Profitability comparisons

A comparison of steady-state (equilibrium) profits on an annual per cow basis shows that the TRA, including capitalization of preproduction expenses, has a substantial negative impact whether measured in absolute or percentage terms (table 2). Using the Patterson productivity assumptions, the profit per cow for a taxpayer in the 15% bracket decreases from $34 before to $26 after TRA, a 24% reduction. For a taxpayer in the top tax bracket, there is a 39% reduction from the pre-TRA profit of $36 to the post-TRA profit of $22. Profits after taxes on a per cow basis generally increased with the income tax bracket in the pre-TRA situation, almost entirely as a result of the capital gains tax exclusion.

To place the importance of tax law changes in perspective, we compared the percentage change in profits due to tax reform with the impact of changes in prices, costs, and productivity. A reduction in average prices of approximately 10% for calves (from $88.50 to $80.00 for steers and $83.00 to $74.14 for heifers) and approximately 17% for culls (from $42.50 to $35.38 for cows) reduced steady state profits for the pre-TRA situation by about $27 (80%) for a taxpayer in the 15% tax bracket and by almost $21 (58%) for a taxpayer in the 50% bracket. An increase in costs of $20 per yearling heifer and $25 per cow (8.3%) reduced profits by almost $19 (55%) for a taxpayer in the 15% tax bracket and by almost $12 (33%) for a taxpayer in the 50% bracket. The impact of a change in calving rates is shown in table 2. Moving from the Patterson series to the Rogers series resulted in an $8 (24%) per head reduction in profits for a taxpayer in the 15% bracket and a $1 (3%) per head reduction for a taxpayer in the 50% bracket. An increase in productivity represented by a 50% reduction in cow illness and death rates increased profits by almost $8 (23%) for taxpayers in the 15% bracket and by less than $4 (11%) for taxpayers in the 50% bracket. Thus, the budgeted changes in prices and costs had a greater impact on profits than did tax law changes in the Tax Reform Act of 1986. The TRA, however, had a greater impact on returns than did fairly significant changes in calving rates or illness and death rates.

The livestock industry's interest in restoring preproductive expensing to the tax code was mentioned earlier. To obtain an indication of the relative importance of preproductive expensing to ranchers' profits, we examined the value of the provision in terms of the change in value of an infinite stream of replacement cows that would occur under present income tax provisions with TRA fully effective. We found that addition of expensing would increase profits almost $4 (15%) per cow for the 15% bracket taxpayer and over $7 (33%) per cow for a taxpayer in the 28% bracket. While post-TRA profits in table 2 will be increased by these amounts after January 1, 1989, when expensing is once again available for breeding livestock, the optimum post-TRA culling ages of 10 and 13 years remain the same.

Conclusions

The Tax Reform Act of 1986 can be expected to have significant impacts on beef cattle ranching operations. Provisions requiring capitalization of preproductive expenses increased record-keeping requirements for 1987 and 1988. Capitalization, together with termination of the investment tax credit and the capital gains exclusion, reduces profits for a given level of prices and costs. Numerical analysis indicates that the total package of tax law changes increases the optimum age for culling beef cows, especially for taxpayers in the highest marginal tax brackets. The culling decision is now based on cow productivity rather than the tax bracket of the owner.

The change in tax laws for livestock will make beef cattle investments less attractive, especially for nonfarm investors. While our calculations indicate that the individual rancher will have lower after-tax income for a given level of prices and costs under provisions effective in TRA, we have not attempted to estimate the effect of the changes on the total cattle herd and on cattle prices. It is reasonable to expect an aggregate increase in cattle prices due to a smaller total herd to partially or even totally offset the short-term reduction in profits for the individual rancher.

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Controlling seepage from evaporation ponds

Mark E. Grismer

Under soil conditions characteristic of the west side of the San Joaquin Valley, subsurface drainlines could recover as much as 90% of potential seepage losses from evaporation ponds.

Subsurface drainage from irrigated cropland on the west side of the San Joaquin Valley is managed by reducing the volume of drainage water and disposing of collected drainwater in evaporation ponds. Nearly 6,700 acres of land are now being used for evaporation ponds. Applications for another 10,500 acres of ponds have been made to the Central Valley Regional Water Quality Control Board. Construction of additional evaporation ponds is expected in the near future for irrigated lands having limited or no other alternatives for disposal of drainwater.

Environmental degradation similar to that seen at Kesterson Reservoir could also occur with evaporation ponds. Potential degradation of groundwater below the pond by contaminated pond water may be reduced however, by designing ponds to minimize seepage losses. Seepage is often controlled by lining ponds with compacted clays or plastic. Both are expensive to install. This study was designed to learn if subsurface drainlines beneath evaporation ponds could recover seepage losses and possibly avoid the need for liners.

Model development

Results from field investigations at several evaporation ponds were used to develop a theoretical cross-section of the soil underlying the ponds. Seepage from ponds in operation for over two years was found to be fairly steady, and the soil below the pond was saturated. Pond water levels were held at depths of 0.5 feet to about 6 feet. Flow conditions at pond boundaries varied, depending on the hydrogeologic setting and on whether or not there was a subsurface drainage system around the pond.

The conceptual cross-section of the pond used in the modeling shows flow features important in seepage losses: perimeter drains, the existence of lateral subsurface

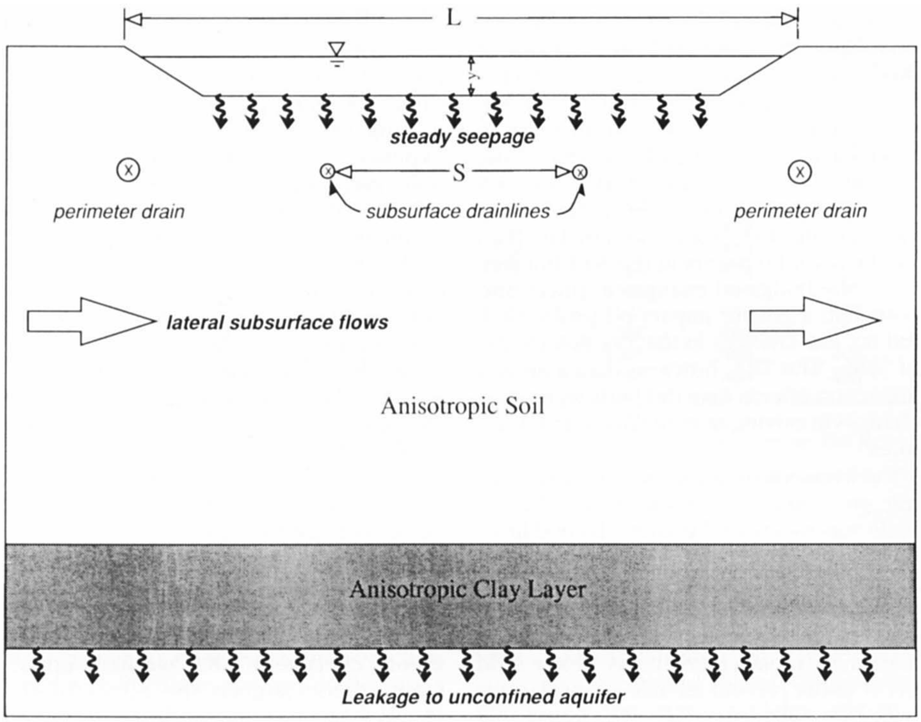

Fig. 1. Schematic illustration of cross-section of evaporation pond site (L is the width of the pond, and S the drainline spacing).

flows below the pond, and the characteristics of soil in its ability to transmit water (fig. 1). In this case, the nature of the soil (anisotropic) and permeability of the clay layer result in greater horizontal than vertical flows.

A model was constructed to analyze long-term seepage losses. Steady flow conditions were presumed to exist below the pond, and available field data appeared to support this assumption. Using the model, it was possible to estimate the effects of changing lateral flow conditions, soil permeabilities, and number of subsurface drainlines on seepage losses.

Results and discussion

The efficiency of subsurface drainlines beneath an evaporation pond in recovering deep seepage losses was compared with losses occurring with only perimeter drains. Factors considered in the analysis included the following simulation conditions for seepage from an evaporation pond:

Pond water depth, 2 ft
Depth of clay layer, 40 ft
Thickness of clay layer, 10 ft
Drainline depth, 2-6 ft
Lateral subsurface flows, 0-1 ft/yr
Soil permeability (isotropic), 1 ft/yr
    horizontal direction, 10-100 ft/yr
    vertical direction, 0.1-1 ft/yr
Clay layer permeability (isotropic), 0.01 ft/yr
    horizontal direction, 1 ft/yr
    vertical direction, 0.01-0.1 ft/yr
Hydraulic head below clay layer, 0

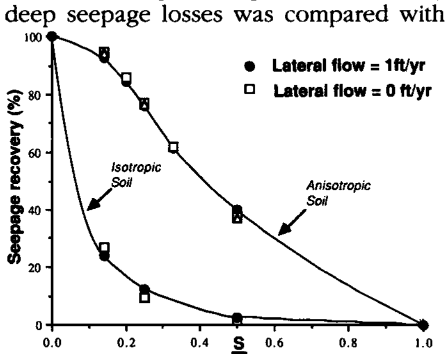

Fig. 2. Dependence of seepage loss recovery on soil conditions and drainline spacing for a pond width (L) of 400 feet.

Of the conditions listed, deep seepage losses were affected most by changes in soil and clay layer permeability and volume of lateral subsurface flows. For all drainline spacings, increasing the horizontal and vertical permeability of the clay layer ten times increased seepage losses eight times. Increasing lateral flows from 0 to 1 foot per year results in an 11.6% increase in deep seepage losses in soil favoring horizontal (anisotropic) flow conditions and a 28.3% increase in soils permitting flows in all directions (isotropic). Changes in the drain depth from 2 to 6 feet below the pond had little effect on seepage losses. Reducing the thickness of the clay layer increased seepage losses at a rate proportional to the layer thickness.

For practical purposes, drainline spacings that reduce deep seepage losses by ten times, that is, a 90% or greater seepage recovery, may be a valuable design consideration.

Though deep seepage losses differ for different hydrogeologic conditions, the percent seepage recovery, as dependent on the number of drainlines, was different only in the case of isotropic soil conditions. Figure 2 illustrates the dependence of percent seepage recovery on drainline spacing for soil permeabilities subject to lateral flows of 0 and 1 foot per year. Although subsurface lateral flows tend to increase seepage losses, they had little effect on the amounts of seepage recovered by the drainlines. Similarly, changes in soil permeability had a large effect on seepage losses, but little effect on the amounts of seepage recovered by the drains. For the range of conditions considered, it is only the type of soil (isotropic or anisotropic) which affects the ability of drainlines to recover seepage.

Results of this study indicate that for anisotropic soil conditions and existence of a clay layer at about 70 feet deep, a drainline spacing of 100 feet for a pond 700 feet across should recover approximately 90% of potential seepage losses (fig. 2). The actual volume of net seepage losses depends on the size of the pond, and the permeability of the soil and lower clay layers.

Conclusions

Seepage of potentially toxic materials from drainage water evaporation ponds may be controlled in part by subsurface drainlines directly below the pond. The extent to which the drainlines recover seepage depends on the area of the pond, soil permeabilities below the pond, and the number or spacing of drainlines.

For ponds on soils favoring flows in the horizontal direction, bounded by a more slowly permeable clay layer at the bottom, seepage control by subsurface drainlines can be very effective. For hydrogeologic conditions characteristic of the west side of the San Joaquin Valley, subsurface drainlines at a spacing of approximately 10% of the pond width should recover over 90% of seepage losses that would occur if the pond had only perimeter drains. The net volume of seepage losses depends on soil permeability at the site. Finally, if the subsurface drains are to be effective in recovering seepage losses, drainlines and sump pumps must be of adequate capacity to carry anticipated flows.

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