



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

***Invited presentation at the 2018 Southern Agricultural  
Economics Association Annual Meeting, February 2-6, 2018,  
Jacksonville, Florida***

*Copyright 2018 by Author(s). All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

D. Link, L. Almas, W. Colette, D. Lust, N. Meredith and M. Rhoades  
West Texas A&M University

# Cropping Matrix as a Constraint to Land Application of Feedyard Manure in the Texas Panhandle

# Contact Information

- Email [djlink1@buffs.wtamu.edu](mailto:djlink1@buffs.wtamu.edu)

- Dave Link



link5857



- @Link13Dave



Dave Link





**Table 2. Average Annual Agricultural Cash Receipts, High Plains Trade Area, 2009-2012.**

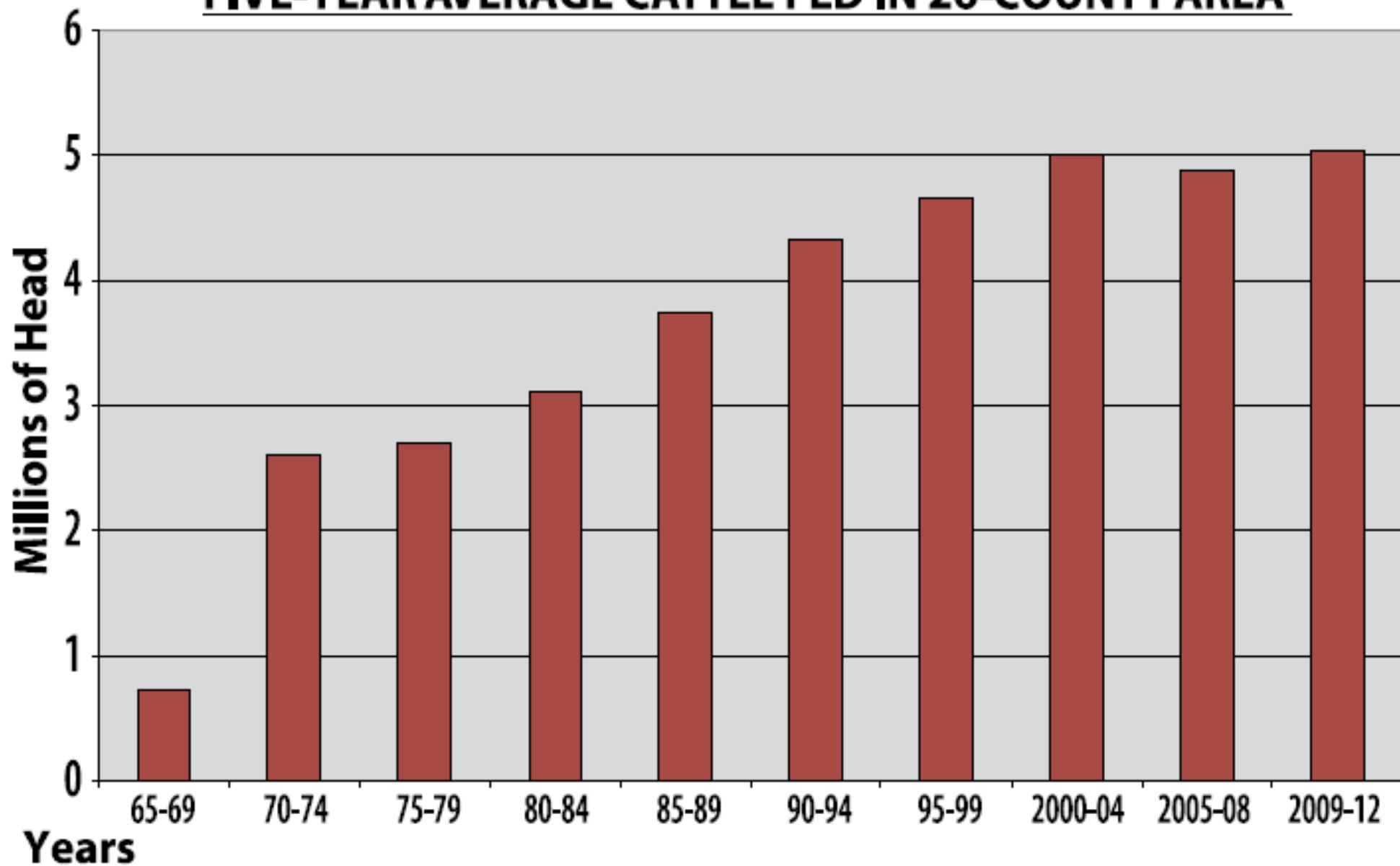
	<b>Value (\$1,000,000)</b>	<b>Percent of State Total</b>	<b>Regional Economic Impact* (\$1,000,000)</b>	<b>State Economic Impact* (\$1,000,000)</b>
<b>Crops:</b>				
Corn	\$688.1	58.0	\$1,043.8	\$1,383.9
Wheat	\$218.4	40.8	\$331.3	\$439.2
Cotton	\$320.9	13.2	\$536.7	\$721.9
Sorghum	\$133.6	20.3	\$202.6	\$268.6
Ensilage	\$138.3	63.3	\$219.8	\$285.4
Hay	\$126.2	9.9	\$200.5	\$260.3
Other Crops	\$73.1		\$116.2	\$150.9
<b>Total Crop Receipts</b>	<b>\$1,698.6</b>		<b>\$2,650.9</b>	<b>\$3,510.2</b>
<b>Livestock and Livestock Products:</b>				
Fed Beef - Value Added	\$1,865.8	78.5	\$3,555.6	\$4,367.5
Cow-calf and Stockers	\$357.4	8.5	\$681.1	\$836.6
Hogs	\$204.9	94.2	\$277.3	\$322.5
Dairy	\$595.3	36.9	\$866.6	\$1,043.1
Other	\$27.0		\$36.6	\$42.6
<b>Total L &amp; LP</b>	<b>\$3,050.4</b>		<b>\$5,417.2</b>	<b>\$6,612.3</b>
<b>Other Ag-Related</b>	<b>\$14.5</b>		<b>\$21.8</b>	<b>\$25.5</b>
<b>Total Agricultural Receipts*</b>	<b>\$4,763.5</b>		<b>\$8,089.9</b>	<b>\$10,148.0</b>

\*Does not include impacts of forward-linkages through the processing sectors.

# Crop Nutrient Needs

	Irrigated					Non-Irrigated			
	Wheat	Corn	Cotton	Sorghum		Wheat	Corn	Cotton	Sorghum
Quantity Produced/Acre	30	180	900	3800		20		400	2500
Production Units	bu/acre	bu/acre	lint lbs/ac	lbs/acre		bu/acre	bu/acre	lint lbs/ac	lbs/acre
Nutrient Requirements (lbs):									
Nitrogen (N)	53	240	121	94		35		54	62
P <sub>2</sub> O <sub>5</sub>	23	100	55	41		15		24	27
K <sub>2</sub> O	38	240	108	144		25		48	95
Source: McFarland, M. and Stichler, C.									

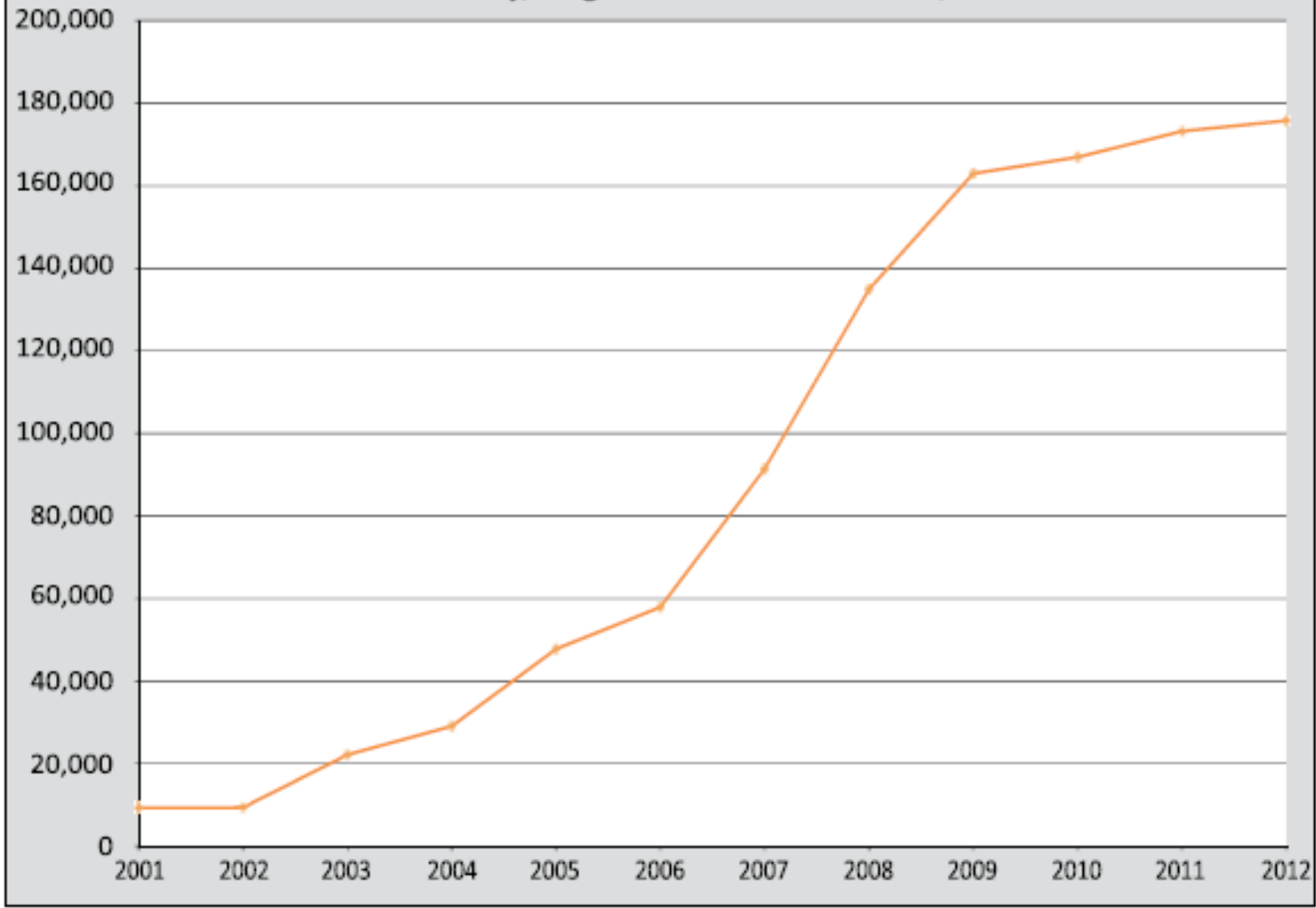
## FIVE-YEAR AVERAGE CATTLE FED IN 26-COUNTY AREA





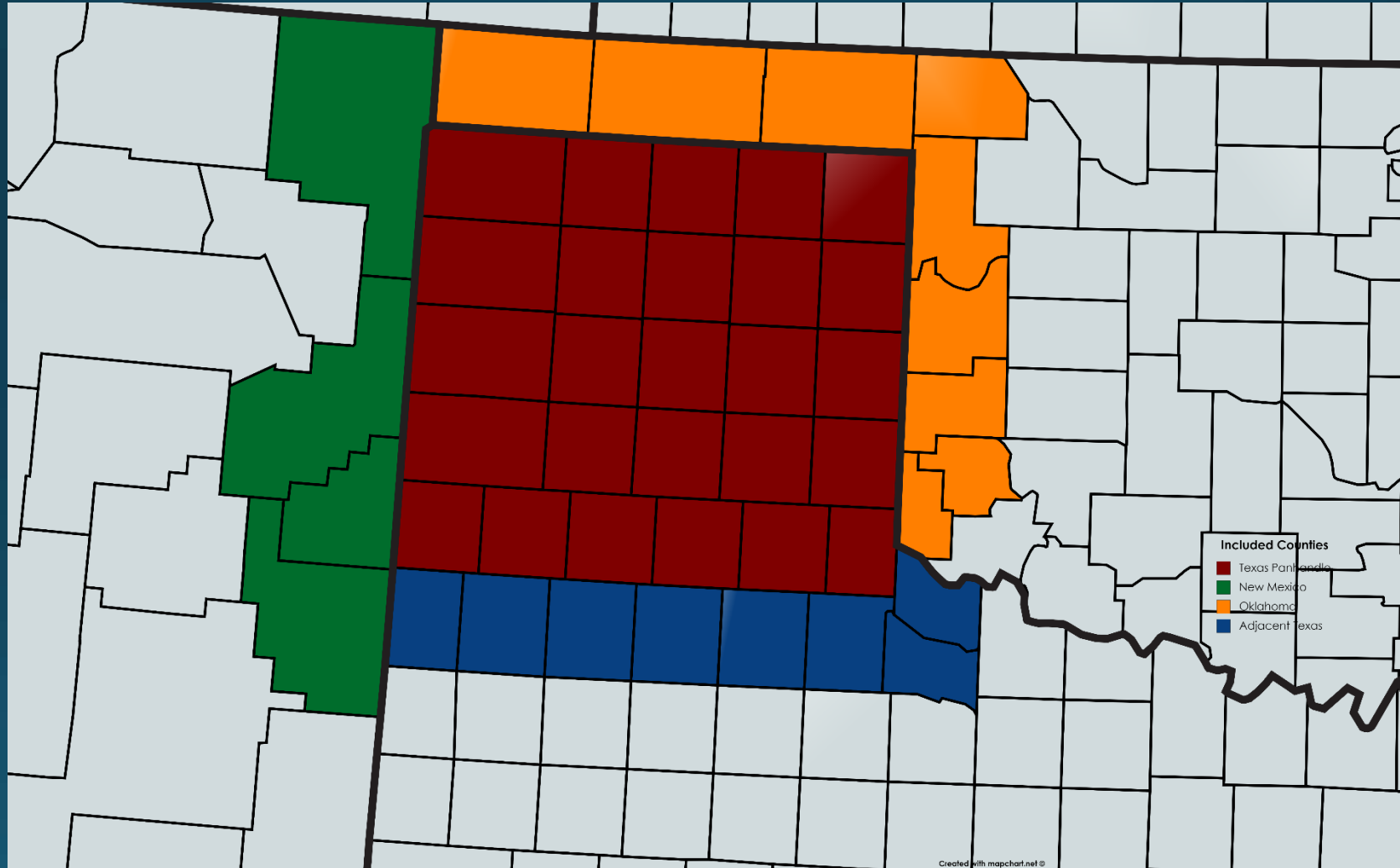
**FIGURE 3**

**Milk Cow Inventory, High Plains Trade Area, 2001-2012**



Amosson, Et al.

# Counties Included in the Analysis



# Manure Production

Feedyard Manure (lbs)/Ton:	Production:	8 pounds per head per day							
Nitrogen (N)	18.8								
P <sub>2</sub> O <sub>5</sub>	17.1								
K <sub>2</sub> O	25.2	Source:	Texas Cattle Feeders Association and Texas Agricultural Extension Service						
Dairy Manure lbs/hd/yr/available									
Nitrogen (N)	73.5								
P <sub>2</sub> O <sub>5</sub>	29.4								
K <sub>2</sub> O	58.1	Source:	<a href="http://livestocktrail.illinois.edu/dairynet/paperDisplay.cfm?ContentID=274">http://livestocktrail.illinois.edu/dairynet/paperDisplay.cfm?ContentID=274</a>						

# Methods

- 2012 Census of Agriculture county cropping data
- Calculate crop fertilizer demand
- Census dairy cattle by county
- NASS fed cattle by county
- Calculate manure output and nutrient content
- Establish balance using Phosphorus as the constraint
- Transportation from “producing” counties to adjacent counties



Solver Parameters



Set Objective:

SDS18



To:  Max

Min

Value Of:

0

By Changing Variable Cells:

SC\$12:\$K\$14



Subject to the Constraints:

SC\$12:\$K\$14 >= 0  
 SC\$15:\$K\$15 <= SC\$16:\$K\$16  
 SL\$12:\$L\$14 = SM\$12:\$M\$14

Add

Change

Delete

Reset All

Load/Save

Make Unconstrained Variables Non-Negative

Select a Solving Method:

Simplex LP

Options

Solving Method

Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Help

Solve

Close







## Conclusions

- Crops can utilize all the manure generated
- No problem getting rid of future manure

## Further Research

- Quantify value of manure as crop input
- Look at profit maximization for crop producers
- Examine alternatives; raw, compost, energy generation
- Develop the economics

# References

- Amosson, S., R. Dudensing, B. Guerrero, and K. Ledbetter. "The Impact of Agribusiness in the High Plains Trade Area." Sixth Edition, Texas AgriLife Extension Service, 2015.
- Fischer, D.B. "Energy Aspects of Manure Management." University of Illinois Extension, August, 1998. Internet site: <http://livestocktrail.illinois.edu/dairynet/paperDisplay.cfm?ContentID=274>
- McFarland, M. and Stichler, C. "Crop Nutrient Needs in South and Southwest Texas." Texas Agricultural Extension Service, 2001.
- National Agricultural Statistics Service, USDA. "2012 Census of Agriculture: Texas, State and County Data," Vol. 1, Part 43A.
- Texas Cattle Feeders Association and Texas Agricultural Extension Service. "Feedyard Manure: A Farmland Fertilizer." Seminar Proceedings, Hereford, TX, January 20, 1992.