

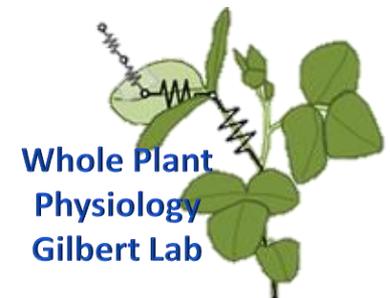
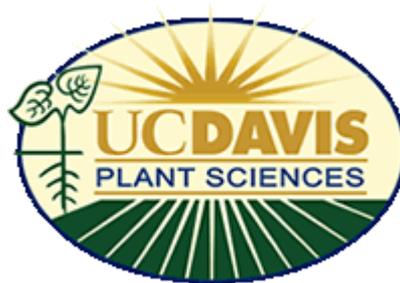


Improving Competitiveness of California Blueberry Farms

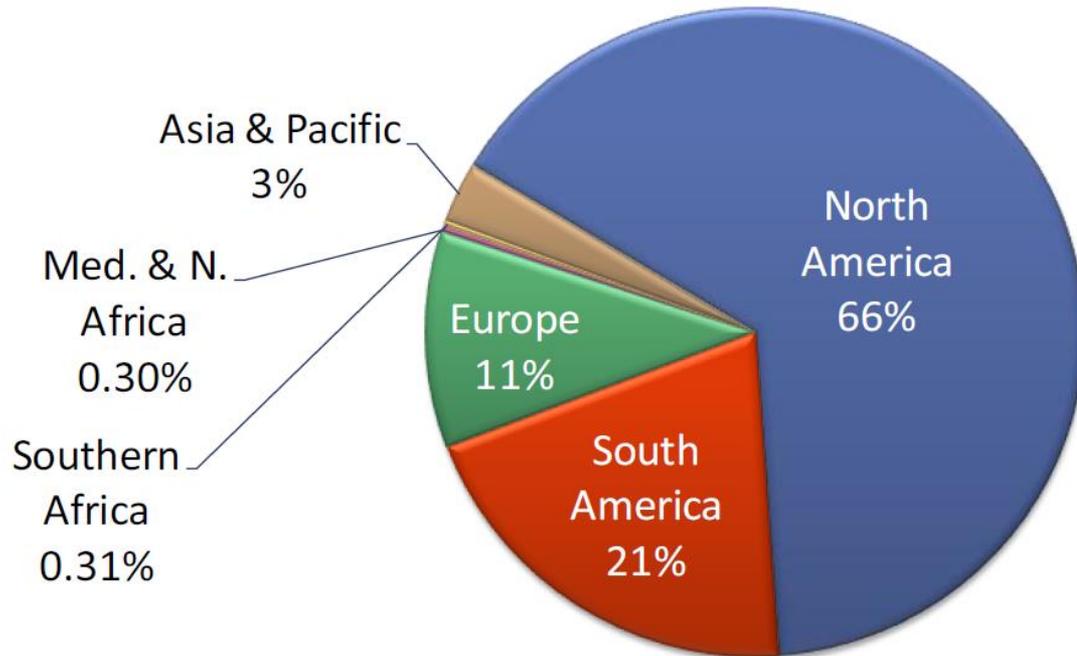
Isabel Hernández PhD.

University of California, Davis

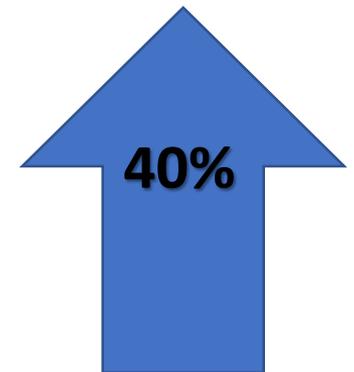
isahernandez@ucdavis.edu



Blueberry: World Production



by 2019



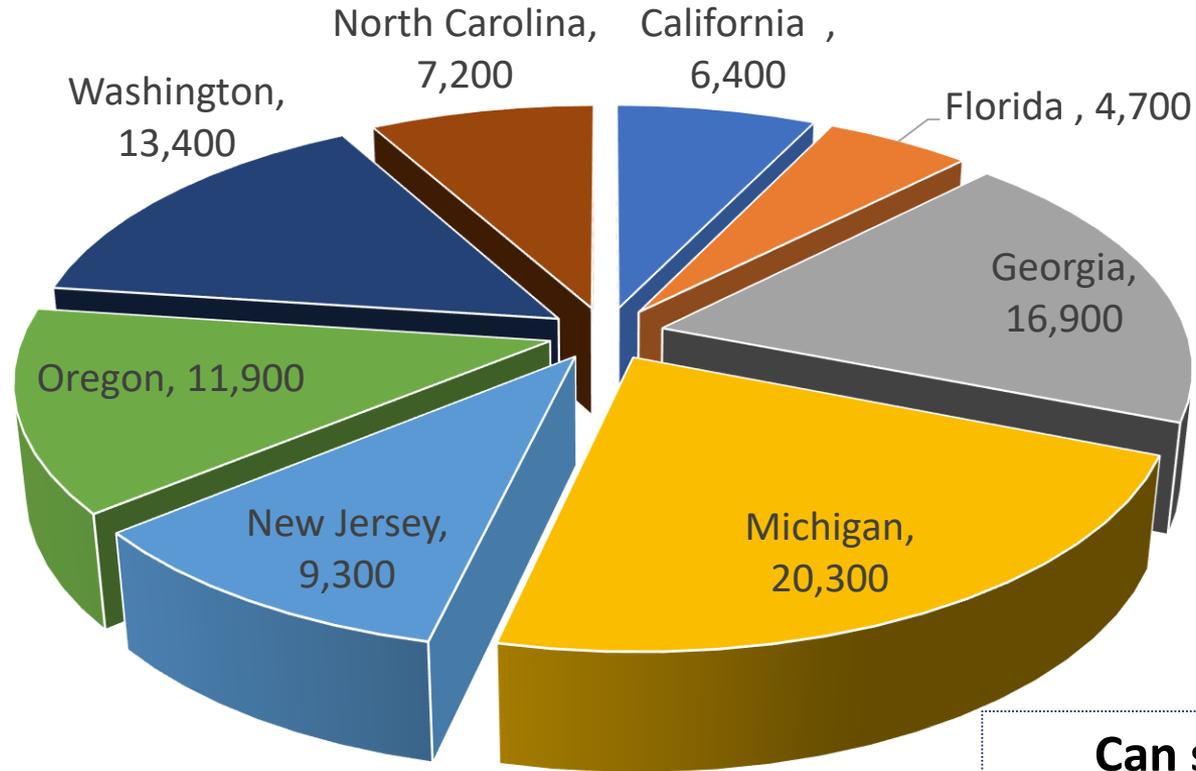
560,000 Tons
2014

***Important Nutritional
and Medicinal
Characteristics***

(US Highbush Blueberry Council, 2009)

Blueberry in California

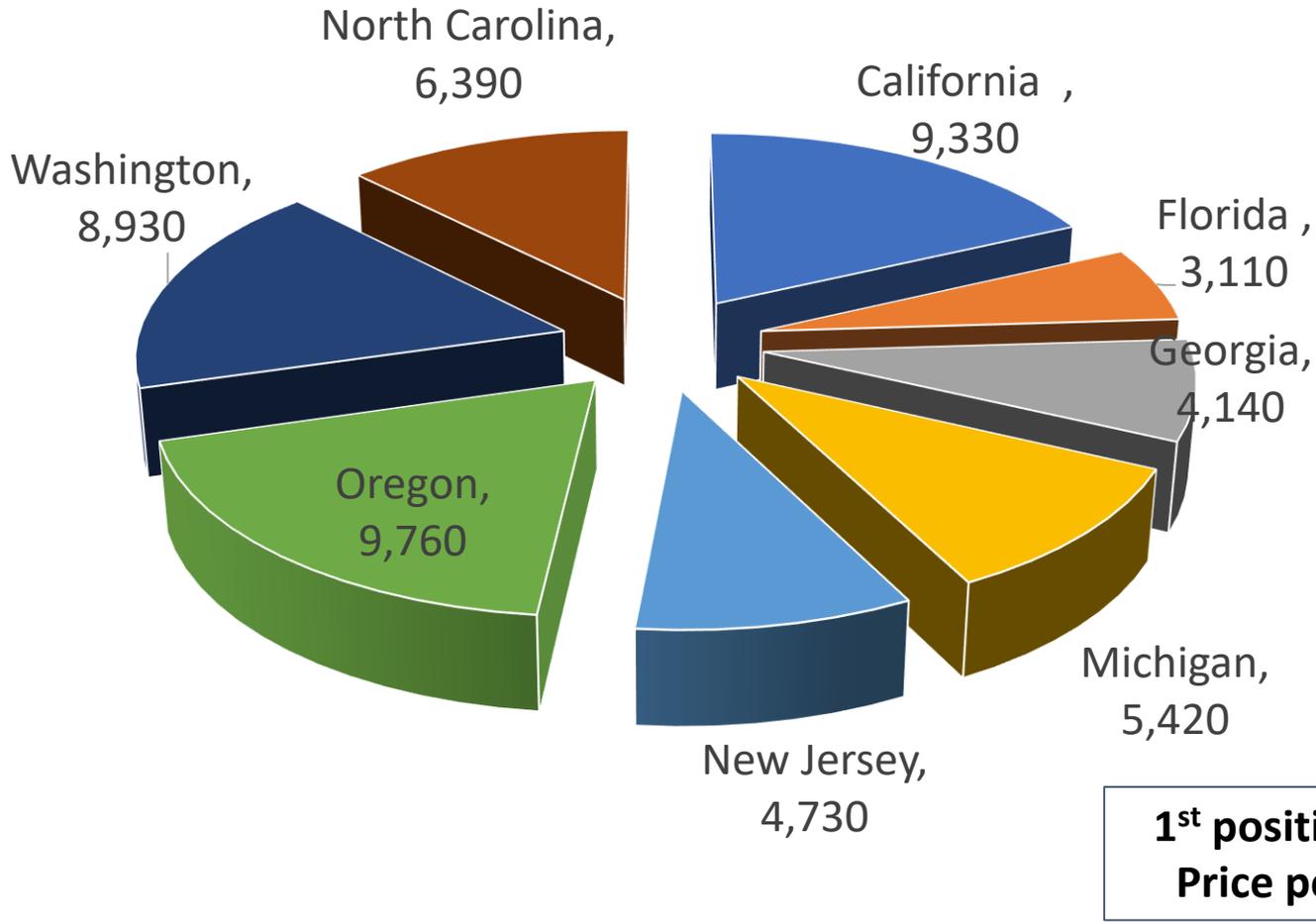
7th position



Can supply demand on May (Off-season)

AREA HARVESTED (Acres) in 2016 *Source: USDA- NASS, 2017*

Blueberry in California



YIELD PER ACRE (lbs) in 2016 *Source: USDA- NASS, 2017*



Blueberry
production in
California

Source: California Blueberry Commission.
Annual report 2015-2016

COUNTY	ACREAGE
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Tulare	1,410
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San Joaquin	1,310
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Kern	1,012
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Fresno	719
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Glenn	708
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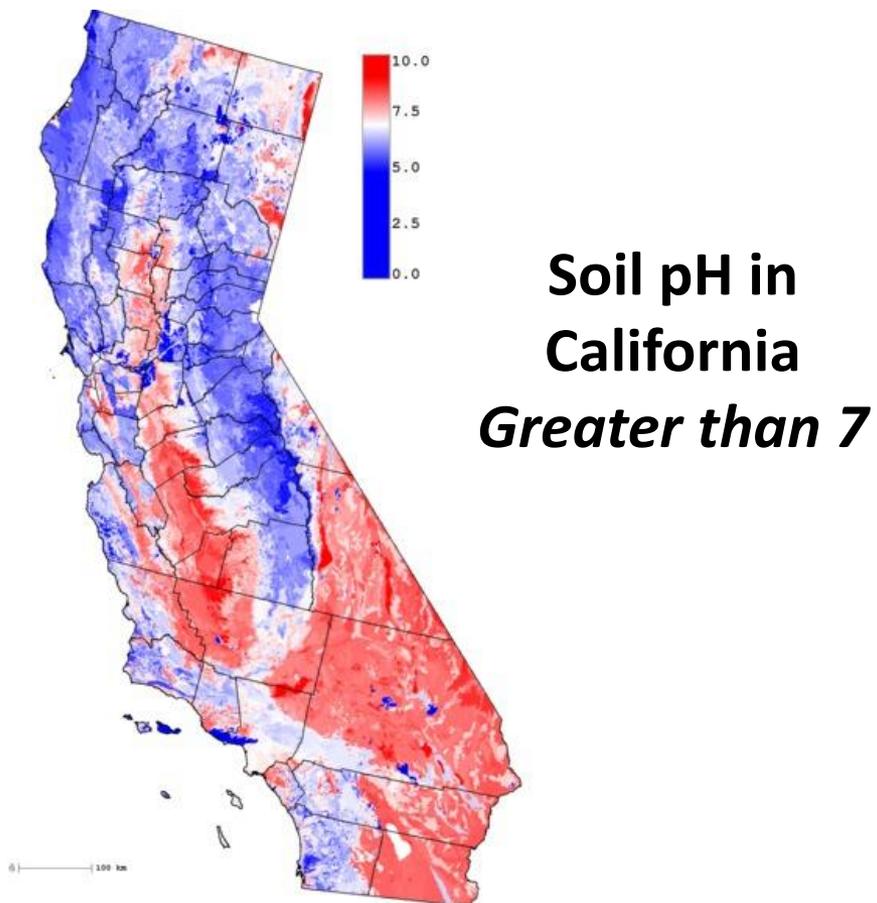
Ventura	528
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Monterrey	432
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Kings	185
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Why does California lag in blueberry production?



Blueberry Growing Requirements

- Optimum pH range: 4.5 - 5.5
- Prefer ammonium (NH_4^+)

In high pH soils ...

Deficiency:

- N: nitrate is abundant
- Fe, Mn non-available



(UKY, 2012)



Soil preparation

- Test the soil (pH)
- Test the water
- Organic matter
- Good drainage



When soil pH from neutral to alkaline

- 3 to 5 tons per acre
- Apply with abundant water
- Organic production: Elemental sulfur

Soil preparation

- Pine bark in sandy soils
- Every 2 to 3 years





Soil preparation

- Raised beds
- Flat row
- Mulch application

Cultivar selection

- Chilling requirement: Number of hours from 32 to 45°F



Northern
Southern

Source: Western Institute for Food
Safety and Security UC Davis



Cultivars in California

Jewel, Emerald, Star, South Moon, O'Neal, Snowchaser,

Factors to consider

- Timing
- Post harvest:
 - *Firmness*
 - *°Brix*
 - *Weight*



TIMING OF FRUITING OF BLUEBERRIES: variety choice for farmers

	EARLY	MID	LATE	Comment
Blueray	X			
O'neal		X		
Southern Bell		X		
Abundance				Not competitive
Aurora		X		
Biloxi		X		
Blue Crisp				Not competitive
Bluecrop		X		
blueray		X		
Brunswick		X		
Burgandy	X			
Camelia	X			
Cape Fear		X		
Centurion			X	
Darrow		X		
Draper				Not competitive
Duke		X		
Duplin				Not competitive
Earliblue				Not competitive
Echota				Not competitive
Elliott		X		
Emerald	X			Tested well for CA
Gergia Gem				Not competitive
Gulf Coast				Not competitive
Jewel	X			Tested well for CA
Jubilee	X			
Legacy	X			
Magnolia				Not competitive
Marimba		X		
Maru		X		

	EARLY	MID	LATE	Comment
Millennia		X		
Misty		X		
Nui		X		
Ochlocknee			X	
Ono			X	
Ozarkblue		X		
Palmetto		X		
Powder blue			X	
Primaddona		X		
Rahi			X	
Rebel			X	
Reka		X		
Reveille				Not competitive
Sampson				Not competitive
Santa Fe		X		
Sapphire		X		
Sharpblue	X			
Sierra			X	
Snowchaser	X			
Southern belle		X		
Southmoon	X			Select for taste
Spring High				Not competitive
Springwide				Not competitive
Star		X		Lower yield
sweet crisp		X		
Unknown 1				Not competitive
Vernon			X	
Whitu			X	
Windsor		X		



Irrigation

- 2 drippers per plant: each one: 8 liters/hour in sandy soils
- Evapotranspiration: According to CIMIS <https://cimis.water.ca.gov/>
- In Davis, summer season irrigation: 17 minutes per day distributed every 6 hours

Critical levels for soil nutrient content

- pH: 4.5 – 5.5
- EC: less than 2 dS/m
- P (Bray): 25 to 50 ppm
- K: 100-150 ppm
- Ca: 1000 ppm
- Mg: 60 ppm
- Mn: 20 ppm
- B: 0.5 ppm



Source: (Strik, 2017)



Pruning in California

- Right after harvest
- 36 – 48 inches with angle

(Jimenez, 2015)

IS THERE A GRAFTING ADVANTAGE?



October 2016

Advantages on grafting blueberry



Photos: R. Darnell

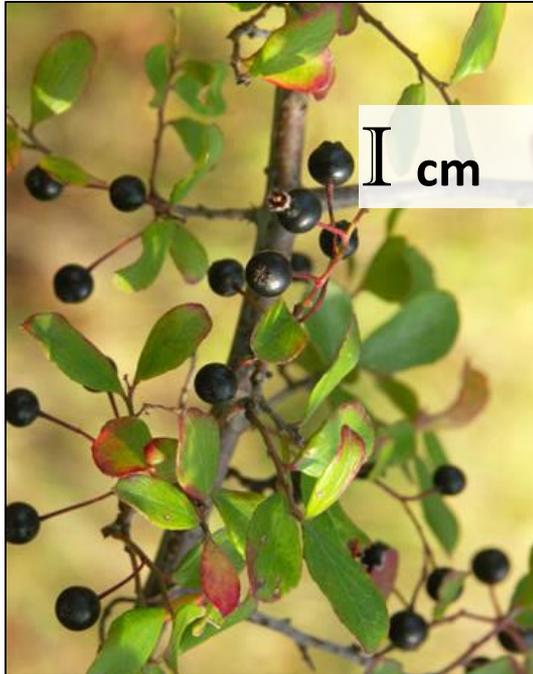
3. Single trunk
harvesting



Good for mechanical

SPARKLEBERRY

Vaccinium arboreum Marsh.



pH: Tolerates soil pH 4-7

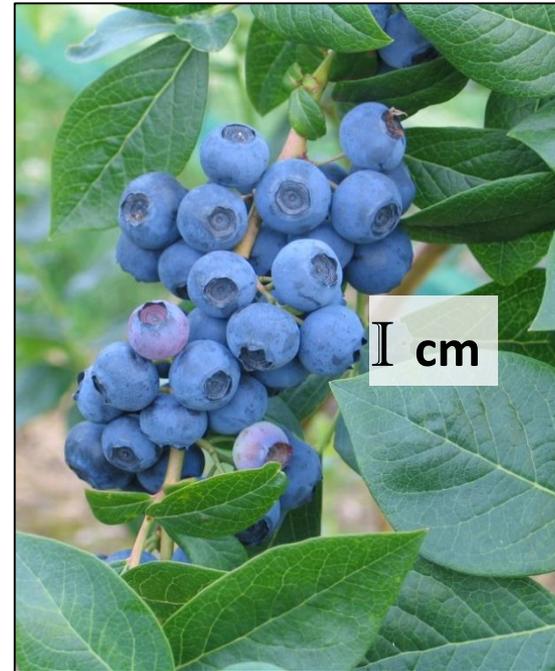
Roots: Coarse with deep root

Stem: Erect and single

Fruit: Bitter and high # of seeds

Southern highbush BLUEBERRY

Vaccinium corymbosum L.



pH: 4.5 to 5.5

Roots: Shallow : 15 to 36 cm

Stem: Multi-trunk

Fruit: Sweet, low # seeds per fruit

Ideal moment to graft



Floral buds

vegetative buds



Sparkleberry

Blueberry

Whip and tongue grafting



Use parafilm and rubber band



After 3 weeks after...



Advantages on grafting blueberry



Blueberry: cv. *'Meadowlark'*

Rootstock: *Sparkleberry*

Non-amended soil (pH 6.0)

(Darnell et al., 2015; in Florida)

2. Tolerance to high pH →
California

Good for soils in



Pot-in Pot system

15 gallon pots

Advantages pot in pot system



NO SOIL
ACIDIFICATION



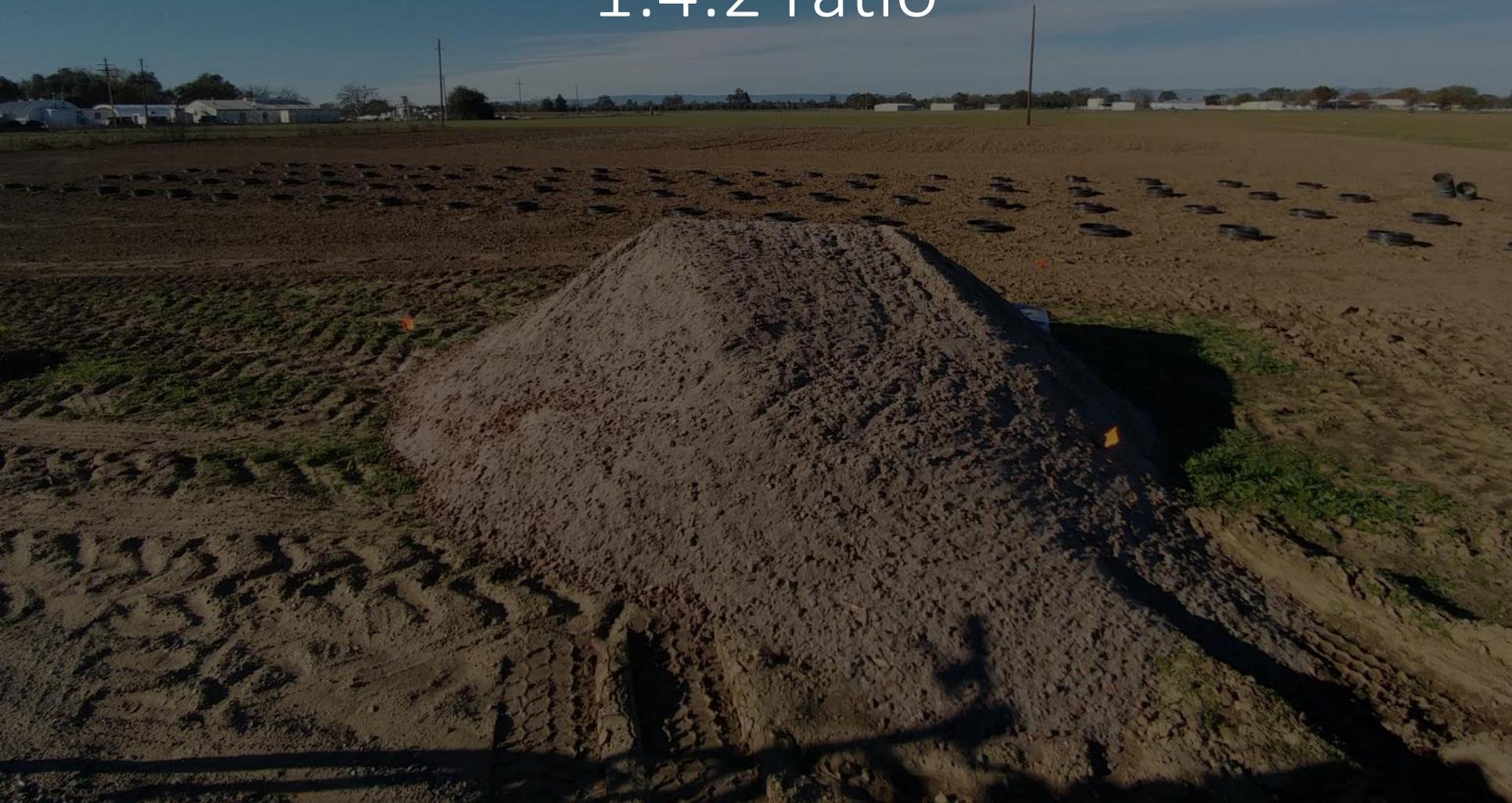
NO WEED
COMPETITION



FLEXIBILITY

Canadian peat moss: play sand: pine bark

1:4:2 ratio



Veg Crops at UC Davis



November 2016

Solution
applied by
irrigation

Element	ppm	Source
NH₄⁺	99	Ammonium Sulfate*, Monoammonium Phosphate
NO₃⁻	51	Calcium Nitrate
P	50	Monopotassium Phosphate*, Monoammonium Phosphate
K	150	Potassium Sulfate*, Monopotassium Phosphate
Ca	71	Calcium Nitrate
Mg	32	Magnesium Sulfate
S	183	Ammonium, Magnesium, and Potassium* - Sulfate
Fe	3	Iron EDDHA
Cu	0.185	Copper EDTA
B	0.542	Solubor
Mn	1.204	Manganese EDTA
Mo	0.053	Sodium Molybdate
Zn	0.37	Zinc EDTA



1 year old
plants

First
harvest (2
year old
plants)



Acknowledgments



“Improving Competitiveness of Small and Large California Blueberry Farms through Grafting”

Granted on October 2015



Dr. Matthew Gilbert
Dr. Viviana Medina
Joe Real
Dr. Rebecca Darnell
Dr. Wei Yang

Henry A.
Jastro awards
2014- 2016



ARS



Kearney- ANR

