University of California
Agriculture and Natural Resources
Making a Difference for California

California Sorghum Silage

Jennifer Heguy – UC Cooperative Extension Farm Advisor
Merced, Stanislaus & San Joaquin Counties
Deanne Meyer – UC Cooperative Extension Specialist
UC Davis

Sorghum Silage for California Dairies, March 7 & 9, 2017, Madera & Tulare

Outline

- Overview of UC sorghum silage project
- Sorghum management surveys
- 2016 sorghum silage samples
- What's next?

University of California
Agriculture and Natural Resources
Making a Difference for California

Alternative forages: how does sorghum fit into existing nutrient management and feeding systems in California

Sorghum Project Goals

- Determine the value of sorghum as silage in California dairy farm systems with regards to:
  - efficiency of irrigation water use,
  - quantity and nutritional quality of the silage produced,
  - as well as the ability to comply with current crop nutrient management regulations.

Sorghum Project Goals

- Years one & two:
  - water use and efficiency of sorghum varieties;
  - sorghum silage management practices, nutrient profile, fermentation characteristics.
- Years three & four:
  - **feeding study** with lactating cows to determine maximum inclusion rates of the most promising sorghum silages without compromising animal performance & health

University of California
Agriculture and Natural Resources

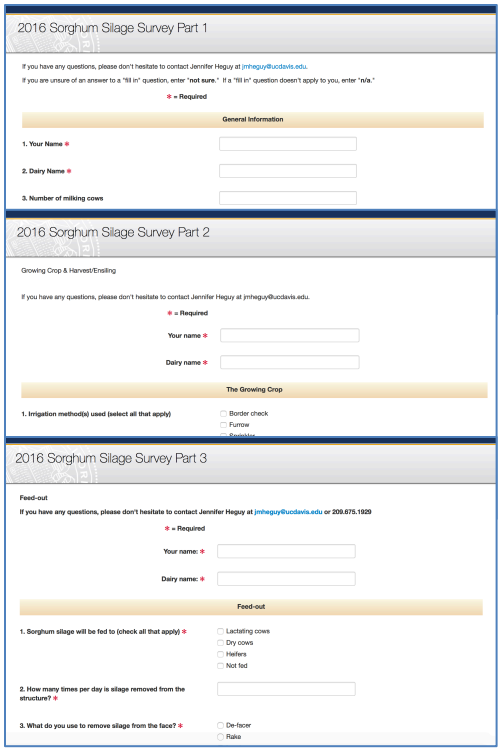
Making a Difference for California

Sorghum Silage Management Surveys

Objectives & Methods

Gather information on current sorghum management practices from seed to feed out.

- Questions broken up into three, short electronic surveys:
    1. Pre-plant & planting
    2. Growing, harvesting & ensiling
    3. Feed out
- Links emailed & texted to participating producers



Survey Results

General Information; 16 dairies enrolled, 14 returned survey #1

- Locations:
  - Stanislaus (1); Merced (1); Madera (2); Fresno (1); Tulare (8); Kings (3)
- Herd size: 320 – 5,500 milking cows (median=2,013)
- Sorghum acres: 42 – 574 acres (median 188)
- Years growing sorghum (past 5 years)
  - Average: 2.8 years
  - 1st year growing sorghum for 4 producers

Survey Results

- Crop prior to sorghum
  - 1 corn silage
- Planting dates (n=14)
  - April (2); May (6); June (5); July (1)
- Sorghum type:
  - Brown midrib = 10
  - Grain = 5
  - Unknown = 1

Survey Results

- Structure type:
  - Piles = 12
    - One pile (n=7), two piles (n=3) or three piles (n=2)
  - Bags = 4
    - All ≥ 5 bags
- Silage surface:
  - 50% on dirt
  - 50% on concrete/gravel

University of California
Agriculture and Natural Resources
Making a Difference for California

2016 sorghum silage samples

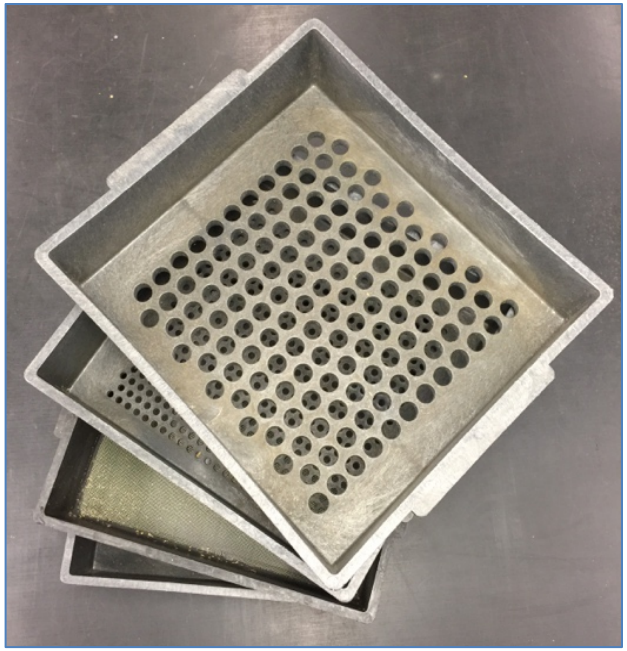
Objectives & Methods

Snapshot of sorghum grown for silage on California dairies.

- At harvest, 10 consecutive truckloads of chopped sorghum were sampled and composited
  - Sent off for wet chemistry analysis
  - Particle separator analysis
- Delivery rate
  - Range: 12 – 78 minutes (median = 40)
- All dairies utilized custom harvesting services

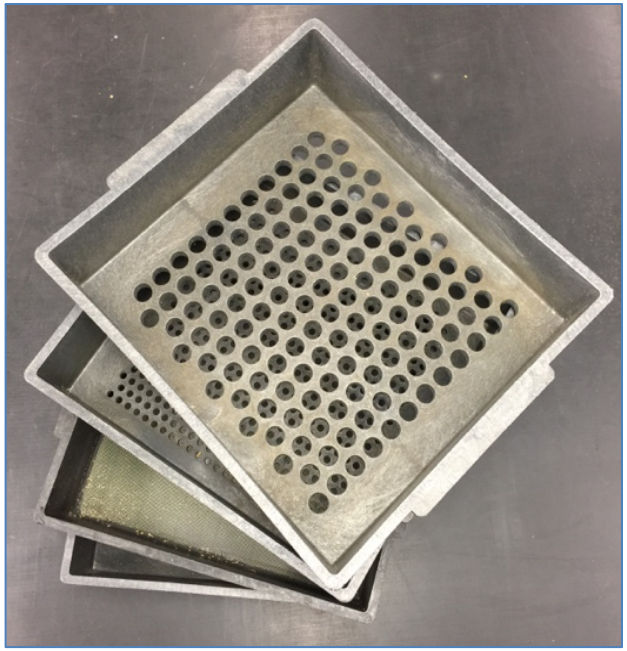
Particle Separator

- Measures particle size distribution
  - Can be monitored during harvest to look at particle size/cut length and processing
- Recommendations depend on formulated ration



Particle Separator

Screen	Pore Size (inches)	Particle Size (inches)	Corn Silage	Haylage
Upper Sieve	0.75	>0.75	3 to 8%	10 to 20%
Middle Sieve	0.31	0.31 to 0.75	45 to 65%	45 to 75%
Lower Sieve	0.05	0.07 to 0.31	30 to 40%	20 to 30%
Bottom Pan	.	<0.07	<5%	<5%



Particle Separator

Screen	Sorghum Average	Sorghum Median	Corn Silage	Haylage
Upper Sieve	**28%**	**27%**	3 to 8%	10 to 20%
Middle Sieve	**51%**	**52%**	45 to 65%	45 to 75%
Lower Sieve	**19%**	**21%**	30 to 40%	20 to 30%
Bottom Pan	**2%**	**2%**	<5%	<5%

Tray 3: all dairies < 30%; Tray 4: all dairies < 5%

Why is there so much material in tray 1?

Greater chop length? Harder to chop? Sugar-cane aphid?

Why is there so little material in tray 3?

Lack of grain? Sugar-cane aphid?

Particle Separator

Tray	Sample A	Sample B
Upper Sieve	9%	59%
Middle Sieve	59%	33%
Lower Sieve	29%	7%
Bottom Pan	3%	>1%

Nutrient Analysis

Nutrient Composition of BMR Sorghum (n = 10)

	DM	CP	ADF	NDF	Ash	Lignin	Starch	NDFD 30	NFC
Average	28.3	9.7	34.4	50.2	12.4	3.3	9.8	50.2	25.5
Median	28.3	9.7	34.7	50.4	11.7	3.3	9.6	51.2	26.4
Minimum	23.2	7.7	30.4	44.9	9.2	1.8	2.5	35.1	14.4
Max	34.6	11.4	39.3	55.3	21.5	4.8	22.3	60.3	32.9

NDFD 30:

Goal: 62.9 (85^{th} percentile)

Average: 53.8

Minimum: 42.7 (15^{th} percentile)

Based on population statistics from 4 years of data with 600k + US samples

Nutrient Analysis

Nutrient Composition of Grain Sorghum (n = 5)

	DM	CP	ADF	NDF	Ash	Lignin	Starch	NDFD 30	NFC
Average	28.6	9.8	34.7	48.2	11.9	2.7	13.6	43.4	27.8
Median	28.2	10.6	34.0	45.6	12.2	2.8	14.5	41.2	28.9
Minimum	25.3	7.5	30.5	44.9	9.5	1.7	1.9	39.7	18.8
Max	32.5	11.7	40.2	53.3	15.4	3.4	22.5	53.2	35.6

NDFD 30:

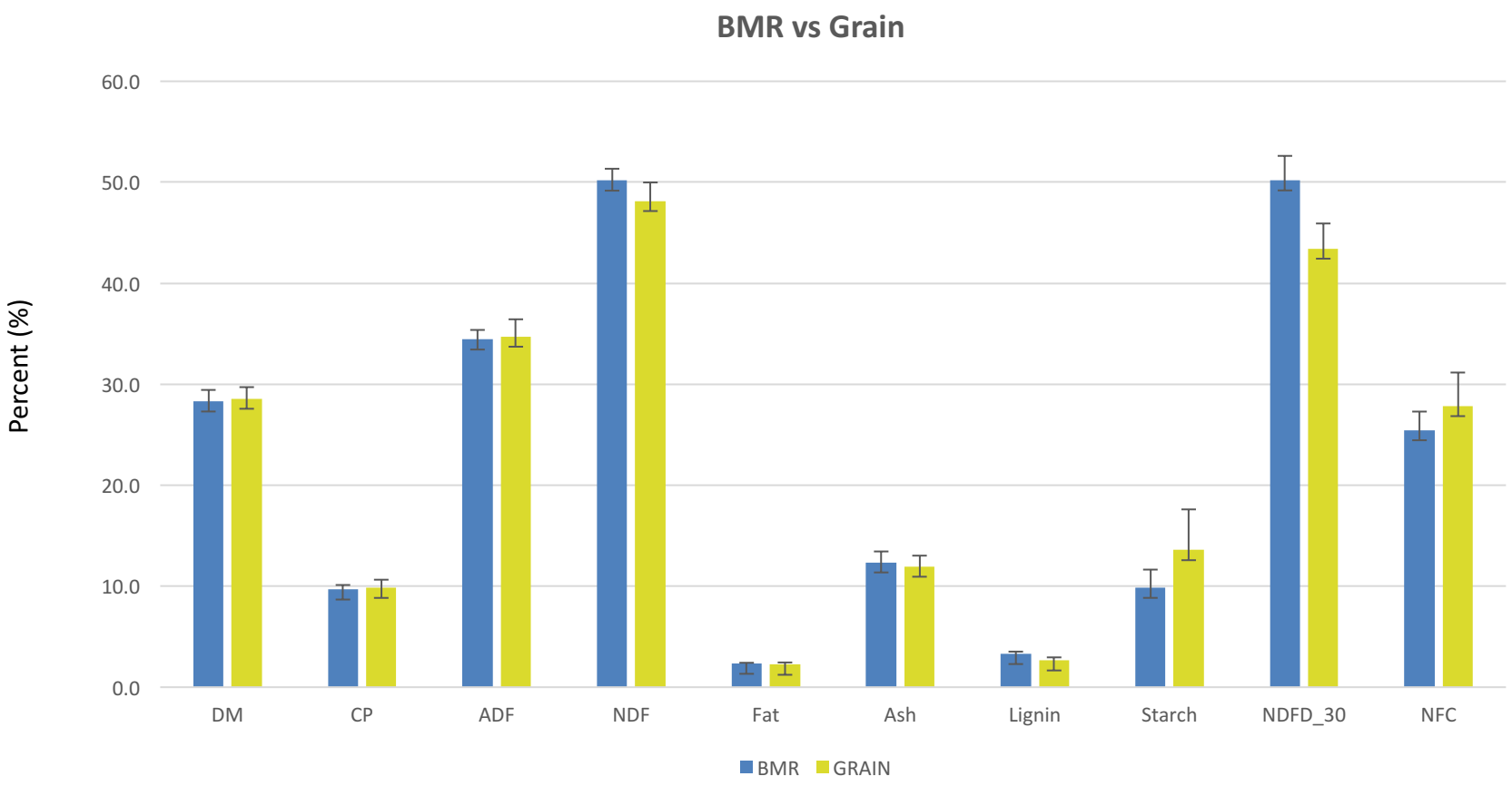
Goal: 62.9 (85th percentile)

Average: 53.8

Minimum: 42.7 (15th percentile)

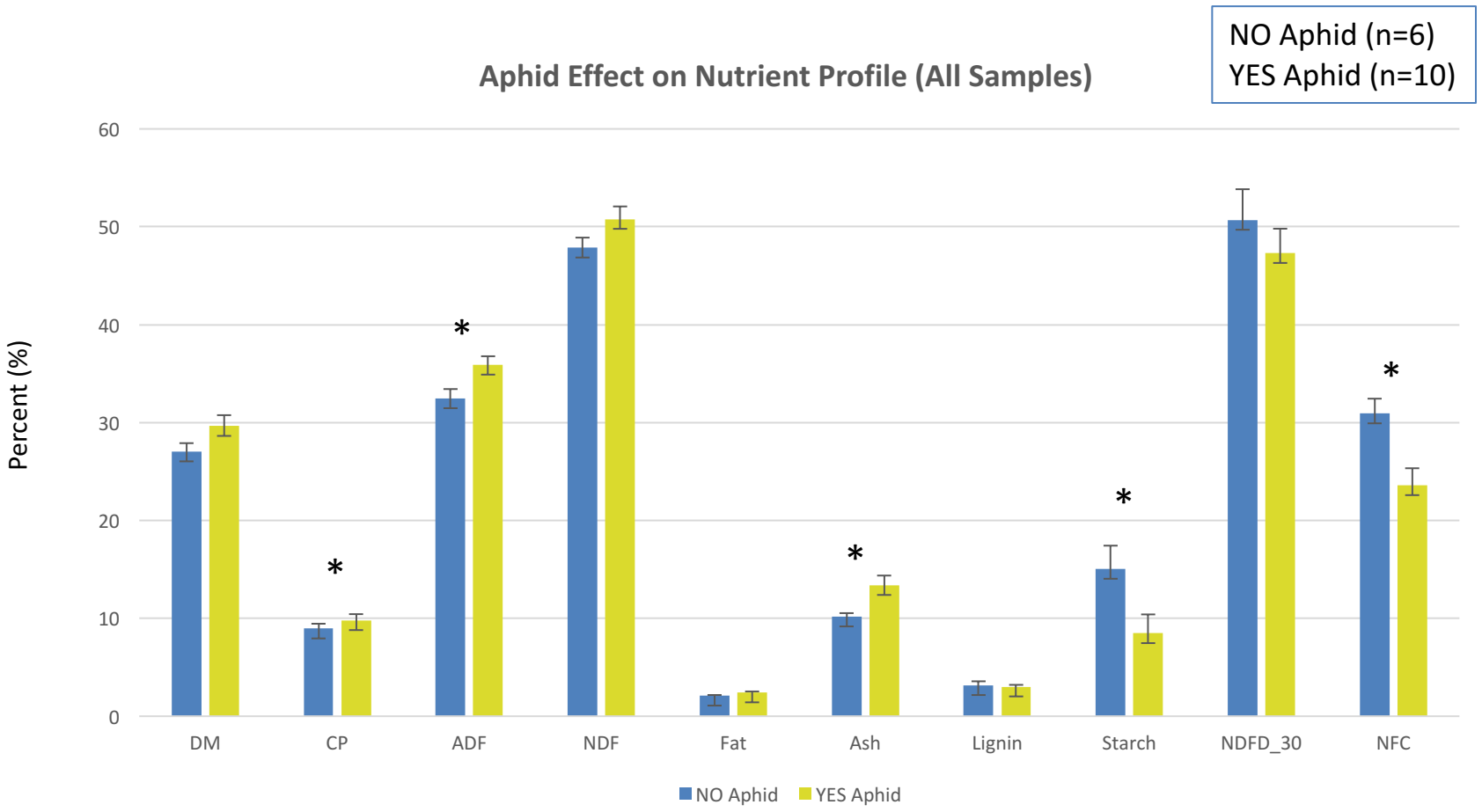
Based on population statistics from 4 years of data with 600k + US samples

Nutrient Analysis



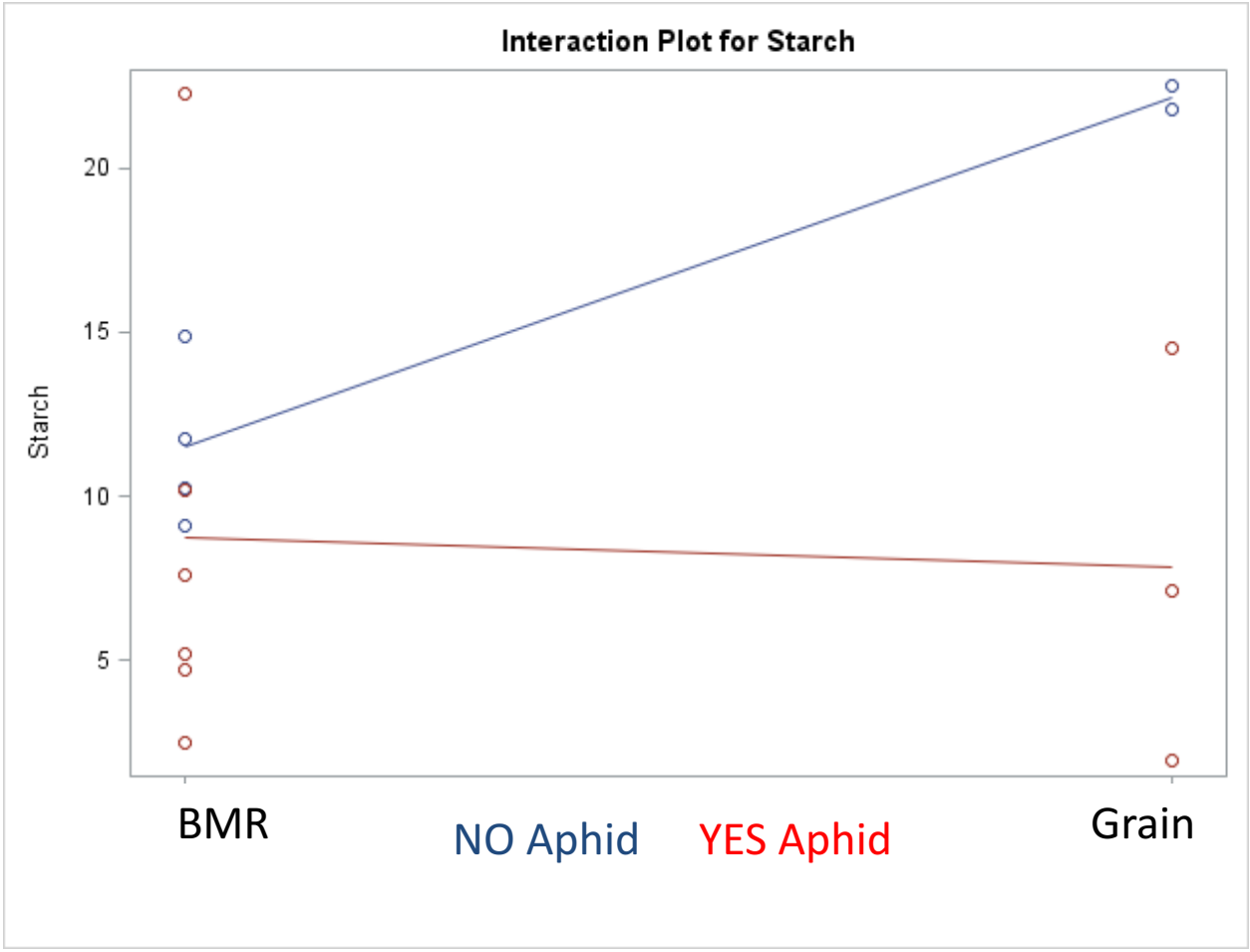
BMR & Grain samples not significantly different.

Nutrient Analysis



* CP, ADF, Ash, Starch & NFC were significantly different.

Nutrient Analysis



Very small data set, but indicates that SCA affected starch in grain type

Nutrient Analysis

Nutrient Composition of Harvested Corn in the SJV (n=21)

	CP	ADF	NDF	Starch	NFC
Average	7.7	25.1	41.8	29.2	43.7
Median	7.8	25.5	42.6	28.3	43.1
Minimum	6.2	20.2	35.2	23.3	36.6
Max	8.8	28.3	46.7	36.7	50.7

Nutrient Composition of Harvested Sorghum in the SJV (n=16)

	CP	ADF	NDF	Starch	NFC
Average	9.5	34.6	49.7	10.9	26.3
Median	9.7	34.9	50.4	9.6	27.4
Minimum	5.7	30.4	44.9	1.9	14.4
Max	11.7	40.2	55.3	22.5	35.6

Nutrient Analysis - Summary

- Very small sample size with great variability
- Sugar-cane aphid likely impacted nutrient composition in 2016

University of California
Agriculture and Natural Resources
Making a Difference for California

What's next?

What's Next?

Return to the 16 sampled structures to sample at feed out:

- Nutrient profile
- Fermentation characteristics: previously assayed samples show high butyric acid – undesirable fermentation acid → smells bad & decreases DMI

Make loose associations between management characteristics and silage quality

- Narrow down the varieties and management characteristics to study in years 2, 3 & 4

University of California
Agriculture and Natural Resources
Making a Difference for California

Project Team

Jennifer Heguy

Deanne Meyer

Nicholas Clark

Jeff Dahlberg

Bob Hutmacher

J.P. Martins

Noelia Silva-del-Rio

Patricia Price

Thank you to the dairy producers, custom harvesters and nutritionists working with us on this project!

University of California
Agriculture and Natural Resources
Making a Difference for California

Thank You!

Jennifer Heguy
jmheguy@ucdavis.edu
(209)525-6800

UC CE University of California Cooperative Extension