FORAGE-LIVESTOCK FIELD DAY REPORT - 1998

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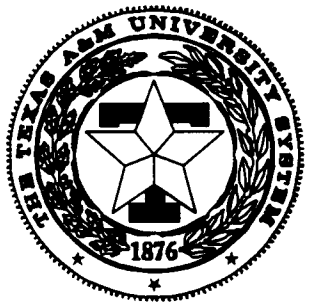

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EFFECTS OF LAND-APPLIED POULTRY LAGOON EFFLUENT ON THE ENVIRONMENT. 1. FORAGE PRODUCTION

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Background. One method for handling manure from caged-layer poultry operations is to flush it into a lagoon for anaerobic treatment. Large volumes of liquid effluent are produced. Effluent is recirculated for use as flush water. Recirculation and evaporation from the lagoon surface rapidly concentrate the nutrient and salt load in the effluent. A common disposal method is by irrigation of the effluent onto fields in close proximity to the lagoon. Poultry lagoon effluent has high concentrations of N, P, K, calcium (Ca), and magnesium (Mg) and includes iron (Fe), manganese (Mn), zinc (Zn), and copper (Cu) that can benefit vegetation. Nutrient concentrations in effluent vary widely among lagoons (Table 1). Concentrations are dependent upon meteorological conditions, the feedstuff, lagoon size, loading rates, disposal rates, and other factors. We evaluated the effect of poultry lagoon effluent on forage grass production. This study included hand application of poultry lagoon effluent at rates of zero, 480 (1X), and 960 (2X) lb N/acre/yr to 4 x 8 ft plots by use of sprinkler cans. The cropping rotation included 'TAM 90' annual ryegrass and 'Coastal' bermudagrass. Soils were a Bowie fine sandy loam near Overton and a Ships clay near College Station. Nutrient concentrations of the effluents are shown in Table 1. Applications were made before each regrowth of forage. Yield estimates from each harvest were taken by hand clipping two random one-foot square quadrants from each plot over three replications. Harvested forage was oven-dried, weighed, and weights were projected to yield per acre.

Research Findings. Data in Table 2 are the forage yield estimates in response to effluent applied based on N rates. Grass production was significantly increased by application of 480 lb of N/acre at both sites. Doubling this rate increased yield only with the bermudagrass - ryegrass forage system on the Ships clay. Including ryegrass as a double-crop system with bermudagrass increased dry matter production by 6,000 lb/acre on the Bowie soil at Overton.

Application. Effluent from poultry lagoons is a good source of nutrients for forage production. This liquid source of plant nutrients is produced in excess of amounts that can be used for forage production on limited acreage surrounding the laying-hen houses. A system is needed that will permit economical transport and application of effluent at greater distances from the production source. Using the high end of the ranges of nutrients in lagoons shown in Table 1 and applying N at 480 lb/acre per year, a nine surface acre lagoon that averages 12 ft deep could provide nutrients for 1000 acres of forage grass per year, assuming no evaporative loss.

Table 1. Range of plant nutrient concentrations in effluent from six poultry lagoons in Texas in the summer of 1994 and the average concentrations in effluents used in this study.

Nutrient	Concentration			Nutrient	Concentration		
	Range	College Station	Overton		Range	College Station	Overton
	----------ppm----------				----------ppm----------		
Nitrogen	400-1650	581	1480	Sodium	180-360	327	908
Phosphorus	20-170	76	155	Zinc	<1		
Potassium	540-1150	1121	3217	Iron	0-6		
Calcium	20-70	85	114	Copper	0-2		
Magnesium	0-70	36	13	Manganese	<1		
pH		7.85	8.07	EC mS/M		843	1458

Table 2. Forage† yield by harvest and the totals on the Ships clay at College Station and the Bowie fine sandy loam at Overton.

Effluent rate	1995						1996	Totals
	4/14	6/5	7/6	8/8	9/5	10/19	4/4	
	----------lb/acre‡----------							
Ships cl								
C-0X	867 a	1004 b	925 d	1081 b	787 b	650 c		5315 c
C-1X	829 a	2049 a	2501 ab	3508 a	2337 a	1742 b		12965 b
C-2X	603 a	2489 a	2769 a	3799 a	2548 a	2526 ab		14734 ab
CR-0X	878 a	820 b	955 d	1211 b	569 b	653 c	153 c	5240 c
CR-1X	946 a	1728 a	1550 cd	2920 a	1964 a	2487 ab	1421 b	13017 b
CR-2X	1036 a	1809 a	1921 bc	3741 a	2299 a	3201 a	2309 a	16316 a
	3/20	4/10	5/4	6/8	7/10	8/14	10/2	Totals
Bowie fsl								
C-0X				2099 b	1860 b	3062 b	2490 b	9512 c
C-1X				3437 a	3516 a	4801 a	3034 b	14787 b
C-2X				3954 a	3811 a	4623 a	3659 a	16047 b
CR-0X	1341 c	1631 b	2877 b	2164 b	1959 b	3070 b	2403 b	15446 b
CR-1X	2048 a	2326 a	3227 a	3109 a	3435 a	4565 a	3088 ab	22055 a
CR-2X	1693 b	2265 a	3121 ab	3938 a	3724 a	4354 a	3244 a	22339 a

†Forage: C = Coastal bermudagrass; CR = Coastal bermudagrass/ryegrass.
‡All yields are an average of three replications. Within a column, yields followed by the same letter are not statistically different by the Student-Newman-Keuls test at an alpha of 0.1. Application rate: 0X = 0 lb N/ac/yr; 1X = 480 lb N/ac/yr; 2X = 960 lb N/ac/yr.