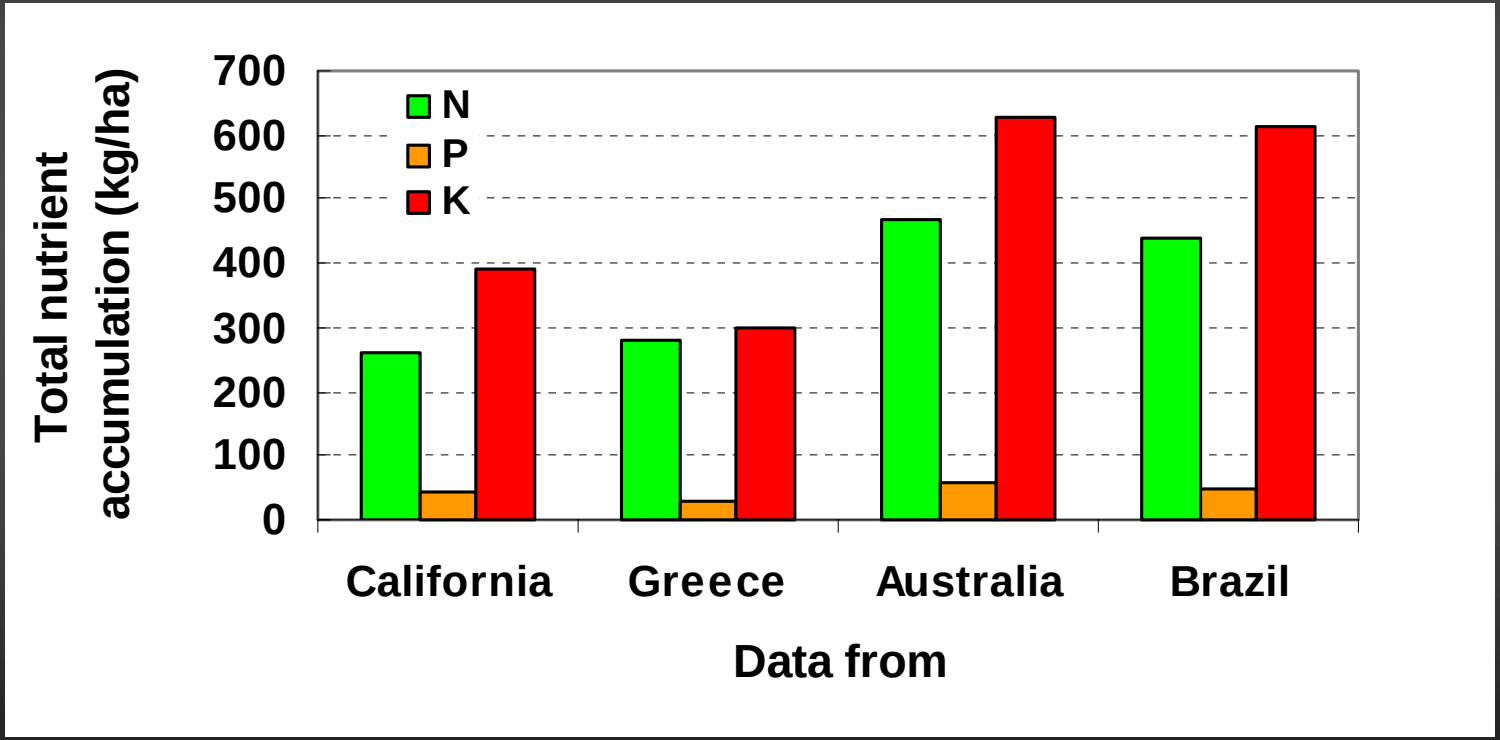
Research update :
Soil fertility effects on processing tomato yield and fruit quality

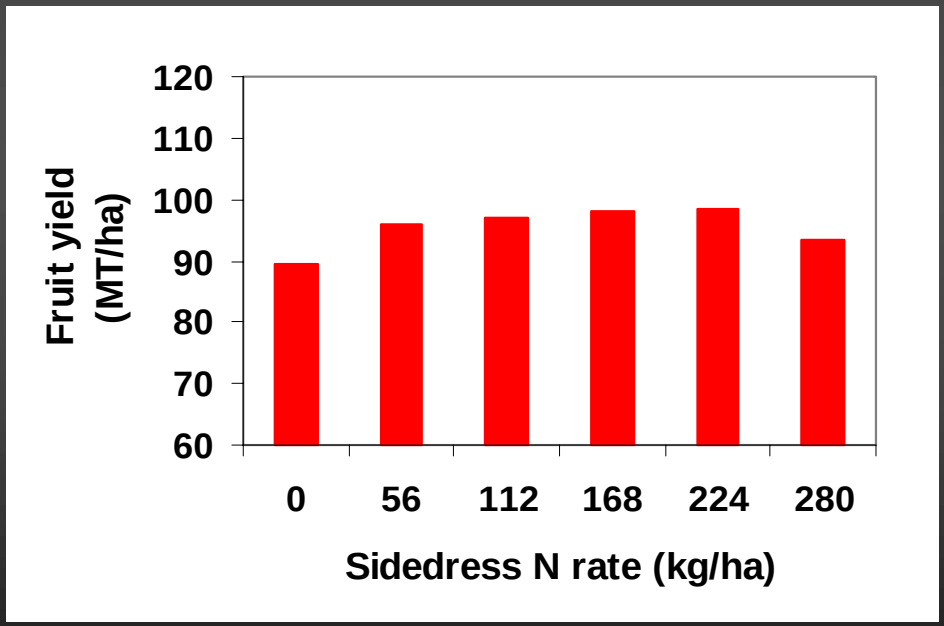
Nutrient requirements for high-yield production :

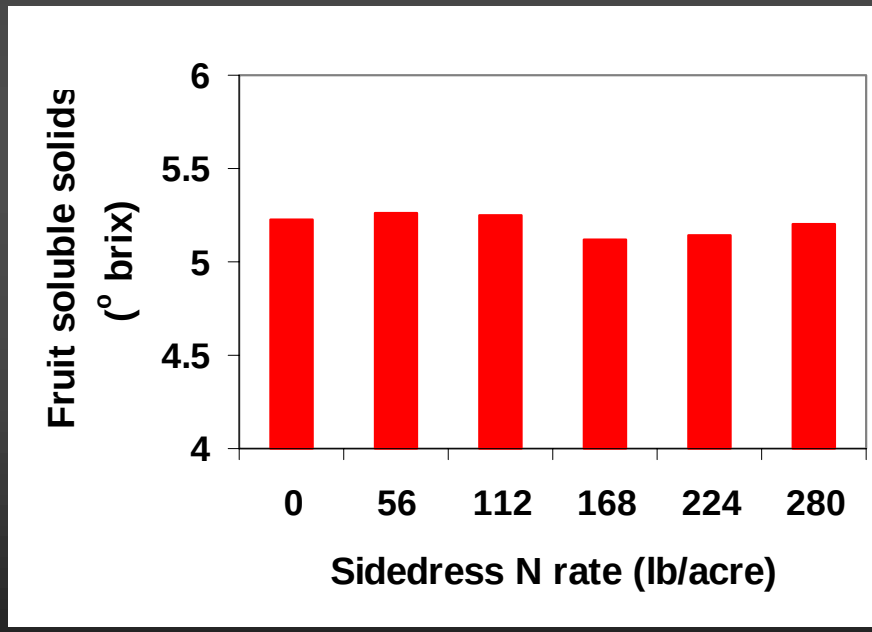
Crop nutrient uptake estimates from various countries :



Nitrogen effects :
N rate trials in California (1998-99)

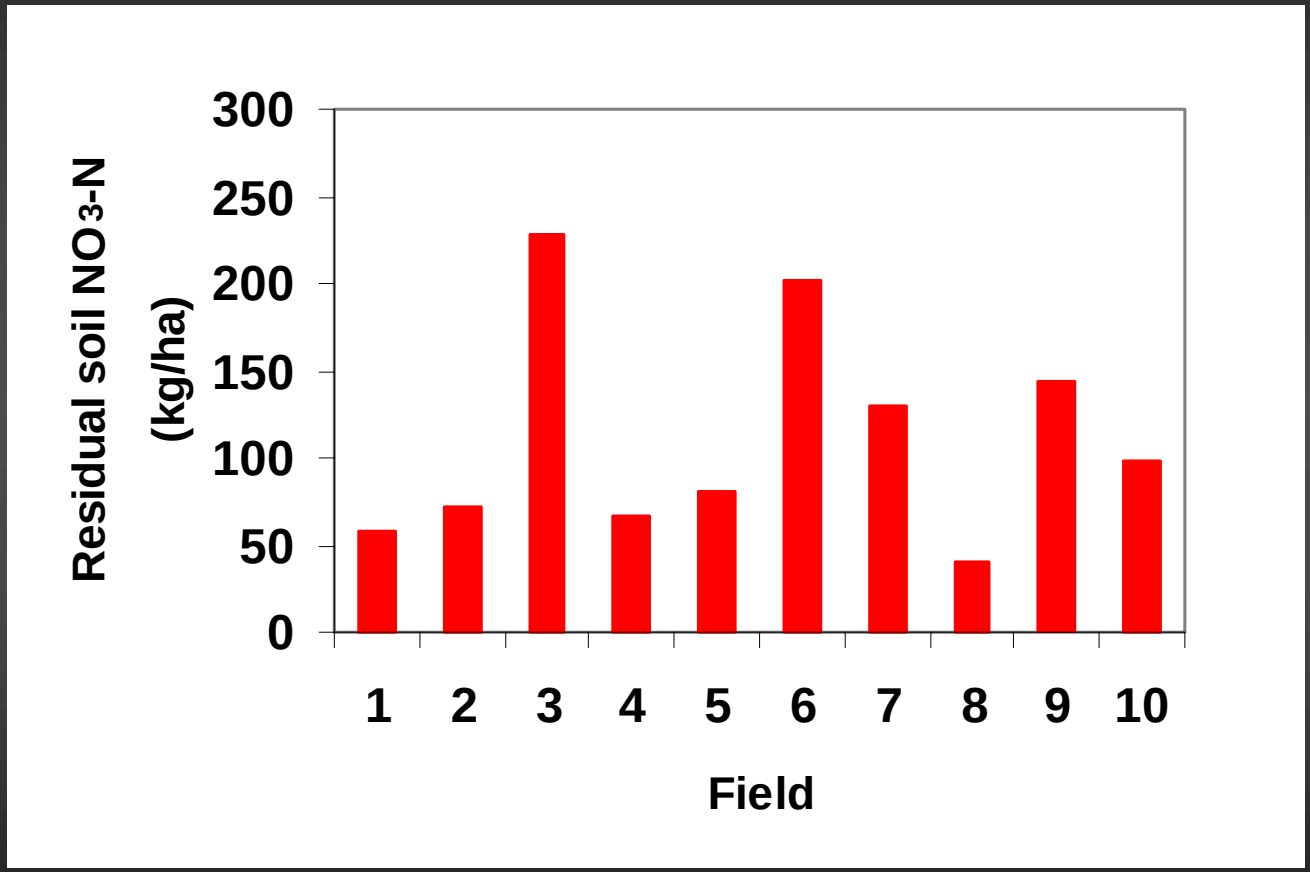
Average of 10 field trials :





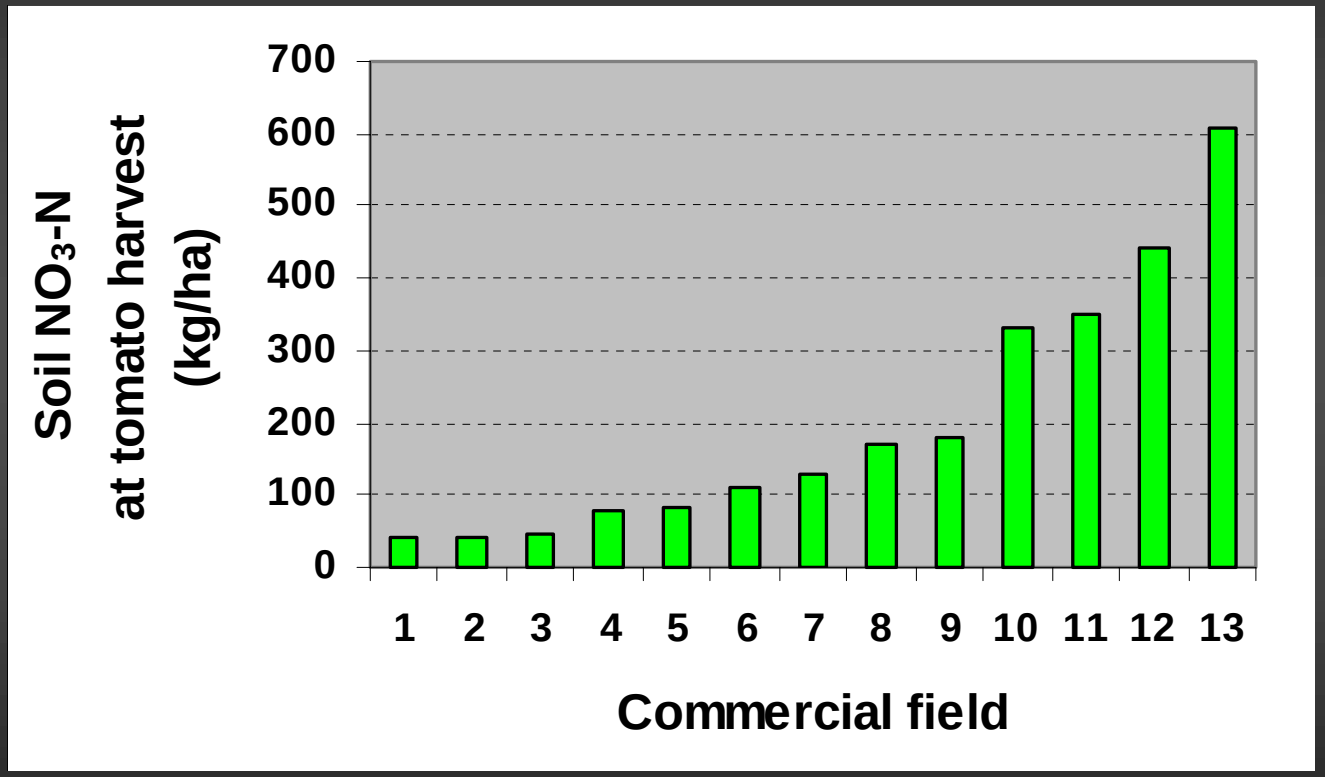
Why such flat response ?

Residual soil NO_3-N variable, but substantial :



Top 60 cm of soil, 1998-99 California sidedress N trials

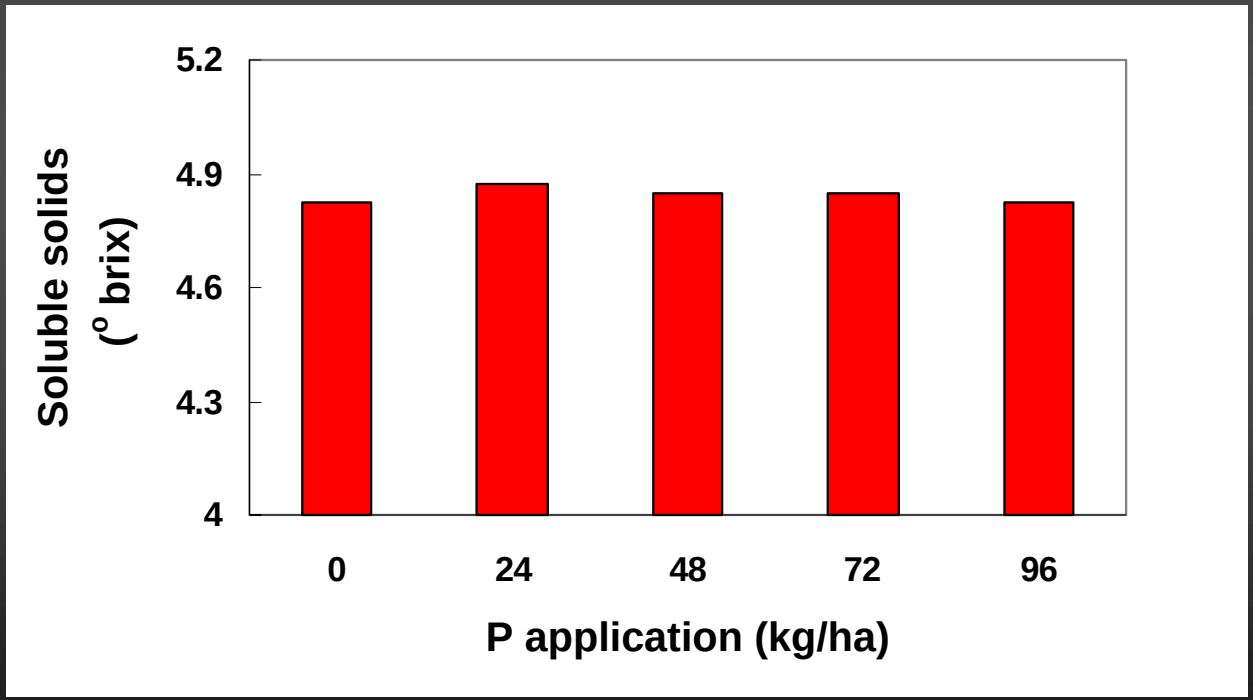
Excessive N fertilization is common :



2003-04 Australian data

Phosphorus effects :

- ✓ Yield response in soils up to approximately 20-25 PPM bicarbonate extractable P
- ✓ Petiole PO_4-P 'sufficiency standards' too high
- ✓ Fruit quality effects minimal

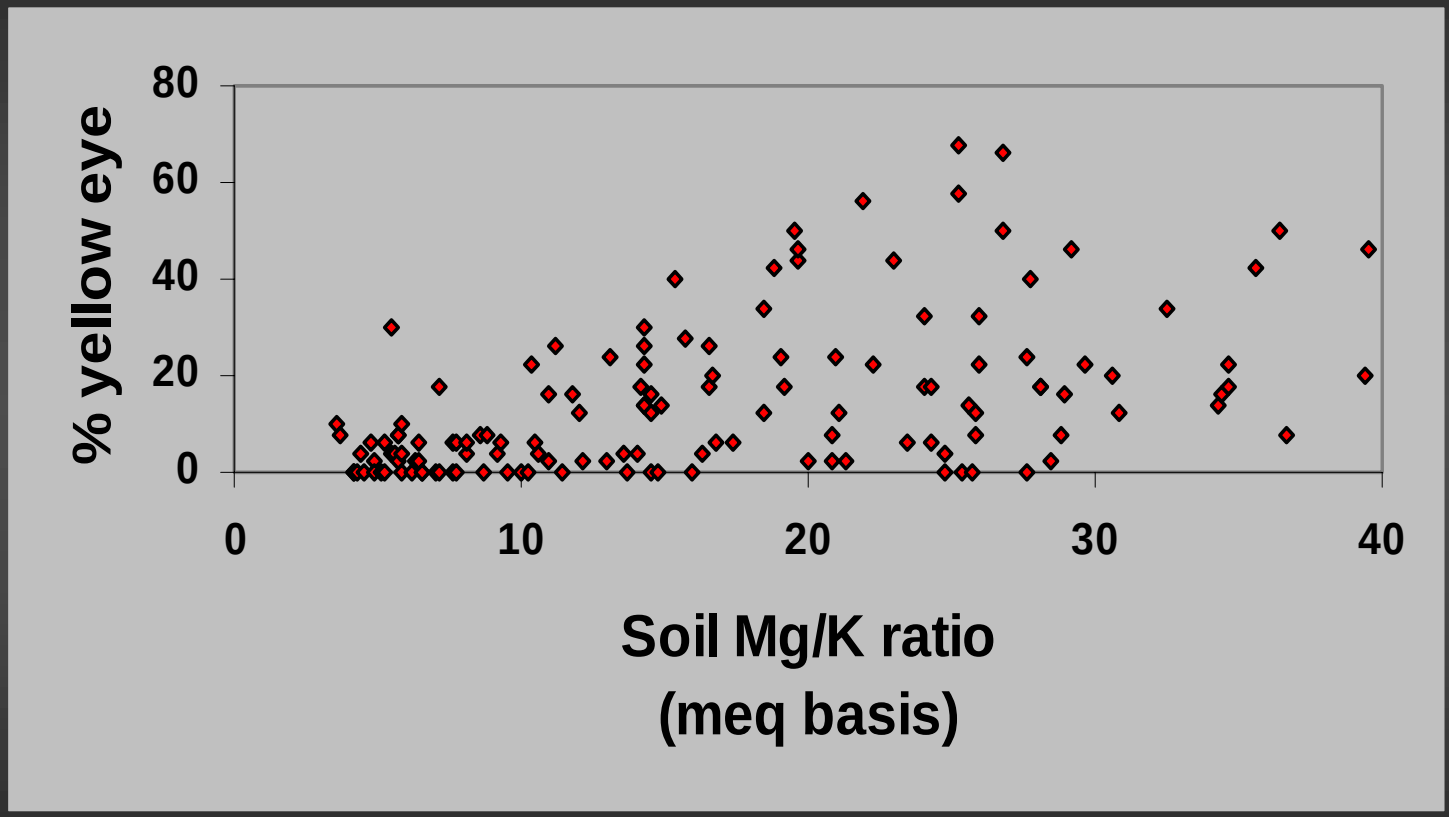


Mean of 4 California trials

Potassium effects :

- ✓ Soil K availability problematic in some production regions, not in others
- ✓ K required for maximum yield may be different than K required for maximum quality

Soil Mg suppresses K uptake :

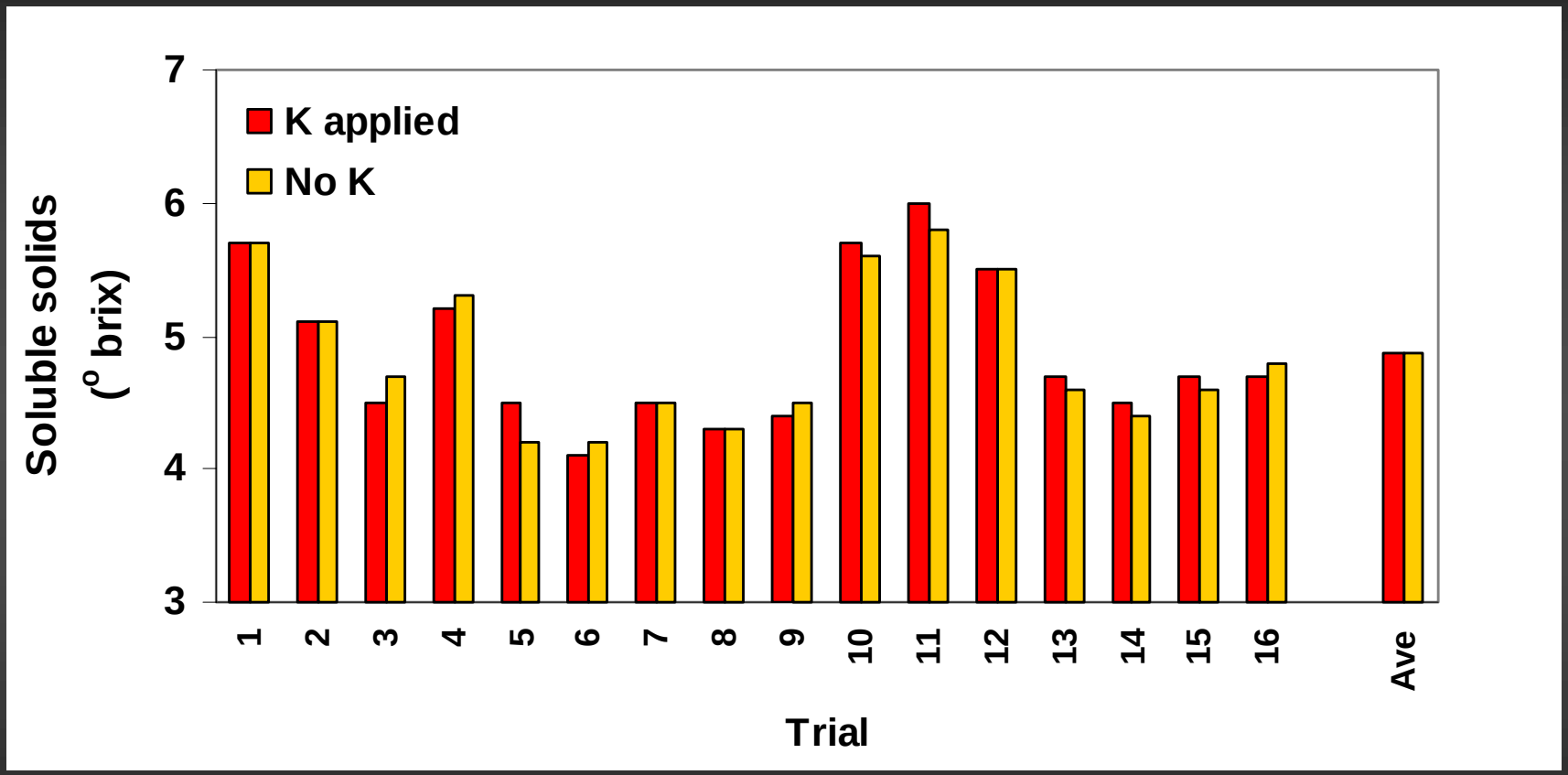


1996-97 California field survey

K fertilizer response may vary depending on application technique and irrigation method :

Soil K (PPM)	K application technique	# of trials	# of fields with Yield improvement	# of fields with Yellow eye reduction
< 150	Preplant or sidedress	7	3	2
> 150	Preplant or sidedress	5	0	3
> 150	Drip fertigated	4	2	4

However, K fertilization does not increase soluble solids :



Soil test interpretation for potassium :

Response to K unlikely if all these conditions are met :

Quantity:

> 200 PPM exchangeable K

Intensity:

> 3% of base exchange (meq basis)

Mg / K ratio:

< 10:1

Micronutrient effects :

✓ No hard evidence of micronutrient effects under normal field conditions

California:

Large scale field surveys (> 100 fields) show no evidence of yield-limiting deficiencies or fruit quality effects for Ca, Mg, S, Zn, Mn, or Fe

Australia :

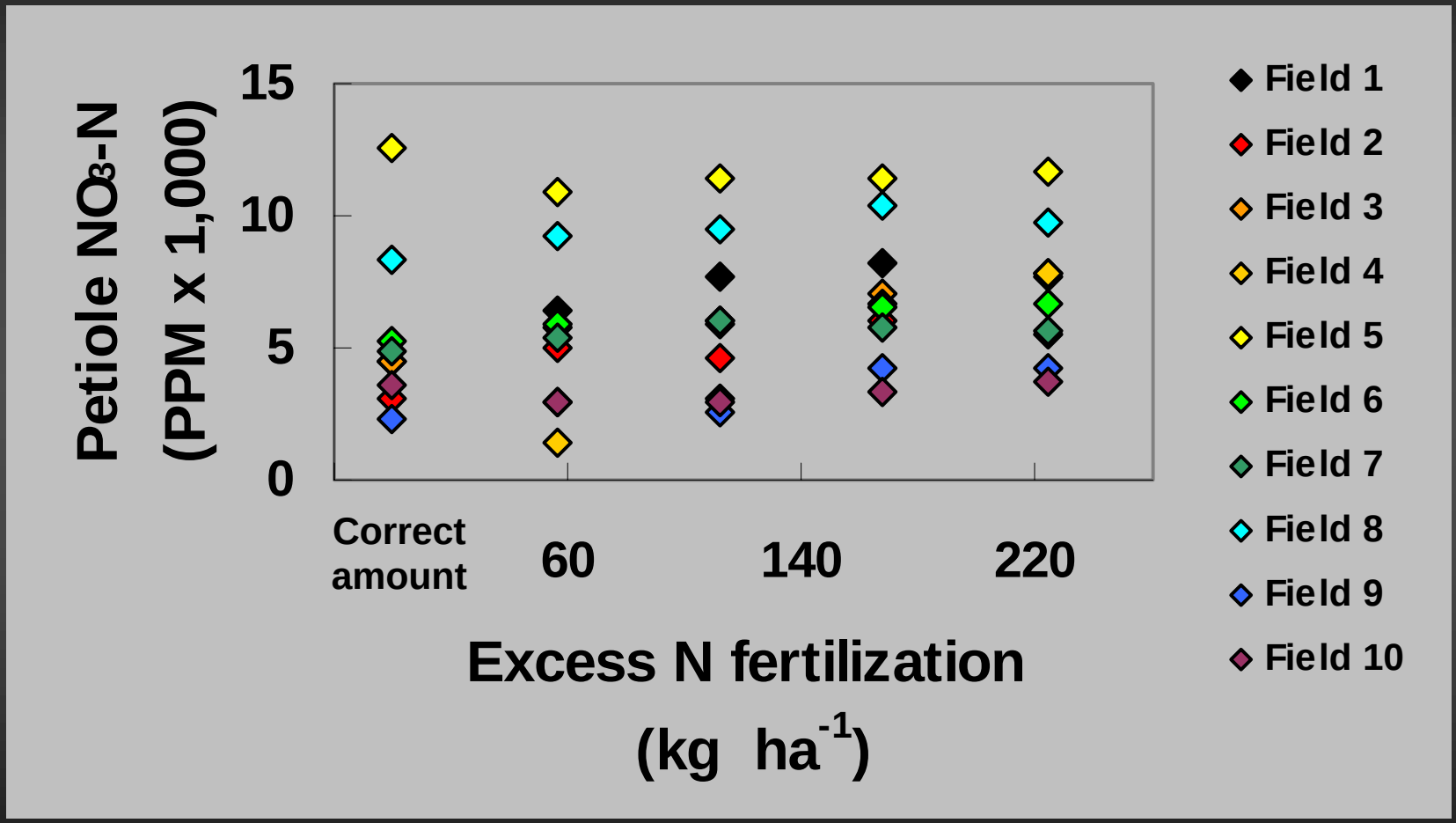
Small-scale field surveys in individual years show positive correlation between some micronutrient concentration in petiole sap and fruit brix; however, those associations do not hold up across years

Tissue sampling as a management tool ?

In the California experience, petiole testing is :

- **useful only to identify yield-limiting deficiency**
- **unreliable for precision fertilizer management**

Factors other than soil nutrient availability can affect petiole nutrient concentration :



1998-99 California sidedress N trials

Water quality protection :

In summary :

- ✓ High-yield processing tomato production does not require exactly ‘balanced’ nutrient regimes
- ✓ The interpretation of current plant tissue tests requires additional research, and perhaps new techniques
- ✓ Large gains in yield or fruit quality are more likely to come from improvements in aspects of production other than fertilizer management
- ✓ Future fertilizer management research must include environmental protection