



Interseeding Forage Kochia into Established CRP Grass Stands

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Introduction

The Conservation Reserve Program (CRP) removed 36 million acres of environmentally sensitive and highly erodible cropland from production and placed it in perennial vegetative cover. In the western U.S., where winter feeding of harvested and stored forages account for 50% to 70% of the yearly input livestock costs, there is an opportunity to use expired CRP acres for fall and winter livestock grazing. However, during the fall and winter season, stockpiled range grasses (e.g., crested and intermediate wheatgrass) do not meet the minimum crude protein (CP) (>7%) needed for mid-gestation grazing livestock. Therefore, as more producers in semiarid regions look to convert expired CRP acres to fall and winter grazing, methods are needed that can successfully renovate wheatgrass monocultures through the interseeding of nutritious species, such as forage kochia.

Forage Kochia

Forage kochia should not be confused with annual kochia (*Kochia scoparia*) which is a common agronomic weed. Forage kochia (*Bassia prostrata*) is a drought and saline-tolerant perennial semi-shrub that grows 1 to 3 feet in height, and is broadly adapted to semiarid rangeland areas receiving 5 to 20 inches of yearly precipitation. Forage kochia is competitive against the annual weeds, downy brome (e.g., cheatgrass) (*Bromus tectorum*) and halogeton (*Halogeton glomeratus*), and is one of few species that can successfully establish on severely degraded rangelands. Forage kochia's grazing potential includes high CP (>7%) during the critical fall/winter grazing period, high palatability to cattle, increased carrying capacity of fall/winter grazing lands, improved cattle body condition during fall and winter grazing, and compatibility in mixtures with adapted grasses.



Western U.S. rangeland



Immigrant forage kochia

Establishment Guidelines

To establish a successful forage kochia stand the following recommendations should be followed. Some type of light to moderate soil disturbance should be done prior to the seeding. In existing perennial grass and shrub stands, a more severe soil disturbance plan needs to be used. In this study, it was found that the two pass plots had the highest rate of return. Always use new, fresh seed. Germination and viability is lost from normal seed storage. It is recommended that a seed analysis be conducted. Broadcast the seed on top of the soil (or snow) in December through February. Depending on the purpose, seeding rates will vary from 1-6 pounds of forage kochia seed per acre.

Interseeding Project

In 2006, Ron Harper, a cattle producer in Levan, Utah, received a Western Region Sustainable Agriculture Research and Education (WSARE) farmer/rancher grant for the purpose of evaluating the use of forage kochia to improve nutritional value of established CRP rangeland. The objectives of the study were to: (1) determine potential to interseed forage kochia into established CRP, and (2) evaluate how the interseeding affected forage mass and forage nutritive value.

Interseeding Treatments

Tillage treatments, to thin existing grass stand, were made in strips 47 feet wide by 1 mile long on 14 September 2006, using one or two passes with a 47 foot wide chisel plow with 16 inch sweeps spaced 12 inches apart. There were 10 strips for each treatment.



Reduction of existing grass stand

In mid-January 2007, 'Immigrant' forage kochia seed was broadcast by a plane at a rate of 1.9 lbs pure live seed (PLS) per acre over the tillage treatments. At the time there were 5 inches of existing snow on the soil surface.



Forage Kochia aerial seeding

Once plants were mature, establishment counts, forage mass, and nutritive values were determined using the line-intercept method and clipped samples during 4 consecutive years at the initiation of fall grazing (Oct. 2010-2013). Each year following data collection, the entire research plot was grazed, or clipped to a stubble height of 2 inches to simulate grazing. Partial budgeting was used to compare the economic cost and added grazing-value of interseeding forage kochia into existing CRP.

Significant Findings and Comparisons

- The objective was to reduce, but not eliminate wheatgrasses, inasmuch as a grass component is important to fall/winter grazing of forage kochia. The chisel plow was effective as wheatgrass was reduced by 30% and 44%, for the 1-pass and 2-pass chisel plow treatments, respectively. Annual weed frequencies were very low for all three treatments (Table 1).
- The greatest amount of forage kochia plants was found in the 2-pass chisel plow treatment, which was nearly double (1.8 times greater) that observed in the 1-pass treatment (Table 1).
- Averaged over years, the 2-pass chisel plow treatment had 161% and 303% greater forage mass than the 1-pass and control treatments, respectively (Table 2).
- Forage mass varied by year with annual precipitation; however, the 2-pass treatment resulted in significantly greater forage mass than the other treatments in every year, including the drought of 2012.
- The additional forage mass directly increased available stocking rate with 1.6 and 0.9 AUM (animal unit month) for the 2-pass and 1-pass treatments, respectively, as compared to 0.5 AUM for the control (Table 2).

- Average CP concentrations of 8.8% and 7.8% for the 2-pass and 1-pass treatments, respectively, exceeded the critical level of 7% needed for ruminants (Table 2). Conversely, the CP of 4.5% found in the control treatment, consisting of a wheatgrass monoculture, was below the 7% level (Table 2).
- Energy, measured as NEm and NEg (Net Energy for maintenance and gain), on average was the same between the 2-pass and 1-pass treatments, and both were greater than the control (Table 2).
- The 2-pass treatment had the highest yearly net return of \$46.98 acre, which was 176% and 321% greater than the 1-pass treatment and control, respectively (Table 3).

Table 1. Soil cover frequency following interseeding forage kochia into wheatgrass-dominated CRP near Levan, Utah. Tillage treatments included no tillage (control), and 1- or 2-passes with a chisel plow.

Tillage	Forage Kochia	Wheatgrass	Annual Weeds	Other Vegetation	Soil
	-----%-----				
2-pass	34.3 a	24.7 b	2.9 b	16.8 ab	21.3 b
1-pass	18.9 b	32.4 b	9.0 a	14.8 b	24.9 ab
Control	0.00 c	45.2 a	3.0 b	19.3 a	29.2 a

*Values within a column followed by a different letter (a, b, c) are significantly different at the 0.05 probability level.

Table 2. Forage mass, nutritive values, and predicted intake and stocking rate following interseeding forage kochia into wheatgrass-dominated CRP acreage near Levan, Utah. Tillage treatments included no tillage (control), and 1- or 2-passes with a chisel plow.

Tillage	Forage Mass	CP	ADF	NEm	NEg	Predicted DMI	Predicted Stocking Rate
	lb/acre	-%-	-%-	Mcal/lb	Mcal/lb	lb/day	AUM/acre
2-pass	2991 a	8.8 a	37.5 b	0.50 a	0.25 a	21.8 a	1.6 a
1-pass	1810 b	7.8 b	38.0 b	0.49 a	0.24 a	21.9 a	0.9 b
Control	988 c	4.5 c	45.9 a	0.40 b	0.16 b	24.3 b	0.5 c

Values within a column followed by a different letter (a, b, c) are significantly different at the 0.05 probability level.

Table 3. Economic analysis following interseeding forage kochia into wheatgrass-dominated CRP acreage near Levan, Utah. Tillage treatments included no tillage (control), and 1- or 2-passes with a chisel plow.

Tillage	Total Cost	Amortized Cost	Grazing Value	Net Return
	-----\$ acre-----			
2-pass	69.00	17.28	64.26	46.98
1-pass	54.00	13.52	38.34	24.82
Control	0.00	0.00	18.80	18.80

Calculated based upon actual seeding costs; including, tillage costs for 1-pass chisel plow treatment at \$15 acre, 2-pass chisel plow at \$30 acre, forage kochia PLS seed cost of \$17.37/lb, planting rate of 1.9 PLS lb/acre, and aerial broadcast seeding cost of \$6 acre. The treatment cost was amortized over 5 years using a 5% discount rate. Grazing values determined by estimating the replacement cost of buying feeder quality grass hay and calculated as: Grazing Value = ((Predicted maintenance DMI of grass hay per cow per day *30 days per month* price of hay / 88% intake to feed efficiency) *AUM of tillage treatments), where the Utah 8-yr average grass hay price of \$113.50 was used.

Summary and Implications

The primary purpose of interseeding forage kochia into established CRP was to improve stockpiled fall forage mass and nutritive value, and thereby increase AUM and grazing value. Both the 1-pass and 2-pass chisel plow tillage treatments allowed forage kochia to be established in a mixed stand with the existing wheatgrasses, with the 2-pass treatment resulting in nearly a 3-fold increase in forage mass and AUM, compared to the control. The addition of forage kochia improved the nutritive content of the stockpiled forage in terms of both protein (>7% CP) and energy (0.25 Mcal/lb), resulting in the possibility of fall/winter grazing without protein or energy supplementation. The \$64.26 acre grazing value for the 2-pass treatment is greater than the 2014 national average CRP rental contract of \$51.09 acre. This suggests that interseeding forage kochia into established wheatgrass with the intention of fall/winter grazing may be an attractive and economic alternative to returning expired CRP acres to crop production.



Winter kochia grazing

Overall, this research documented that interseeding forage kochia into existing CRP can increase its potential use for fall and winter grazing by livestock.

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See the above listed research manuscript for a complete reference listing and other information. The authors gratefully acknowledge producer Ron Harper for participating in this on-farm research project.

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