

Economic and Environmental Impacts of Fertilizing Crops and Pasture with Poultry Litter

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Project Cooperators

- Texas State Soil and Water Conservation Board (TSSWCB)
 - “PLAN for Tomorrow: **P**oultry **L**itter **A**pplication on **N**ew Sites”
 - “Environmental Effects of In-House Windrow Composting of Poultry Litter” with Texas AgriLIFE Research, Texas Water Resources Institute
- Texas AgriLIFE Extension
 - Outreach and education
- **USDA-ARS** - chief in-house research agency of USDA
 - Solving agricultural problems (every \$ returns \$10+ to economy).
 - SWAT model, screw worm eradication, “mad cow” DNA test

Project Overview

- In 2000, began studying on-farm impacts of poultry litter fertilizer.
 - Offsite (3rd party) application
 - **NOT** litter management at poultry production facility
 - Application to both cropland and pasture
- By 2010, the most comprehensive study of its kind in US.
 - Long-term, real-world data on:
 - Soil and water quality
 - Land management
 - Agro-economics



My perspective in 2000

- Litter can be a good fertilizer and soil amendment, but...
 - Can it be economical in production agriculture??
 - Can it be environmentally friendly??
- Widespread distribution should prevent environmental problems
 - Even in areas with abundant supply.
- Why farmers and ranchers do not fertilize more with litter...
 - Cheap commercial N (\$125/ton)
 - Expensive transportation
 - Only consider application to pasture land.



Study Site

Study Site

- USDA established three experimental watersheds in late 1930's to evaluate land management effects on soil erosion and floods.
 - One of these was the Blacklands Experimental Watershed located near Riesel, TX, now called "**Riesel Watersheds**"
 - Valuable resource for research with 70+ years of legacy data from Vertisol - "shrink-swell" clay
 - Current management - native prairie, improved pasture, corn, sorghum, wheat, oats; cow-calf herd



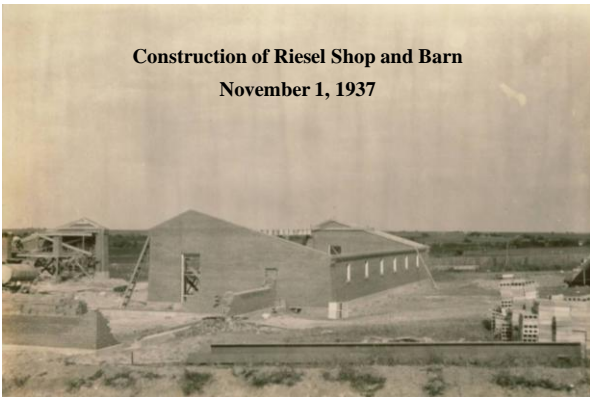
USDA-ARS Headquarters Building, Riesel, Texas
September 1938



USDA-ARS Headquarters Building, Riesel, Texas
2006



Construction of Riesel Shop and Barn
November 1, 1937



Installing original terraces
early in 1940's.



Project Description and Results

Litter Application

6 Tilled Fields
Litter rate: 0, 2, 3, 4, 5, 6 t/ac
10 - 21ac



4 Hay/Pasture Fields
Litter rate: 0, 0 grazed, 3, 6 t/ac
3 - 20ac



Litter Application



Litter Application

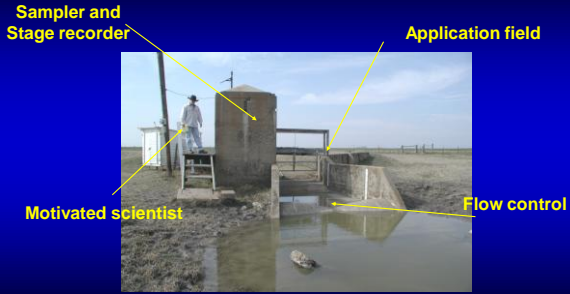


Turkey Litter Analysis

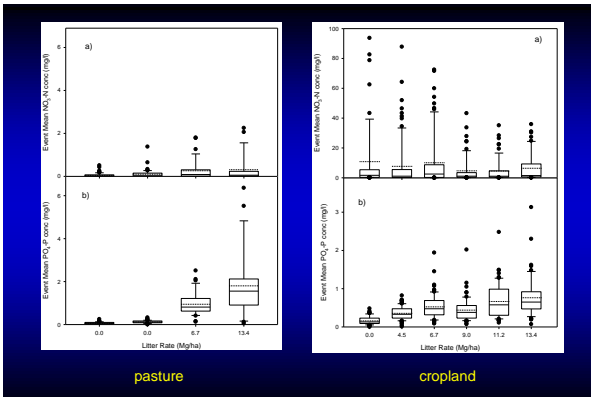
	<u>moisture</u>	<u>N</u>	<u>P₂O₅</u>
9 year avg.	27%	2.6%	4.1%

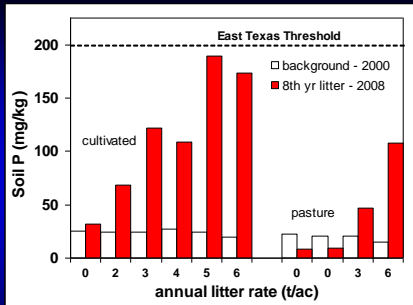
litter rate (t/ac)	average available N (lb/ac)	average available P2O5 (lb/ac)	average available K2O (lb/ac)
1	27	45	25
2	53	90	50
3	80	134	75

Runoff Water Quality









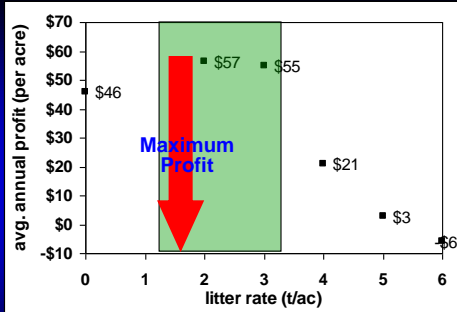
Corn Yield and Economic Results

site	crop	litter rate (T/ac)	average supp N (lb/ac)	average fert cost (\$/ac)	average yield (bu/ac)	average revenue-fert cost (\$/ac)
Y8	corn	6	8	\$123	96	\$135
W13	corn	5	37	\$116	97	\$143
W12	corn	4	68	\$106	94	\$146
Y10	corn	3	79	\$90	99	\$172
Y13	corn	2	104	\$78	99	\$191
Y6	corn	0	153	\$70	86	\$158

* 150 lb N per acre was based on previous recommendations for corn; however, historical yield averages and USDA-ARS research clearly indicate that 75-100 lb N per acre is more profitable in the Central Texas Blacklands.

Wheat Yield and Economic Results

site	crop	litter rate (T/ac)	average supp N (lb/ac)	average fert cost (\$/ac)	average yield (bu/ac)	average revenue-fert cost (\$/ac)
Y8	wheat	6	0	\$124	39	\$40
W13	wheat	5	0	\$103	37	\$55
W12	wheat	4	0	\$83	43	\$99
Y10	wheat	3	0	\$62	41	\$111
Y13	wheat	2	0	\$41	40	\$128
Y6	wheat	0	72	\$39	34	\$111



What we have learned...

- Poultry litter can be a great fertilizer for crop and hay production, but it must be managed correctly.
 - **on-site** - treat litter as resource to use/sell and not waste to dispose of.
 - **off-site** - use proper application rate to prevent buildup of P and metals in soil and excessive nutrient and bacteria runoff.
- Optimal rate, both economically and environmentally:
 - cultivated crops = 1-2 t/ac with supplemental N (if needed)
 - hay = 2-3 t/ac with supplemental N (if needed)
- USDA-ARS - Continue to provide scientific basis
 - In-house windrow composting (odor, bacteria)





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