

Biosolids Increase Forage Yield & Quality in Dryland Pasture Part I

Researchers and Collaborators

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Cattle graze on pasture land at Madison Farms, Oregon

Background

Previous research has demonstrated that biosolids provide benefits to soil and plants beyond that provided by inorganic fertilizers. This Research Note summarizes biosolids effects on forage yield and quality at a semi-arid site near Hermiston, Oregon. Soil monitoring data from the same site is presented in a companion Research Note. A more extensive report of crop and soil monitoring data from this site is available at:

<http://www.nwbiosolids.org/Pubs/BiosolidsGrassSoilFertility.pdf>

Objective

Measure long-term effects of biosolids application on forage yield and quality.

Methods

Site

- Madison Farms (near Hermiston, OR)
- Annual precipitation: 6 to 8 inches year; 70% from October to March.
- Annual grass, primarily *Bromus tectorum* (cheatgrass)
- Grazed in spring by beef cattle
- Monitored biosolids site vs. adjacent no-biosolids control site

Biosolids

- Class B biosolids, City of Portland, Oregon
- Surface-applied each year (3 to 5 dry ton/ac) starting in 1990.
- Approximate cumulative application rates:
1999: 40 dry ton/ac
2007: 75 dry ton/ac

Results

Forage (grass) yield

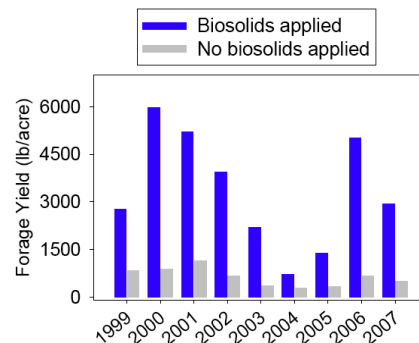
Biosolids increased forage yield 530% and forage protein production 1150%.

With biosolids:

- median annual forage yield was approximately 3000 lb/ac
- median forage N uptake was 100 lb/ac (625 lb protein/ac)

Without biosolids:

- median annual forage yield was approximately 670 lb/ac
- median annual forage N uptake was 7 lb N/ac (45 lb protein/ac)



Forage quality

With biosolids:

- Plants had more shoots with more leaves
- Forage quality was improved
- Forage was more digestible (lower fiber, higher protein)
- Plant nutrient concentrations increased

Forage analysis	Biosolids (BS)	No BS
Crude Protein (%)	17	8
Neutral Detergent Fiber (%)	49	54
Sulfur (%)	0.27	0.12
Phosphorus (%)	0.36	0.21
Potassium (%)	2.6	1.2

Significance

The monitoring data highlighted here show a dramatic grass yield and quality benefit to biosolids application, even for dryland pasture with annual precipitation of 6 to 8 inches. The major factors probably responsible for increased productivity are probably increased nitrogen availability and increased soil water storage. Increased production of digestible forage has increased beef production. Since biosolids application began at Madison Farms in 1990, cattle stocking rates have increased substantially. Animal unit months (a measure of grazing “capacity” of pasture) have increased approximately 10-fold since 1990. Cows grazing the higher-protein, more digestible forage grown with biosolids also gain weight faster than on unamended pasture.

Because biosolids application promotes annual grass growth, heavy grazing in early spring is needed to make use of the increased forage production. Increased annual grass growth is not desirable on most “native” rangeland sites, so biosolids managers need to choose dryland application sites carefully.