



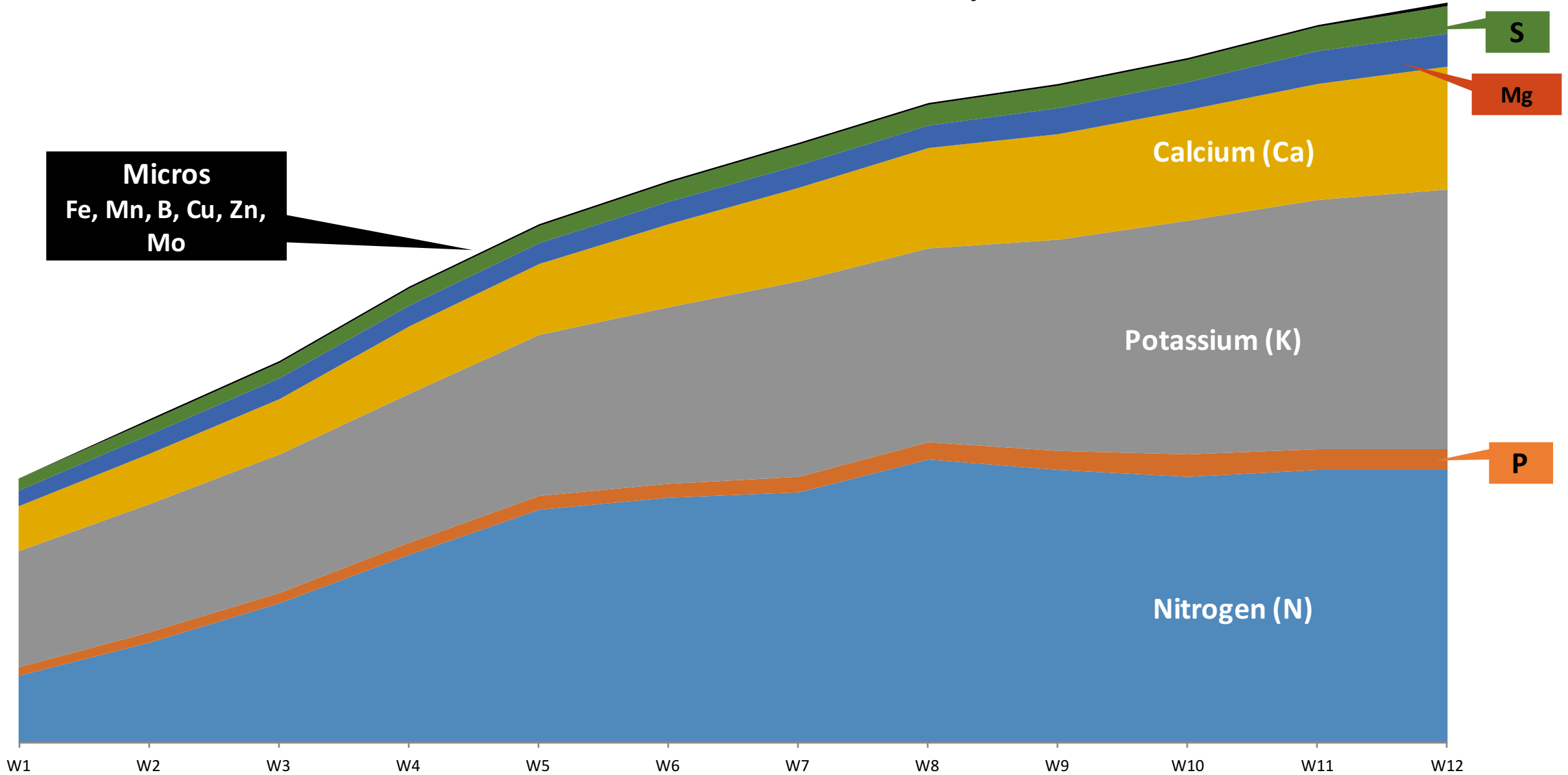
Are Micronutrients & Phosphorus Really that Important?

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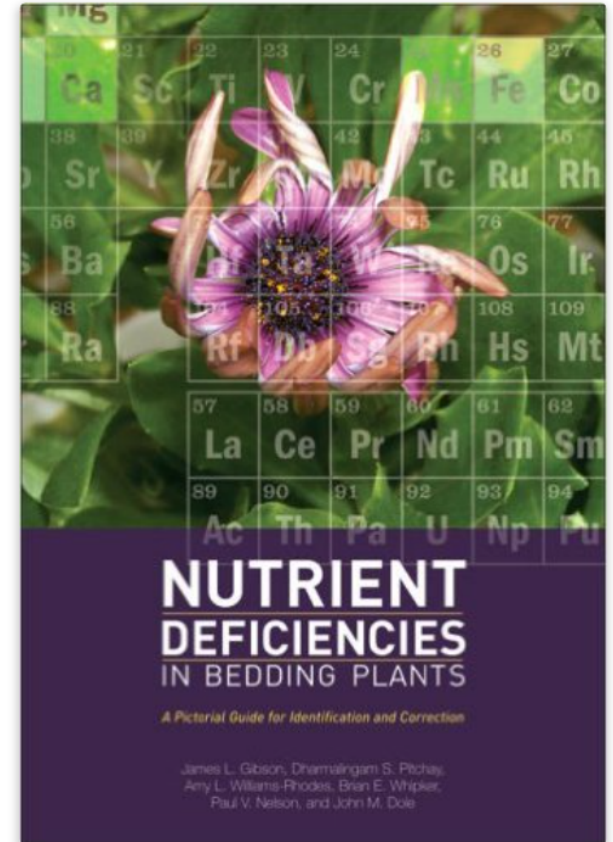
Nutrient accumulation in plants



Extreme, Pervasive vs Transient Deficiencies



Gibson, Whipker et al
(NCSU)

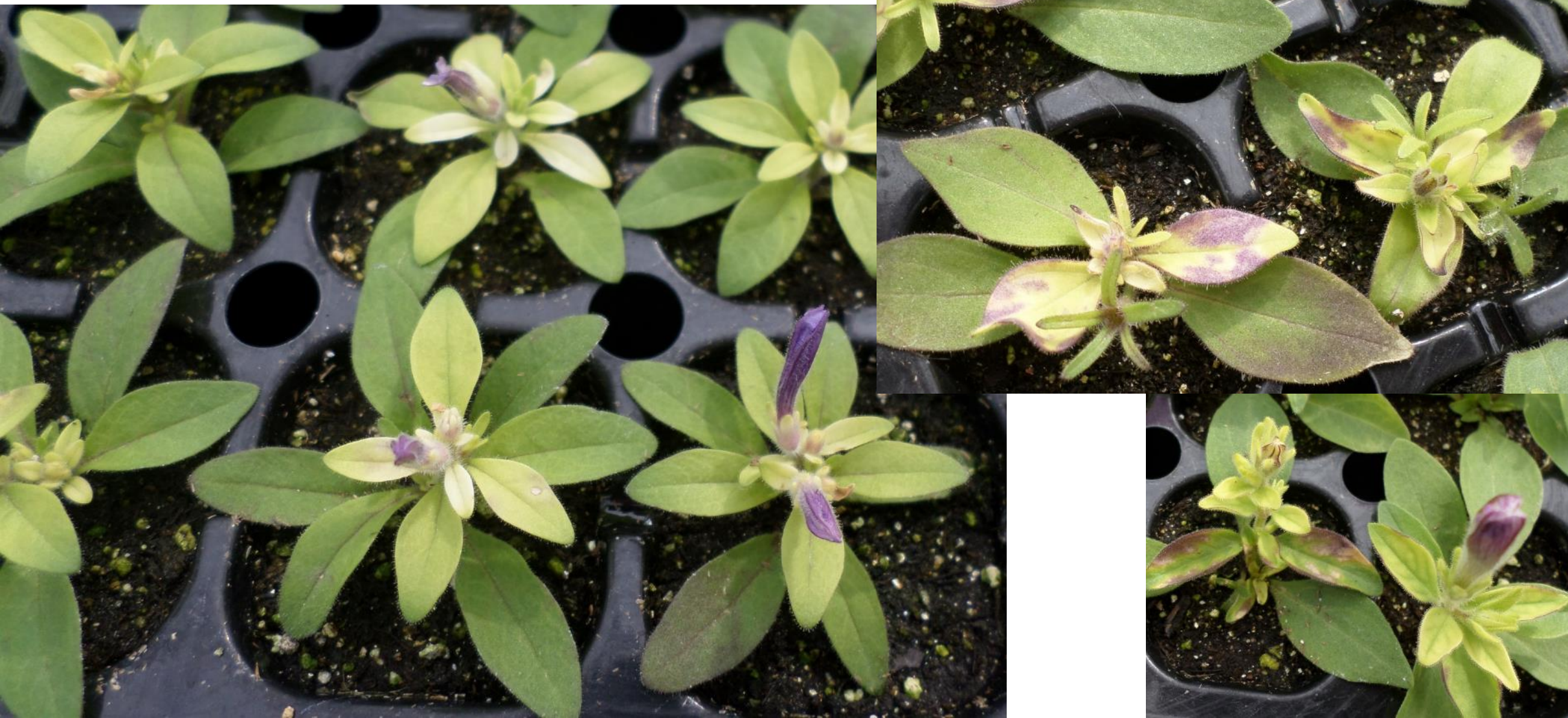


What's the Economic Consideration?

- 'Week 10' Petunia problem



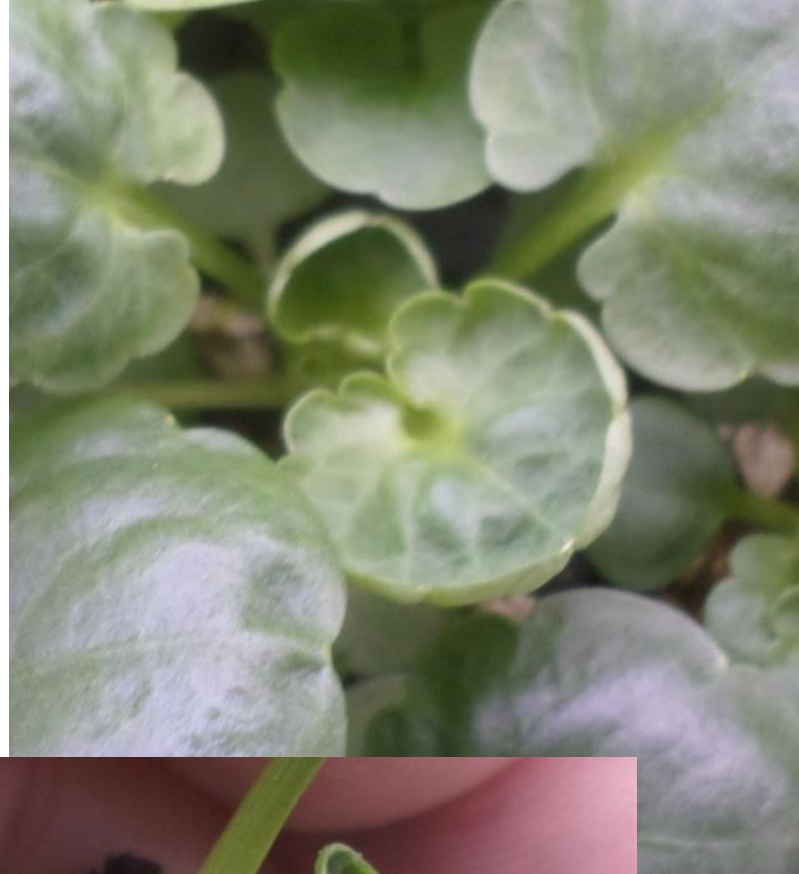
Chlorosis



'Oct 10th' Problem



Runts & Abnormals



Collateral problems



Uniformity of Germination



When the root is ready to grow what nutrients are available at the root-soil interface?



How did we end up with these problems?

- The BIG Miss
 - Misunderstandings & Misinterpretations *aka “Alternative truths...”*
- Sub optimum P issue
 - Paul Nelson’s iconic photo of influence of increasing P on internode stretch
 - Growers moved to low P feeds
 - Soil suppliers reduced (eliminated) P from starter charge
- Sub optimum Micros
 - Royal Heins (Van Wingerden) strategy to control height reduce feeds
 - Micros are applied relative to the N in the pre-mix bag –oops...

How do the Micros change with N fertilizers

20-10-20	Target Rate	A		
N		300		
P	14-20	65		
Fe	1.00	1.52		
Mn		0.76		
B	0.50	0.38		
Zn		0.76		
Cu		0.38		
Mo	0.25	0.76		

Well then, What about different Formulations?

20-10-20	Target Rate	13-2-13	15-2-20			
N						
P	14-20	6	6			
Fe	1.00	0.49	0.67			
Mn		0.24	0.34			
B	0.50	0.12	0.20			
Zn		0.24	0.34			
Cu		0.12	0.34			
Mo	0.25	0.24	0.34			

How Do I Optimize My 'Micros+P' Program?

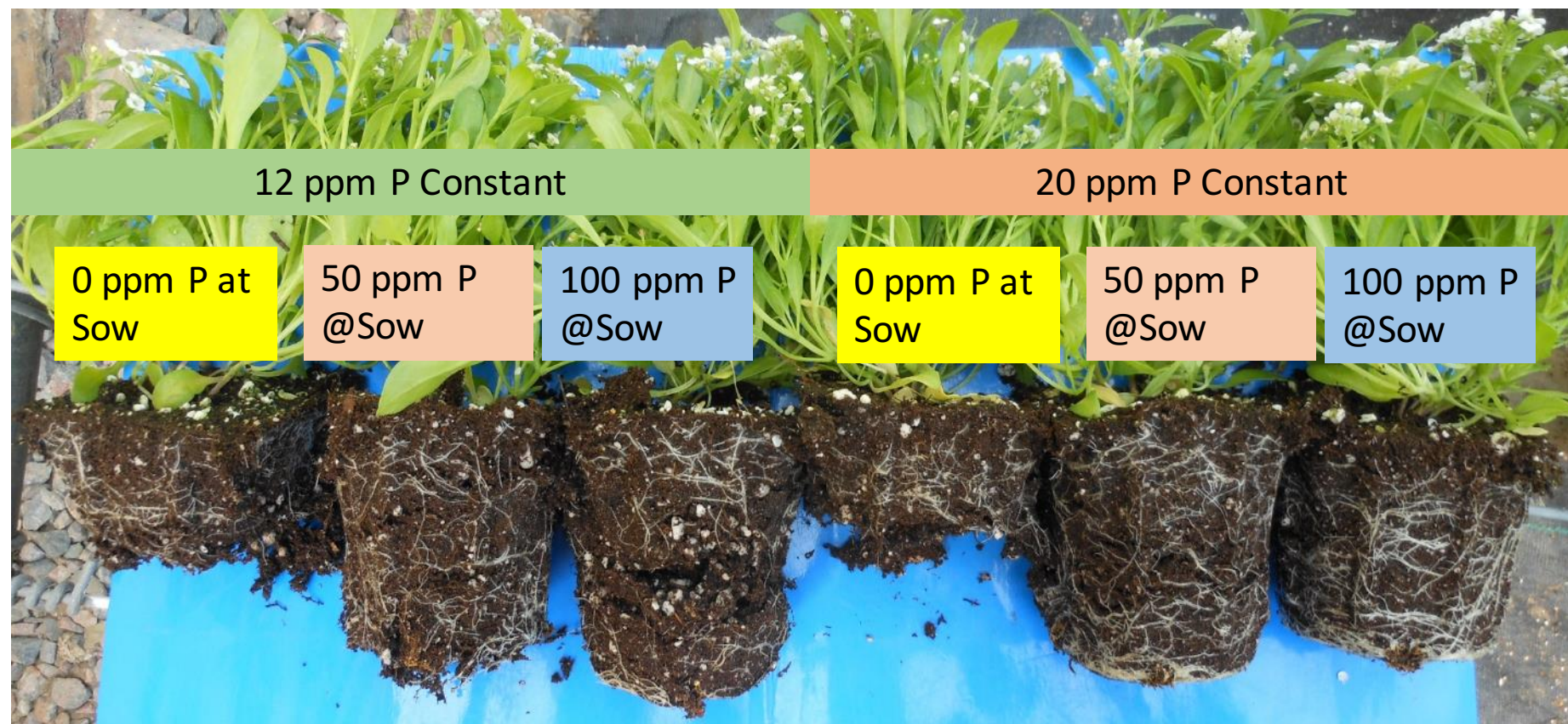
- Set irrigation targets
 - Water+Fertilizer = Target
 - Alkalinity (Bicarbonate) is critical
- Fine Tune with Chelate vs Sulfate
- Clay binders
- '2-bag' system
 - A- micros+P
 - B-Nitrogen (Ca, K, Mg, NH₄ ratios)

	Target Rate
P	14-20
Fe	1-1.5
Mn	
B	0.65-1
Zn	0.5-?
Cu	<3?
Mo	<1?

Adjusted Fertilizer Program vs Original



Early Benefits of P Where P is Required



12 ppm P Constant

20 ppm P Constant

0 ppm P at Sow

50 ppm P @Sow

100 ppm P @Sow

0 ppm P at Sow

50 ppm P @Sow

100 ppm P @Sow

12 ppm P Constant

20 ppm P Constant

0 ppm P at Sow

50 ppm P @Sow

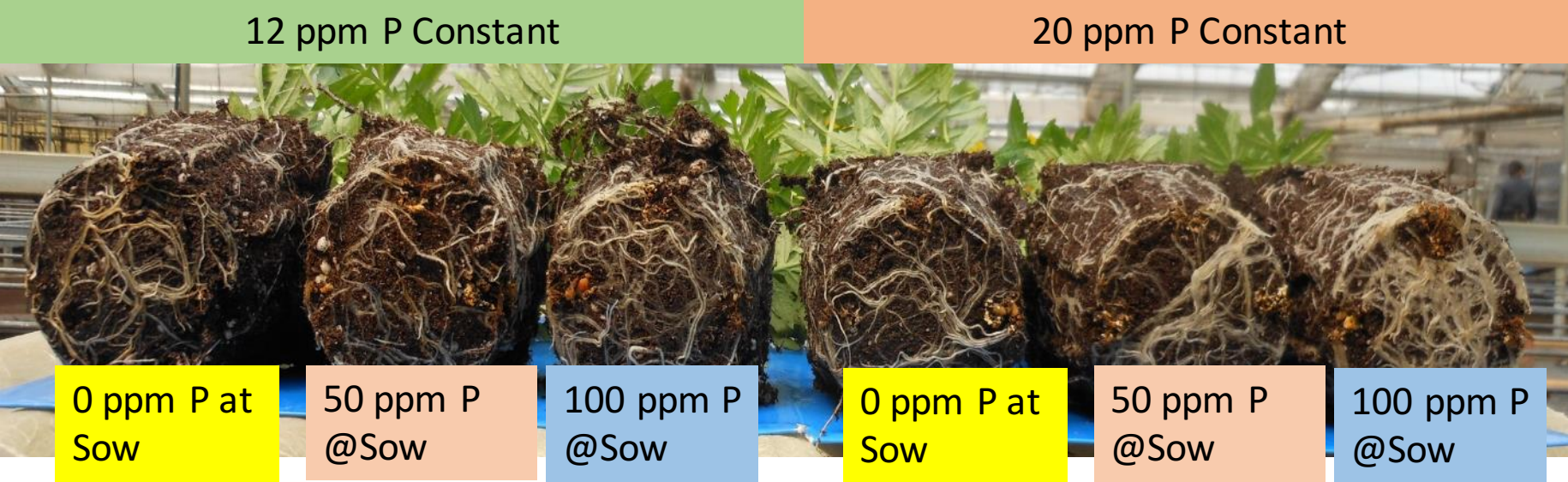
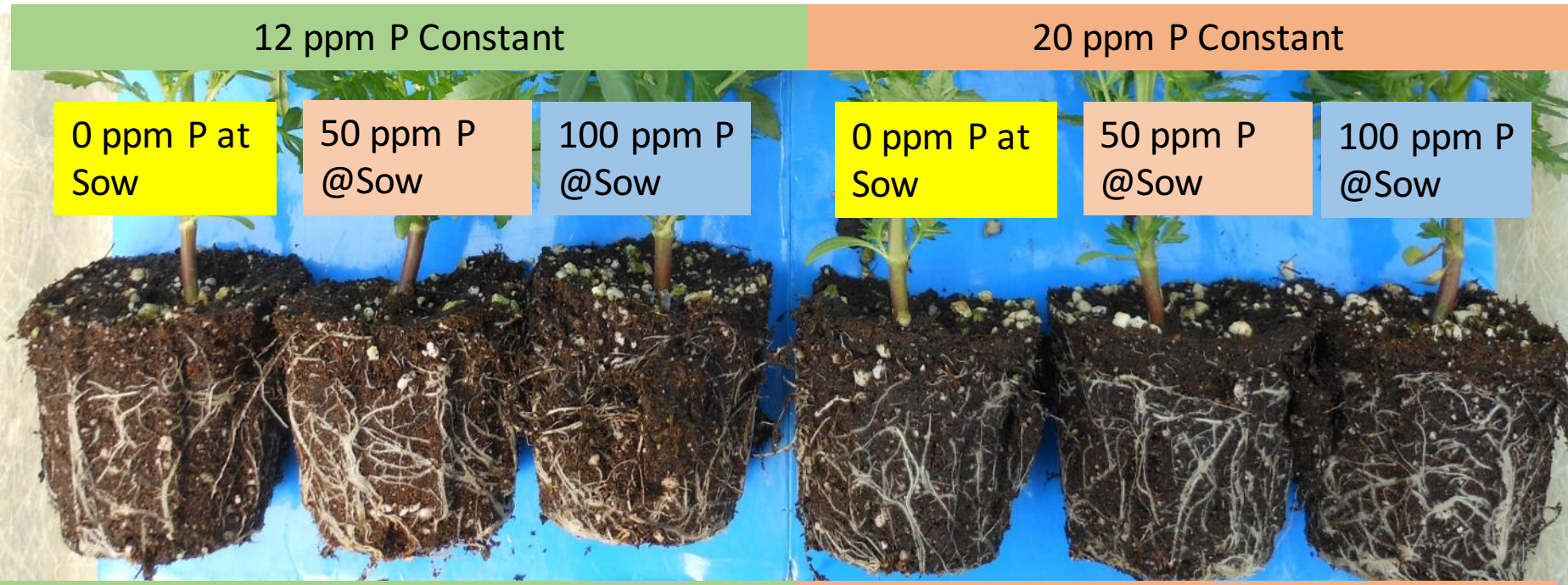
100 ppm P @Sow

0 ppm P at Sow

50 ppm P @Sow

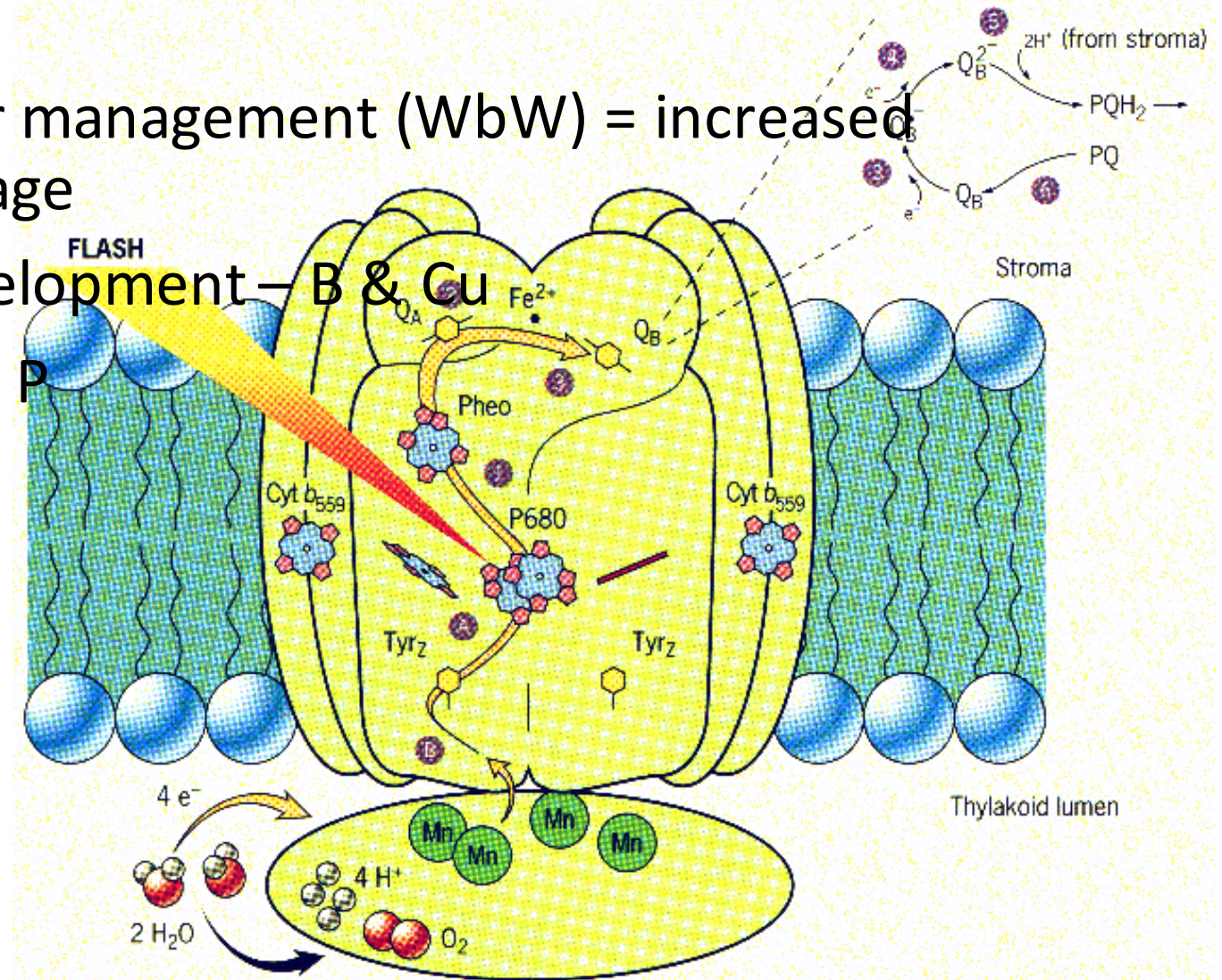
100 ppm P @Sow

Early Benefits of P Where P is Not Required



What Are the Benefits of Fine-tuned Micro+P?

- Coupled with improved water management (WbW) = increased usable yield – complete package
- Uniform foliage & flower development – B & Cu
- Improved root development - P
- Shorter crop time – Fe:Mn



Continuing Challenges

- Bucket Chemistry
 - Formulation concentrated chelates act weird.
 - Mixing methodology
 - Precipitation & consumption in the irrigation lines
- Species optimization
- CEC capacity of media
- Interaction with soil pH and localized availability
- Buffering capacity of soil solution.