

Precision Manure Management



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Manure Pattern Distribution Factors

- **Application Method**
- **Manure Consistency**
- **Wind**





Horizontal Beater

- Most Common
- Simple Operation
- Narrow application swath
- Leaves clumps
- Uneven Distribution
- Apron vs. Hydraulic Push-Off



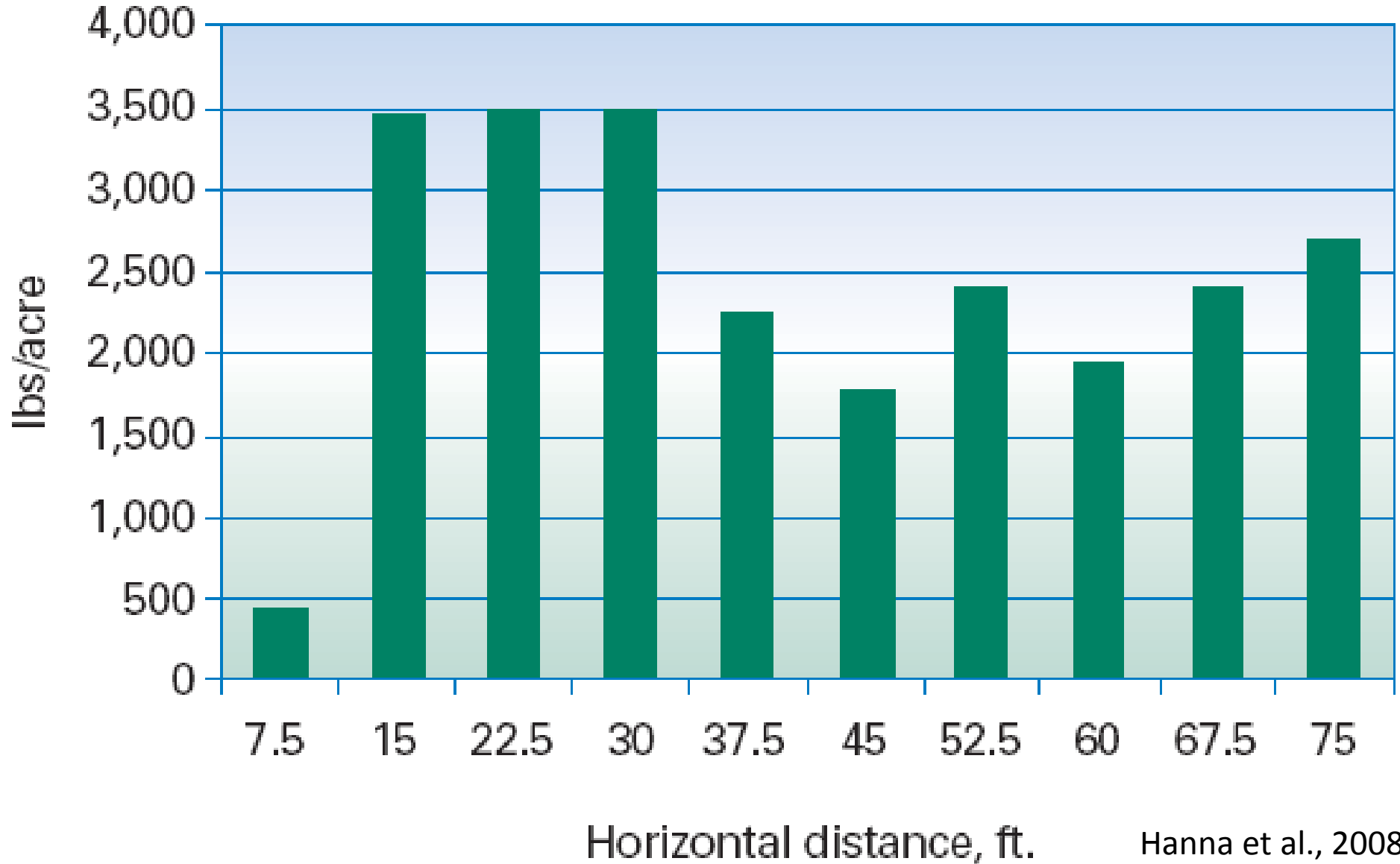


Side Delivery

- Breaks up material well
- Great for light applications of manure
- Handles wet and solid manures
- Wide spreader pattern
- Fairly Uniform spread pattern



Side Delivery Spreader



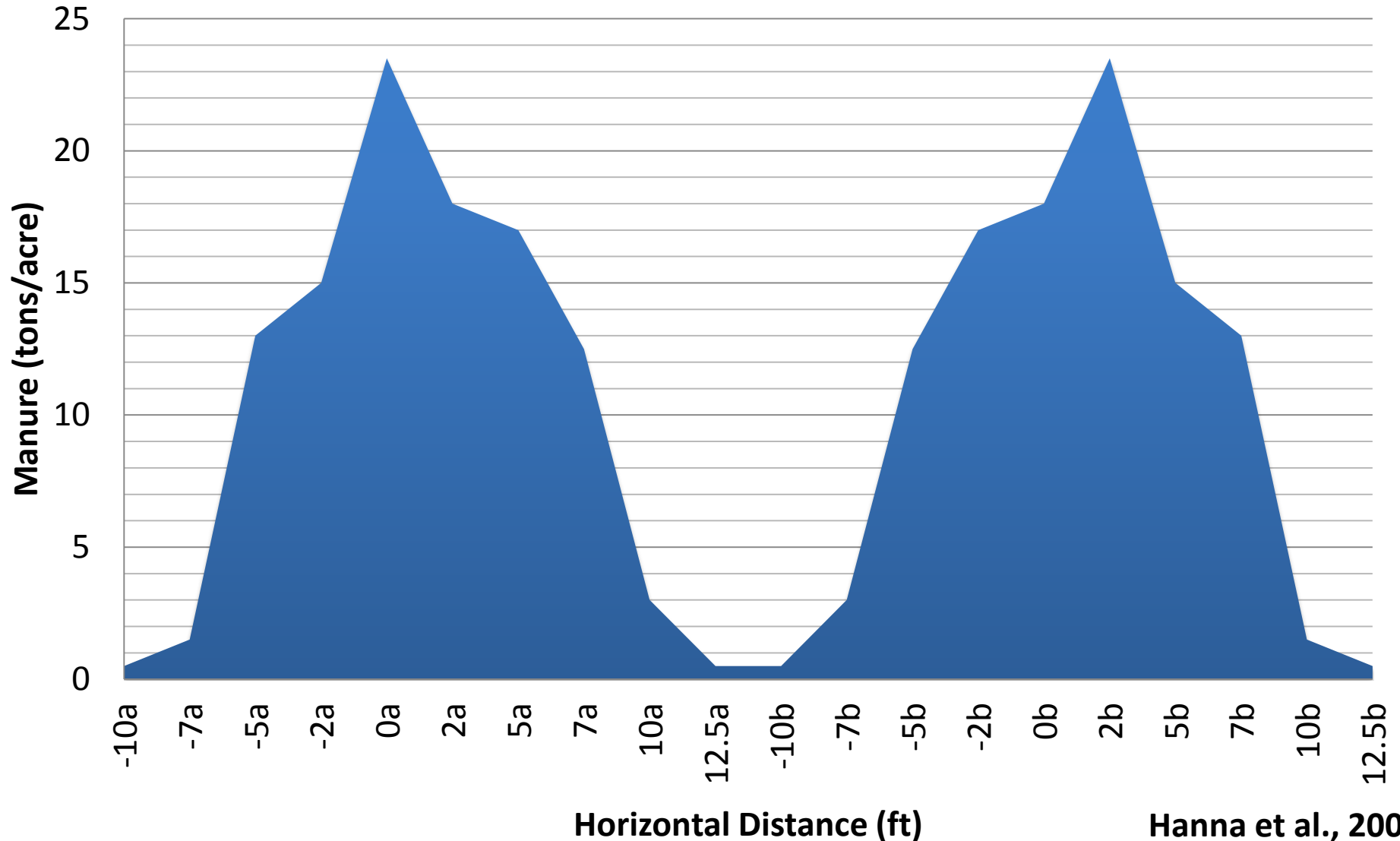
Vertical Beater

- Fairly even spread pattern
- Breaks up material
- Wide spread pattern
- Great for no-till operations

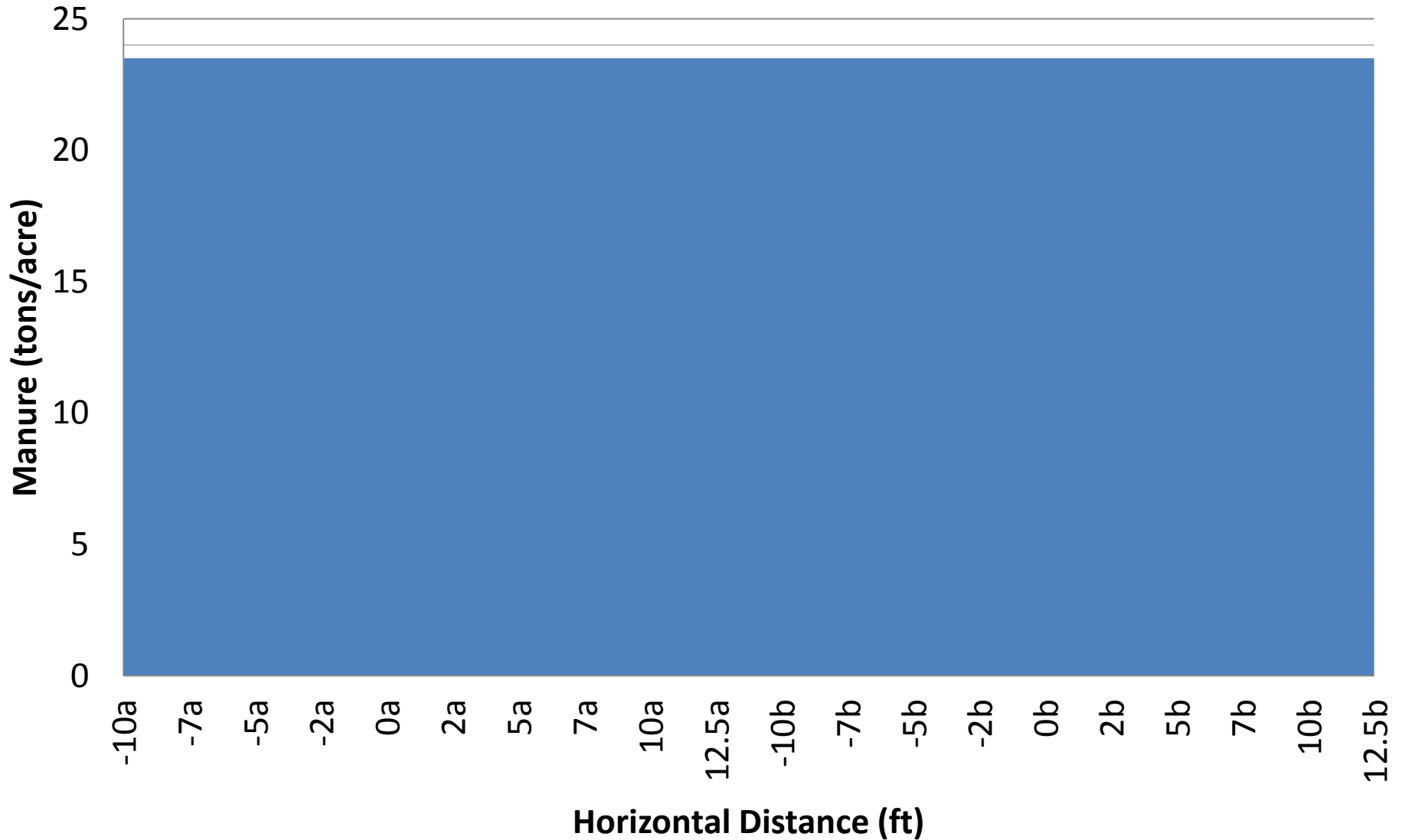




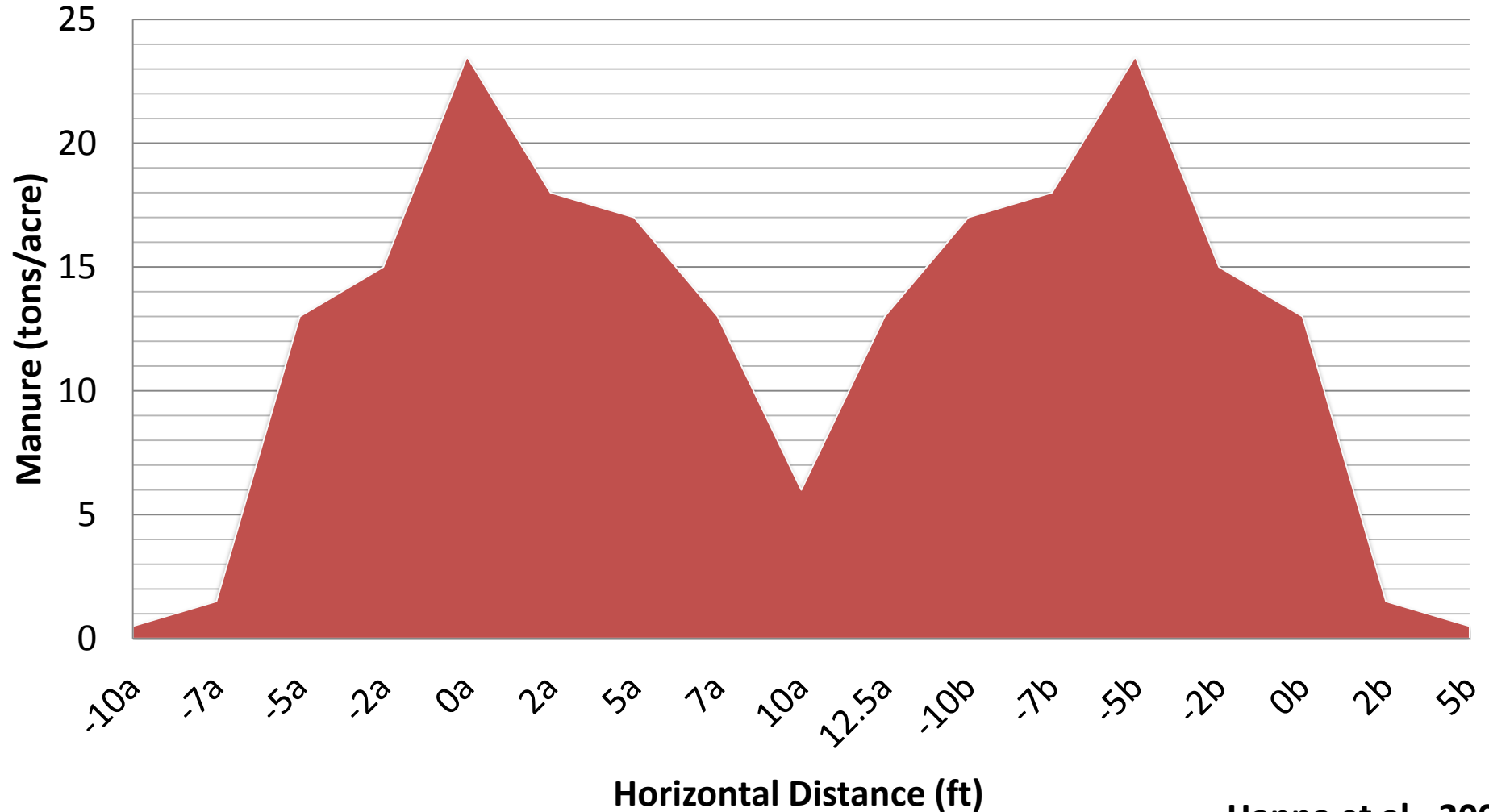
Finding Variation of Application



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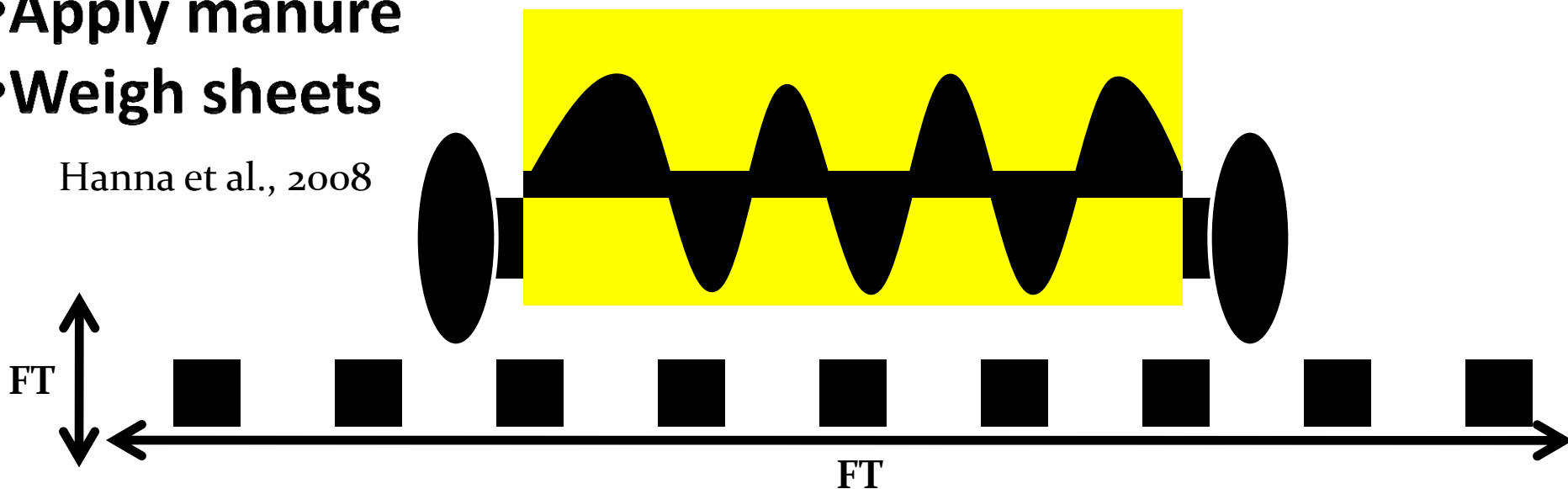
Materials

- 8-13 sheets of a uniform size
(2ft x 2ft landscaping cloth)

Procedure

- Tare sheet weight (average)
- Place sheets out and measure distance
- Apply manure
- Weigh sheets

Hanna et al., 2008



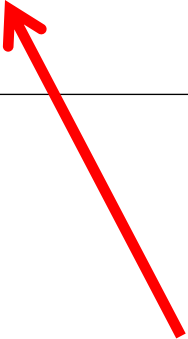
Finding Variation of Application

- Find percent difference from maximum.
- If zone is greater than 30% adjust path by overlapping.

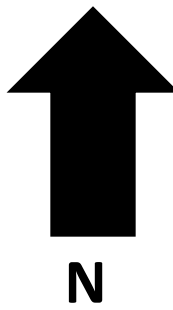
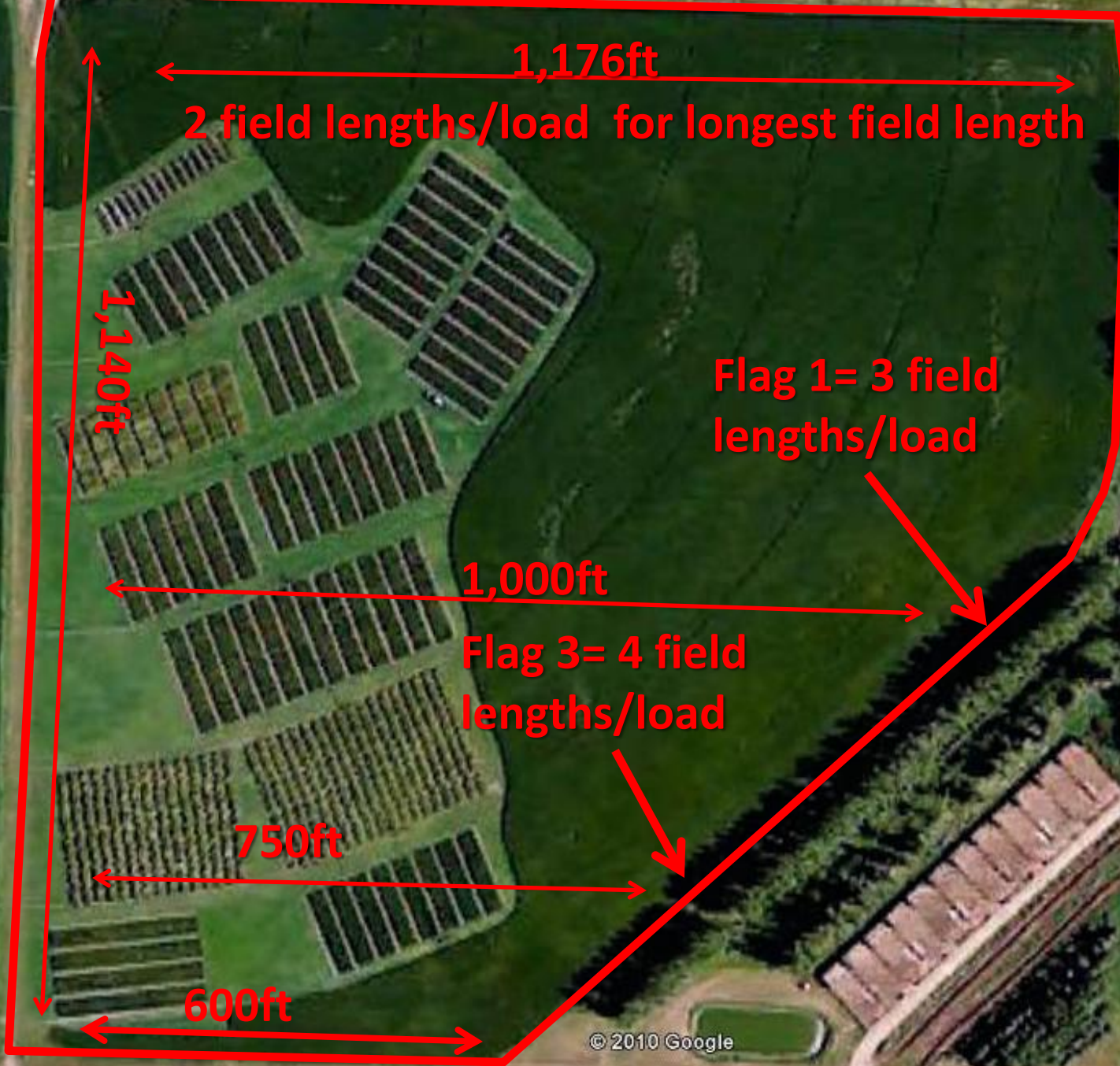
	Application Rate (tons/ac)	% From Maximum	Average Application Rate (tons/ac)
Left	3	87.2	
	13	44.7	
	15	36.2	
	23.5	0	
	18	23.4	13.1
	17	27.7	
Right	12.5	46.8	
	3	87.2	

Finding Variation of Application

Application Rate (tons/ac)	% From Maximum	Average Application Rate (tons/ac)	Adjusted Application Rate (tons/ac)	Adjusted % From Max	Adjusted Application Rate (tons/ac)
3	87.2	13.1	3.0	87.2	
13	44.7		13.0	44.7	
15	36.2		15.0	36.2	
23.5	0		23.5	0.0	
18	23.4		18.0	23.4	
17	27.7		26.5	14.9	
12.5	46.8		15.5	33.7	
3	87.2		15.5	33.7	
			17	27.7	
			18	23.4	
		23.5	0	15.1	
		15	36.2		
		13	44.7		
		3.0	87.2		



30% Cutoff



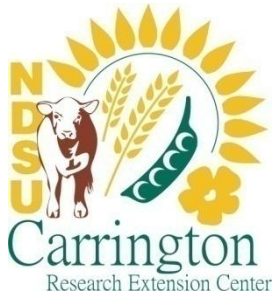
# of Passes	Field Length (Feet)	Spreader Width	Spreader Weight	Manure Application Rate (Tons/Ac)
2	1,176			46.5
3	1,000	8 Feet	20.1 Tons	36.5
4	750			36.5
Average=				39.8
4	600	8	20.1	45.7

We adjusted # of passes when application rate was greater than 15%



Conclusions

- **Spreader types vary application pattern and rate.**
- **Rear delivery system will apply higher rate of manure at the same speed as a side delivery system.**
- **Side delivery systems can cover a wider area in one pass, but this reduces application rates.**
- **Regardless of spreader, compensating for variation can reduce differing fertility zones.**
- **Adjust # of passes accordingly as field length changes.**



Spring Wheat Response of Fall vs. Spring Applied Manure

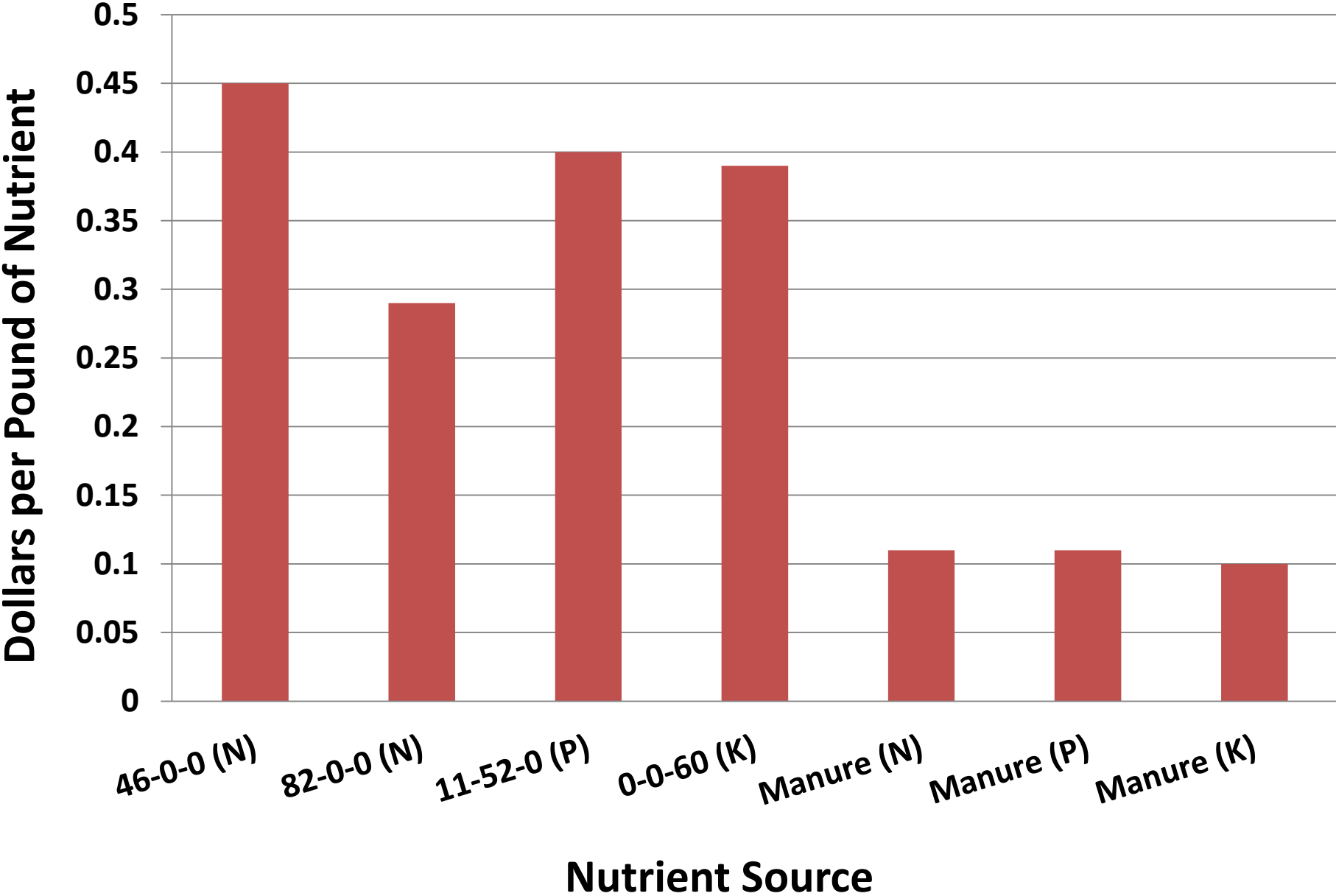
- 2008 and 2009
- Applied 150lbs of N from manure (50% mineralization) and urea
- Conventional Till
- Spring and Fall application

Cost Analysis of Manure Fertilizer

- 46-0-0 = \$415/ton
- 82-0-0 = \$470/ton
- 11-52-0 = \$500/ton
- 0-0-60 = \$465/ton
- \$64/25 tons Manure
- Manure Analysis
 - 7-7-10/ton



Cost of Various Fertilizers



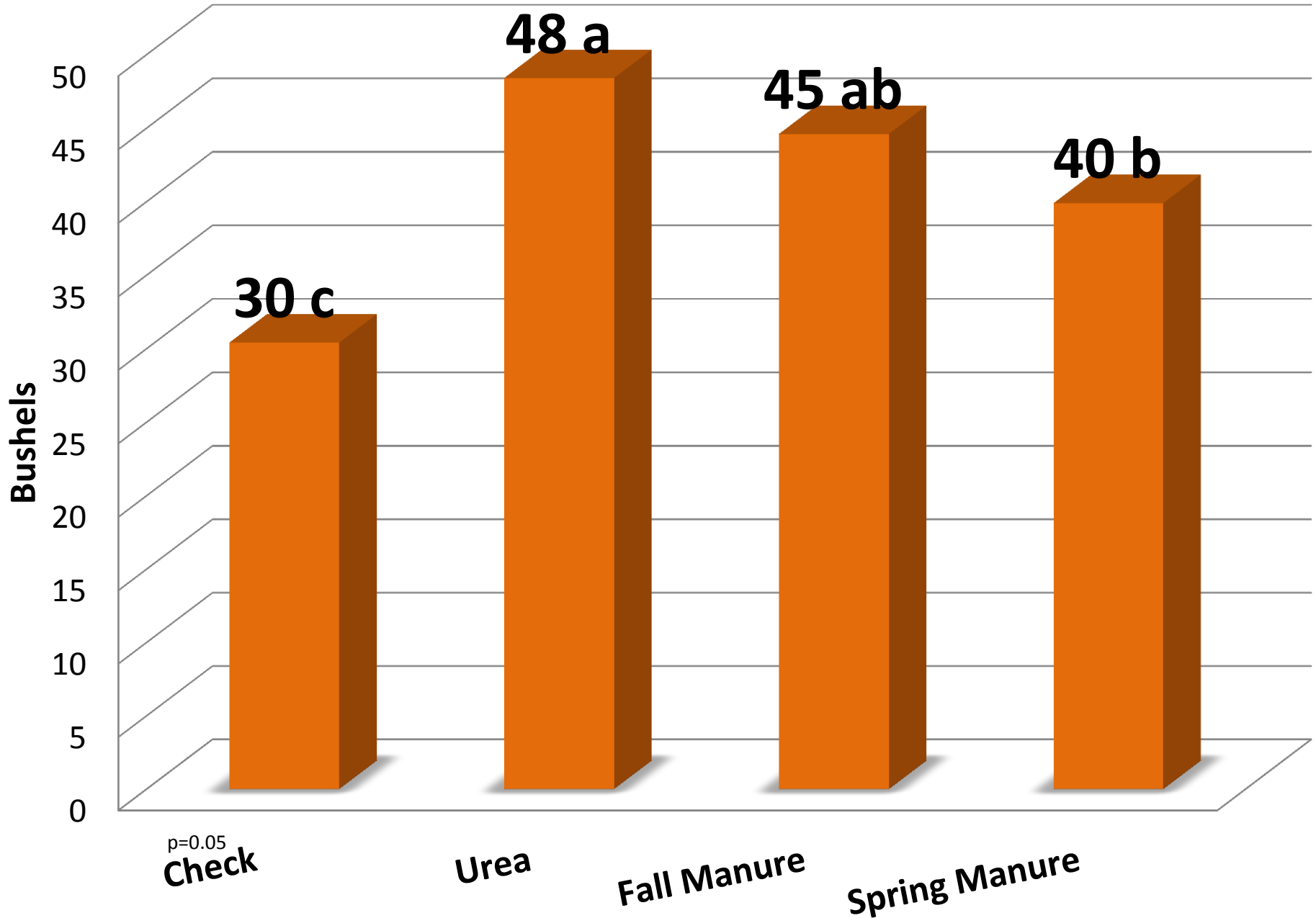
Things to Remember

- The cost for conventional fertilizer application was not assumed
- Soil benefits from manure
- Need to utilize manure anyways

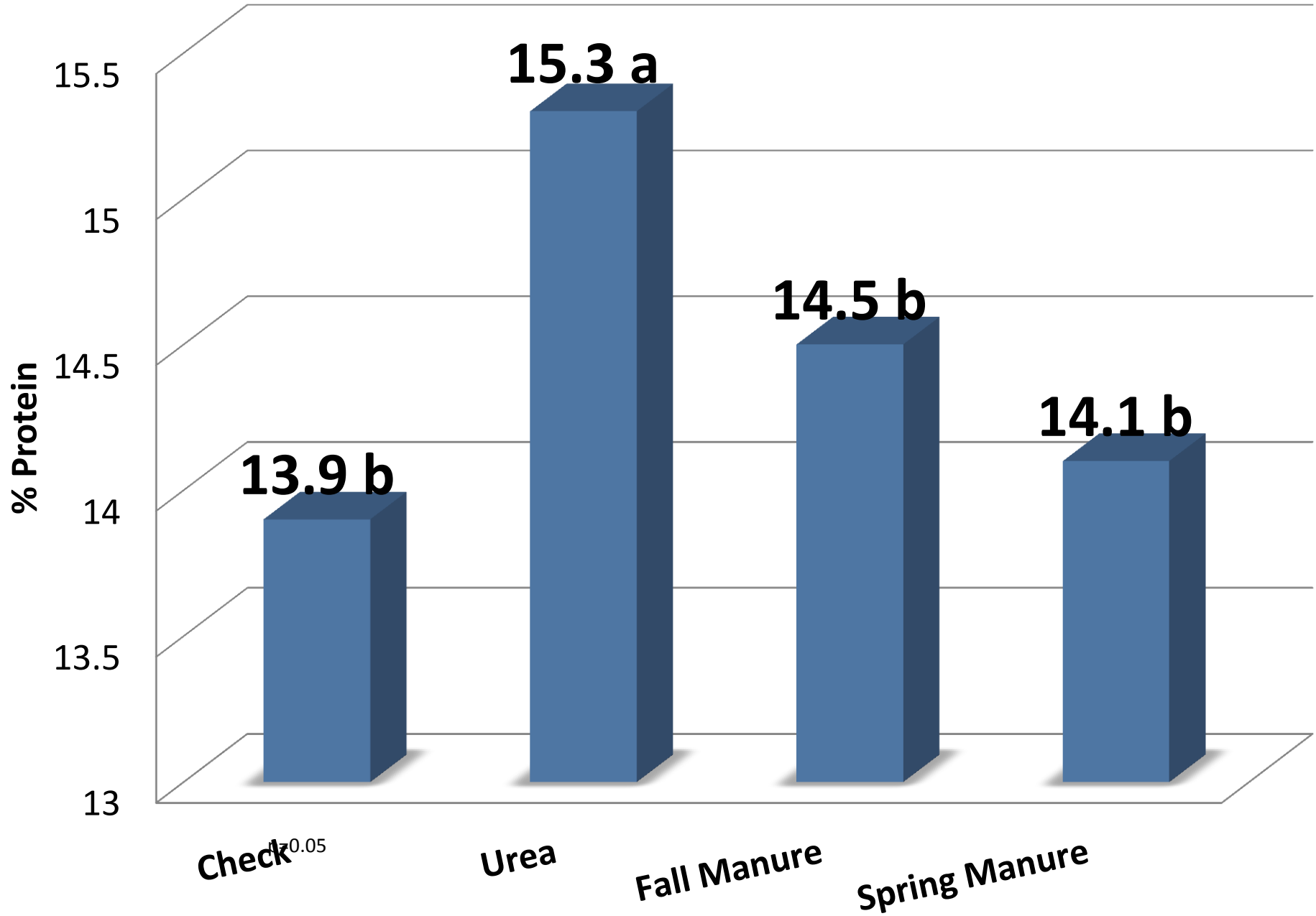




Wheat Yield Over 2 Years



Wheat Kernel Protein Over 2 Years



Spring Wheat Response of Fall vs. Spring Applied Manure

- Yield = Urea (a) > Fall Manure (ab) > Spring Manure (b) > Check (c)
- Protein = Urea (a) > Fall Manure (b) > Spring Manure (b) > Check (b)
- Both growing season were not ideal for microbial action
- 50% N mineralization should be adjusted for high N demands during early growth

Did the Manure Make Me Money?

- \$4.20 Base Price
- 15.3% Protein = \$5.70/bu
- 14.5% Protein = \$5.40/bu
- 14.1% Protein = \$4.95/bu
- 13.9% Protein = \$4.80/bu



	Check	Urea	Fall Manure	Spring Manure
Yield (Bu/ac)	30	48	45	40
Fertilizer Cost (\$N/ac)	0.00	67.50	16.50	16.50
\$/bu	4.80	5.70	5.40	4.85
Gross (\$)	141.00	273.60	243.00	198.00
Net (\$)	141.00	206.1	226.50	181.50
\$ Gained (\$ Treatment – \$ Check)	0.00	62.10	82.50	37.50

- Doesn't account for other fertilizers

More Info & References

- Nutrient Management News
- <http://www.ndsu.edu/nm>
- <http://www.ag.ndsu.edu/extension>
- <http://www.manure.umn.edu>
- <http://www.health.state.nd.us/WQ/AnimalFeedingOperations/AFOPProgram.htm>
- Hanna, M., T. Richard, and H. Norman. 2008. Calibration and uniformity of solid manure spreaders. Iowa State University Extension. Ames, IA

Composting Demonstration Day

August 3, 2010, 9:30 a.m.

Carrington Research Extension Center



Topics:

- Composting Animal Manure
- Animal Mortality Composting
- Manure Composting Regulations
 - Compost Tea
- Compost Turner Maintenance
- Stutsman County SCD Compost Turner Demonstration
- CREC Compost Turner Demonstration

To register contact:
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Questions?

N? P? K?
Micronutrients?

N? P? K?
Micronutrients?

N? P? K?
Micronutrients?

N? P? K?
Micronutrients?

Livestock	Total N	P₂O₅	K₂O
	-----lbs/ton-----		
-Beef-			
Cow	7	4	7
Feeder Calf	9	4	8
Finishing	11	7	11
Lagoon	4	3	4
	Total N	P₂O₅	K₂O
	-----lbs/1000 gal-----		
Dairy	31	15	22
-Swine-			
Nursery	25	19	22
Farrow-Finish	28	24	23
Farrow-Feeder	21	18	19