Biosolids (sludge) vs. Anhydrous Ammonia Fertilizer—Irrigated Corn/Soybean Rotation

Burdette Piening

Private Industry Cooperator: Charlie Hartwell

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 and soybean rotation.

BIOSOLLDS

Treatment:

Load sludge: Spring 1993

Spread sludge: Spring 1993-35 tons/acre

Disc: 1993—incorporate biosolids .

Field cultivate: 1993

Plant

Herbicide: 1993-3.5 quarts Bullet

1994-6 ounces Canopy,
2 quarts Lasso MT and
2 pints Command

1995-l gallon Bullet,
.67 ounces Permit and
.67 ounces Accent

Cultivate/Ridge: 1993

Harvest

AN-HYDROUS

Treatment:

None

Fertilize: 1993—Anhydrous Ammonia, 90 pounds

None

Field cultivate: 1993

Plant

Herbicide: 1993-3.5 quarts Bullet

1994-6 ounces Canopy,
2 quarts Lasso MT and
2 pints Command

1995-l gallon Bullet,
.67 ounces Permit and
.67 ounces Accent

Cultivate/Ridge: 1993

Harvest

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BIOSOLIDS Comparative cost (per acre)		ANHYDROUS Comparative cost (per acre)	
	1993		**1993**
Load and spread sludge	$ .96/ton		
Less city reimbursement	- .65/ton		
Total	$ .31/ton		
	35tons/acre		
	$10.85/acre		
40% x $10.85/acre (see Summary)	$ 4.34	None	$ 0.00
Disc (40% x $5.81)	$ 2.32	None	$ 0.00
None	$ 0.00	Fertilize (Anhydrous) 90 lbs. @ $170/ton	$ 9.33
None	$ 0.00	Apply fertilizer	$5.88
Total	$ 6.66	**Total**	**$15.21**
	1994		**1994**
30% x $10.85/acre	$ 3.26	None	$ 0.00
Disc (30% x $5.81)	$ 1.74	**None**	**$ 0.00**
Total	$ 5.00	**Total**	**$ 0.00**
	1995		**1995**
20% x $10.85/acre	$ 2.17	**None**	**$ 0.00**
Disc (20% x $5.81)	$ 1.16	None	$ 0.00
Fertilize (Ammonia Nitrate) (120 lbs. @ $169/ton)	$29.82	Fertilize (Ammonia Nitrate) (120 lbs @ $169/ton)	$29.82
Apply fertilizer	$ 3.50	Apply fertilizer	$ 3.50
Total	$36.65	**Total**	$33.32

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VARIABLE	1993 CORN (IRR)	1994 SOYBEANS	1995 CORN (IRR)
Final population (seeds/acre)			
Biosolids	26,400	—	24,900
Anhydrous	26,200	—	24,200
Moisture (%)			
Biosolids	22.3 *	12.0 **	13.6
Anhydrous	21.2	11.9	13.5
Test weight (pounds/bushel)			
Biosolids	53.0	53.9 *	56.9
Anhydrous	53.0	51.1	56.9
Yield (bushels/acre)	(15.5%)	(13.0%)	(15.5%)
Biosolids	100	67	150
Anhydrous	84	66	151

1993 Soil Test

92 pounds residual Nitrogen
pH 6.4
O.M. 2.7%
Texture-Silt loam
Phosphorus 59 ppm (very high)
Potassium 286 ppm (very high)
Zinc 1.74 ppm (high)

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 immediately available

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

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Summary: The corn fertilized with biosolids did not yield significantly higher than the anhydrous fertilized crop (significant @ .11). The biosolid was incorporated in this comparison. It was an unusually wet growing season in 1993 and mineralization of organic nitrogen may have influenced grain moisture at harvest in this field.

Soybeans were grown on this field in 1994 with no additional fertilizer applied to either treatment. There was no significant difference between treatments.

Corn was grown on this field in 1995 with a blanket fertilizer treatment of Ammonium Nitrate applied to the entire field. No significant differences were measured.

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 $7.00/acre more than the biosolids treatment in the application year while 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.