Farm Size, Irrigation Practices, and On-Farm Irrigation Efficiency in New Mexico’s Elephant Butte Irrigation District

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Abstract

Relationships between farm size, irrigation practices, and on-farm irrigation efficiency in the Elephant Butte Irrigation District, New Mexico, U.S.A. are explored using 2001 water delivery data supplied by the District. The study area is experiencing rapid population growth, development, and competition for existing water supplies. It is assumed that water will ultimately be transferred from agriculture to other uses. Analysis of pecan orchard water delivery data, fieldwork, and interviews with farmers found extremely long irrigation durations, inefficient irrigation practices, inadequate on-farm infrastructure, and lack of interest in making improvements to the current irrigation system or methods on the smallest farms.

These findings are attributed to the nature of residential, lifestyle, or retirement agriculture. Irrigation practices on large, commercial orchards are relatively different from the smallest farms: irrigation event durations are shorter, less water is applied, and the producers are commercially oriented. With respect to future increases in the efficiency of irrigation water usage, large, commercially-oriented producers already have a high level of physical efficiency. Small producers appear to view irrigation as a consumptive, recreational, social, or lifestyle activity, rather than an income generating pursuit, thus the cost of inducing changes in their practices may be extremely high.

Agricultural Structure in the United States

- Structure of agriculture refers to
  - # & size of farms
  - Ownership & control of resources
  - Mega-regional/technological & capital organization of farming

- U.S. agricultural structure is dualistic & will likely become more so in the future.
  - 18% of farms (with annual sales > $100,000) produce 90% of the total value of ag output
  - 92% of farms produce 10% of the total value of ag output

- 54% of all U.S. farms are retired, residual or lifestyle operations – And account for 7.8% of the value of all U.S. ag output

- 75% of farms have sales < $50,000
  - Mult have average household income of $22,925 & farm income of $-3,786

- 50% of all U.S. farm operators do not consider agriculture to be their principle occupation

- 50% of farms report acre off-farm work

This Research

- Are there differences in irrigation practices & on-farm irrigation efficiency relative to size of farm in the EBID?
- What factors affect irrigation practices & on-farm irrigation efficiency on different-sized EBID farms?
- How might the structure of local agriculture affect water market within the future?
- How might different-sized EBID farms respond to incentives for improved irrigation efficiency?

The Elephant Butte Irrigation District

New Mexico’s Lower Rio Grande Valley is experiencing rapid population growth, development of the rural countryside, and decreasing municipal groundwater supplies. Plans are underway to transfer surface water from agriculture to municipal and industrial use in the region served by Elephant Butte Irrigation District.

Lifestyle agriculture is widespread in the Doña Ana County, where the number of irrigated farms increased 70% between 1974 and 1997 (U.S. Census of Agriculture, various years). Irrigated acreage in EBID has been stable over that period of time (<75,000 acres), while numbers of farms in the smallest acreage categories grew dramatically as a result of land splits. For instance, there were 150 farms with 1-9 acres in 1974 and 691 of these farms in 1997.

On-farm irrigation efficiency (crop consumptive use relative to farm delivery) is high in the EBID as a result of deficit irrigation practices on much of the crop acreage. On-farm efficiencies as high as 94% have been conducted on a small number of relatively large, commercial farming operations. While the large, commercial operations include a large percentage of irrigated acres, they are a relatively small part of the total population of farms.

Alfalfa, pecans, cotton, chile peppers, and onions are the primary crops produced in the District, with over 750 pecan orchards covering approximately 21,000 acres. Pecan consumptive use is 5 acre-feet per tree, yielding on average 2,000 pounds per acre.

Results

- Results for analysis of 2001 pecan parcel water delivery data observed from EBID are summarized here. Data for 340 individual irrigated pecan parcels were sampled. Field observations were conducted in 2001 and 2002 in order to verify results of data analysis. A journal article related to this research is forthcoming in Irrigation and Drainage.

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Discussion

Acres-feet basis averages did not vary greatly across the four farm size groups, although there is a wide range of acre-feet per acre applied. These are not actual field measurements of water applied, rather they are estimated from historical data. Irrigation duration (or hours per acre per irrigation) varied significantly across farm size groups. Small farms have the longest durations per acre. Long irrigation durations result in deep percolation losses in the fields.

Long irrigation durations can be a result of lack of attention to irrigation scheduling, lack of knowledge of crop consumptive water requirements, highly permeable soils, small and/or unlined farm ditches, small farm turnouts, several users irrigating simultaneously, and/or insufficient flows. Long water discharge can be due to poor water delivery infrastructure at the farm turnout and/or insufficient flows. Irrigations on large farms typically require about 30 minutes of water flow per acre through the farm turnout regardless of soil type.

The long durations reported in the EBID data were field verified, with estimates of actual water applied during irrigations. For many parcels, actual water applied was greater than EBID’s estimates of applied water. Irrigation duration is strongly correlated with actual water applied.

For all farm size groups, there appears to be no relationship between seasonal water demand (95% of irrigation duration) and/or insufficient flows. The smallest farms are seemingly consistent in their irrigation practices throughout the irrigation season.

Our research data analysis (fieldwork) tends to show

- 2= ac <5
- 5= ac <10
- 10= ac <20
- ≥20 ac

Average Hours/Acre/Irrigation

This Discussion

- Mean Yields (acres per Acre-foot)
- Production

Conclusions

Many water users interviewed and observed for this research appear to place a low priority on agricultural production and irrigation efficiency. Census of Agriculture data also report large variations in pecan yields relative to orchard size. Small producers tend to have significantly lower yields than large farms. This may be the result of overcharge of water in smaller orchards is thus lower than that in large orchards.

For many small residential, lifestyle, or retirement farm owners in EBID, irrigation is a family business, a social or lifestyle activity, and an end-of-pond enterprise. The small farms are likely to show limited interest in improving on-farm irrigation infrastructure, adapting management intensive irrigation technologies or practices, and taking steps to decrease high irrigation costs. Failure to do so will likely result in decreased overall economic performance, and may result in declining sales of small parcel irrigated water in the near future. Many small pecan orchard owners appear to derive significant satisfaction from current irrigation practices. Small farm operators’ willingness to change practices or respond to financial incentives for water marketing will be limited.