



**Steps in mechanical canopy management**

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## Outline

- Intro: Driving factors of mechanization and precision management
- Part1: Applied water and mechanical canopy management effects on berry and wine phenolics and aroma
- Part2: Toward mechanized variable rate management in precision viticulture
- Conclusions

## Driving Factors for Mechanization and Precision Management

- Timeliness of cultural practices
- Willing labor force
- Cost of labor (\$15/h)
- Quality of life socioeconomic factors
- Proximity to population centers
- Land availability and cost
- Foreign competition



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## PART 1

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Applied water and mechanical canopy management affect berry and wine phenolic and aroma composition of grapevine (*Vitis vinifera* L., cv. Syrah) in Central California



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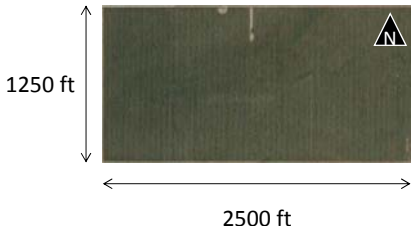
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OUT THIS MONTH!!!

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### The vineyard

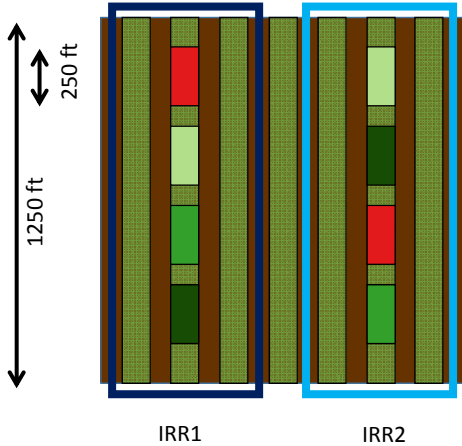
- Syrah (FPS-05)/1103P
- Merced County, CA
- Aged of 10 year at the start of trial
- The vines were trained to a bi-lateral cordon at 4.5ft with two foliage support wires at 5.5ft with a 0.65ft t-top trellis.
- Planted at 7 by 11ft



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### Experimental design

X 4

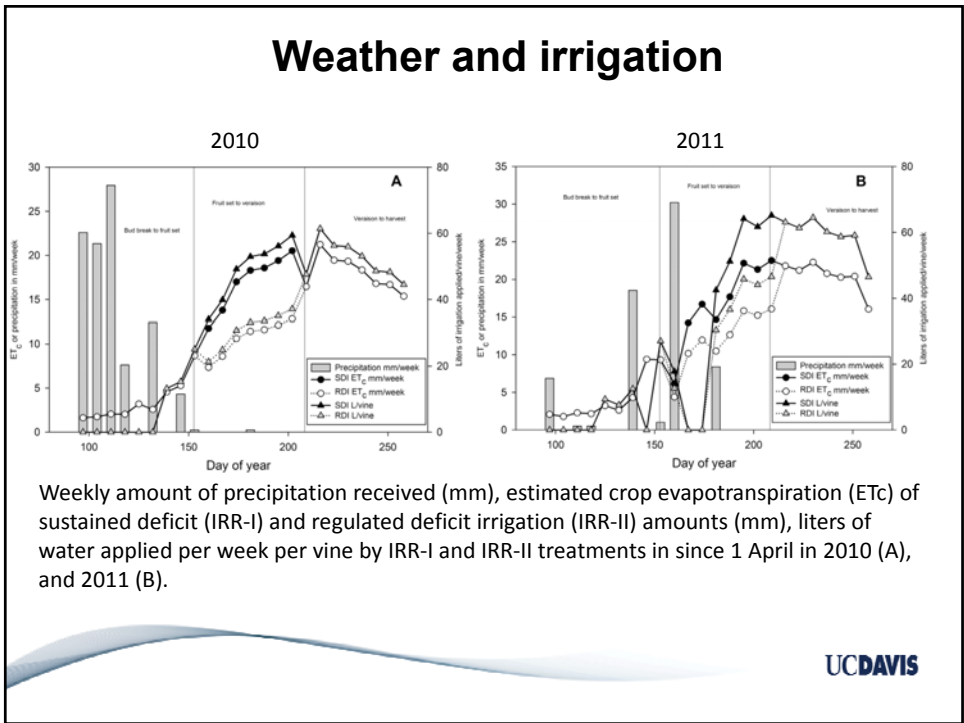


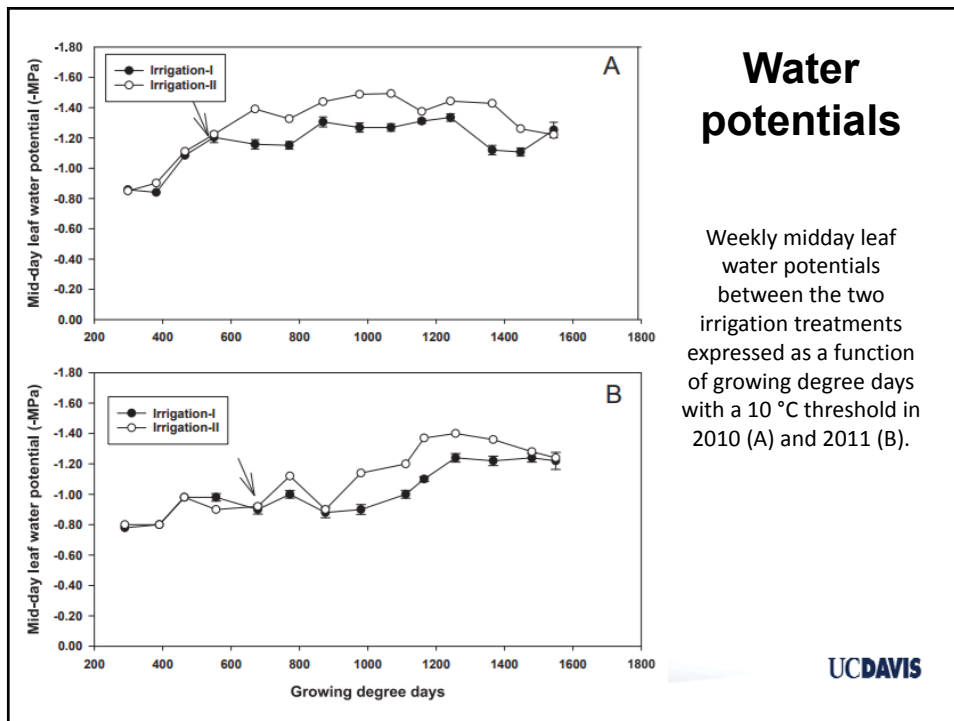
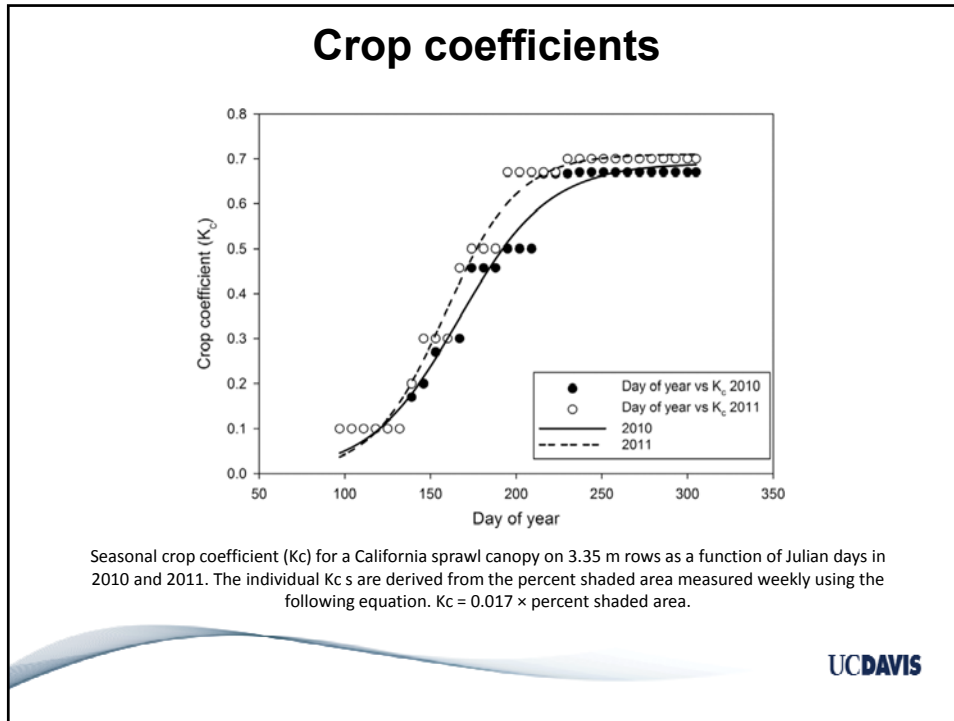
#### TREATMENTS

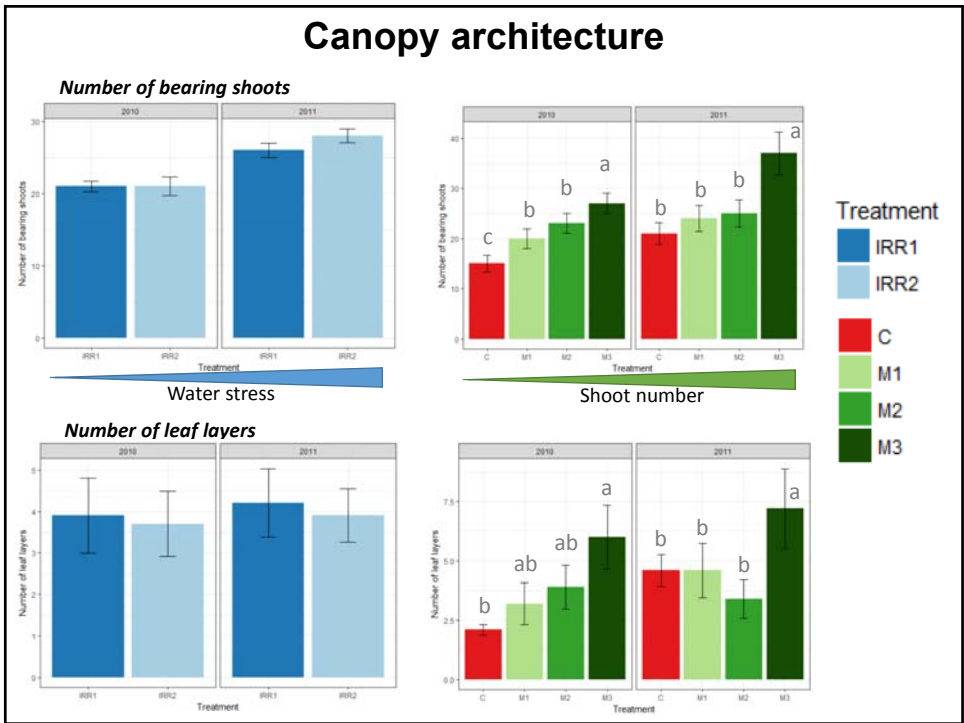
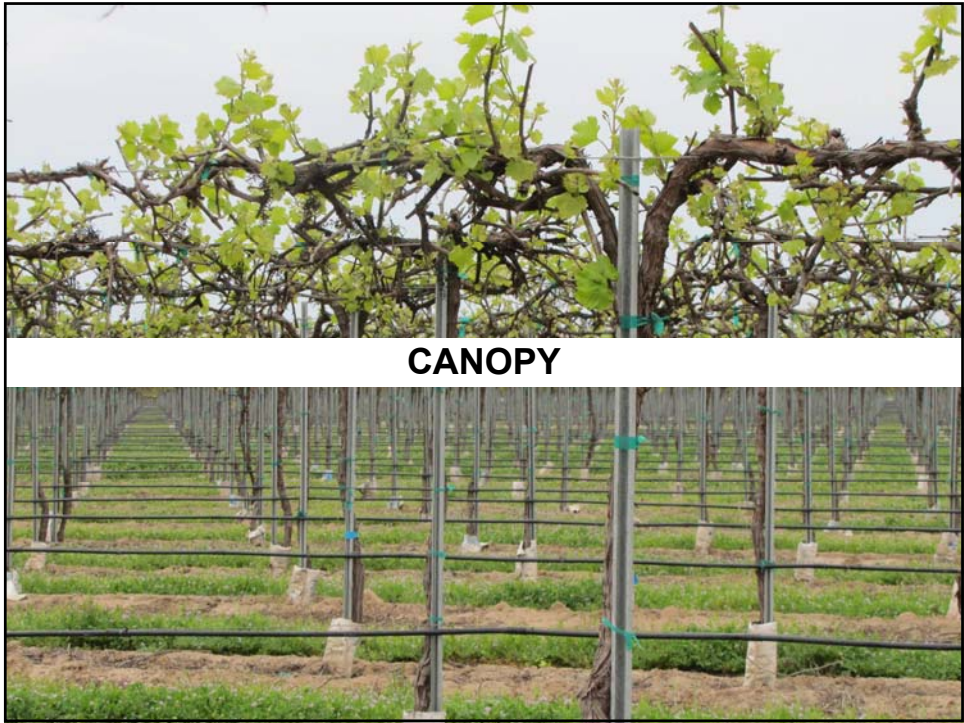
- Canopy management
- C Manually pruned (22 – 2 nodes spurs, CTRL)
  - M1 Box pruned + HEAVY shoot thinning
  - M2 Box pruned + LIGHT shoot thinning
  - M3 Box pruned ONLY
- Irrigation
- IRR1 70% Etc from anthesis to harvest (CTRL)
  - IRR2 70% Etc from anthesis to harvest BUT 50% Etc between fruit set and veraison

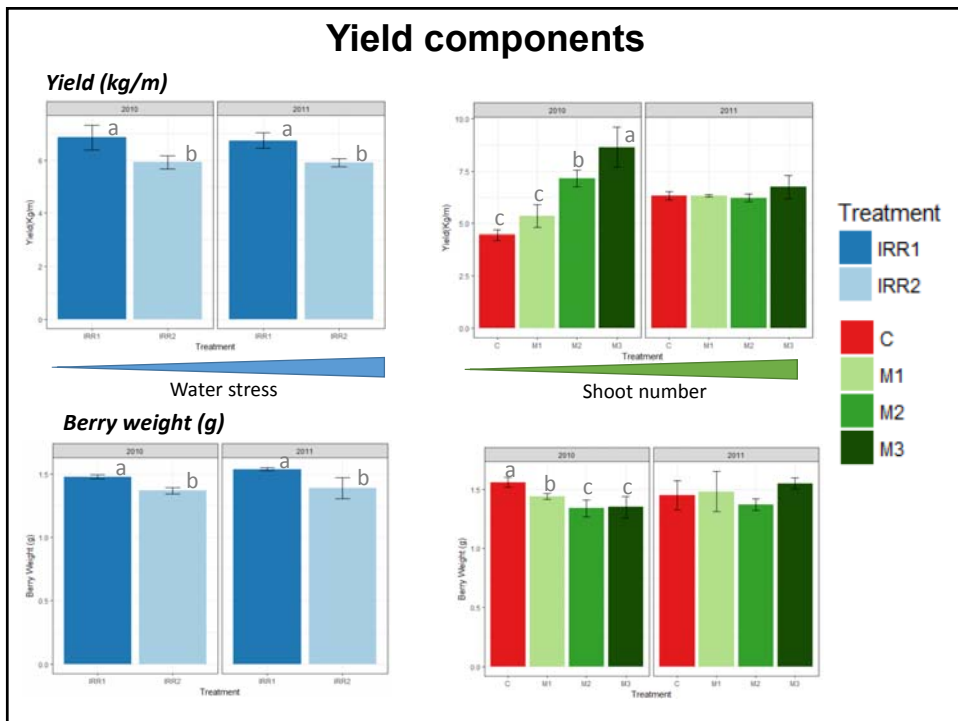
Repeated for 3 years, the first one being a buffer (conversion) year

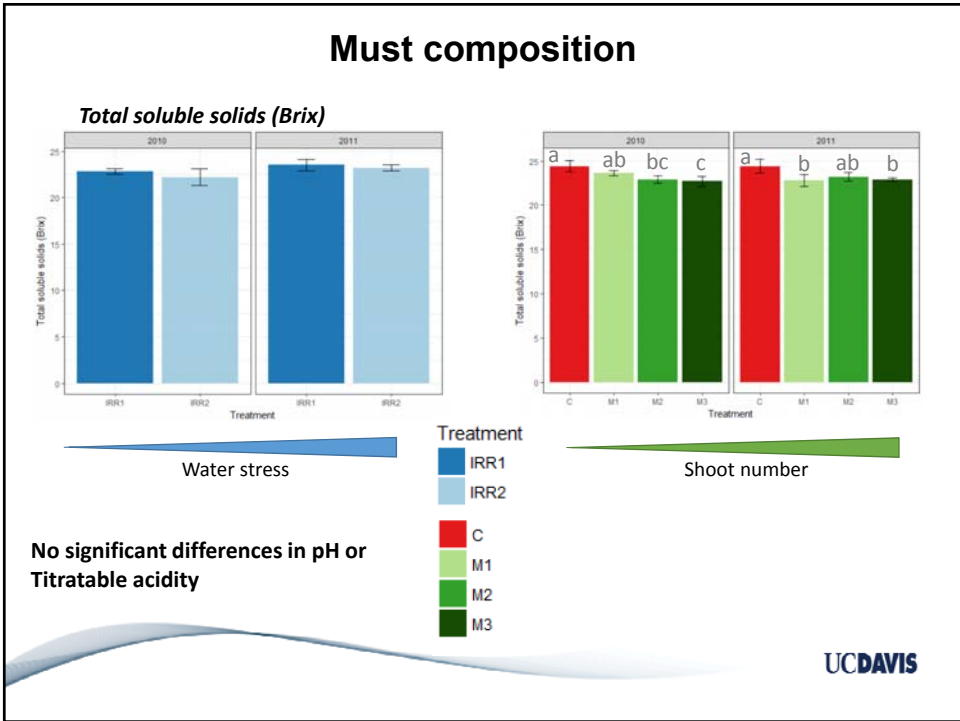
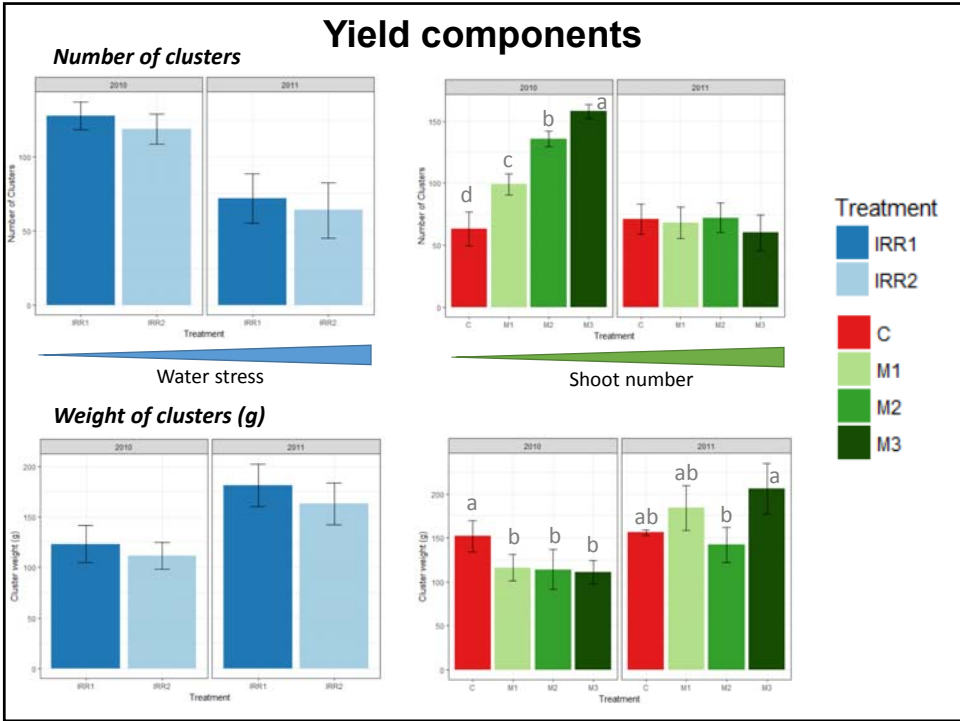
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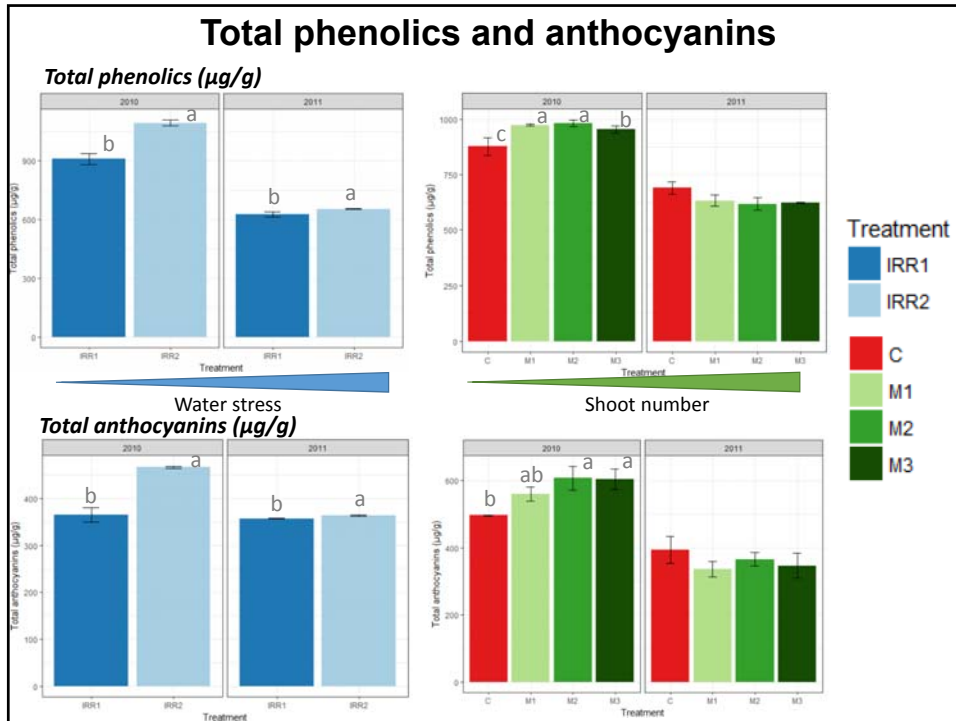


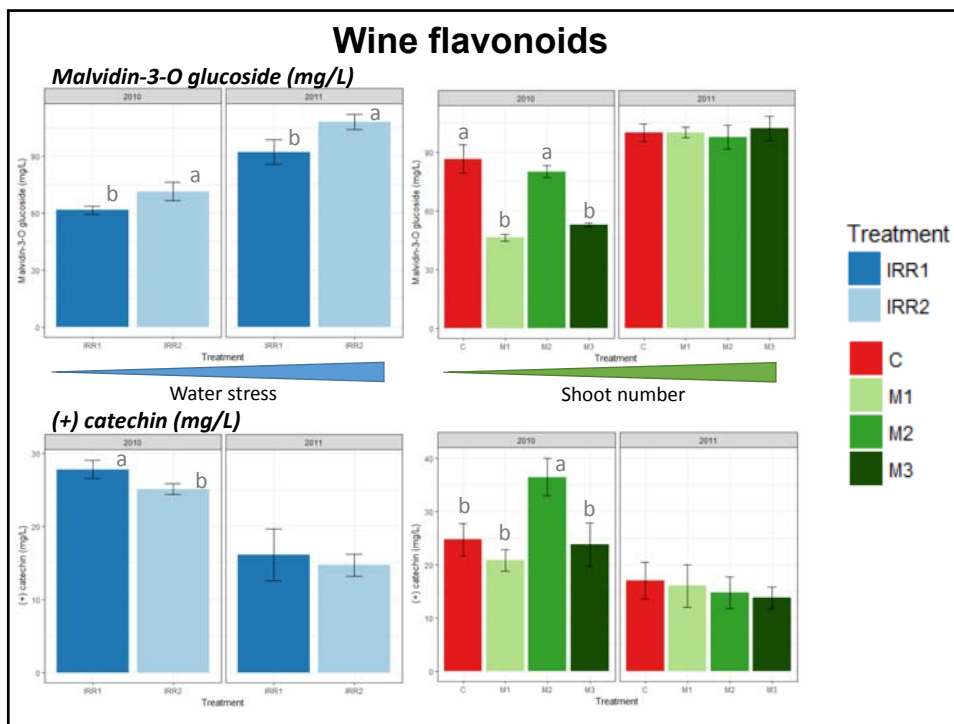






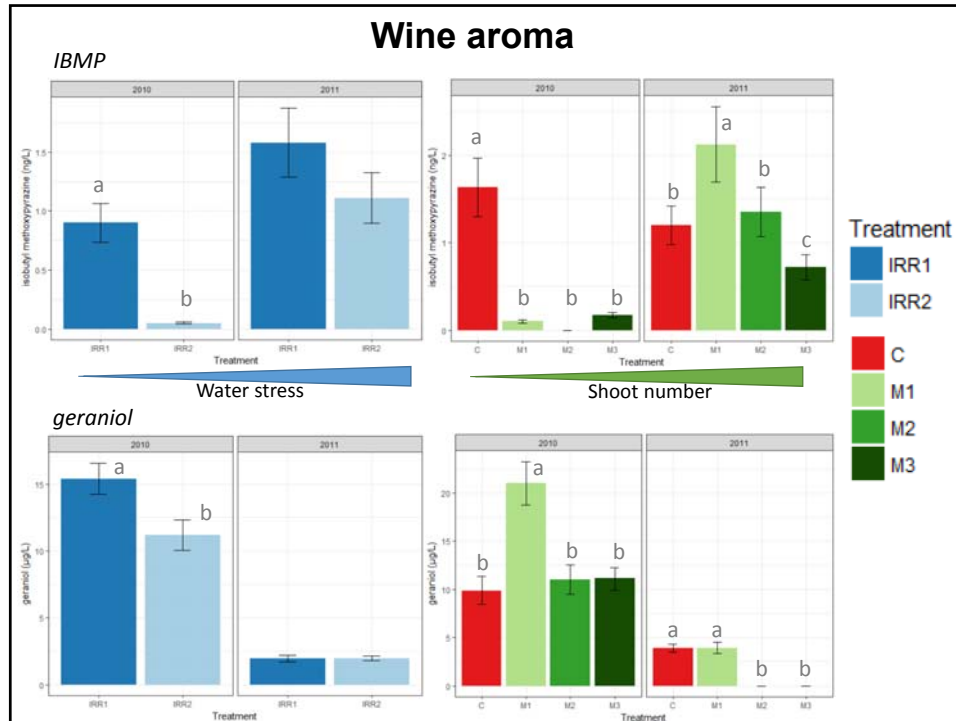






### Other wine compounds

- No significant differences were found in alcohol, pH or titratable acidity.
- Hydroxycinnamic acid concentration was always the greatest in the control
- - Irrigation treatments significantly affected the concentration of flavan-3-ol monomers in both years, and the IRR-II had a lower amount. The only exception was (+) catechin in 2011, but even in this year the same trend was observable
- The CM treatments always had greater quercetin concentration. Polymeric tannins were affected by the treatments in 2010 only. However, the same response was not seen in the following year, although a similar trend was observable.



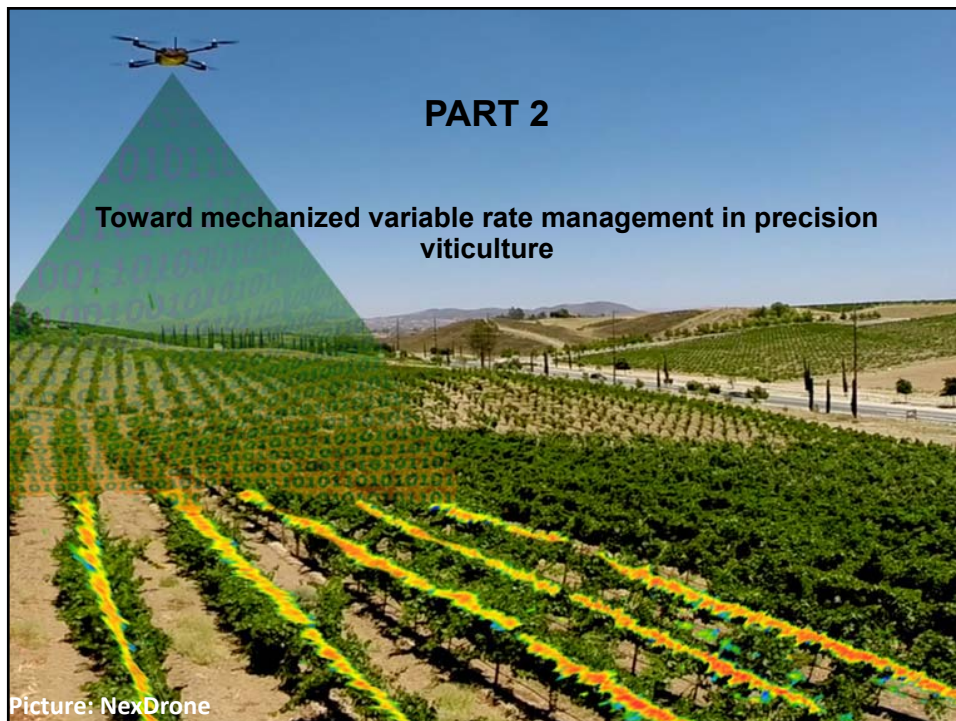
### Other wine aromas

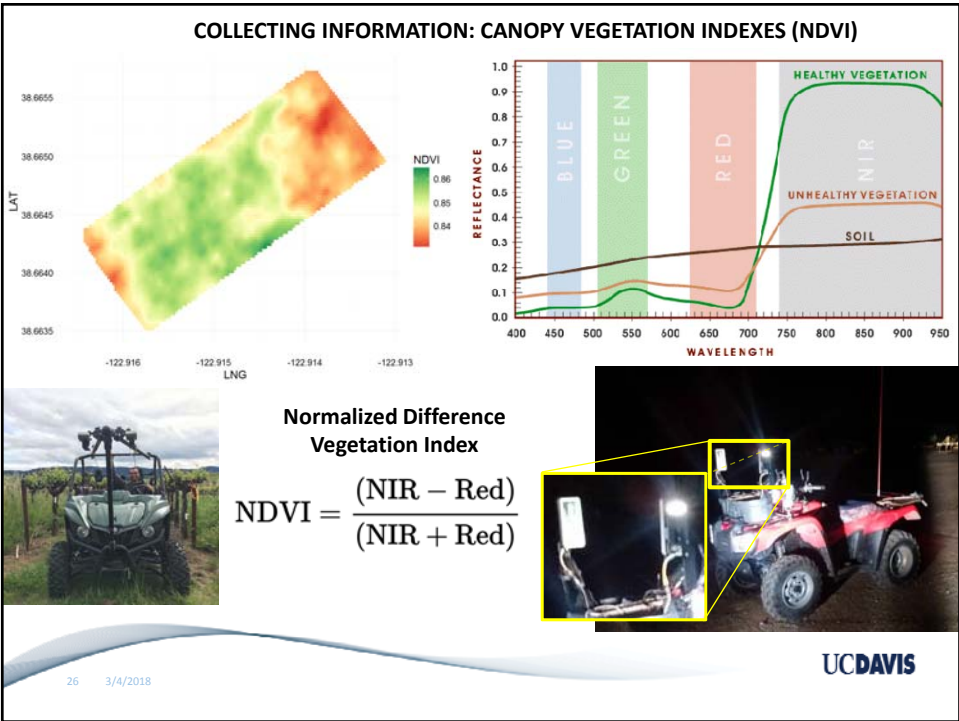
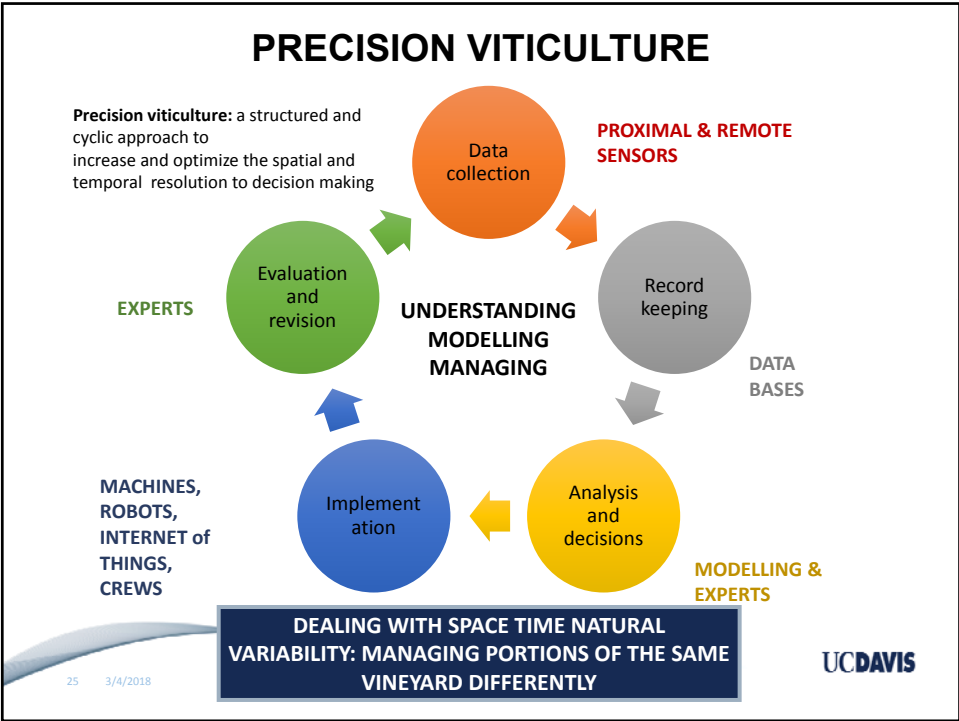
- No significant effect was observed for linalool. The concentration of  $\beta$ -damascenone and  $\beta$ -ionone was the least with the combination of M1 and IRR-II in 2010. However, the same response was not evident in 2011.

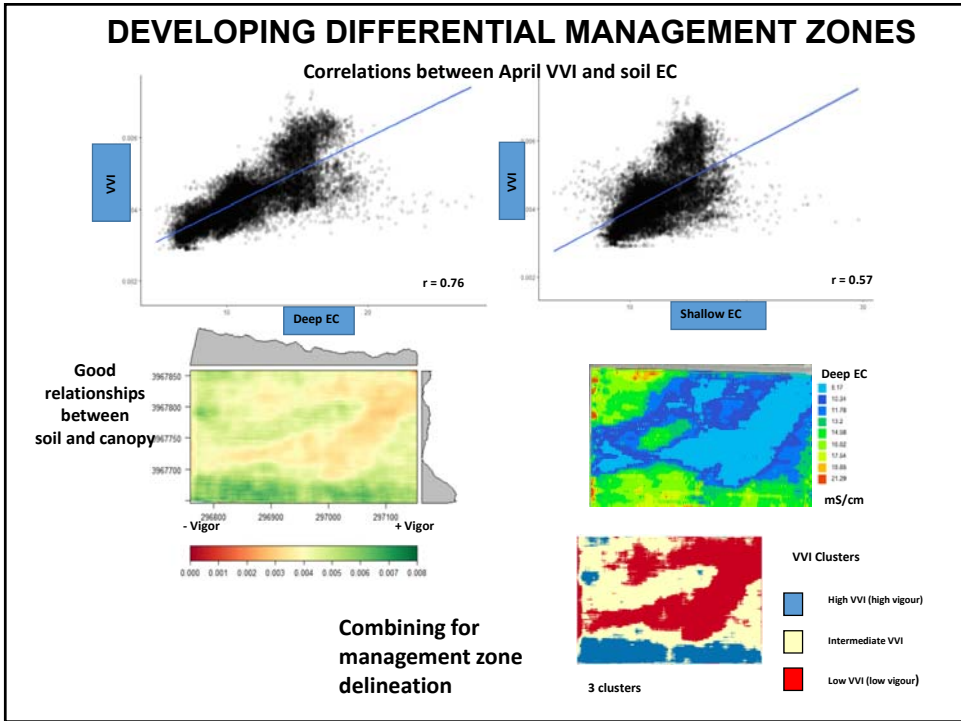
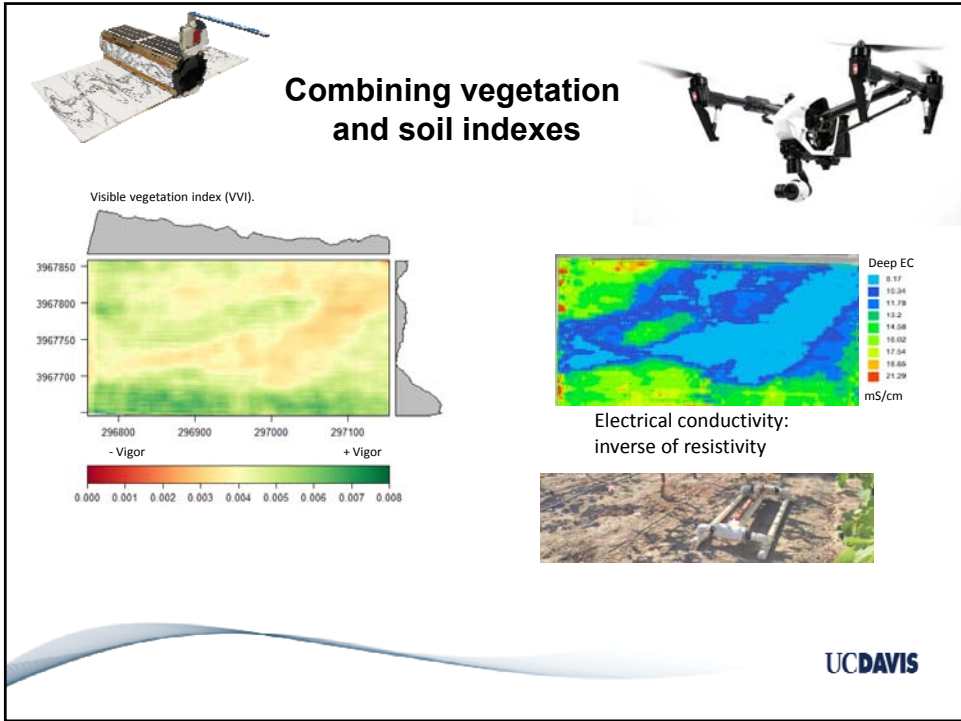
## PART 1: Conclusions


- Irrigation treatments alone were not able to reduce canopy size and leaf layer number in mechanically pruned grapevines. The combination with CM allowed a finer tuning of the canopy characteristics.
- The effect of the CM on berry composition, was less consistent than the effect of irrigation across years.
- The effect of CM practices can be altered by precipitation during the growing season. The higher water availability in spring favored denser canopy and reduced the effect of the mechanical shoot thinning at the defined speeds. It increased the herbaceous volatile compounds in 2011 compared to 2010, and overcame the effect of CM and irrigation on the volatile compounds concentration in the wine
- . In typical years, where no precipitation is received in the San Joaquin Valley from fruit set to veraison, the M2 and IRR-II method may contribute to improve berry skin and wine phenolics as well as to reducing IBMP in wine while achieving high yields.

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NDVI Filtering, Kriging, Data Extraction

TEXT

Trend:

- None
- Lat
- Lng
- Lat + Lng

Variogram Model

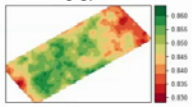
- Sph
- Exp
- Gau
- Ste
- Auto

Block Kriging

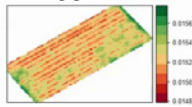
Download

Your NDVI Data   Tuckey Filtering   Speed Filtering   Moran Filtering   **Kriging**   Data Extraction from Map   Data Extraction from File

Kriging prediction




Kriging standard error



Experimental variogram and fitted variogram model



29   3/4/2018


**OUR CURRENT WORK IN PRECISION VITICULTURE (2016-2020)**

The  vineyard project



United States Department of Agriculture  
National Institute of Food and Agriculture











**Dr Kaan Kurtural Lab**  
Oakville Experimental Station





READY FOR THE FUTURE?



## CONCLUSIONS

- Mechanization has economic benefits (reduction of costs and time), but also allows to a better timing of cultural practices.
- Precision viticulture add more accurate spatial cultivation to better timing, therefore increasing quality, yield and environmental sustainability
- Precision viticulture methods will justify an increase of the mechanization in premium wine production
- Mechanization of cultural practices is the present and future of grapevine industry and research

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