

# **Investing for Profitability: How Water Conserving Irrigation Technology Improves Farm Profitability**

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Growers are increasingly encouraged to conserve water because fresh water is becoming more scarce each day, and because there are social/environmental costs associated with wasting our most precious resource, water. When growers set out to conserve water, they typically expect to spend money on water conserving irrigation equipment, and precious management time, to achieve their goals. It is the subject of this paper to show that in addition to water savings, farm profitability is often increased as a result of decreasing farm costs and/or increasing farm income. In fact, increased profitability is often the primary motivator for adoption of water conserving equipment rather than just water savings. The three examples that follow illustrate that water can be saved and overall profitability increased by adopting modern irrigation technology.

## **Quady Winery, Madera, CA**

The management at Quady Winery knew that the variable soils in their 10-acre home vineyard presented irrigation challenges. When the entire parcel was irrigated manually with a few valves, the sandy soils were often overwatered and/or the heavier soils experienced runoff. Also, the existing drip system was old and needed to be updated. To better manage the vines and irrigate more precisely, in 2003 the system was upgraded with new drip irrigation, additional control valves, soil moisture sensors and a Rain Bird® Cyclik™ wireless control system. Each control valve was placed according to soil type, and the wireless control system allowed individual valves to be easily and inexpensively programmed to apply the right amount of water at the proper frequency. Western Ag and Turf in Madera, CA supplied the design, materials and expertise.

Each soil type on the home vineyard was now irrigated properly and water was saved. For instance, the sandy soils were never irrigated more than an hour at a time, and the heavier soils never were irrigated more than four hours at a time. This cycle and soak

irrigation method applied water to the soil in a manner which maximized lateral water movement in the soil profile as opposed to downward water movement. Thus, deep percolation and runoff were avoided, and less water was applied overall. Specifically, irrigation run time was decreased from 65 hours per week down to 36 hours per week, a net savings of 45%. Considering a crop ET of about 2-acre feet per acre, 4.44-acre feet was applied without the upgrade, and only 2.22-acre feet with the upgrade. This amounted to net savings of 22.2-acre feet for the 10-acre vineyard, which is over 7 million gallons of water! But that's not all.

In addition to water savings, other irrigation expenses were significantly reduced. Pumping costs decreased from \$187 per acre to \$93 per acre, a net savings of \$94 per acre. Irrigation labor decreased from \$720 per acre (one laborer working on irrigation 12 hours per day about 50 days per year) to \$144 per acre, a net savings of \$576 per acre.

Naturally, in order to make these gains, an investment was required. Here's how much: the irrigation system improvements cost \$805 per acre including \$354 for the new drip irrigation, \$204 per acre for the valves, controls and sensors, and \$247 per acre for labor and misc. pipe and fittings. In addition, management costs increased to \$170 per acre due to the ability to monitor the moisture sensors and program the valves with the proper irrigation schedules.

If these investment costs and resulting savings are graphed in the seven-year Rain Bird® Ag Cash Flow analysis shown below, it can be shown that the system upgrade pays for itself after the first year. After seven years, the cumulative cash flow, all conditions remaining equal, amounts to \$2,695 additional profit per acre, or \$26,950 additional profit on 10 acres. All this in addition to the 7 million gallons of water saved per season on 10 acres!

Other advantages to adopting modern irrigation technology exist but are less easily quantifiable. First, the ability to properly manage irrigation and improved vine health allow the fruit to sugar up and gain maturity more uniformly and with better predictability. Second, precise irrigation control promotes healthy root systems that help the vines fight off disease. Third, pulse irrigation disperses the water laterally in the soil, to spread out the roots and promote a healthier root system. Fourth, managed deficit irrigation before verasion, and maintaining higher soil moisture later in the season, is the

best way to obtain the sugar, color, flavor and phenolics for which the winemaker is looking. Bottom line, Quady management believes that in addition to water savings and increased profitability, winegrape quality has improved as a result of better water management.

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Grower Name: Quady California Desert Wines Date: 20 Sep 04  
Field Location: Madera, CA No. Acres: 10  
Phone #: 559-673-8068 Crop: Winegrapes  
Project Filename: C:\Rain Bird Ag\Marketing\Cash Flow Software\Sep 04\Quady Winery 24 Sep 04 DB.rcp

### Project Analysis

Project Cost Per Acre: \$ 805

Amount to be Financed: \$ 0

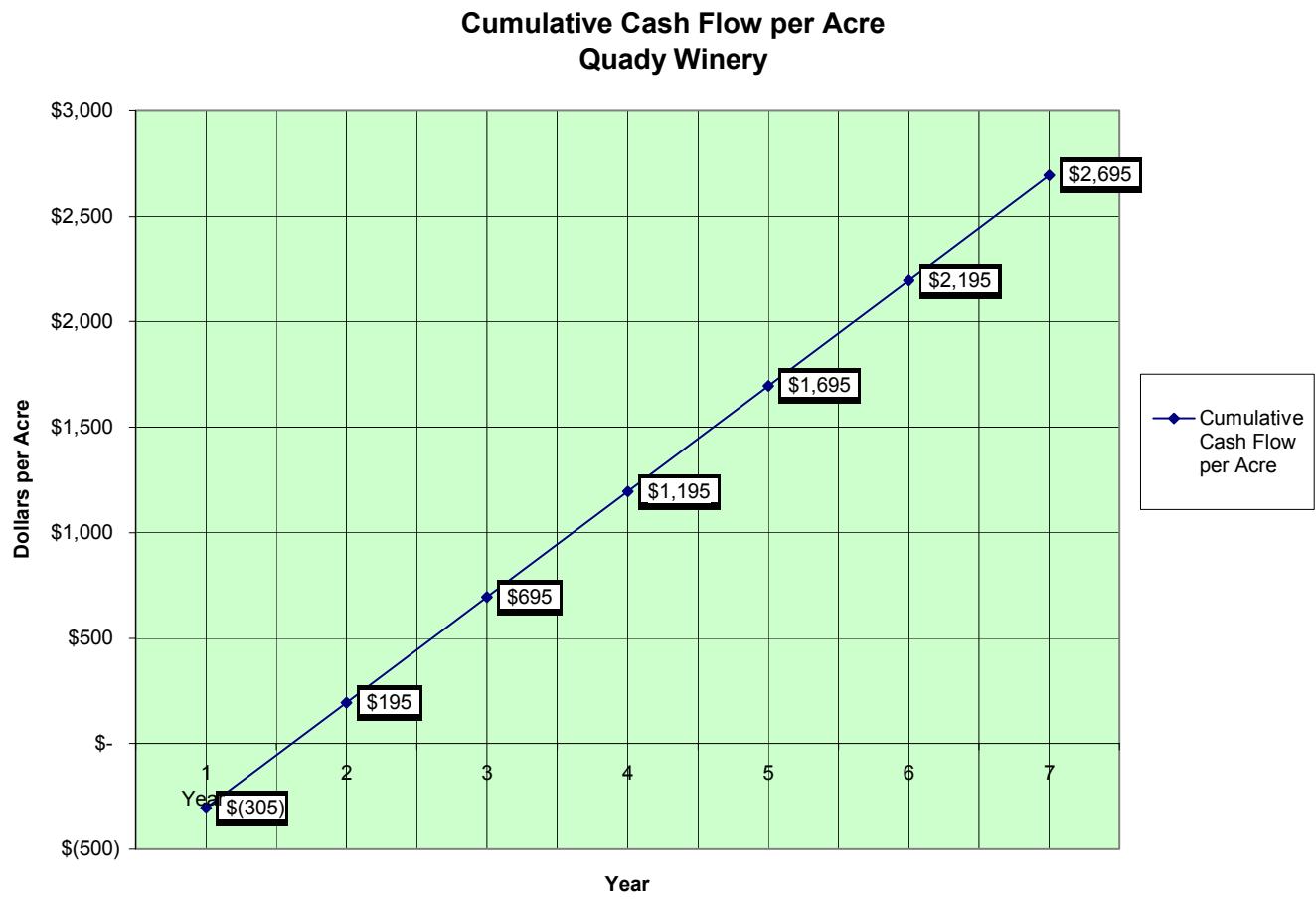
Additional Profit Per Acre: \$ 500

### Cash Flow Per Acre

|                       | Year 1  | Year 2 | Year 3 | Year 4   | Year 5   | Year 6   | Year 7   |
|-----------------------|---------|--------|--------|----------|----------|----------|----------|
| Project Costs:        | \$ 805  | \$ 0   | \$ 0   | \$ 0     | \$ 0     | \$ 0     | \$ 0     |
| Additional Profits:   | \$ 500  | \$ 500 | \$ 500 | \$ 500   | \$ 500   | \$ 500   | \$ 500   |
| Cash Flow Each Year:  | \$ -305 | \$ 500 | \$ 500 | \$ 500   | \$ 500   | \$ 500   | \$ 500   |
| Cumulative Cash Flow: | \$ -305 | \$ 195 | \$ 695 | \$ 1,195 | \$ 1,695 | \$ 2,195 | \$ 2,695 |

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It is to be understood that the Rain Bird Ag Cash Flow Software is an estimating tool and does not purport to guarantee any specific results. Individual conditions affecting agricultural results vary widely and are largely unpredictable. Rain Bird does not guarantee or assume responsibility for profits or results attained through the use of this planning and estimating tool. It provides the Ag Cash Flow Software solely for your use in planning your farming operations.



### Goschie Farms

Gayle Goschie and her brothers just celebrated 100 years of growing hops at their Silverton, Oregon farm. Part of their success is attributed to their ability to continue to incorporate modern farming practices over the years, including irrigation. For decades, Goschie farms irrigated with a large ‘gun’ sprinkler system which broadcast water widely to the entire crop. The water application efficiencies with sprinklers are considered to be 65% at the farm, and two pumps are required to deliver the water at the proper pressure.

In 2001, a 42-acre drip system using Rain Bird® PC Dripliner was installed to replace the gun sprinkler system. Stettler Supply in Salem, Oregon provided the design, materials and expertise. The improved drip delivery method allowed Goschie management to more accurately adjust the delivery rates and amounts of water for each

application, thereby creating more effective water usage. Goschie considers the drip system application efficiency to be 95% which is 30% better than the gun system. Since irrigation in Oregon is supplemental to rainfall, the amount applied through the drip system over the season is only 8"/acre. Thus, on 42 acres, the sprinkler system applies 54-acre feet of water to achieve the 8" desired, whereas the drip system applied only 31-acre feet of water. This is net savings of 23-acre feet on 42 acres, or nearly 7.5 million gallons of water, by using drip irrigation! But of course, that's not all.

Goschie Farms was able to realize other significant cost savings by adopting drip irrigation. First, energy costs were substantially reduced because one booster pump was completely eliminated, and another was turned down from 75 hp to 30 hp. This resulted in net savings of \$15 per acre. Irrigation labor was reduced from \$30 per acre to \$13 per acre as high quantities of low cost labor were replaced with a minimal quantity of medium cost management labor. Cultivation costs were reduced from \$60 per acre to \$15 per acre because weed growth was reduced under drip, and less mowing was required. Maintenance costs were reduced from \$20 per acre to \$18 per acre. Chemical costs were reduced from \$120 per acre to \$80 per acre because of a 20% reduction in fungicide use and a 50% reduction in aphicide use. The reduction in fungal growth and aphid populations is attributed to the reduced humidity associated with drip irrigation.

Perhaps most significantly, yields under drip have increased by 24%, from 6.5 bales per acre with sprinklers to 8.5 bales per acre with drip in 2004. With hops valued at \$3.00 per pound, the yield increase alone resulted in a revenue increase of \$1,200 per acre! Although more hops were harvested under drip, harvesting costs remained constant since harvesting efficiencies were increased. Fertilization costs also remained constant because the drip system used lower quantities of a higher cost, liquid fed fertilizer compared to the higher quantities of lower cost broadcast fertilizer used with the sprinkler system. Although costs were the same, the drip system provided additional value by allowing for a more precise application of crop nutrients on a weekly basis compared to four applications of granular fertilizer with the gun system.

What did these significant achievements cost? The graphs below illustrate that in addition to water savings, profitability is significantly increased with the adoption of improved irrigation technology. Using Cash Flow, we see that the cost to invest in the

drip irrigation system was only \$600 per acre, thus the additional profits of \$1,308 per year from increased revenue and decreased costs are only offset by \$600 per acre the first year. This results in a net gain of \$708 per acre the first year, and \$8,556 per acre, all things remaining the same, over the course of 7 years. This is an increased profit of nearly \$60,000 in seven years on 42 acres in addition to the 7.5 million gallons of water saved the first year! It is likely that with such decisions, Goschie Farms will be farming in another 100 years.

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Grower Name: Goschie Farm Date: 9-24-04  
 Field Location: Silverton, OR No. Acres: 42  
 Phone #: 503-932-8119 Crop: Hops  
 Project Filename: C:\Rain Bird Ag\Marketing\Cash Flow Software\Sep 04\Goschie 9-28-04.rcp

#### Project Analysis

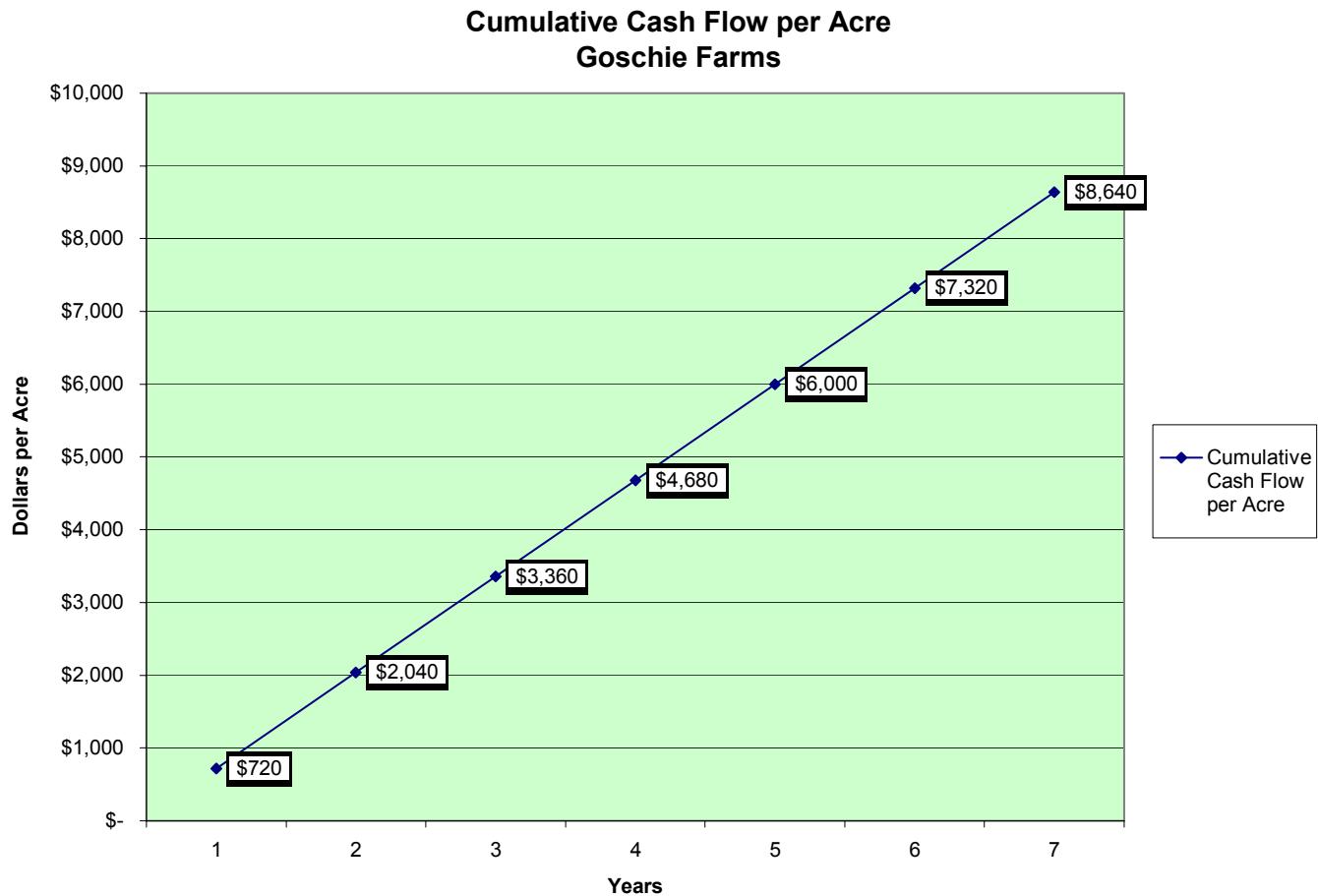
Project Cost Per Acre: \$ 600  
 Amount to be Financed: \$ 0  
 Additional Profit Per Acre: \$ 1,320

#### Cash Flow Per Acre

|                       | Year 1   | Year 2   | Year 3   | Year 4   | Year 5   | Year 6   | Year 7   |
|-----------------------|----------|----------|----------|----------|----------|----------|----------|
| Project Costs:        | \$ 600   | \$ 0     | \$ 0     | \$ 0     | \$ 0     | \$ 0     | \$ 0     |
| Additional Profits:   | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 |
| Cash Flow Each Year:  | \$ 720   | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 | \$ 1,320 |
| Cumulative Cash Flow: | \$ 720   | \$ 2,040 | \$ 3,360 | \$ 4,680 | \$ 6,000 | \$ 7,320 | \$ 8,640 |

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### **Tom Rogers Farm**

Tom's family has been growing almonds in Madera for over 20 years. Their 135-acre ranch consists of trees of various ages, but all are highly productive and command premium prices due to quality. Tom is a leader in his community and is interested in doing his part to irrigate properly. Towards that end, he has recently begun several upgrades that have saved him labor and management time, and will ultimately save him water too.

In 2003, Tom invested in Rain Bird® Cast Iron Valves, Cyclik™ controllers and LF1200™ sprinklers. His primary goal was to save labor and management time since, oftentimes, it was he that changed the valves and checked the sprinklers. Tom felt that higher value activities should occupy his time, and that automation was key. Tom first upgraded his sprinklers because “without reliability, I cannot automate.” Once the

system was reliable, the investment in the wireless control system allowed him to program the valves to come on and off at the right time without extensive support from labor or management. The cost of the upgrade was \$452 per acre including \$236 per acre for sprinklers, \$118 per acre for controls, valves and sensors, and \$98 per acre for miscellaneous pipe, fittings and labor. Western Ag and Turf in Madera provided the design, materials and expertise.

This past year, upgrading the system saved Tom significant labor and management time. Specifically, he reduced irrigation labor costs from \$36 per acre to \$9 per acre, and management time from \$358 per acre to \$89 per acre. As illustrated in the Cash Flow graphs below, Tom paid for the system within two years, and the investment yielded \$1,620 per acre in additional profits over a seven-year time period. On 47 acres this amounts to over \$76,000 over seven years!

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|  |                 |
|--|-----------------|
| Grower Name: Tom Rogers  | Date: 20 Sep 04 |
| Field Location: Madera, CA   | No. Acres: 47   |
| Phone #: 559-930-0340  | Crop: Almonds   |
| Project Filename: C:\Rain Bird Ag\Marketing\Cash Flow Software\Sep 04\Tom Rogers 26 Sep DB.rcp |                 |

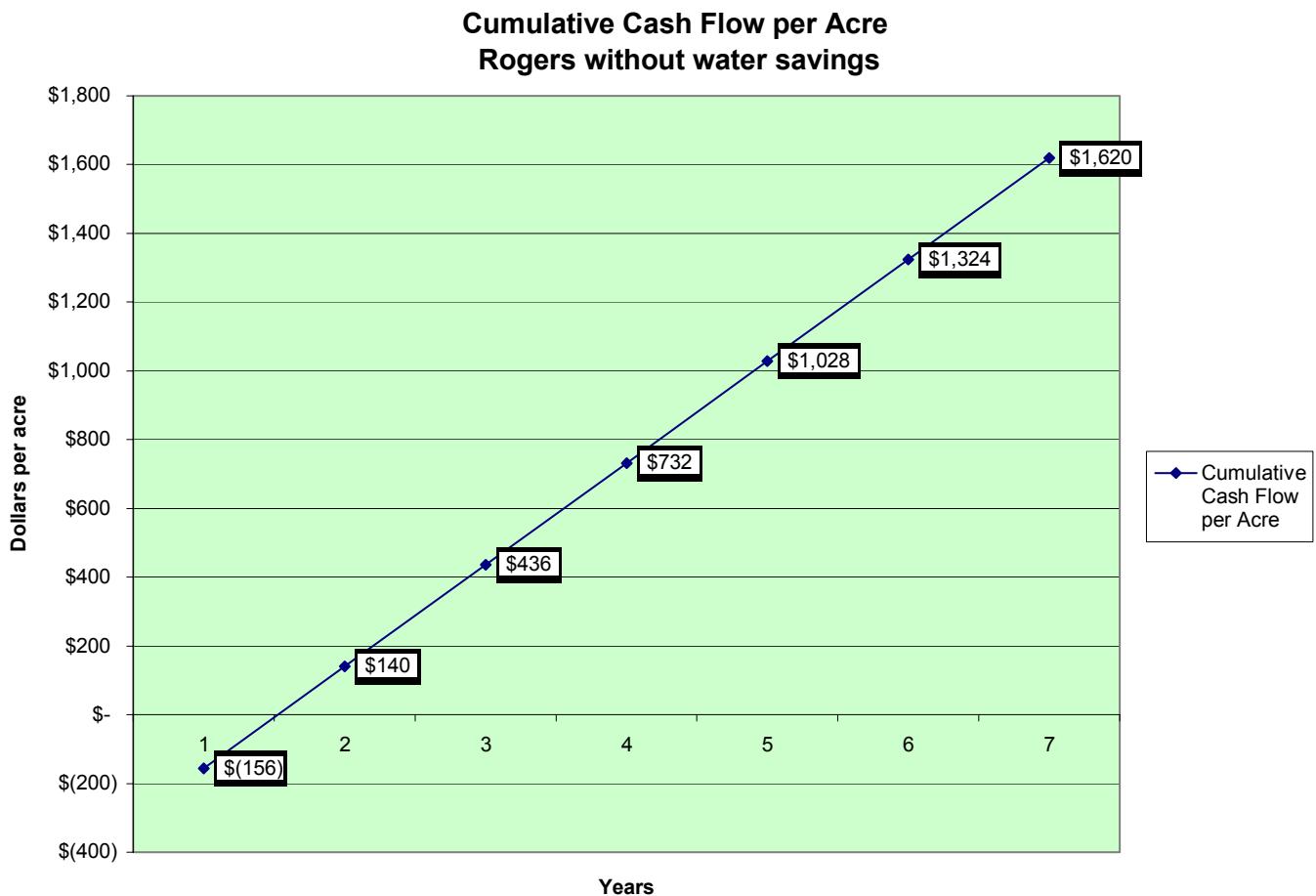
**Project Analysis**

Project Cost Per Acre: \$ 452  
Amount to be Financed: \$ 0  
Additional Profit Per Acre: \$ 296

**Cash Flow Per Acre**

|                       | Year 1  | Year 2 | Year 3 | Year 4 | Year 5   | Year 6   | Year 7   |
|-----------------------|---------|--------|--------|--------|----------|----------|----------|
| Project Costs:        | \$ 452  | \$ 0   | \$ 0   | \$ 0   | \$ 0     | \$ 0     | \$ 0     |
| Additional Profits:   | \$ 296  | \$ 296 | \$ 296 | \$ 296 | \$ 296   | \$ 296   | \$ 296   |
| Cash Flow Each Year:  | \$ -156 | \$ 296 | \$ 296 | \$ 296 | \$ 296   | \$ 296   | \$ 296   |
| Cumulative Cash Flow: | \$ -156 | \$ 140 | \$ 436 | \$ 732 | \$ 1,028 | \$ 1,324 | \$ 1,620 |

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Although the irrigation system uniformity at Rogers farm was improved approximately 10% with the purchase of new sprinklers, Tom did not take advantage of that feature the first year; he applied 3.75 acre-feet of water to all of his trees regardless of sprinkler uniformity values. If he takes advantage of the higher uniformity performance of the new sprinklers and runs them a shorter duration next year, Tom could save 25-acre feet of water or more on his 47 acres, a saving of over 8 million gallons of water! In addition, the cost of his energy and water could be reduced from approximately \$175 per acre to approximately \$147 per acre for a net additional saving of approximately \$28 per acre. If this potential savings were added to the labor savings already mentioned, Tom could reap an additional \$1,816 of profits per acre over seven years. On 47 acres, this amounts to over \$85,000 of additional profits over seven years in addition to saving 8 million gallons of water or more each year!



## Rain Bird Ag Cash Flow Software

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Grower Name: Tom Rogers Date: 20 Sep 04  
 Field Location: Madera, CA No. Acres: 47  
 Phone #: 559-930-0340 Crop: Almonds  
 Project Filename: C:\Rain Bird Ag\Marketing\Cash Flow Software\Sep 04\Tom Rogers with water savings1.rcp

### Project Analysis

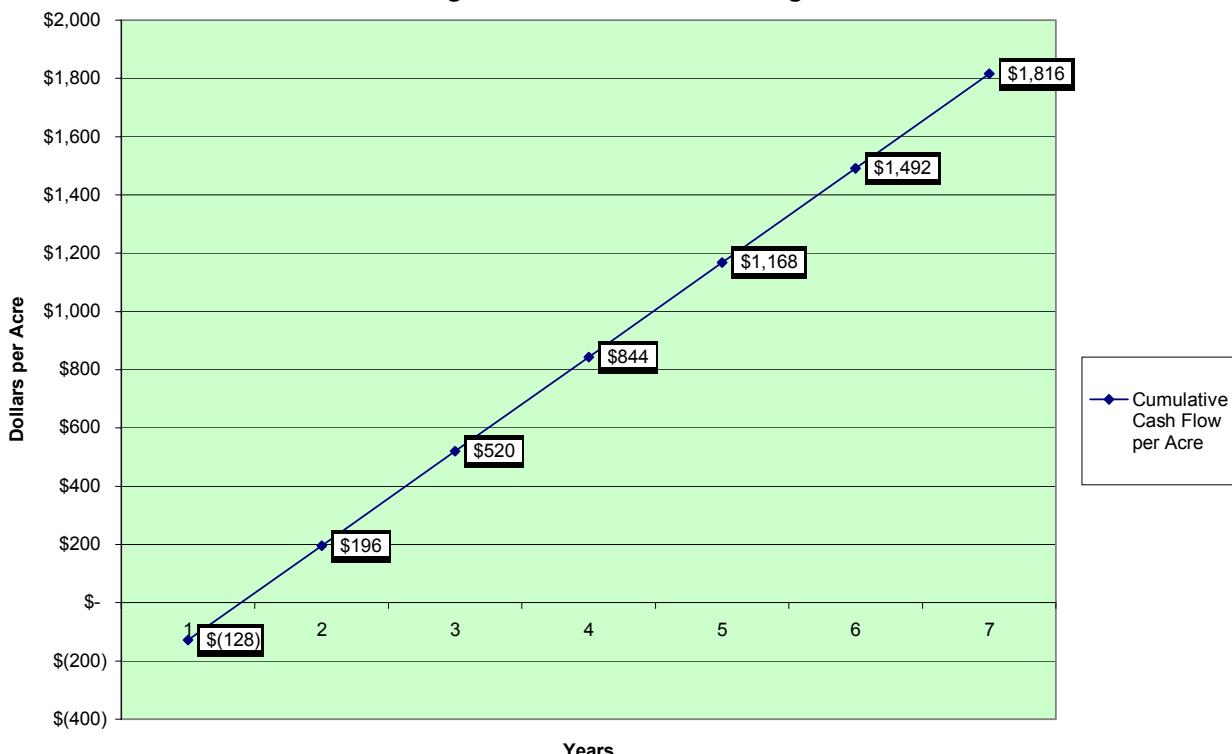
Project Cost Per Acre: \$ 452  
 Amount to be Financed: \$ 0  
 Additional Profit Per Acre: \$ 324

### Cash Flow Per Acre

|                       | Year 1  | Year 2 | Year 3 | Year 4 | Year 5   | Year 6   | Year 7   |
|-----------------------|---------|--------|--------|--------|----------|----------|----------|
| Project Costs:        | \$ 452  | \$ 0   | \$ 0   | \$ 0   | \$ 0     | \$ 0     | \$ 0     |
| Additional Profits:   | \$ 324  | \$ 324 | \$ 324 | \$ 324 | \$ 324   | \$ 324   | \$ 324   |
| Cash Flow Each Year:  | \$ -128 | \$ 324 | \$ 324 | \$ 324 | \$ 324   | \$ 324   | \$ 324   |
| Cumulative Cash Flow: | \$ -128 | \$ 196 | \$ 520 | \$ 844 | \$ 1,168 | \$ 1,492 | \$ 1,816 |

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### Cumulative Cash Flow Per Acre Rogers Farm with Water Savings



## **Summary**

In summary, water conservation is important and warrants investment in irrigation technology because of the substantial amounts of water that can be saved. However, the capabilities inherent in water conservation equipment often reduces farm costs and increases farm income so much that the cost of buying water conservation equipment is usually offset within the first few years after adoption. This makes investing in water conservation equipment a win-win for both growers and the communities where they operate because water is saved and farm profitability is increased.