

Dryland Catchment Test Planted to Hybrid Sorghum and Pearl Millet in Avra Valley Near Three Points, 1986

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INTRODUCTION

As more farmland is abandoned in Arizona for either economic or groundwater reasons, the need is intensified to control erosion and weeds to regain some of the land's former productivity. Thacker (1986) discussed the various aspects of farmland loss in the Avra Valley and concluded dryland farming, in conjunction with rainwater capture, would be a worthwhile endeavor.

Various forms of runoff farming have been utilized for at least 2,000 years where growing season precipitation is 100 mm (3.9 in.) to 250 mm (9.8 in.). Recent developments in design and management of catchment systems optimize the chances of successful crop production (Shanan and Tadmor, 1979). Tucson, with an average rainfall of 158 mm (6.22 in.) between 1 July and 30 September, is comparable to many areas studying water harvesting techniques.

Work began in Texas during the early 1950's to create contour bench terraces where the annual rainfall is 460mm (18.1 in.). For 14 years, grain sorghum yields on benches with a 2:1 catchment-to-cultivated ratio were 80% greater than on unbenched slopes (Jones and Hauser, 1975).

A grain sorghum double-crop simulation test was planted 27 June 1985 at the Marana Agricultural Center. The test plot received an 8.9 in. preplant irrigation and 2.66 inches of rainfall. Of the 72 commercial hybrids, 11 yielded more than 3,000 lb/a (Voigt and Schmalzel, 1986). To determine the probability of a successful dryland sorghum planting relying completely on rainfall, a test was conducted utilizing four land configurations to measure enhancement or loss of effective precipitation.

MATERIALS AND METHODS

Land idled since December 1984 on the Buckelew farm in Avra valley was worked up to create four land treatments: 1.) flat pans 15 ft. wide with two rows 40 in. apart; 2.) two beds on 40 in. centers where the seed was planted in the center of the beds; 3.) three beds 40 in. apart with seed planted in the furrows and 4.) V-shaped catchments 11 ft. wide and 6 in. deep planted with two rows 40 in. apart, 20 in. off the center.

Three commercial grain sorghum hybrids and one pearl millet hybrid (see Table 2) were planted in 20 ft. rows at 3 seeds per foot. A split-plot design with four replications was used; land treatments were the main plots and varieties/crops were subplots. The soil (Glendale Silty Clay Loam) was very dry when the plots were planted on 25 July 1986. A significant amount of rain did not fall until the first week of August (.78 in. for 4 to 11 August), which probably prompted any germination that occurred. During the rest of August, 1.22 in. of rain fell; only .22 in.

more moisture fell in a significant amount before a frost the last week of November; the effective total rainfall was 2.22 inches.

RESULTS AND DISCUSSION

The harvest consisted of plant counts and stage-of-growth- attained notes since birds and rodents consumed any seed produced. Land treatments influenced emergence (Table 1); in-the-furrow planting was better than either catchments or the flat, both of which were better than planting on beds. Catchments may have been at a disadvantage because the seed rows were 20 in. away from the first accumulation of water instead of being at the bottom, as in the furrows. Also, the reduced slope of the catchment requires more rainfall and a smoother, more compact soil surface for runoff to occur.

A varietal difference existed as well (Table 2); Triumph TWO 54yg emerged better than the others. When emergence was factored by growth stage attained (plants emerged x1 if plants died at the three leaf stage, x2 at the five leaf, x5 before booting, x7 at boot and x10 if plants developed a panicle), the furrow system was still superior. However, the catchment now showed an advantage over the flat treatment. No interaction resulted between treatments and varieties (P value .497).

Apparently, planting in the furrow is an acceptable method of obtaining a stand. It has the added benefit of using standard, though more energy consuming, listing equipment; catchments, on the other hand, required more specialized and precise equipment. Weeds also respond to these land treatments. Mats of a summer grass covered the catchment bottoms and the furrows were filled with tumbleweed seedlings in February. This study continues in 1987.

Table 1. Number of seedlings emerged per plot and counts factored for growth stage attained for four land treatments.

| Land Treatment | Number | LSD .05 (8.8) | Factor | LSD .05 (60) |
|----------------|--------|---------------|--------|--------------|
| In furrows | 36 | a | 292 | a |
| In catchments | 18 | b | 129 | b |
| On flats | 15 | b | 44 | c |
| On beds | 1 | c | 1 | c |

Table 2. Number of seedlings emerged per plot for three sorghum hybrids and one pearl millet hybrid.

| Variety | Number | LSD .05 (9.0 plants) |
|-------------------|--------|----------------------|
| Triumph TWO 54yg | 26 | a |
| Cargill 70 | 18 | ab |
| SeedTec WAC 652G | 14 | b |
| 81-1163 X 78-7088 | 11 | b |

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