Revegetation of Retired Farmland: Response of Range Grasses to Establishment Irrigations and Microcatchment Water Harvesting

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ABSTRACT

In July 1987, an experiment was initiated to evaluate the effects of water harvesting and establishment irrigations on the establishment and persistence of buffelgrass, kleingrass, and sideoats grama grass on retired farmland. A density evaluation in November 1987 revealed a significant increase in percent cover of the grasses due to establishment irrigations. No significant differences were detected among water harvesting treatments or flat-disked controls. Evaluations will continue to measure any long-term effects from these treatments.

INTRODUCTION

The conventional wisdom of range seeding in Arizona is that seedings will be successful approximately one year out of ten. The availability of soil moisture is very critical between the time of germination and establishment of the seedlings (1,2). In most years, precipitation will not keep the top centimeter of soil moist long enough to allow the seedlings to become established (2).

On retired farmland, a history of irrigation may have added salts to the soil which will reduce the availability of soil moisture to the plants (3). Clay soils can further complicate the problem, because clays have a large surface area and will tenaciously hold water (4).

Microcatchment water harvesting has improved the survival and productivity of perennial plants in the desert range (5).

This test was initiated to gain more insight into this problem, and to develop methods for improving the chances of establishing range grasses on retired farmland.

MATERIALS AND METHODS

The site at Three Points Test Area is a farm in the Avra Valley purchased by the City of Tucson and retired for a water transfer. The soil, a Valencia sandy loam, was last farmed in 1984. Tumbleweed (Salsola kali) has domimated the site since retirement. In July 1987, the site was disked twice, plowed, and disked.

The water harvesting treatments were 40-inch beds and 80-inch wide water harvesting microcatchments. Each microcatchment was formed with a pair of road grader blades welded together into a "V" shape. The blades formed an 80-inch wide, V-shaped ditch that is only 3-4 inches deep in the middle of the "V". The idea was to concentrate rainwater at the bottom of the "V", to improve the chances of getting at least a few seedlings established.

The 40-inch beds were also considered rainwater harvesting microcatchments, since they concentrated rainwater in the furrows. Some type of furrow is needed because many farms have sloped, furrow irrigation systems and could not be flat-irrigated without difficulty.

Flat-disked plots were used as controls.

The flat-disked, 40-inch bed, and 80-inch microcatchment treatments were tested with and without establishment irrigations. Plot design is randomized complete blocks with 3 replications. Plot size is 20 feet by 150 feet.

The plots were seeded on July 14, 1987 with a mixture of buffelgrass (Cenchrus ciliaris), kleingrass (Panicum coloratum), and sideoats grama grass (Bouteloua curtipendula). Plots were then culti-packed to prevent seeds from floating in irrigation or rainwater. These grass species were selected because they are known to be tolerant to high sodium soils.

Irrigations were made on July 15th, 18th, and 21st, 1987. Unirrigated plots received only the 4.67 inches rainwater that came between the time of seeding and the first density evaluation on November 1987. Precipitation was measured with recording rain gauges. A hygrothermograph recorded temperature and humidity data.

Plant cover evaluations were made in November 1987, by random sampling with a one-half square meter quadrat. The density and average basal diameters were measured and recorded for each of the three range grass species. The combined data for the three grass species are presented as the percent of ground surface that is covered by the basal areas of the grass plants. No attempt was made to measure weed cover.

RESULTS AND DISCUSSION

The percent cover of range grass for each treatment is presented in Table 1. In this environment, 10% cover would be a high figure for a high rainfall year. As expected, all irrigated treatments had numerically higher percent covers than the unirrigated plots. The unirrigated flat treatment had virtually no grass cover. However, the coefficient of variation was very high and there were no significant differences between the six treatments.

Table 1. Response of buffelgrass, kleingrass, and sideoats grama grass to water harvesting and establishment irrigations.

Irrigation Treatment	Water Harvesting Treatment	Percent Cover of Range Grasses
Irrigated	40-inch beds	1.189 a*
Irrigated	80-inch catchment	0.979 a
Irrigated	Flat Disked	0.843 a
Unirrigated	80-inch catchment	0.124 a
Unirrigated	40-inch beds	0.106 a
Unirrigated	Flat	0.000 a

*Means followed by the same letter within a column do not differ significantly at the 0.05 level. CV = 148%.

When evaluated separately as a treatment, irrigation significantly increased the percent cover of the range grasses (Table 2).

Table 2. Response of buffelgrass, kleingrass, and sideoats grama grass to establishment irrigations.

Irrigation Treatment	Percent Cover of Range Grasses
Irrigated	1.004 a*
Unirrigated	0.082 b

*Means followed by the same letter within a column do not differ significantly at the 0.05 level. CV = 148%.

Microcatchment water harvesting, evaluated separately as a treatment, had no significant effects on the percent cover of the range grasses (Table 3). In the treatments that were irrigated, we did not expect any benefits from water harvesting at this early date.

Table 3. Response of buffelgrass, kleingrass, and sideoats grama grass to microcatchment water harvesting.

Water Harvesting Treatment	Percent Cover of Range Grasses
40-inch Beds	0.648 a*
80-inch Microcatchments	0.552 a
Flat Disked (check)	0.430 a

*Means followed by the same letter within a column do not differ significantly at the 0.05 level. CV = 148%.

Evaluations of this experiment will continue for the next few years. We will determine whether any significant differences due to water harvesting emerge over time, and whether the effect of establishment irrigations will diminish over time.

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