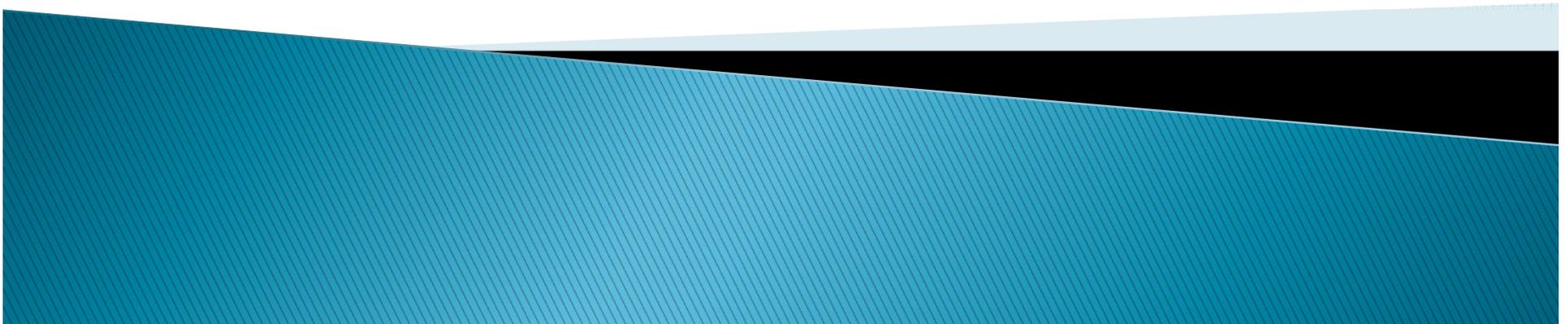


# A Cost–Benefit Analysis of Drip Irrigation

By: Aaron Hutson



# How A Drip Irrigation System Works

- ▶ Applies water directly to plant's root zone
- ▶ Uses drip lines with emitters to accomplish this
- ▶ System has pressure regulators, chemical injectors and control equipment to get water to drip lines
- ▶ Can be automated more than other systems



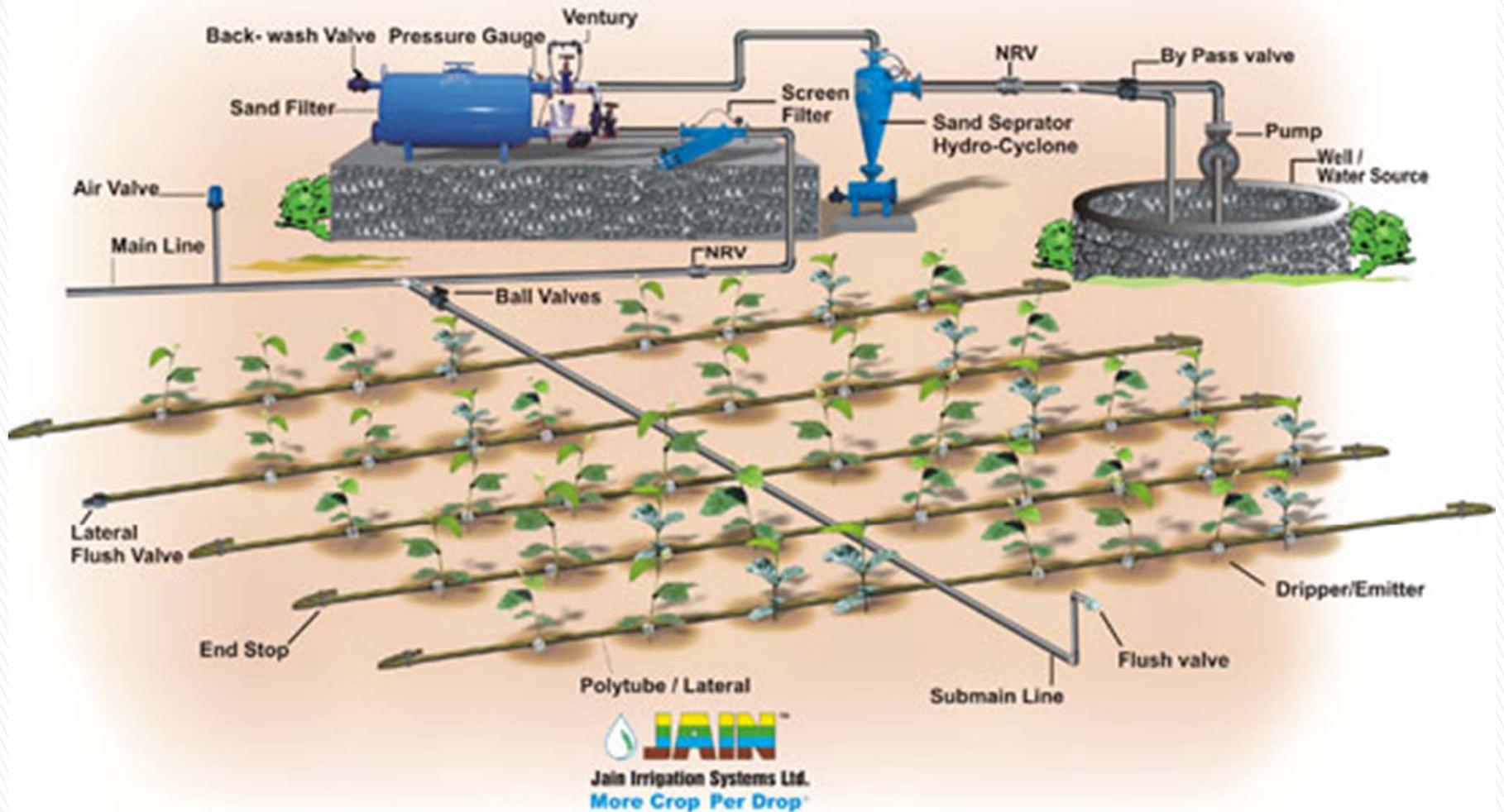


Photo from:  
[http://www.justbiit.com/cms/irrigation/?Drip\\_Irrigation\\_Vs\\_I-SyS](http://www.justbiit.com/cms/irrigation/?Drip_Irrigation_Vs_I-SyS)

# University of Nebraska Studies

- ▶ 2 years, 2005 and 2006
- ▶ Found that water stress will have a negative impact on yields
- ▶ Found that drip irrigation will improve the crop's water use efficiency
- ▶ Improved efficiency can lead to lower irrigation costs



# Kansas State University

- ▶ System has been in use since 1989
- ▶ System has not had any major problems or failures while in use
- ▶ Study observed that drip irrigation life expectancy allows it to be competitive with center pivot systems
- ▶ Observed lower nitrogen build up in groundwater when nitrogen was fertigated with drip irrigation system



# California Irrigation Conversion

- ▶ There are about 73,000 acres that have converted from flood and sprinkler systems to drip irrigation systems
- ▶ Most conversion is due to drip irrigation with groundwater pumping being more reliable and efficient
- ▶ There are a lot of farmers planting almonds, drip irrigation offers excellent irrigation guarantees
- ▶ Some farmers won't convert, mostly due to poor groundwater availability or quality



# Initial Investment Costs

- ▶ Flood/Furrow system: about \$165/acre
- ▶ Center pivot system: about \$367/acre
- ▶ Drip irrigation system: about \$832/acre
- ▶ Also need to consider: anticipated water availability, soil type, field shape, field size, anticipated crop price, anticipated yield, anticipated input costs



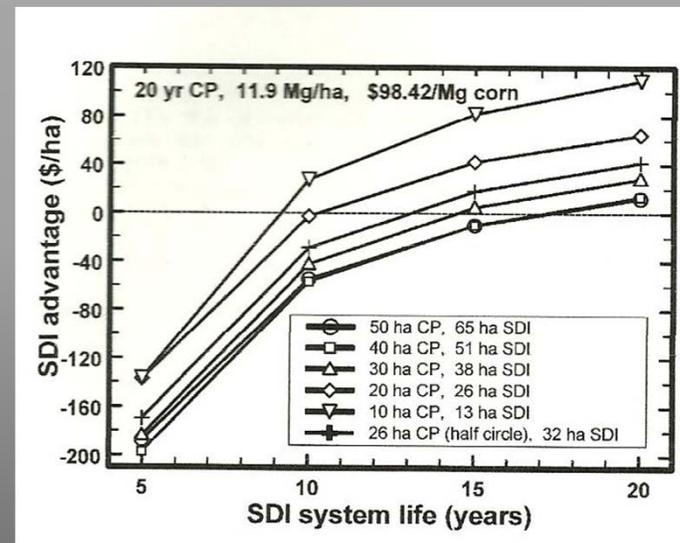
# Water Use Efficiency

- ▶ Flood/Furrow system: about 65%
- ▶ Center pivot system: about 85%
- ▶ Drip irrigation system: about 95%–99%
- ▶ Factors impacting efficiency: Soil type, terrain, crop health, weather



# Center Pivot vs. Drip Irrigation

- ▶ Time for drip irrigation system to pay its initial investment back vs. Center Pivot
- ▶ Both systems life expectancy: 20 years



# Overall Possible Returns

- ▶ This farmer had some government financial assistance
- ▶ Field size unknown
- ▶ Drip system allowed for better profits from reduced inputs and increased yield

**Drip Irrigation Payback in Years Based on Actual Results\***

	Drip Scenario 1:	Drip Scenario 2:	Drip Scenario 3:	
<b>Drip Irrigation System Investment</b>	\$1,200	\$1,200	\$1,100	per acre
EQIP Cost Share	\$0.0	\$0.0	\$330.0	30% of cost
<b>Grower Investment</b>	<b>\$1,200.0</b>	<b>\$1,200.0</b>	<b>\$770.0</b>	per acre
<b>Potential Yield Increase with Drip</b> (assuming 175 bu/ac with Gravity)	50	50	100	bushels/acre
Corn Price	\$3.50	\$2.50	\$3.50	per bushel
<b>Potential Additional Revenue</b>	<b>\$175.00</b>	<b>\$125.00</b>	<b>\$350.00</b>	per acre
<b>Potential Savings</b>				
Fuel Savings	\$25.00	\$25.00	\$25.00	per/acre
Labor Savings	\$26.62	\$26.62	\$26.62	per/acre
Chemical/Fungicide Savings	\$27.50	\$27.50	\$27.50	per/acre
Fertilizer Savings	\$43.88	\$43.88	\$43.88	per/acre
Cultivation Savings	\$37.50	\$37.50	\$37.50	per/acre
<b>Potential Cost Savings</b>	<b>\$160.50</b>	<b>\$160.50</b>	<b>\$160.50</b>	per/acre
<b>Payback Calculation †</b>	<b>3.6</b>	<b>4.2</b>	<b>1.5</b>	<b>Years</b>

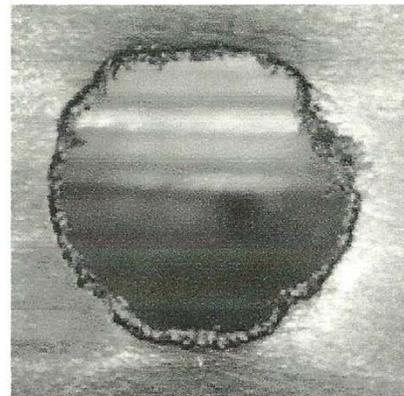
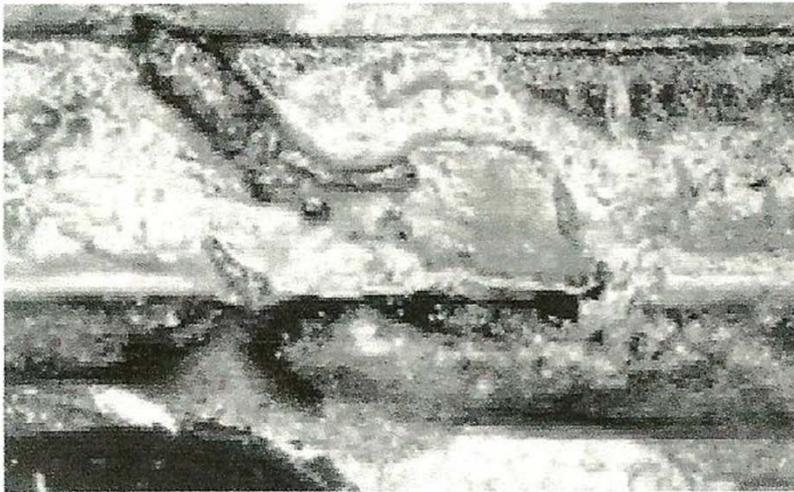
\*Results based on specific conditions - variations may apply.  
 † Grower Investment divided by sum of Potential Additional Revenue and Potential Cost Savings.  
 Drip Scenario 1: No Subsidy: 50 bu/ac yield increase: \$3.50/bu  
 Drip Scenario 2: No Subsidy: 50 bu/ac yield increase: \$2.50/bu  
 Drip Scenario 3: EQIP Subsidy: 100 bu/ac yield increase: \$3.50/bu

# Common Problems

- ▶ Root intrusion into drip tape
- ▶ Insect damage to drip tape
- ▶ Rodents damaging drip tape
- ▶ Some soils are fine enough particle size to enter drip tape through emitters
- ▶ Some bacteria may combine with soil particles to plug emitter



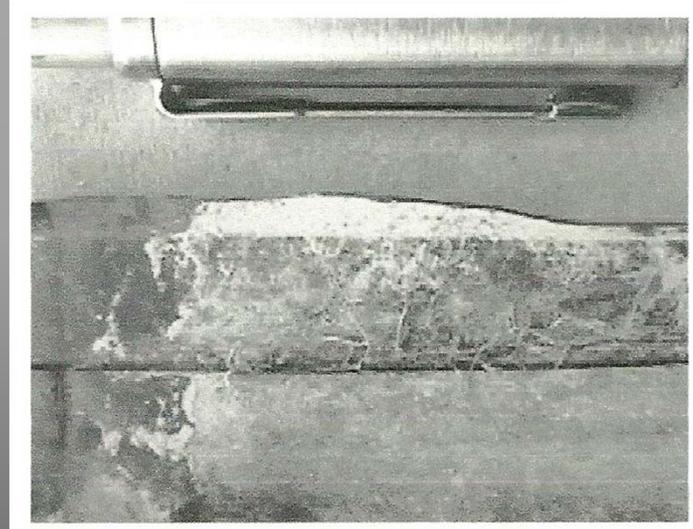
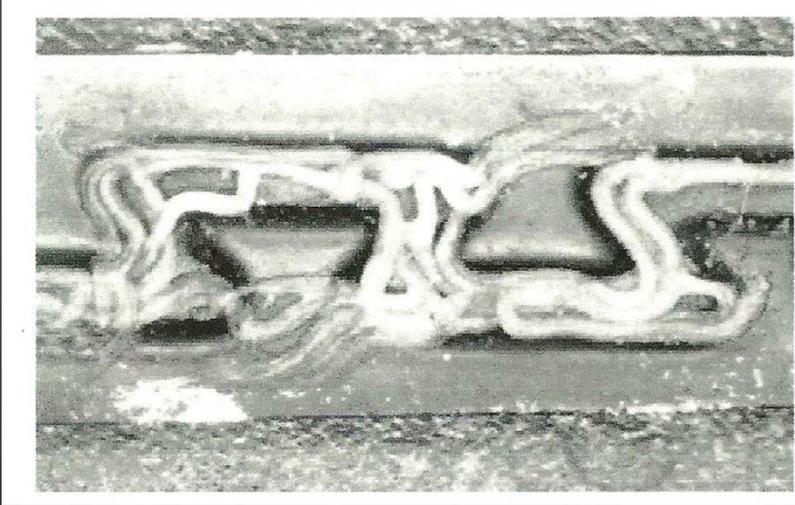
# Common Problems (cont.)



Bacteria and soil combining  
to plug emitter

Insect damage

# Root Intrusion



# Rodent Damages



# Solutions to Problems

- ▶ Insecticide injection to kill insects
- ▶ Chlorination and other chemical treatments to kill bacteria
- ▶ Herbicide injection to kill roots
- ▶ No good solution known for rodents at this time



# Conclusions

- ▶ Drip irrigation has high initial costs, but does have the potential to pay for itself fairly quickly
- ▶ Drip irrigation has better water efficiency, making it a good choice in low water or water restricted areas
- ▶ Depending on your willingness to do so, drip irrigation is a good investment overall



Questions?