Papago Floodwater Pastures

Show Promise

by J. R. Simpson, R. A. Young, P. R. Ogden & C. W. Whitfield*

Intense summer rainstorms associated with warm, moist, unstable air flowing North and West from the Gulf of Mexico cause brief periods of rapid runoff in many areas of the southwestern U. S. The use of flood runoff from such storms to irrigate supplementary perennial grass pastures was tested by the Bureau of Indian Affairs on the Papago Indian Reservation in Southern Arizona. The results of these pilot studies were sufficiently encouraging to warrant an economic analysis of the possibility of extending the development to approximately 25,000 acres of alluvial soils on low level lands elsewhere on the reservation (Simpson, 1968). The findings should be of interest in other areas where similar conditions prevail.

Background

The 2.8 million acre Papago Reservation is in South central Arizona, its eastern border lying about 26 miles West of Tucson. The reservation consists of arid valleys lying between 1,400 and 2,600 feet above sea level, broken by occasional mountain ranges with peaks reaching above 7,000 feet elevation. The high temperature and low rainfall are typical of the Sonoran Desert. The sparse annual precipitation is distributed mainly in two periods — the intense, localized summer rains in July, August and September; and lighter, more generalized winter rains originating in the Pacific. Summer rains are unpredictable, and extreme drought conditions are experienced in about one year of every four. This, together with years of over-grazing, have led to conditions where annual plants provide most of the forage on the reservation grazing lands. Supplementary forage, in order to provide feed during dry seasons, would be very desirable on the reservation.

Additional pasture development would be carried out in the same manner as was done on the 5,000 acres completed in the past six years. Bulldozers topple the trees and in the same operation, dislodge roots with a "root knife," literally plowing the land. The trees are small enough to be left to rot, and no further land preparation is required. The area is then fenced, and corrals, water spreading dikes, and "charcos" (earthen watering ponds) are built. The pastures are seeded by aircraft just prior to the summer rains. Grazing is deferred for one year to allow the stand to develop.

Remove the competition and blue panicgrass, in photo at left, responds on a Papago Reservation flood plain. In the same picture the stand of mesquite and annual grasses are shown which provide poor and undependable forage. Total annual cost per acre is $2.99 when amortized at 8 per cent for 50 years.

In photo at right is another fence line contrast which shows the dense stand of blue panicgrass developed after root plowing and seeding. After treatment a dependable, good quality forage supply is obtained providing 1.4 animal unit months per acre. Before treatment the same area yielded 0.66 animal unit months per acre — a 23 fold increase.

* Simpson is former graduate Research Assistant and now with New Mexico State University; Young is Associate Agricultural Economist; Ogden is Associate Professor of Range Management; and Whitfield is Land Operations Officer, B.I.A., Papago Reservation Sells.
Because of the vast area of the reservation, some basis for preliminary screening of potential sites for development was needed. The U.S. Air Force provided aerial photographs, which were helpful in this regard. On-the-spot inspections were made of locations selected on the aerial photos and twenty three sites comprising 22,700 acres were chosen as suitable for detailed analysis. Considerable variation was observed in size, estimated productivity and development costs among the sites. Each site was evaluated individually, but for the sake of brevity, we report the average costs and returns for all sites here.

Yield Estimates

Blue panicgrass and Lehman lovegrass are the most successful of the perennial grasses tested, the former judged to be best adapted to "well-flooded" areas (about 90 per cent of the area studied), and the latter best in the areas of lighter inundation. Blue panicgrass on well-flooded areas is estimated to produce about 1,040 pounds of usable forage, oven dry weight basis (ODW), per acre per year. Lehman lovegrass on the less watered locations is estimated to produce 180 pounds of usable forage per acre per year. On the assumption that 20 pounds of ODW forage equals 1 animal unit day, average yield is estimated at about 42 animal unit days (or 1.4 animal unit months) per acre per year for the entire development. It is assumed that the pastures can supply feed for four months of each year.

Cost Estimates

Costs per acre are given in the accompanying table for the initial investment and for annual operation and maintenance expenses. The initial expenses are converted into annual equivalent costs, using the appropriate annuity tables, on the basis of an eight per cent interest rate and a life of fifty years. The resulting costs per animal month (AUM) is $2.14, a relatively favorable figure. (Other investigations have estimated the market value of an animal unit month of forage on western ranges at around $3.00) (Gardner, 1962; Jeffries, 1964). Reducing the amortization period from 50 to 25 years, other factors unchanged, leads to a cost of $2.37 per AUM. Reducing the interest rate from eight per cent to six per cent results in costs of $1.77 per AUM at 50 years and $2.07 per AUM at 25 years.

Conclusion

Other investigators have found that clearing and reseeding rangelands characterized by dense woody cover is often a questionable proposition. The present study suggests that under conditions where local runoff can be inexpensively utilized to boost forage yields, such investments can be relatively attractive.

Summary of Cost Computations

A. Initial Investment in Pasture
   - Clearing: $14.30
   - Seed (includes application): $3.40
   - Fencing: $4.80
   - Dikes: $0.80
   - Watering ponds: $4.90
   - Corrals: $0.50
   **Total Initial Investment:** $27.90

B. Annual operating and maintenance costs per acre
   - Fences and corrals (3% of original investment): $0.14
   - Watering ponds: $0.07
   - Eradicating woody invaders (aerial spray at 5 year intervals): $0.50
   **Subtotal—Operating costs:** $0.71

C. **Total annual cost per acre:** $2.99

D. **Cost per Animal Unit Month***
   - $2.14

***1967 prices.

***1.4 AUM per acre per year.