---

---

---

---

---

---

---

29



---

---

---

---

---

---

---

---

30



31

---

---

---

---

---

---

---

---



32

---

---

---

---

---

---

---

---



33

---

---

---

---

---

---

---

---



34

---

---

---

---

---

---

---

---



35

---

---

---

---

---

---

---

---



36

---

---

---

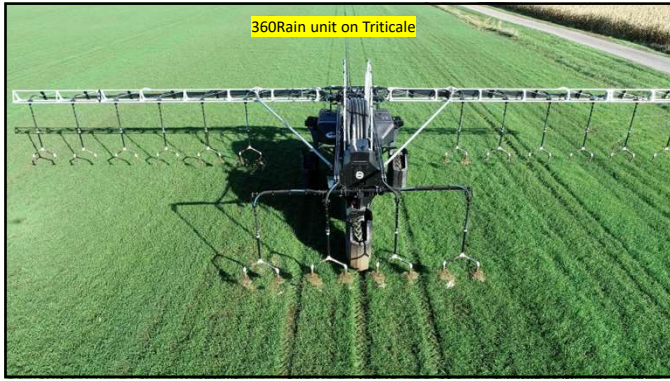
---

---

---

---

---



37

---

---

---

---

---

---

---

---



38

---

---

---

---

---

---

---

---



39

---

---

---

---

---

---

---

---



40

---

---

---

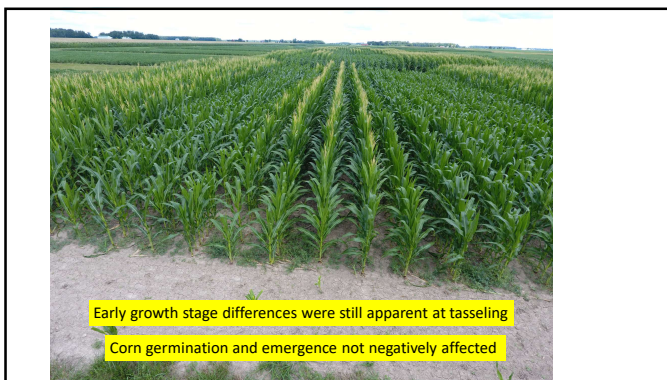
---

---

---

---

---



41

---

---

---

---

---

---

---

---

**Fall strip-till with manure**  
all treatments got 200# N as 28%UAN side-dress

Fall treatment	2021	2022	2023	Average bu/ac
Swine 5,000 gallons = 200# N	243.9	260.7	223.2	242.6
Swine 8,000 gallons = 320# N	245.0	267.7	239.1	250.6
Dairy 8,000 gallons = 128# N	239.1	225.8	224.9	229.9
Dairy 12,000 gallons = 192# N	242.2	245.5	217.5	235.1
No fall manure = 0# N	228.6	213.2	206.1	216.0
Zero nitrogen	64.6	90.4	48.5	68.7

42

---

---

---

---

---

---

---

---



43

---

---

---

---

---

---

---

---



44

---

---

---

---

---

---

---

---



45

---

---

---

---

---

---

---

---



46

---

---

---

---

---

---

---



47

---

---

---

---

---

---

---