

United States Department  
of Agriculture,

Natural Resources  
Conservation Service

Conservation Innovation  
Grant 69-3A75-17-53

# Subsurface Drip Irrigation System

# Utilizing Dairy Manure Effluent



WUD

WESTERNUNITEDDAIRIES

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UNIVERSITY OF CALIFORNIA  
Agriculture and Natural Resources

UC Cooperative Extension



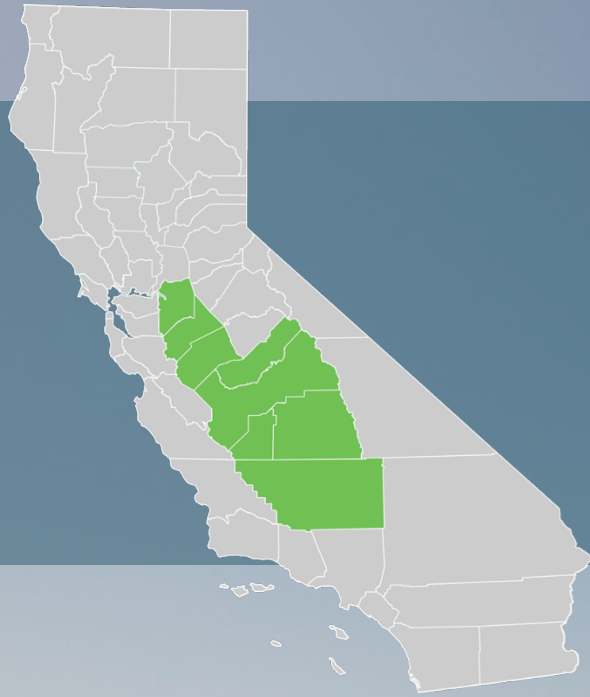
Sustainable Conservation



United States  
Department of  
Agriculture

Natural Resources Conservation Service

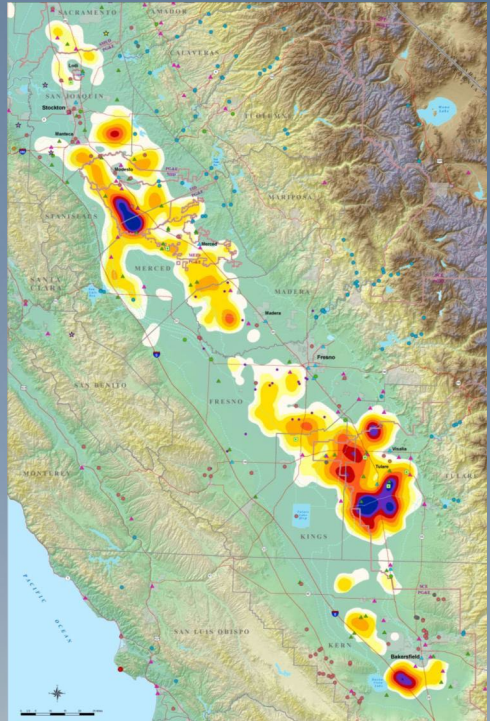
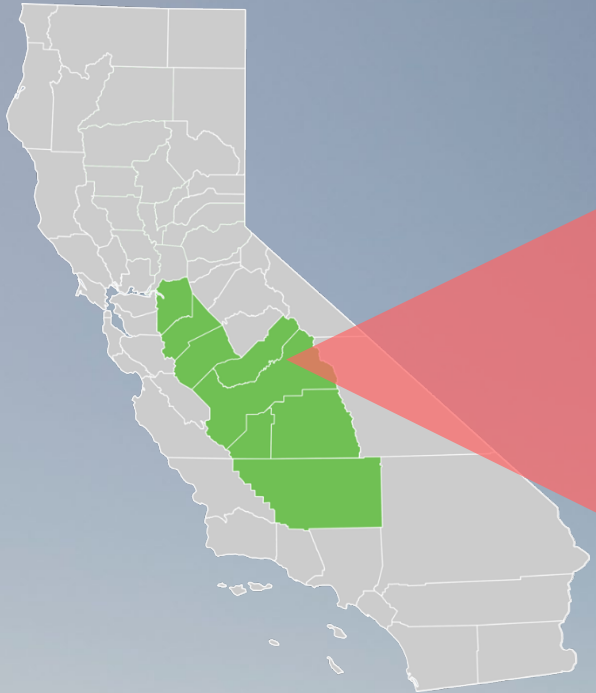




- **#1** milk-producing state 18%
- **\$6.37B** cash receipts in 2018
- **50,000** jobs in 2014











SUBSURFACE DRIP IRRIGATED FIELD

DAIRY

FILTRATION

LAGOON 2

SOLID SEPARATOR

LAGOON 1

















McRee



De Jager



West Star





# Applying Liquid Manure Through Subsurface Drip Irrigation Service

## Emissions in Dairy Forage Production



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Assistance / Environmental Quality Incentives Program

Stay Connected

# UC DAVIS STUDY

## Greenhouse Gas Emissions

### Objectives

- Compare the effects of subsurface drip- and flood-irrigation on yield, water and nitrogen (N) use, and nitrous oxide emissions in silage corn.
- Using liquid and solid manure as sole N sources in subsurface drip and flood irrigated systems, as well as during the winter rainy season.
- Optimize fertigation with liquid manure.

### Methods



- Location: Chowchilla, California Central Valley.
- Automated adjustment of manure water flow based on electrical conductivity to keep N concentration constant.
- Sand separators and filtration of manure/fresh water blend with periodic back flushing with fresh water.
- Prototype system capable of irrigating/fertigating 16 ha corn crop divided into three blocks (max. three 8-hour sets per day).
- Nitrous oxide fluxes measured with static chamber technique
- Strip tillage and surface application of solid manure; SDI treatment; incorporation of solid manure by tillage

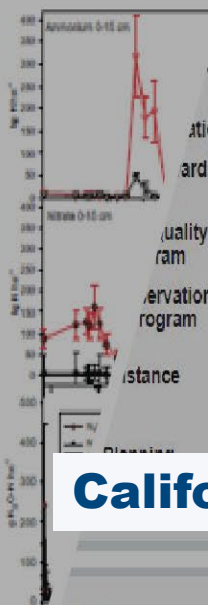


Fig. EQIP Factsheet

EQIP Factsheet

## Environmental Quality Incentives Program



# EQIP NRCS

## Practice Standard Adoption

### California = \$2,871.00 per acre

From weather to pests, each American farmer faces a unique set of challenges. The Environmental Quality Incentives Program (EQIP) provides financial and technical assistance to help farmers address natural resource concerns and deliver environmental benefits such as conserved ground and surface water, reduced soil erosion and sedimentation, and improved habitat.

### Benefits

This voluntary conservation program helps producers make conservation investments that conserve natural resources for their operations.

EQIP  
 Environmental Quality Incentives Program

State Water Efficiency & Enhancement Program

## State Water Efficiency & Enhancement Program

The State Water Efficiency and Enhancement Program (SWEET) provides financial assistance to help producers invest in conservation irrigation systems that reduce greenhouse gases and save water on California agricultural operations. Key components include (among others) soil moisture monitoring, drip systems, switching to energy-efficient pumps, pump retrofits, variable frequency drives and installation of renewable energy to reduce energy costs.

# SWEET CFDA

and enhancement

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# Change in Net Income

WITHOUT EQIP			
INCREASED REVENUE:	\$ 255.00	INCREASED COST:	\$ 189.71
Yield		Inputs (energy, maintenance, germination)	
DECREASED COST:	\$ 123.78	INCREASED COST:	\$ 107.25
Inputs (water, fertilizer)		Labor (maintenance, germination)	
DECREASED COST:	\$ 84.00	INCREASED COST:	\$ 342.32
Labor (system operation)		Depreciation	
<b>Total Increased Net Income</b>	<b>\$ 462.78</b>	<b>Total Decreased Net Income</b>	<b>\$ 639.32</b>

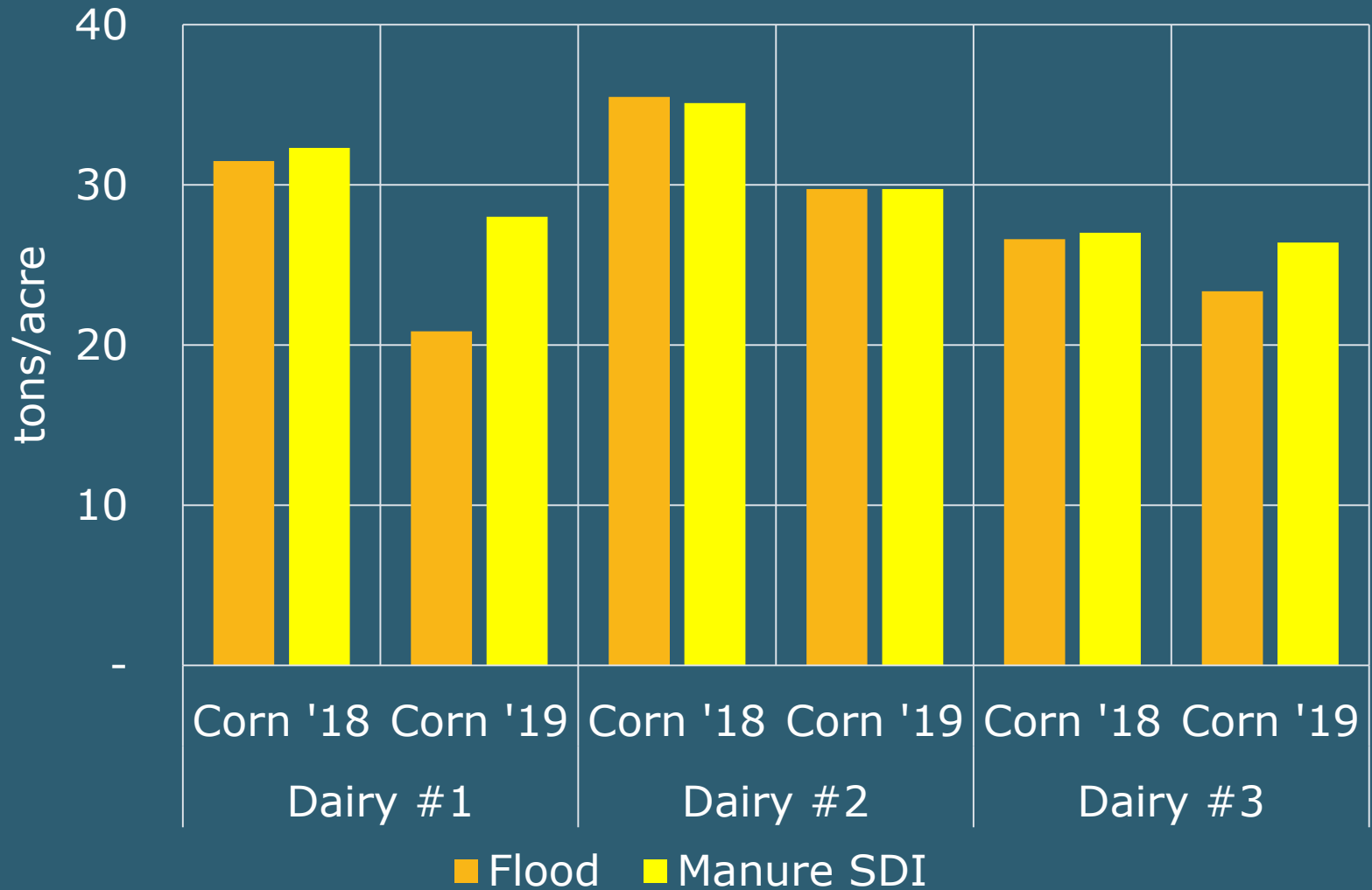
**ANNUAL PER ACRE DECREASE IN NET INCOME = (\$ 176.54)**

WITH EQIP			
INCREASED REVENUE:	\$ 255.00	INCREASED COST:	\$ 189.71
Yield		Inputs (energy, maintenance, germination)	
DECREASED COST:	\$ 123.78	INCREASED COST:	\$ 107.25
Inputs (water, fertilizer)		Labor (maintenance, germination)	
DECREASED COST:	\$ 84.00	INCREASED COST:	\$ 55.26
Labor (system operation)		Depreciation	
<b>Total Increased Net Income</b>	<b>\$ 462.78</b>	<b>Total Decreased Net Income</b>	<b>\$ 352.22</b>

**ANNUAL PER ACRE INCREASE IN NET INCOME = \$ 110.56**

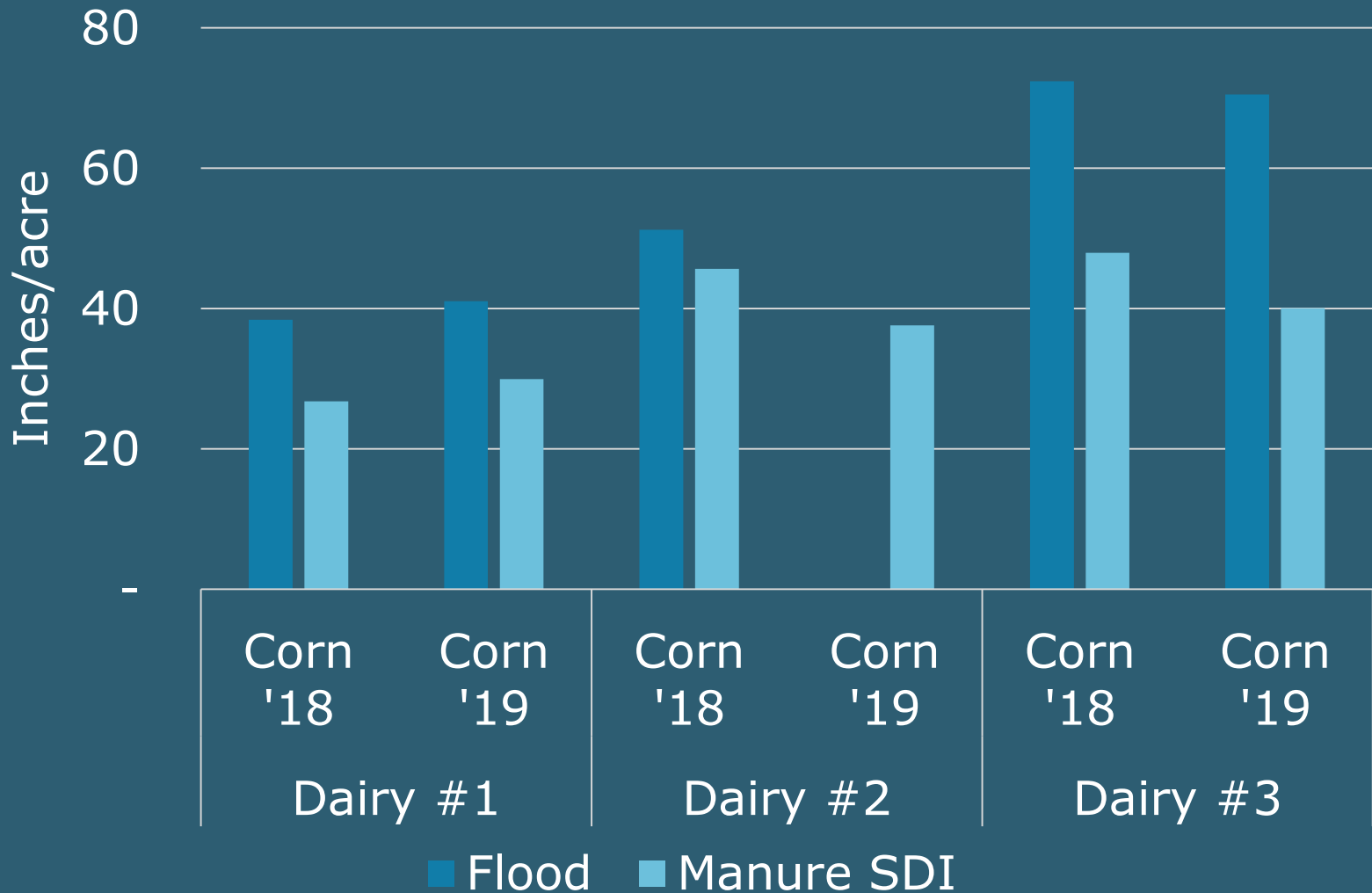


# *Yields*



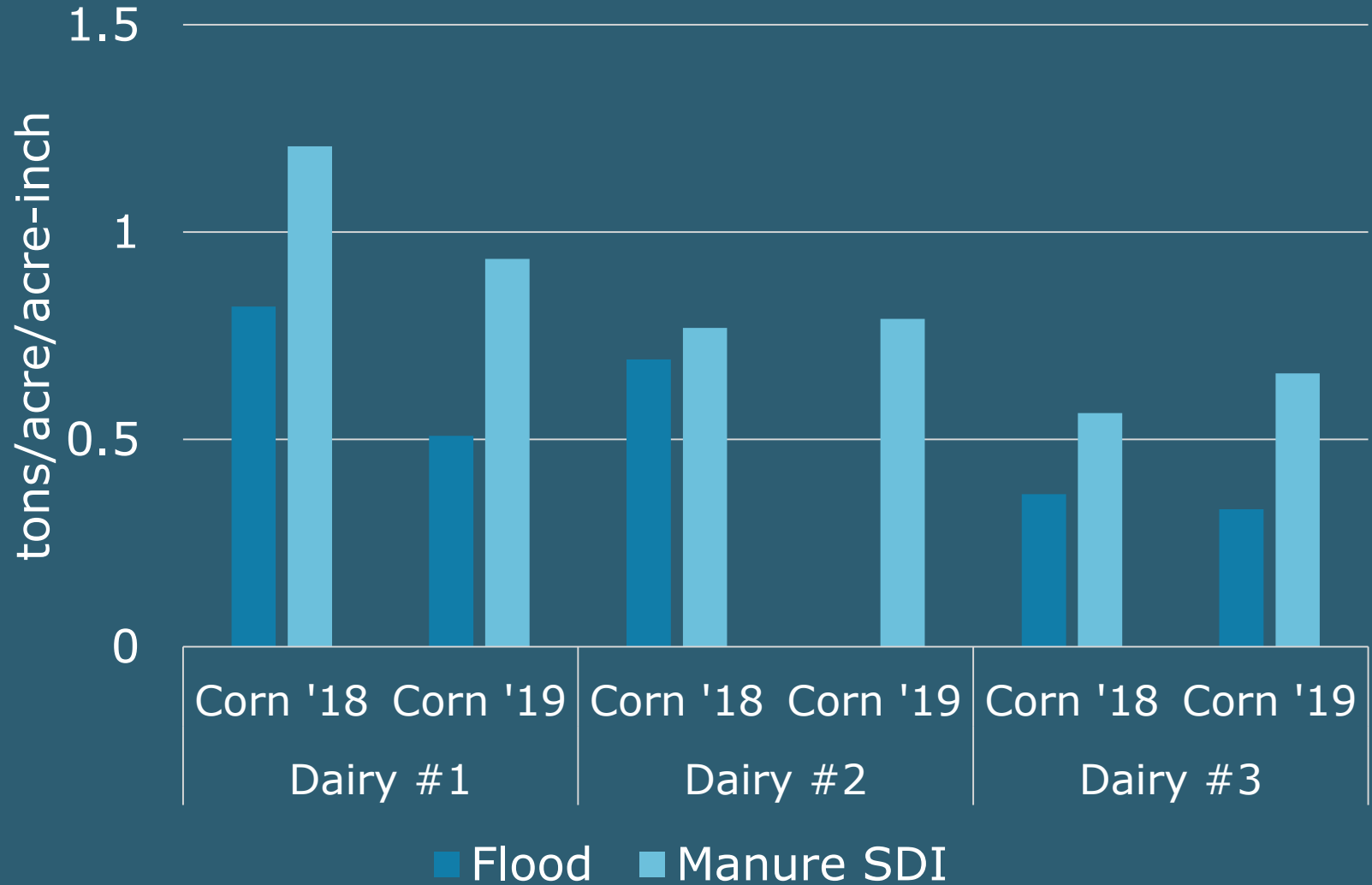


# *Water Applied*



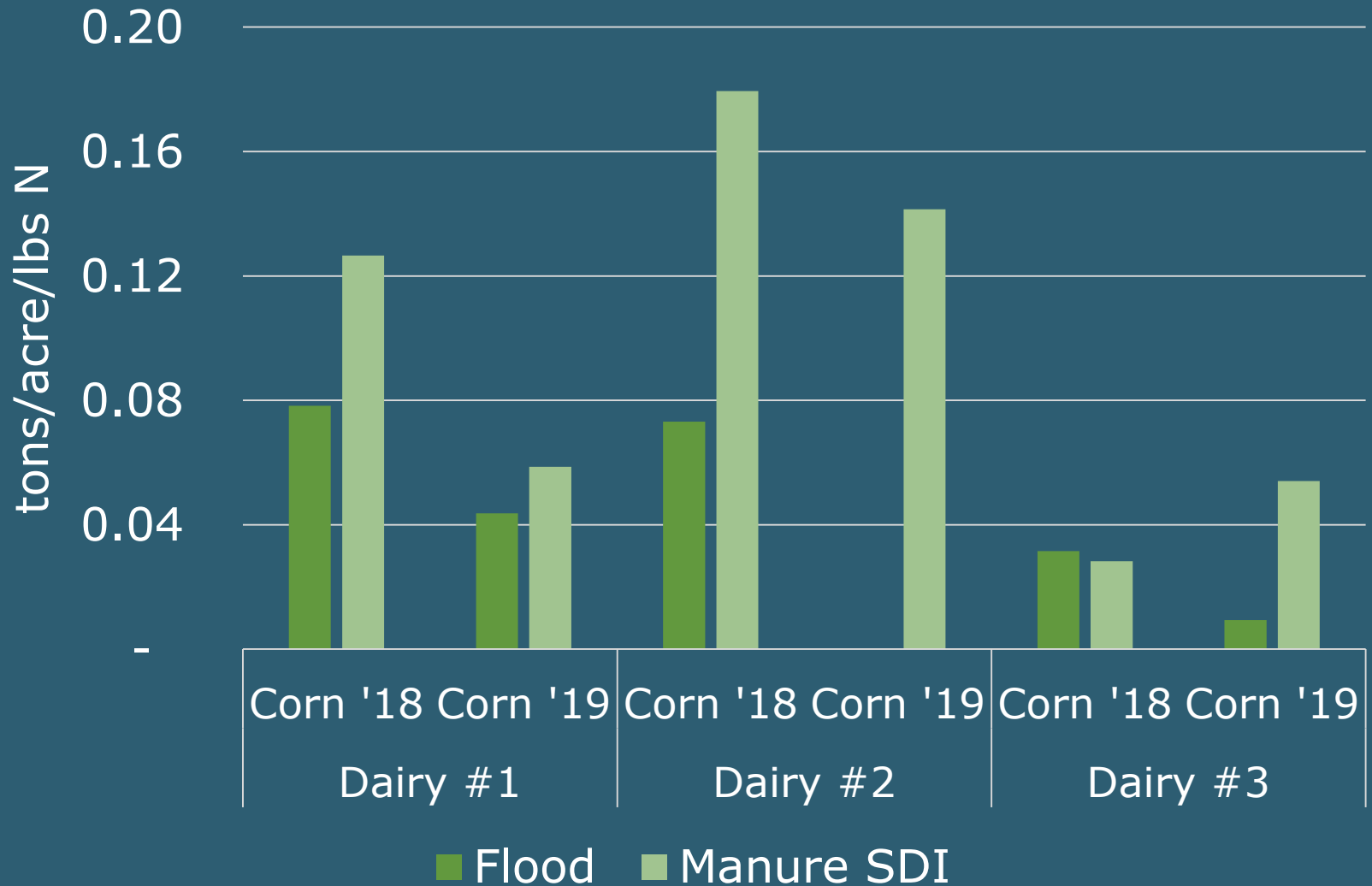


# Water Use Efficiency





# *Nutrient Use Efficiency*



# *Lessons Learned*

- Whole farm nitrogen balance
- Management and staff capacity
- Secondary or tertiary lagoon
- Dedicated manure pipeline



# Take Away

- Increases yields
- Increases water use efficiency
- Reduces overall water use
- 6 years of testing with proven results
- Automated system
- Up to 90% Reduction of Greenhouse Gas Emissions
- NRCS cost share of \$2871.00/acre
- Increases Annual Net Income per acre



# *Future for the Partners*



**UNIVERSITY OF CALIFORNIA**  
Agriculture and Natural Resources

UC Cooperative Extension



De Jager Farms | McRee Dairy | West Star Dairy





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**Reports available at**  
[www.suscon.org/technical-resources](http://www.suscon.org/technical-resources)