

Forage yield and nutritive value of perennial grain Kernza grown in monoculture and intercropped with red clover

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Outline

- Kernza and Intermediate wheatgrass
- Research question and hypotheses
- Material and methods
- Results
- Conclusion





What is Kernza®?

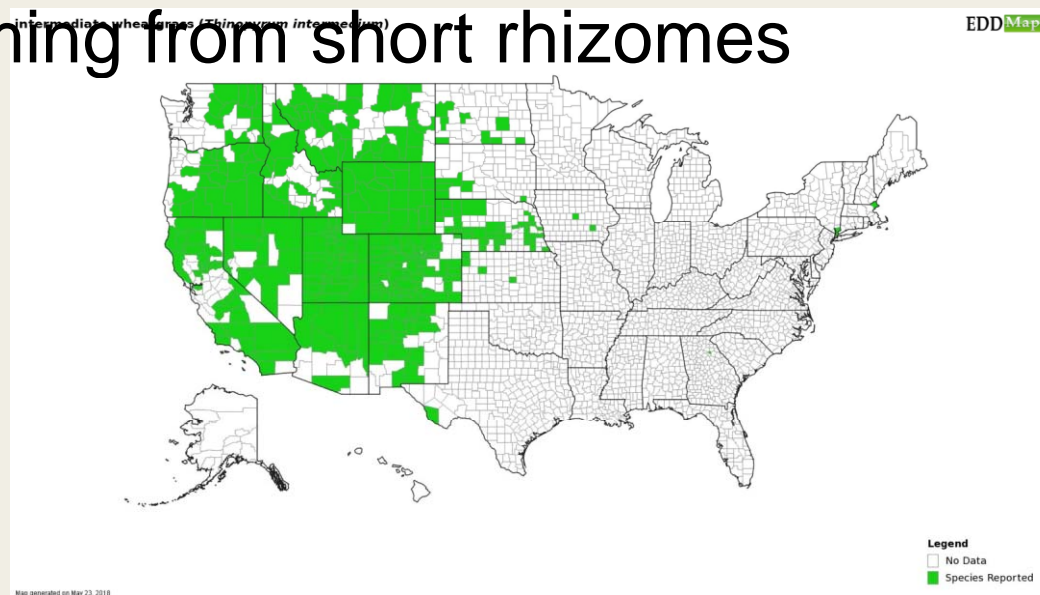
- Kernza is the grain of Intermediate wheatgrass (*Thinopyrum intermedium*)
- Bred at The Land Institute (Salina, KS) for increased grain production and trademarked as a grain crop



Intermediate Wheatgrass

(*Thinopyrum Intermedium*)

- Imported from eastern Europe in 1932 and now widely used for forage in the Western USA
- Cool season, perennial grass
- Adapted to low-rainfall areas $> 350 \text{ mm y}^{-1}$
- Deep and dense root system
- Sod-forming from short rhizomes





Kernza for dual-use: grain and forage

- Grain yields are variable and still lower than annual cereals.
- Intermediate wheatgrass forage is widely used in the western USA and represents an additional source of income.
- Proposed management system:





Kernza intercropped with legumes

- Perennial grass monoculture may have disease problems in the long term and must rely on external N fertilizer.
- Forage legumes such as **red clover** are known to provide nitrogen through biological N fixation and increase forage nutritive value.



Research question

What grain yield, forage yield, and nutritive value can be expected from Kernza monoculture vs Kernza-red clover in dual-use systems?





Hypotheses

1. Forage yield is lowest in the spring, highest at grain harvest (summer), and intermediate in the fall.
2. Forage nutritive value is highest in the early spring, lowest in the summer and intermediate in the fall.
3. Intercropping Kernza with red clover increases annual forage production and nutritive value.
4. Kernza grain yields are similar between the monoculture and biculture.

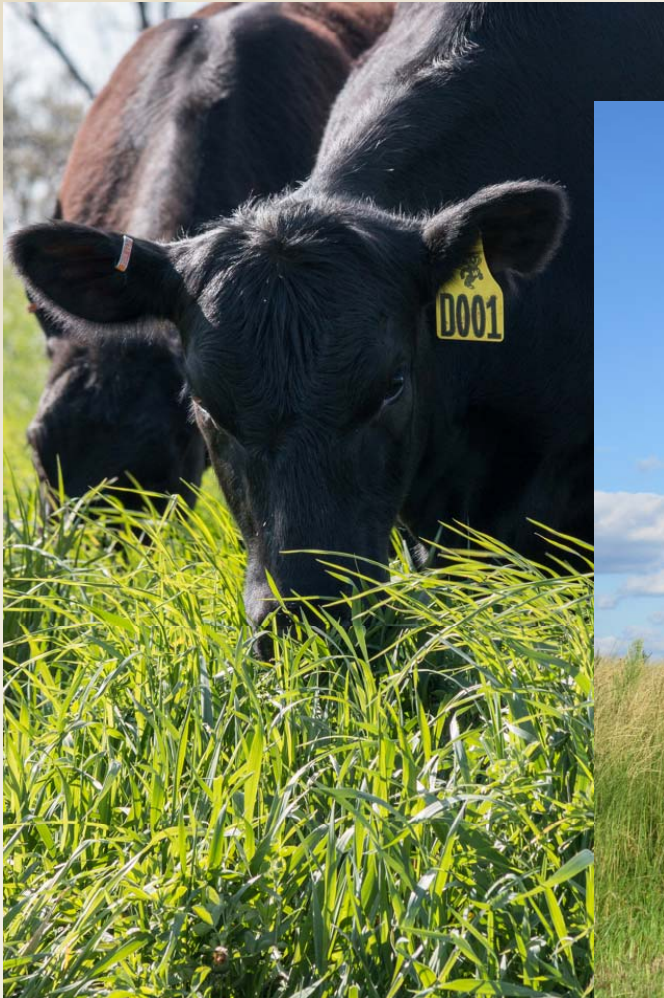


Material and methods

- Three Wisconsin locations: Arlington (S), Lancaster (SW) and Sturgeon Bay (NE). Average precipitation: 800 mm.yr⁻¹
- Fall planted Kernza stand in first production year
- Stand composition treatments:
 - Kernza monoculture, 60 kg.ha⁻¹ N at elongation
 - Kernza-red clover biculture, unfertilized
- Randomized complete block design with 3-5 replications
- Small plots of 3.5 x 4m in Arlington and Sturgeon Bay; 0.15-0.5 acres in Lancaster
- Quadrat sampling (50x50cm) at the soil surface 3 times during the growing season

Material and methods

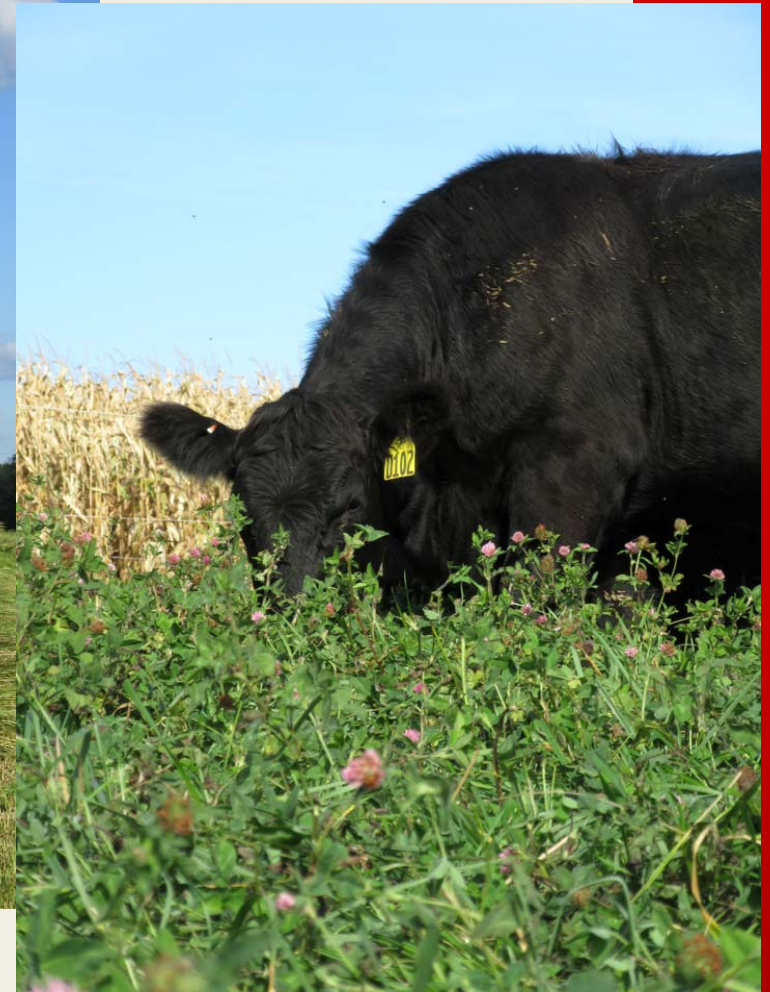
Spring forage harvest



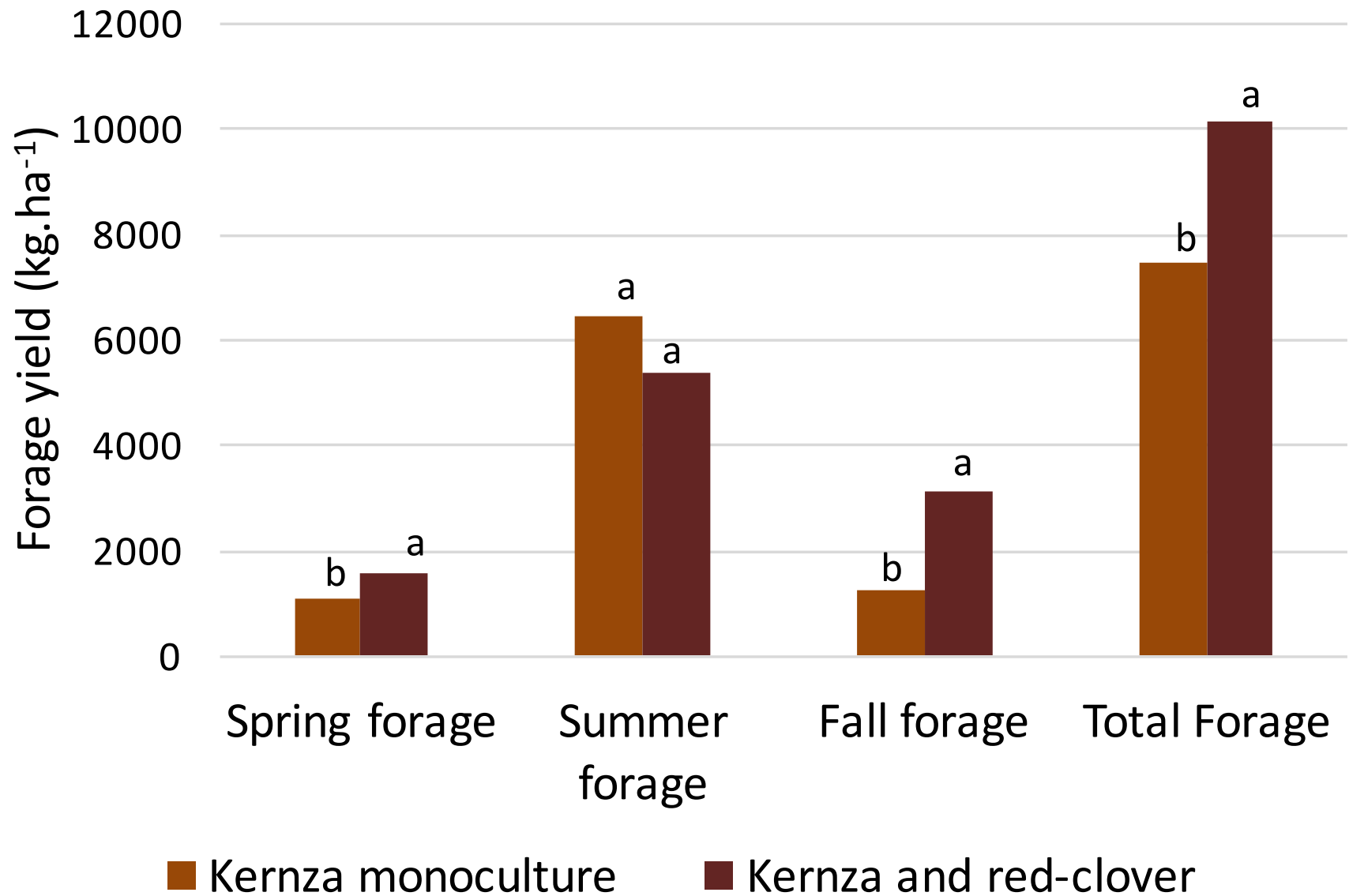
Grain harvest



Fall forage harvest



Forage yield



Forage nutritive value



		Vegetation	Spring forage	Summer forage	Fall forage
NDF	%DM	Kernza mono.	44.7 a	68.8 a	60.7 a
		Biculture	38.2 b ¹	62.1 b	44.9 b
ADF	%DM	Kernza mono.	26.4 a	42.0 b	35.0 a
		Biculture	21.9 b ¹	39.2 a	28.4 b
CP	%DM	Kernza mono.	19.7 b	5.5 b	11.3 b
		Biculture	23.2 a ¹	8.9 a	17.4 a

¹ Data for the Lancaster location only



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1 Data for the Lancaster location only

Grain yield

- Grain yields were similar between the monoculture and the biculture and averaged $905 \text{ kg}\cdot\text{ha}^{-1}$





Conclusion

- Forage yield of first-year Kernza is lowest in the spring, highest at grain harvest, and intermediate in the fall.
- Forage nutritive value is highest in the spring, lowest in the summer and intermediate in the fall.
- Forage production and nutritive value are significantly increased by intercropping Kernza with red clover.

Aknowledgement

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