

# Managing Manure Nutrients for Crop Production

## 2020 Soil Fertility Short Course

### Part 2

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with thanks to:  
Dr. John E. Sawyer  
Associate Professor  
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**How much per acre  
is being applied?**



# Calibrating Liquid Manure Tank Applicators

AE 3601A December 2016



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AE 3600 December 2016

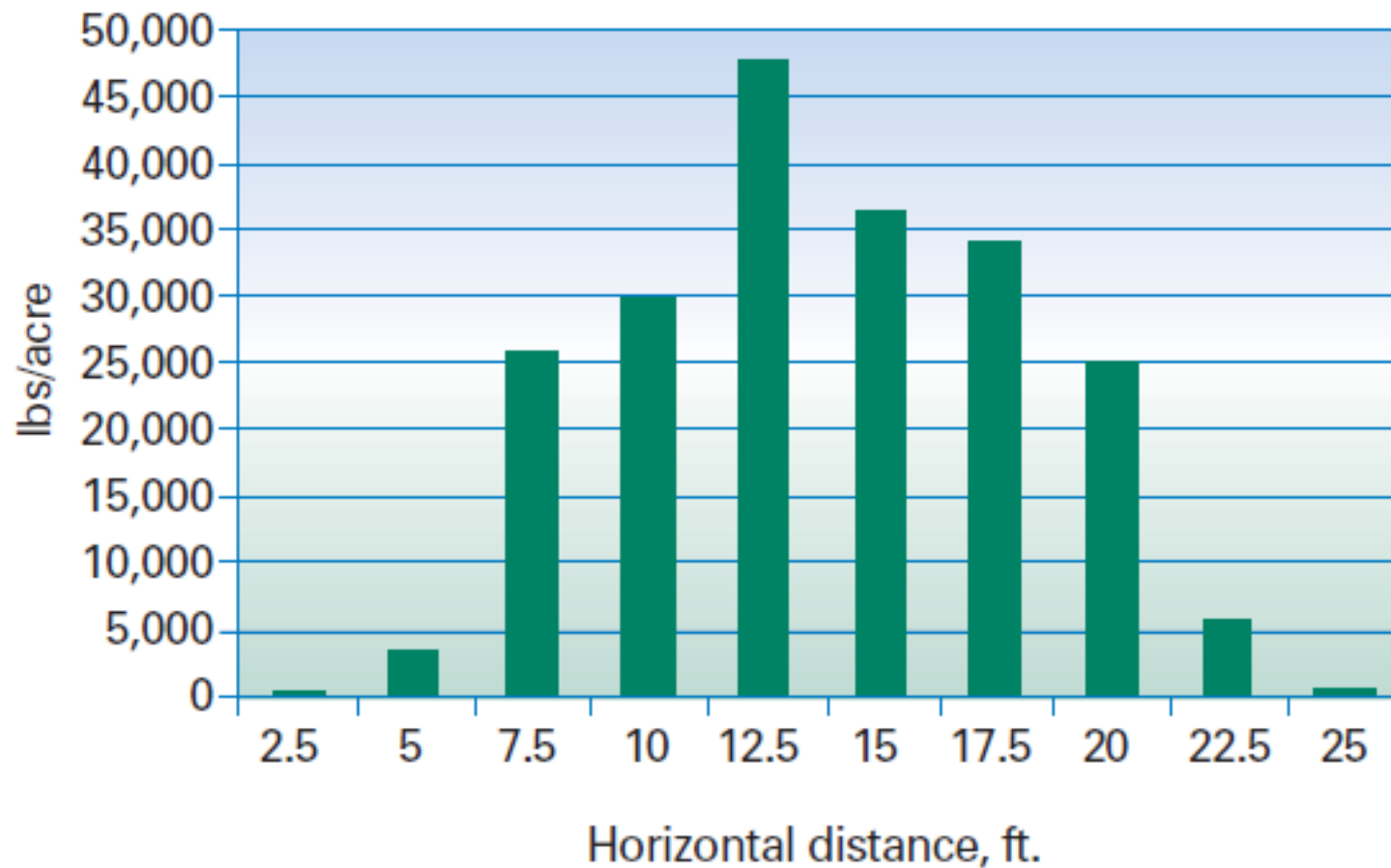
# Calibration and uniformity of solid manure spreaders

## Quiz Questions

- 1** When spreading solid manure with a rear-delivery spreader, is there more variation in manure applied across the swath or in the travel direction?
- 2** About how wide is the effective swath width for a rear-beater spreader to maintain relatively uniform application?

ty Extension publication, *Managing Manure Nutrients for Crop Production* (PM 1811).

The best manure application matches crop needs while considering application uniformity and soil test values. Application uniformity is not as great a concern for soils with adequate levels of P and K and that don't exhibit a significant response to N.



**Figure 2. Typical single-swath pattern for a rear-beater spreader.**



Size sheets 5' X 4'3"

Pounds collected on a sheet = tons/acre applied

# How much are we applying?

- Application Rate (T/acre) =  
 $(3136 \times \# \text{ of Manure}) / (L'' \times W'' \text{ of sheets})$

Example: 1# collected on a 24" x 36" sheet of plastic:

$$(3136 \times 1) / (12 \times 24) = 3136/288 =$$

**10.9 Tons/Acre**

# Is it applied uniformly?

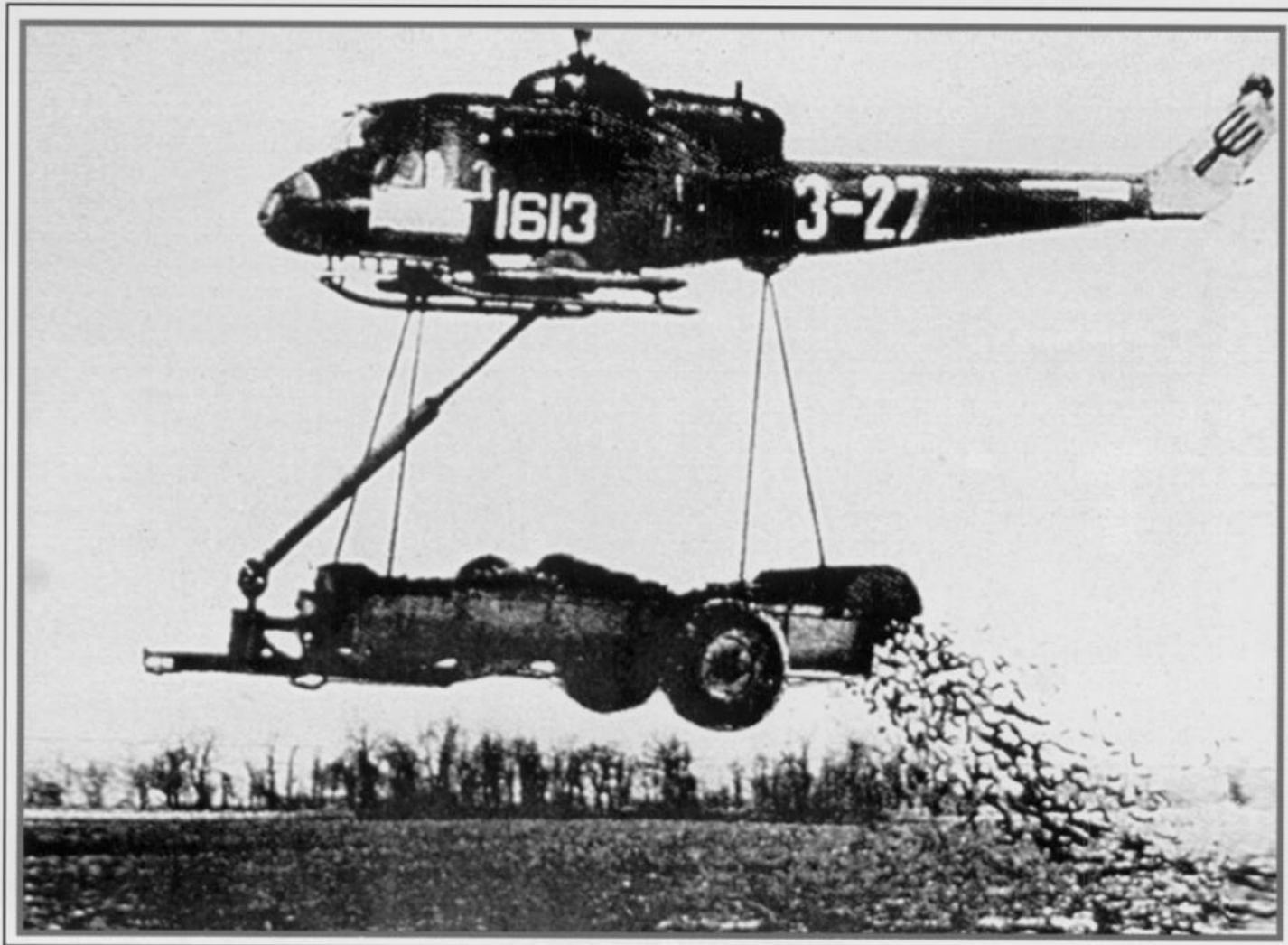


Photo: Dieter Krieg

**Wet Fields, No Problem**

April 1 Edition, *Lancaster Farming* (PA)





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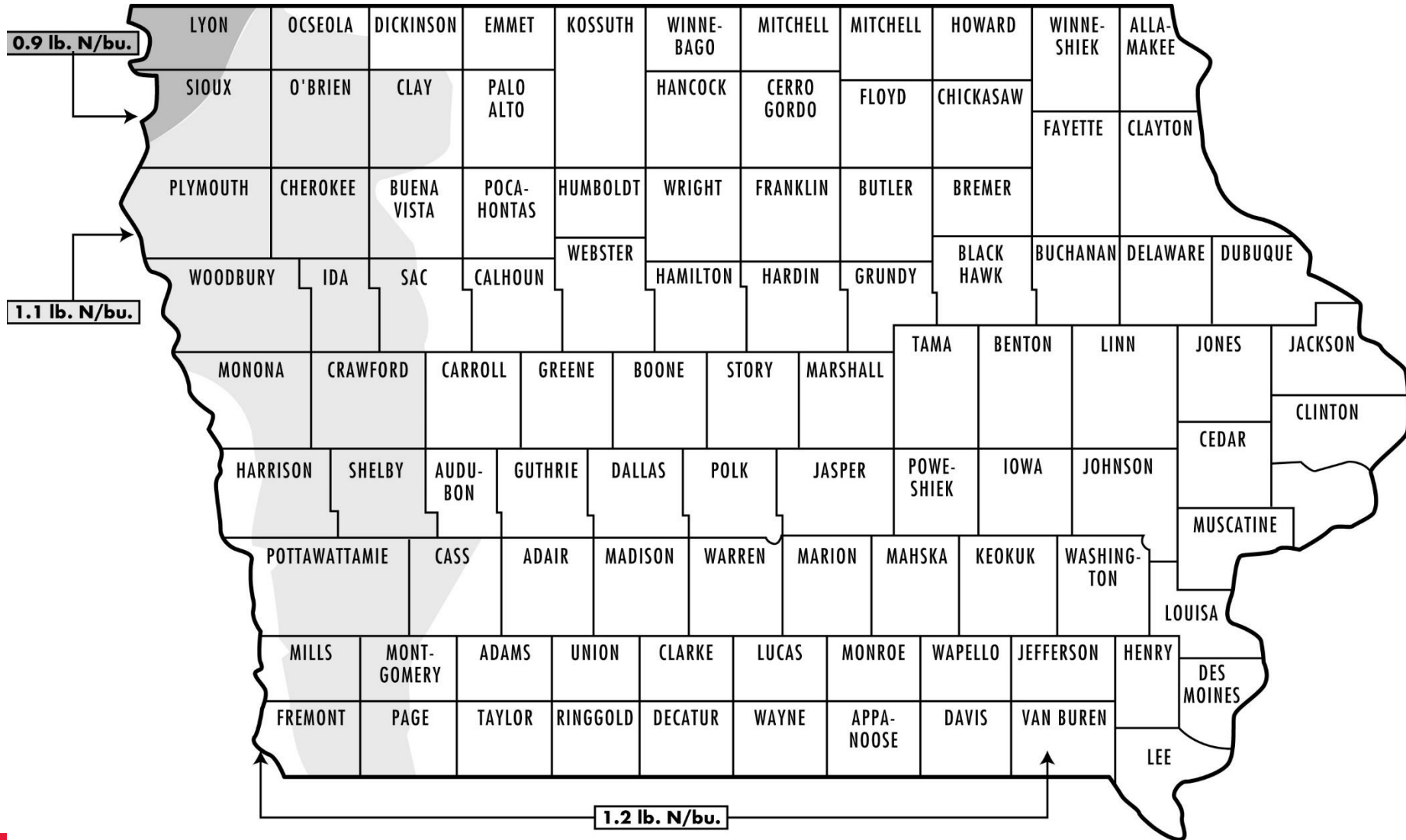
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# Determining Application Rates under a Manure Management Plan

- Method 1 for N
  - Estimate N needs by multiplying the proven yield for a given field (or area of a field) by a factor which represents the crop's N requirement and then taking credit for N from other sources.

$$\text{N fertilizer} = (\text{Proven yield} \times \text{N factor}) - \text{N credits}$$



# **Here is one example for determining N requirements for Iowa manure plans. N supplied by liquid swine manure**

**In Story County, the 5 year corn average, plus 10%, is 212 bu/acre\*\*. Last year's soybean crop yielded 60 bushels/acre.**

$$\begin{aligned}\text{N fertilizer} &= (212 \times 1.2) - 50 \text{ lb N/acre} \\ &= 254 - 50 = 204 \text{ lb N/acre}\end{aligned}$$

**Do we need this much?**

$$\begin{aligned}\text{Manure rate} &= 204 \text{ lb N/acre} \div 37 \text{ lb N per 1,000 gal} \\ &= 5,513 \text{ gal/acre}\end{aligned}$$

$$[5,513 \text{ gal} \times 15 \text{ lb P}_2\text{O}_5/1,000 \text{ gal} = 83 \text{ lb P}_2\text{O}_5/\text{acre}]$$

$$[5,513 \text{ gal} \times 23 \text{ lb K}_2\text{O}/1,000 \text{ gal} = 127 \text{ lb K}_2\text{O}/\text{acre}]$$

\*\* From Appendix A,  
Iowa DNTR Manure  
Management Plans forms



# One method for checking if adequate N is available:

- This method involves use of the Late Spring Soil Nitrate test.
  - Take a 0- to 12-inch soil sample taken when corn is 6 to 12 inches tall.
  - Have the soil samples analyzed for nitrate-N.
  - Use the recommended side dress N rate, based on a table from ISU.
  - Sample in “Sets of 8”?

# Nitrogen fertilizer recommendations for manured soils<sup>a</sup> and corn after alfalfa (from Blackmer, Voss, and Mallarino, 1997)

Grain and fertilizer prices	Soil test nitrate	Recommended N rate	
		Excess <sup>b</sup> rainfall	Normal rainfall
	ppm N	- - - - lb N/acre - - - -	
Unfavorable (1 bu. buys 7 lb. of N)	0-10	90	90
	11-15	0	60
	16-20	0	0 <sup>c</sup>
	>20	0	0
Favorable (1 bu. buys 15 lb. of N)	0-10	90	90
	11-15	60	60
	16-25	0	30
	>25	0	0

<sup>a</sup> Uniform manure, or 2 of 4 years. <sup>b</sup> May rainfall > 5 in.

<sup>c</sup> Optional 30 lb N/acre.

# **Manure Plan Exception to the N Rate Method:**

A high P index for a field can lower the amount you can apply, or keep you from applying manure to the field.

# “Soybean Rule”

- Anyone with MMP or NMP
- Applies to
  - Liquid manure
  - Process wastewater
  - Settled open feedlot effluent
- Planted in or will be beans
- Manure nitrogen limited to 100 lbs/acre of available N

# Frozen Ground Application Rules

- Applies *only* to confinements (>500 animal units) with liquid manure
- Limited from 12-21 to 4-01 on snow covered ground (1" snow or more, or >.5" ice)
- Limited on frozen ground from February 1 to April 1 unless it can be injected or incorporated (or under emergency situations, with permission)

# Manure application timing and nutrient availability

- Fall applications allow time for organic portions of the manure to mineralize.
- Fall applications also allow for more potential N loss to the environment.
- Do not apply liquid manure in the fall until the soil temperature (4" deep in the soil) is 50° F and cooling.
- Applying manure to frozen soils increases the potential for environmental contamination.
  - N and P movement into surface water can be significant.
  - Apply only on relatively flat land (slopes of 4 % or less).

# Assessing Site Vulnerability

The FD-36 watershed

Watershed boundary

Stream channel



# **In Summary - To get value from manure:**

- Know the nutrient content
- Calculate losses and availability
- Know the rate being applied
- Insure that application is uniform



# Questions?

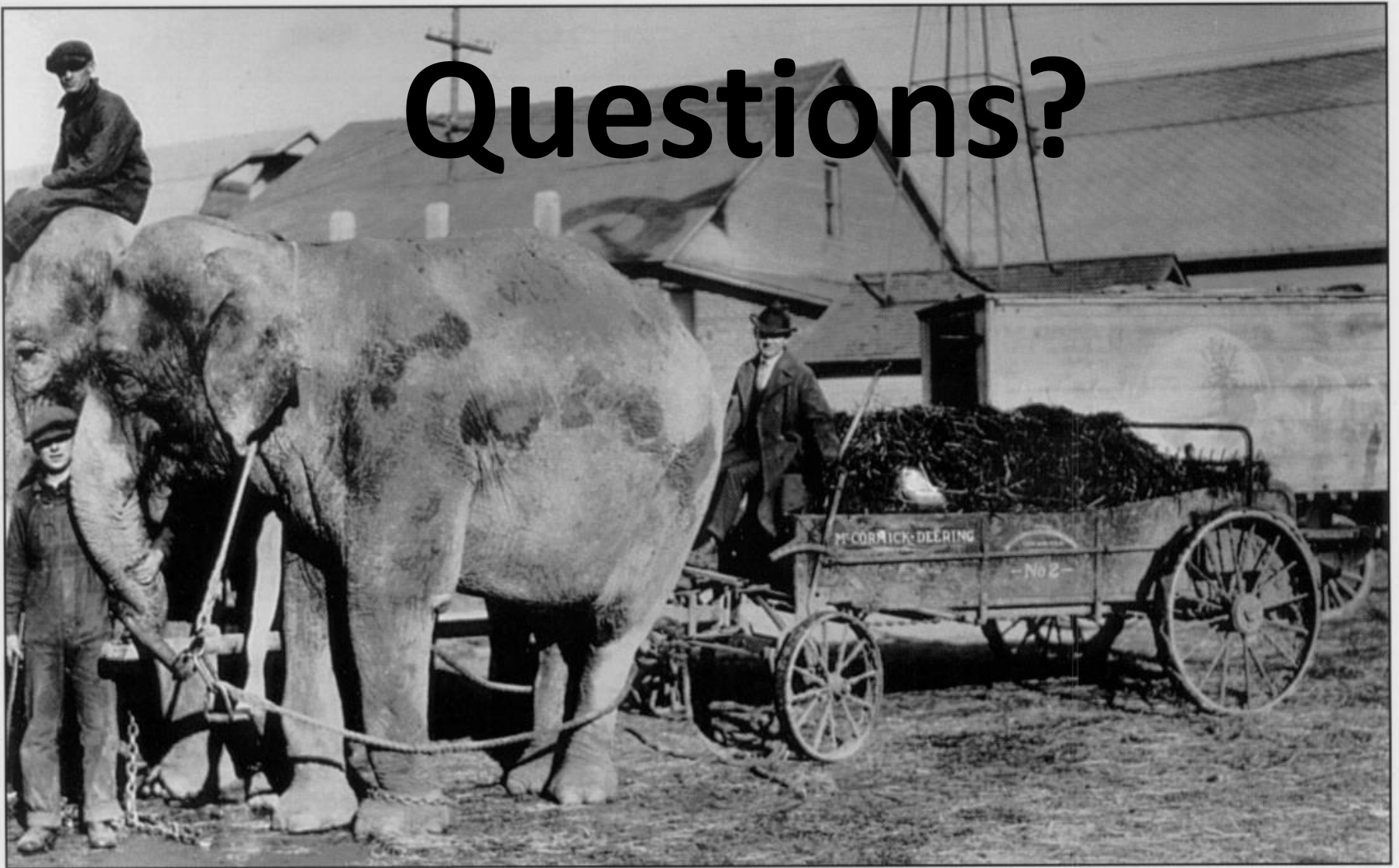


Photo: State Historical Society of Wisconsin

**Elephant Powered**  
McCormick-Deering Archive

# THANK YOU!

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