

Development of new “Working Standards” for Leaf Analysis in Australian Pistachio Orchards

By Jianlu Zhang Financial support from HAL and HIA

Thanks to CMV Farms for hosting the nitrogen experiment

Additional data collected by Andrew Bowring of Kyalite Pistachios

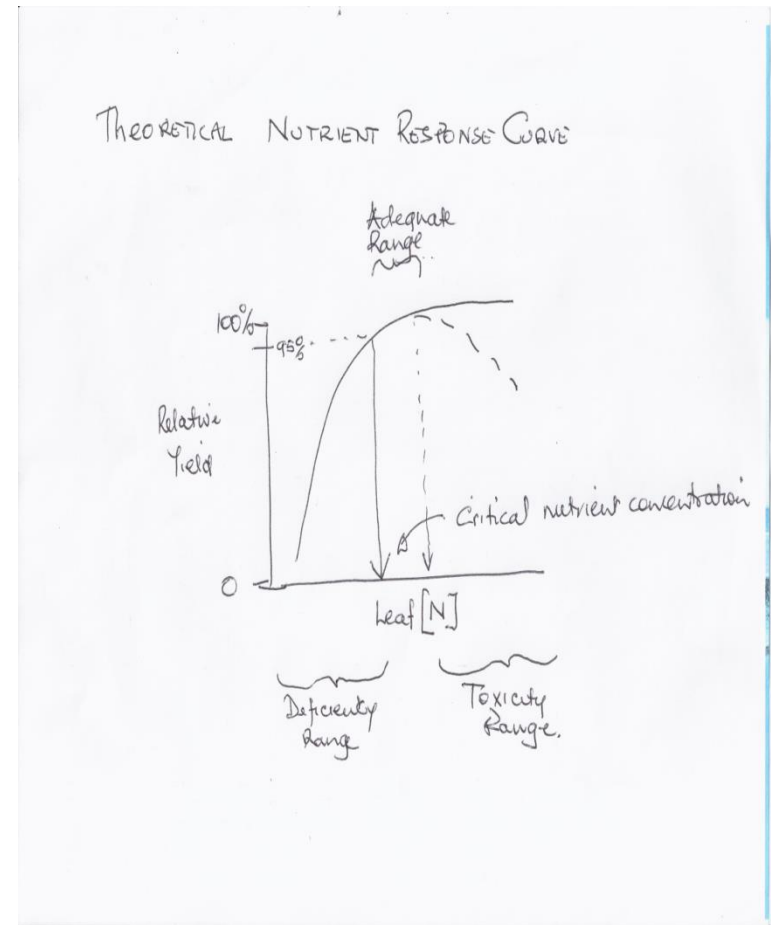
Thanks to those growers who have given permission for the use of their leaf analysis and yield data

Suggestions concerning interpretation of the data from Ben Robinson

Fertiliser decision making - tools

- Deficiency Symptoms
- Observation of growth and vigour, leaf colour etc
- Leaf analysis
- Soil tests
- Nutrient balance sheets and budgets

We should use all of these



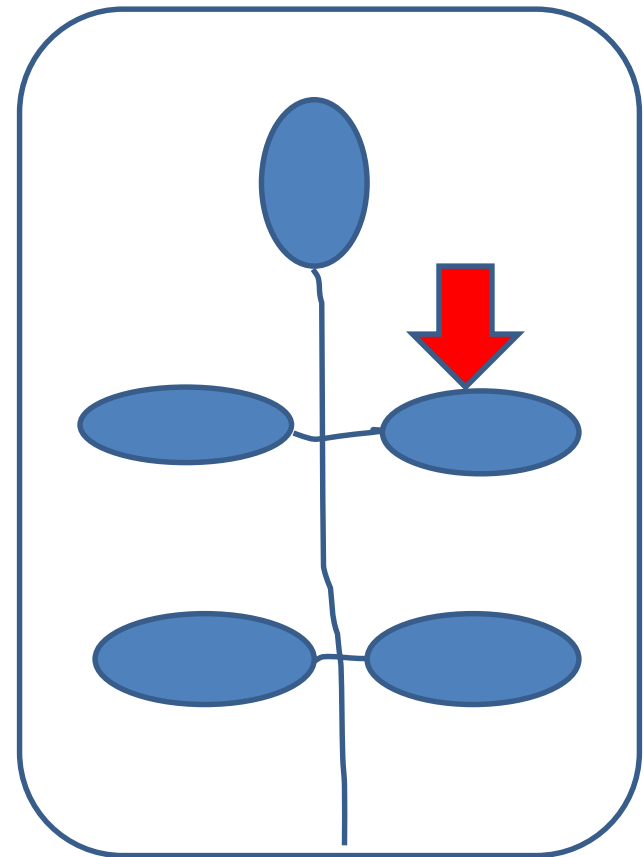
Background

- In the absence of local data, we have been using the Californian leaf analysis standards as the best available source of information
- Jianlu has now put together sufficient data which suggest some modifications to these standards to take account of
 - Sirora rather than Kerman
 - Local experience
 - Data from the Nitrogen trial

What do we sample?

(eg Bob Beede, adapted for local conditions)

- Collect the sample from our late January through mid-February
- Sample non-fruiting branches, 6 ft. (1.8 m) from the ground
- Choose fully expanded sub-terminal leaflets
- Collect 4 - 10 leaflets per tree
- sample 10 - 20 trees/orchard block
- Record if the leaflets have received in-season nutrients sprays
- Deliver the sample to the lab as quickly as possible



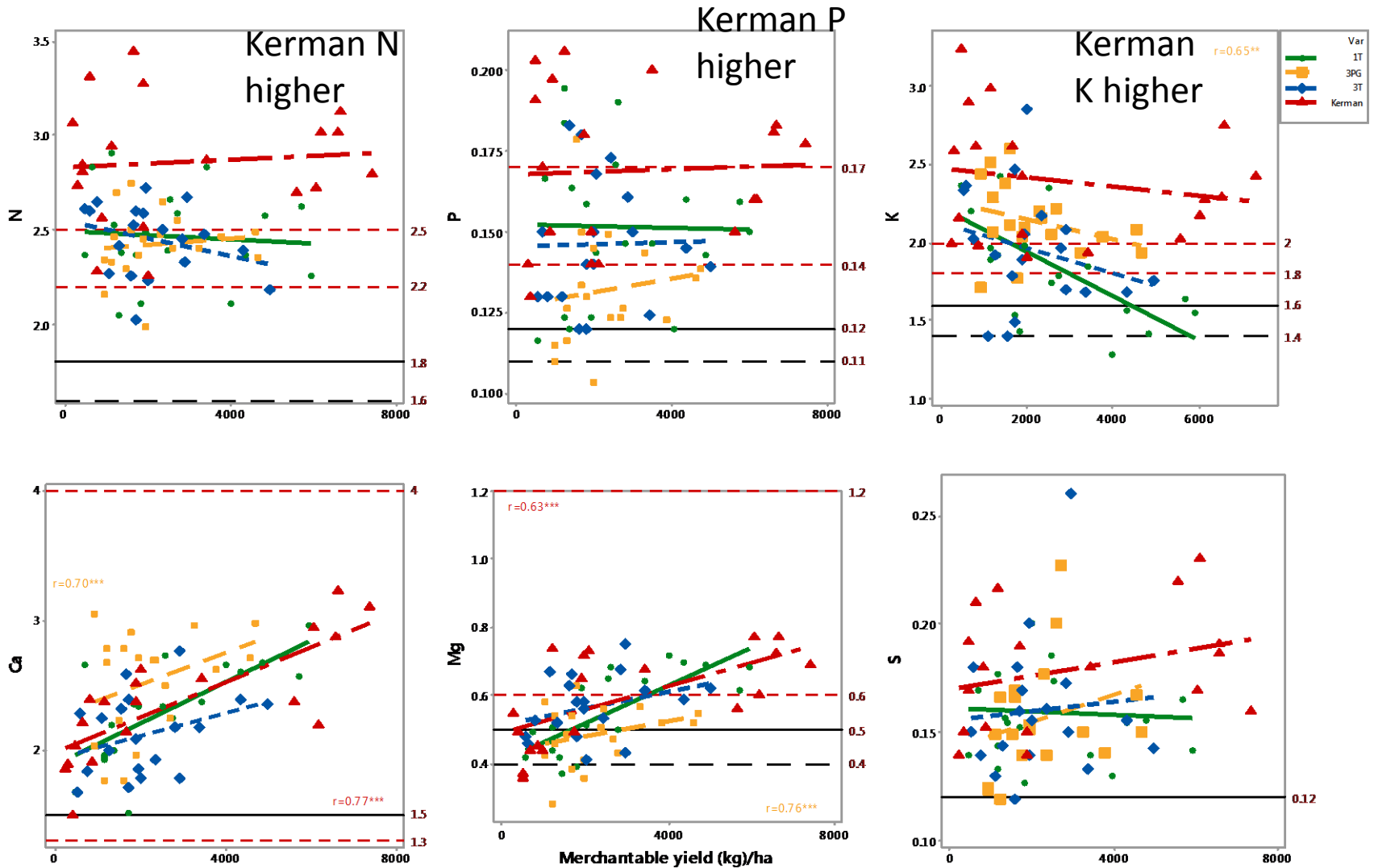
The California Standards we are using now

Element	California	
	Critical value	Suggested range
N (%)	1.8	2.2-2.5
P (%)	0.14	0.14-0.17
K (%)	1.6	1.8-2.0
Ca (%)	1.3	1.3-4.0
Mg (%)	0.6 or 0.4	0.4-1.2
S (%)	-	-
Na (%)	-	-
Cl (%)	-	0.1-0.3
Zn(ppm)	7	10-15
Mn (ppm)	30	30-80
Cu(ppm)	4	6-10
Fe(ppm)	-	-
B(ppm)	90	150-250

Various data have been used to help create our own “working values”

- *Kyalite Pistachios (Provides a Sirora/Kerman comparison and rootstock check)*
- *Nitrogen trial (75 kg treatment shows us what borderline values for leaf N might be)*
- *Across Industry Benchmarking (shows us values associated with “better yields” above 2,500 kg per ha merchantable crop)*
- *Diagnostic testing (relates low leaf zinc and copper associated with deficiency symptoms)*
- *Calcium trial (relationship to Stylar End Lesion)*

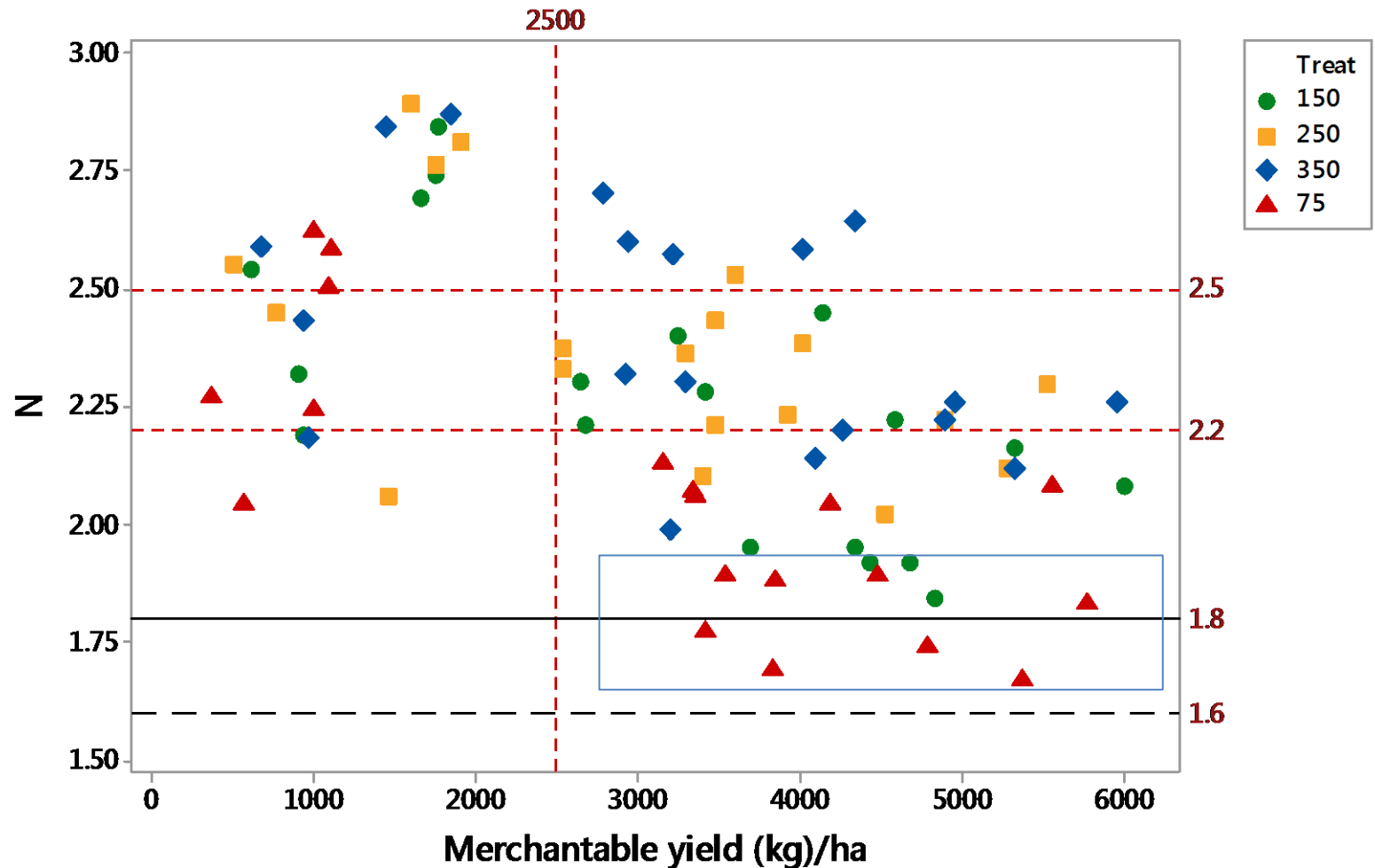
N, P and K values different between varieties but not rootstocks



Various data have been used to create our own working values

- Kyalite Pistachios (*Provides a Sirora/Kerman comparison and rootstock check*)
- Nitrogen trial (*75 kg treatment on crop shows us what borderline values for leaf N might be*)
- Across Industry Benchmarking (*shows us values associated with “better yields” above 2,500 kg per ha merchantable crop*)
- Calcium trial (*relationship to Stylar End Lesion*)

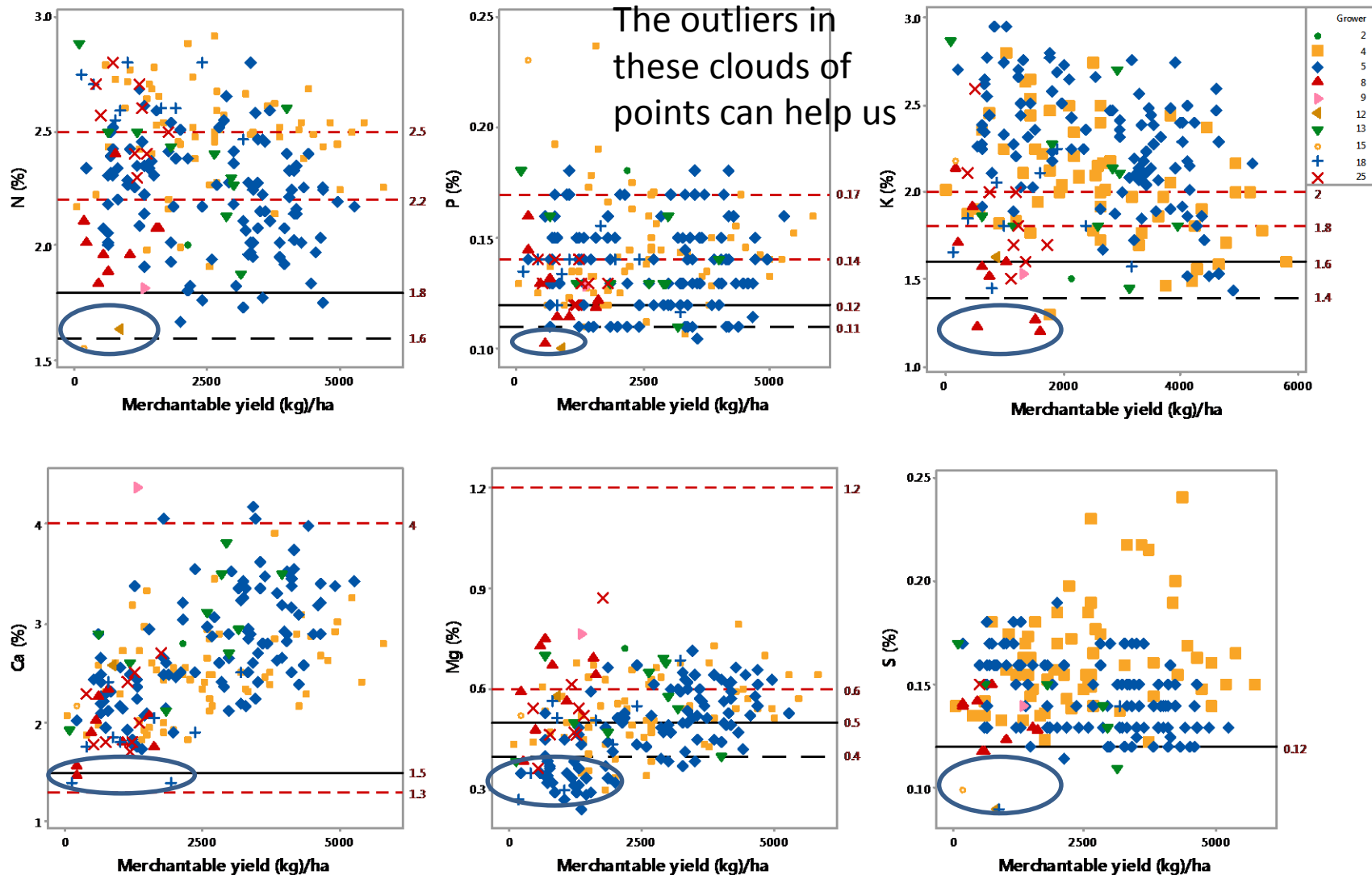
Impact of low nitrogen inputs (important in “on” crop years)



Various data have been used to create our own working values

- Kyalite Pistachios (*Provides a Sirora/Kerman comparison and rootstock check*)
- Nitrogen trial (*75 kg treatment shows us what borderline values for leaf N might be*)
- **Across Industry Benchmarking** (*shows us values associated with “better yields” above 2,500 kg per ha merchantable crop*)
- Diagnostic testing (*low leaf zinc, manganese and copper associated with deficiency symptoms*)
- Calcium trial (*relationship to Stylar End Lesion*)

Macro nutrients from across industry benchmarking



Comparison of standards

Element	California		Australia		Turkey	
	Critical value	Suggested range	Critical value	Suggested range	Critical value	Suggested range
N (%)	1.8	2.2-2.5	1.6	>1.8		1.8-2.4
P (%)	0.14	0.14-0.17	0.11	>0.12		0.06-0.14
K (%)	1.6	1.8-2.0	1.4	>1.6		0.8-1.2
Ca (%)	1.3	1.3-4.0		>1.5		2.3-3.0
Mg (%)	0.6 or 0.4	0.6-1.2	0.4	>0.5		0.5-0.9
S (%)	-	-		>0.12		
Na (%)	-	-		<0.05		
Cl (%)	-	0.1-0.3		<0.4		
Zn(ppm)	7	10-15		>15		10-25
Mn (ppm)	30	30-80		>30		25-50
Cu(ppm)	4	6-10		>4		6-90
Fe(ppm)	-	-		-		43-170
B(ppm)	90	150-250	90	>130		

How should we use these proposed “Working Standards”?

- Provide a report to interested growers and consultants for possible use
- Emphasise that the new “Working Standards” are just that, and should be used along with all the other information on orchard performance that is available.
- Advise leaf analysis laboratories who are working with the industry
- Prepare a paper for the upcoming international nut conference
- Schedule a biennial review with users

Remember that leaf analysis doesn't tell you how much fertiliser to apply. A balance sheet can help

Marketable Yield (kg per ha)	N removed (kg per ha)	P removed (kg per ha)	K removed (kg per ha)
1,000	41	4.4	31
2,000	83	8.8	61
3,000	124	13.2	93
4,000	165	17.6	122
5,000	206	22.0	153
5,000 (data from USA for comparison)	190		170

While we have got this far in catching up what have the Californians been doing?

- In his recent work Patrick Brown and his colleagues have been recommending three samples early mid season and late.
- Patrick has shown how variable pistachio orchards are, in terms of yield potential, which means there may be value in sampling stronger and weaker parts of orchards separately and fertilising each part separately too.
- One thing is clear, our “Working Standards” will continue to evolve