Revegetation of Retired Farmland: Evaluation of Six Range Grasses Under Three Irrigation Regimes

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Abstract

In July of 1986, we seeded buffelgrass, klein grass, "Catalina" lovegrass, "Cochise" lovegrass, bottlebrush, and sideoats grama grass on retired farmland in the Avra Valley west of Tucson. We seeded these grasses under three irrigation regimes: no establishment irrigation, two establishment irrigations, and four establishment irrigations. In measurements of the standing forage in 1987-90, four establishment irrigations significantly increased the standing forage over the unirrigated treatments. However, the two irrigation treatment was not significantly different from either four irrigations or no irrigations. Buffelgrass, klein grass, and the lovegrasses appear to be promising species for vegetative cover for this site. We have also measured significant increases in the standing forage over the last four years.

Introduction

The main objective of this study is to identify range grasses that will persist as a vegetation cover on retired farmland. Previous range seeding research on retired farmland near Tucson failed to identify any plant materials that would persist on the silty clay loam soil (1).

Another objective is to measure the effect of establishment irrigations on these range grasses. The timing of precipitation has been shown to be critical in seeding survival (2,3).

Materials And Methods

The test site at the Three Points Test Area is a farm that was purchased by the City of Tucson and retired for a water transfer. The soil type varies from Anthony sandy clay loam to Glendale silty clay loam, and was last farmed in 1984. The site had a solid stand of tumbleweeds (Salsola kali). We double disked the tumbleweeds, plowed 10-12" deep, and double disked again. Then we ran borders to separate the plots, and double disked the areas within the plots. This intensive land preparation does not represent the kind of work that would be required when establishing a vegetative cover before retiring the land.

The plot design is of randomized complete blocks, three replications, with each species x irrigation treatment entered as a separate plot. The plots are 20'x 300'. The plots are oriented to the land slope to maintain a dead-level grade along the length of the plot, and they are parallel to the old farm furrows.

In July of 1986, we hand sowed buffelgrass (Cenchrus ciliaris), klein grass (Panicum coloratum), "Catalina" Boer lovegrass (Eragrostis curvula), "Cochise" lovegrass (E. lehmanniana Nees x E. trichophora Coss and Durr.), bottlebrush (Anthephora pubescens), and sideoats grama (Bouteloua curtipendula). Only sideoats is native to Arizona; the others all originated in Africa. We selected these grasses because they are known to tolerate high sodium soils and because deep rooting is not essential to their survival. In some cases, we would expect plow layers to impair deep rooting.

Immediately after seeding, we began to apply the establishment irrigations. The irrigation regimes were no irrigation, two irrigations 7 days apart, and 4 irrigations on weekly intervals.

From July 1986 to October 1990, we collected rainfall, temperature, and humidity data with a hygrothermograph and recording raingauges.

Once the grasses were established for just over one year, we began to measure the standing forage. In order to measure the entire growth for the year, we clip plots in the fall after the plants are dormant. All of the standing grass within random drops of a half-square meter quadrat is clipped and oven dried.

We analyzed the forage data as a 4 Year x 6 Species x 3 Irrigation Treatment x 3 Replication factorial.

Results And Discussion

General Trends:
The standing forage for all of the treatments is presented graphically in figures 1 through 6. The trends are that forage has increased over the last four years, that establishment irrigations continue to make a difference in standing forage, and that there are significant differences between the grass species.

Effect of Grass Species:
Over the last four years, buffelgrass has produced significantly more standing forage than all other species (Table 1.). Klein grass and the lovegrasses also appear to be adapted for this site. Bottlebrush and sideoats grama did rather poorly.

Table 1. Main effect of grass species on standing forage, 1987-90.

Species	1987-90 Standing Forage -Kg/Ha, Oven Dry Weight-	
Buffel	1531	a*
Klein grass	863	b
Catalina lovegrass	802	b
Cochise lovegrass	435	bc
Bottlebrush	38	c
Sideoats grama	13	c

*Means followed by the same letter are not significantly different at the 0.05 level.

Effect of Establishment Irrigations:

In figures 1 through 6, the effect of establishment irrigations continues to be evident four years after establishment. Table 2 shows the irrigation treatments analyzed as a main effect, which is that four irrigations are significantly better than none. However, the two irrigation treatment is not significantly different from either the four or no irrigation treatments.

Table 2. Main effect of establishment irrigations on standing forage, 1987-90.

Number of Establishment Irrigations	1987-90 Standing Forage -Kg/Ha, Oven Dry Weight-
4 Irrigations	894 a*
2 Irrigations	762 ab
No Irrigation	185 b

*Means followed by the same letter are not significantly different at the 0.05 level.

Effect of Years:
We have measured a steady and significant increase in standing forage over the last four years (Table 3.).

Table 3. Main effect of years on standing forage, 1987-90.

Year	1987-90 Standing Forage -Kg/Ha, Oven Dry Weight-
1990	803 a*
1989	654 ab
1988	568 bc
1987	428 c

*Means followed by the same letter are not significantly different at the 0.05 level.

Acknowledgements

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Literature Citations

1. Cox, J.R. and R.M. Madrigal. 1988. Establishing Perennial Range Grasses on Abandoned Farmland in Southeastern Arizona. Appl. Agric. Res. 3:36-43.

2. Fraiser, G.W., D.A. Woolhiser, and J.R. Cox. 1984. Emergence and Seedling Survival of Two Warm-season Grasses as Influenced by the Timing of Precipitation: A Greenhouse Study. J. Range Manage. 37:7-11.

3. Fraiser, G.W., J.R. Cox, and D.A. Woolhiser. 1987. Wet-dry Cycle Effects on Warm-season Grass Seedling Establishment. J. Range Manage. 40:2-6.

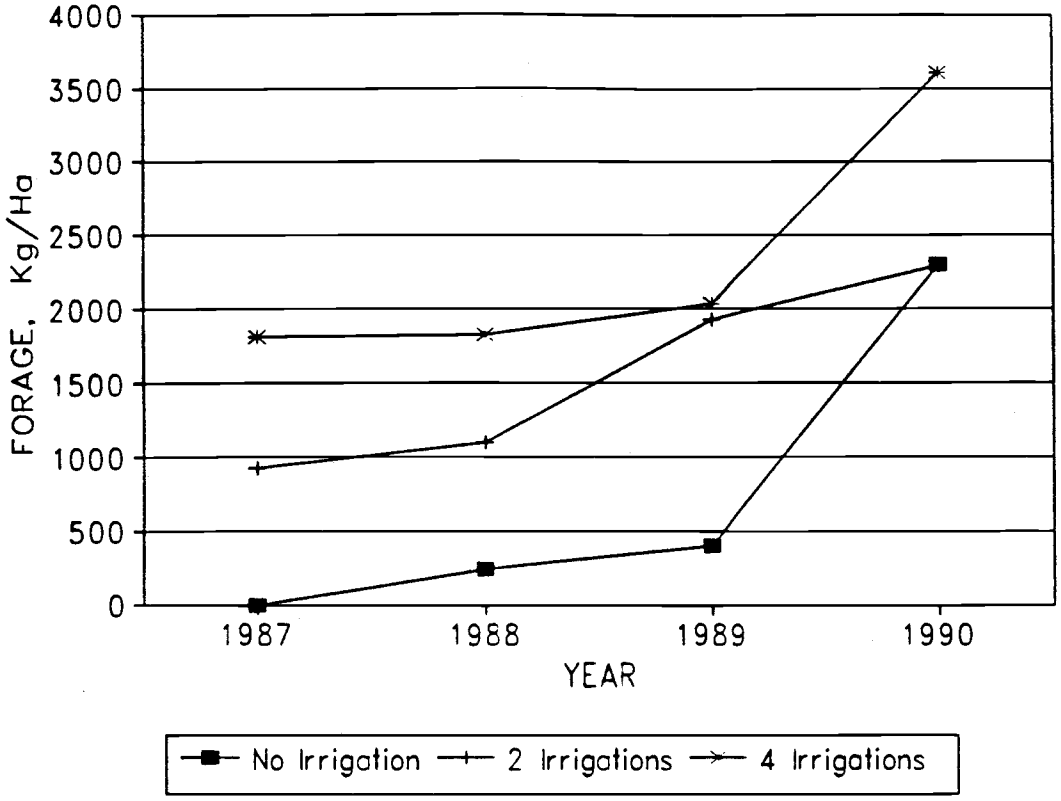

Figure 1. Oven dry standing forage of buffelgrass planted July 1986.

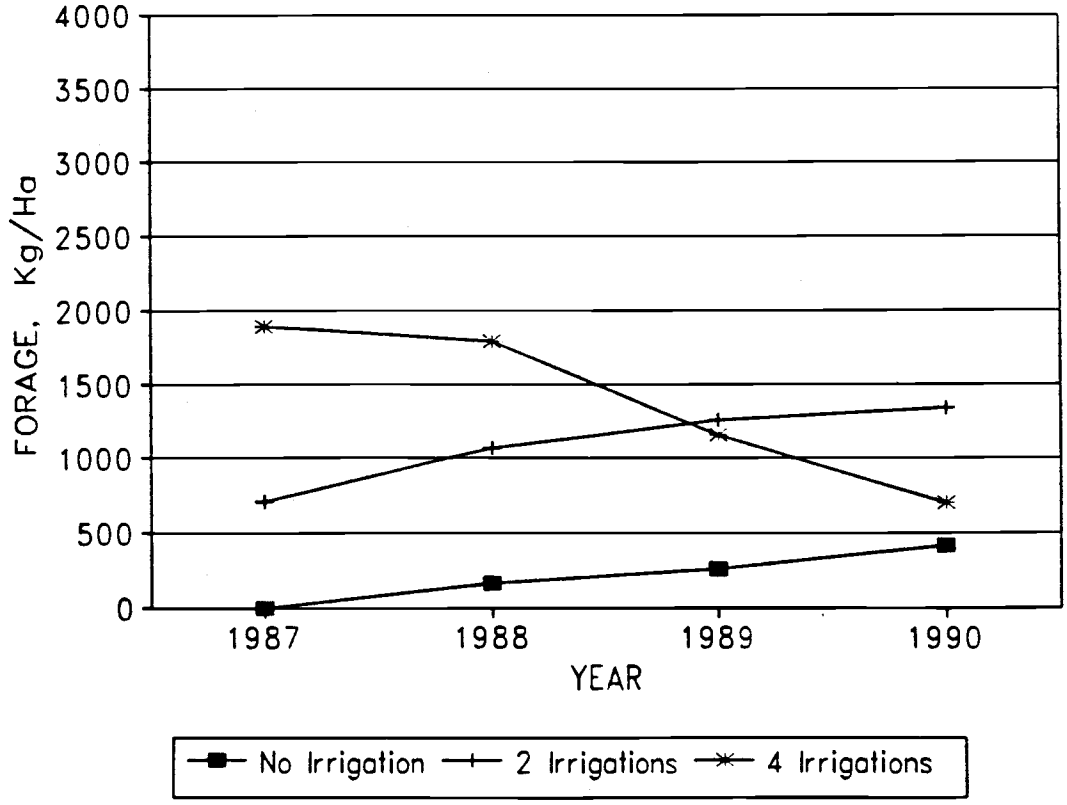

Figure 2. Oven dry standing forage of Klein grass planted July 1986.

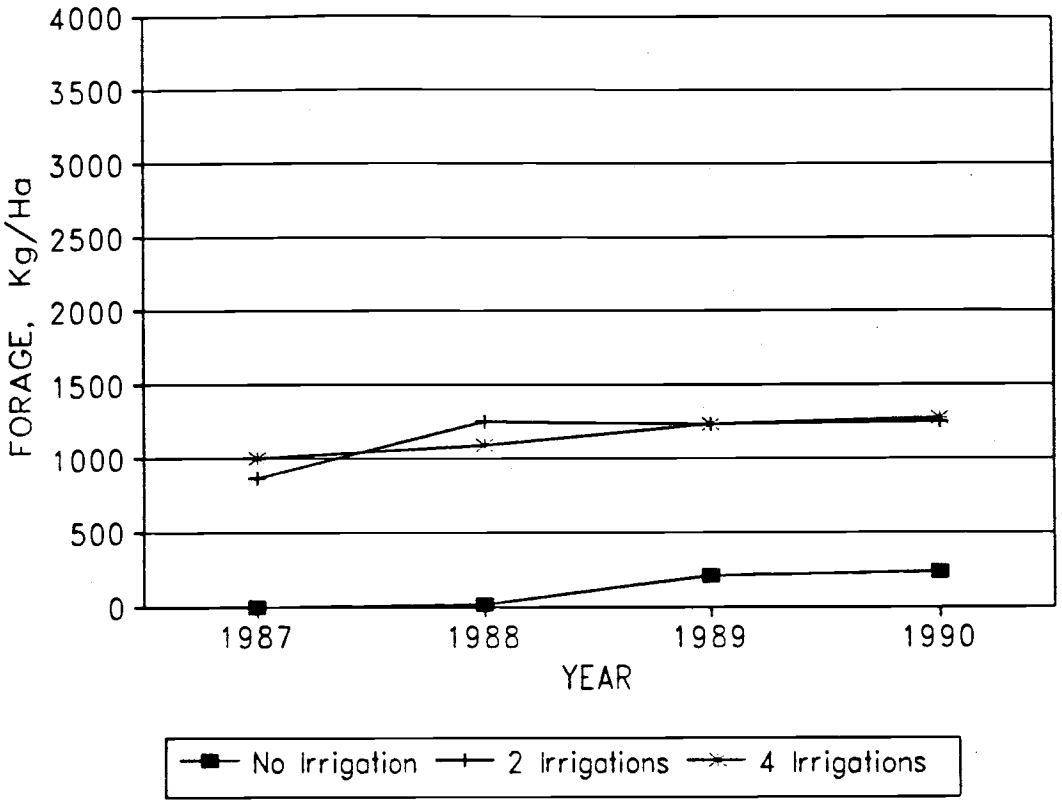

Figure 3. oven dry standing forand of Catalina lovegrass planted July 1986.

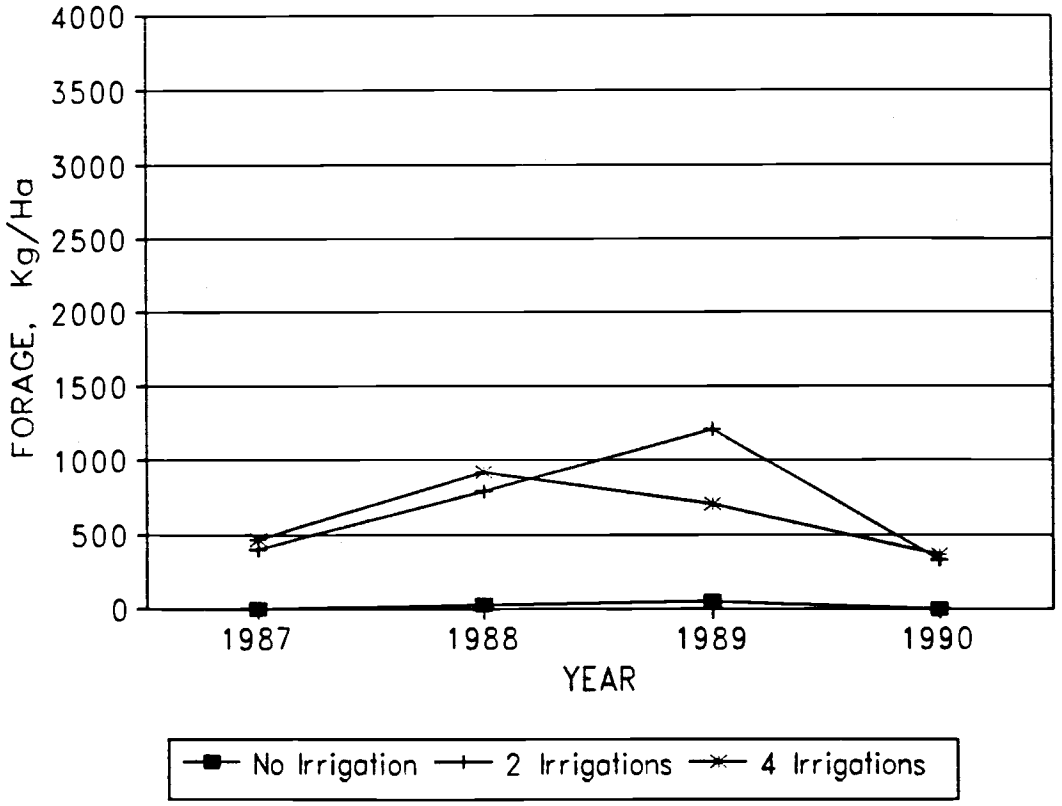

Figure 4. Oven dry standing forage of Cochise lovegrass planted July 1986.

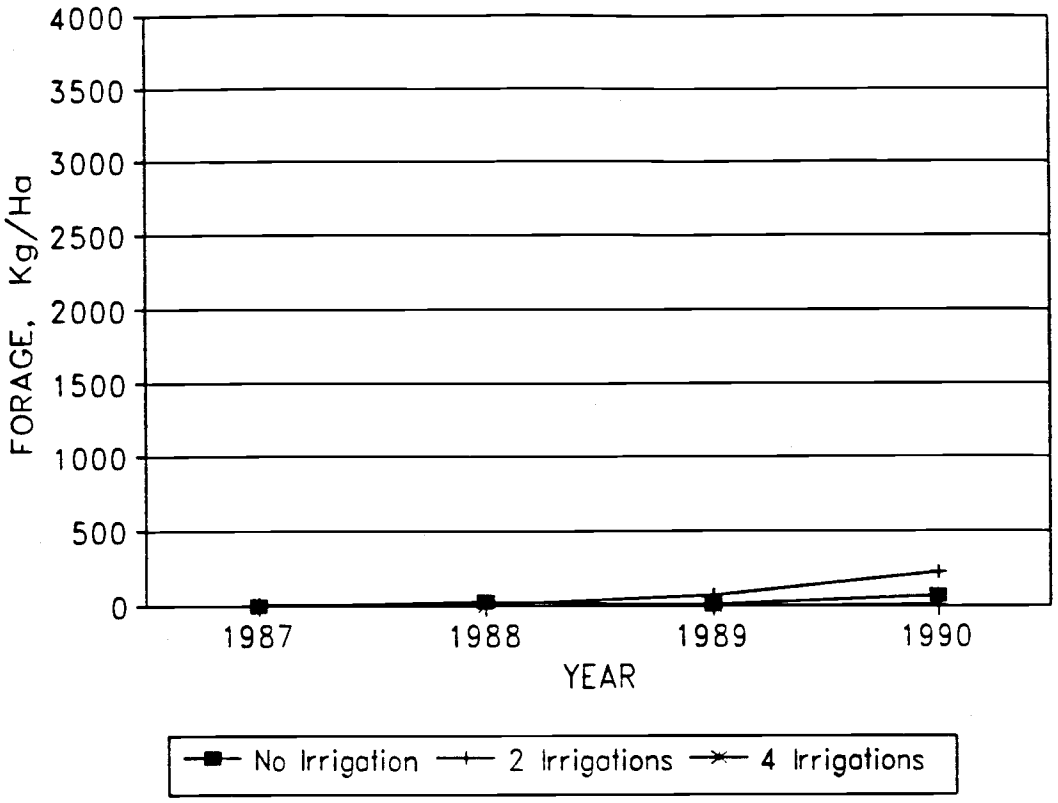

Figure 5. Oven dry standing forage of bottlebursh planted July 1986.

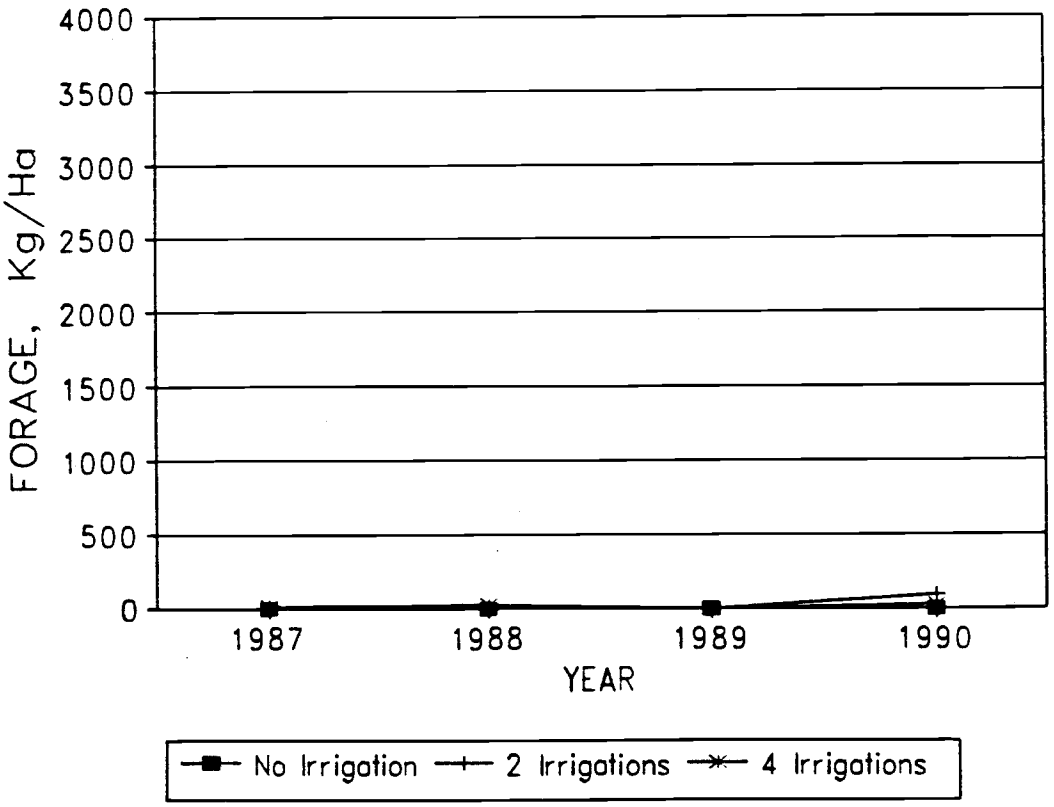

Figure 6. Oven dry standing forage of sideoats grama planted July 1986.