Nebraska On-Farm Research Network

Biosolids (sludge) vs. Anhydrous Ammonia Fertilizer

Study ID: 090109199301M4

County: Lancaster

OBJECTIVE: To determine and document the effect on profitability and soil fertility of biosolids versus anhydrous ammonia fertilizer as a nutrient source. Biosolid effects will be evaluated on a corn, grain sorghum, soybean and wheat rotation.

BIOSOLIDS	ANHYDROUS
Load sludge (1993 only)	None
Fertilize: 1993 - Sludge (45 tons/acre) 1994 - Anhydrous Ammonia 134 pounds 1995 - None 1996 - 70 pounds 11-52-0 50 pounds 34-0-0	Fertilize: 1993 - Anhydrous Ammonia 120 pounds 1994 - Anhydrous Ammonia 134 pounds 1995 - None 1996 - 70 pounds 11-52-0 50 pounds 34-0-0
No-till plant	No-till plant

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BIOSOLIDS		ANHYDROUS	
Comparative cost (per acre)		Comparative cost (per acre)	
	1993		1993
Load and spread sludge	$ .96/ton		
Less city reimbursement	- .65/ton		
Total	$ .31/ton		
	x 45 tons		
	$13.95/acre		
Sludge			
40% x $13.95/acre	$ 5.58	None	$0.00
(see Summary)			
None	$ 0.00	Fertilizer (Anhydrous)	
		120 lbs @ $185/ton	$13.54
None	$ 0.00	Fertilizer Application	$ 5.88
Total	$ 5.58	Total	$19.42
Total	$ 20.90		

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	1994		1994
30% x $13.95/acre	$ 4.19	None	$ 0.00
Fertilizer (Anhydrous)		Fertilizer (Anhydrous)	
134 lbs @ $195/ton	$15.93	134 lbs @ $195/ton	$15.93
Fertilizer application	$ 5.88	Fertilizer application	$ 5.88
Total	$26.00	Total	$21.81

	1995		1995
20% x $13.95/acre	$ 2.79	None	$ 0.00
Fertilizer	$ 0.00	Fertilizer	$ 0.00
Total	$ 2.79	Total	$ 0.00

	1996		1996
10% x $13.95/acre	$ 1.40	Fertilizer Application	$ 3.50
Fertilizer application		11-52-0	$ 9.00
(34-0-0) $3.50/acre	$ 3.50	34-0-0	$ 7.00
11-52-0	$ 9.00		
34-0-0	$ 7.00	Total	$ 19.50

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VARIABLE	1993 CORN	1994 SORGHUM	1995 SOYBEANS	1996 WHEAT
Final Population (plants/acre)				
Biosolids	20,600	N/A	N/A	N/A
Anhydrous	20,800	N/A	N/A	N/A
Moisture (%)				
Biosolids	15.7 ***	13.7 **	10.3	11.5 *
Anhydrous	17.1	13.8	10.3	12.2
Test Weight (pounds/bushel)				
Biosolids	57.3 ***	60.3	56.4	60.4
Anhydrous	56.2	59.8	56.4	60.2
Yield (bushel/acre)	(15.5%)	(14%)	(13%)	(13%)
Biosolids	101 **	155 ***	16 **	47 ***
Anhydrous	96	120	15	35

1993 Spring Soil Test
37 pounds residual Nitrogen
pH 5.3
O.M. 2.3%
Texture - Silt loam
Phosphorus 9.2 ppm (low)
Potassium 264 ppm (very high)
Zinc .59 ppm (medium)

Approximate Biosolids Nutrient Content

Nitrogen	7.6 pounds/ton
Phosphorus	5.8 pounds/ton
Potassium	.6 pounds/ton
Zinc	.3 pounds/ton
Sulfur	1.2 pounds/ton

Note: Nutrients may not be readily available.

* significantly different at 90% confidence level
** significantly different at 95% confidence level
*** significantly different at 99% confidence level

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Summary: The corn fertilized with biosolids yielded significantly higher than the anhydrous fertilized crop in 1993. The biosolids were not incorporated in this comparison. This rolling, upland field had a low phosphorus level which made it a good candidate for biosolid nutrient response. It was an unusually wet growing season in 1993.

In 1994, this field was rotated to grain sorghum and an anhydrous ammonia fertilizer was applied to the entire field. The yield difference between treatments was significantly different at the 99% confidence level.

Soybeans planted in 1996 in the residual biosolids treatments yielded significantly higher than the non-fertilized areas. The yield difference was significant at the 95% confidence level.

In 1996, wheat was grown in this trial. The entire area received a uniform application of nitrogen and phosphorus fertilizer. The residual biosolids strips yielded significantly higher than those strips that did not receive biosolids in 1993. The yield difference was significant at the 99% confidence level.

Biosolid nitrogen resources are estimated to be 40% available the year of application, 30% the following year, 20% the third year and 10% the fourth year. Biosolids also contain other valuable nutrients including phosphorus, potassium, sulfur and zinc. The anhydrous fertilizer treatment cost approximately $11.00/acre more than the biosolids treatment in the application year when the biosolids application expenses are amortized over their useful life. The profitability of using biosolids depends largely on available labor, machine investment and soil characteristics.