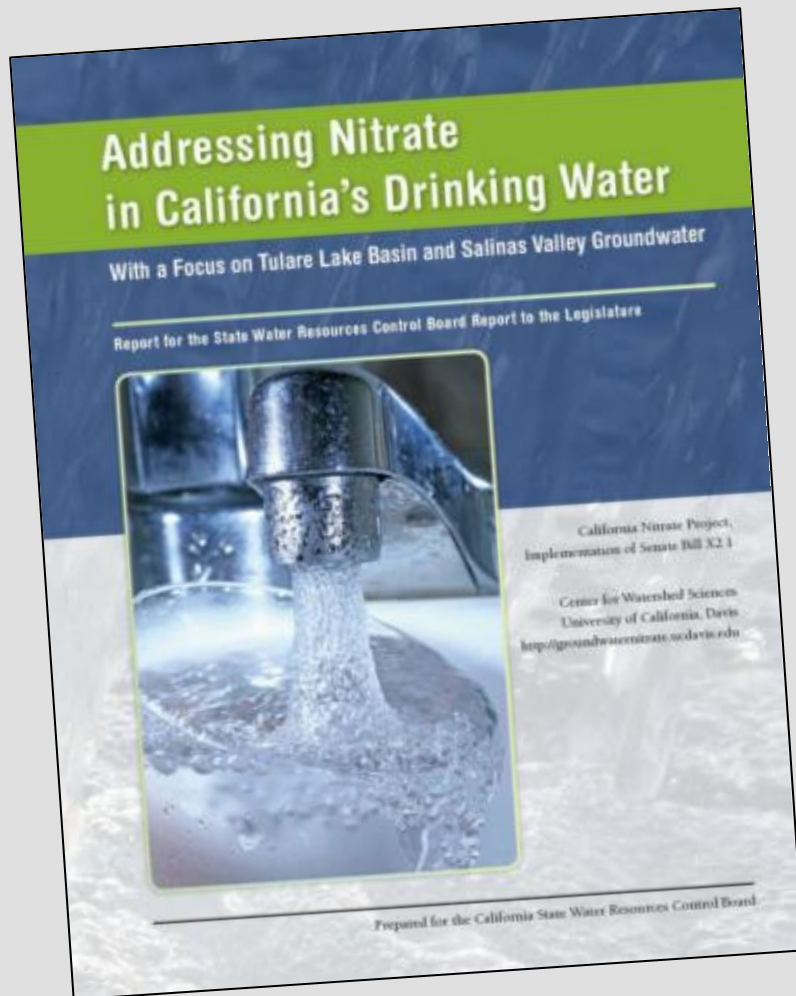


Nitrogen planning in tomato production



Nitrate in groundwater is now the driver of water quality regulation ...



Region 5 Water Quality Control Board is imposing regulations:

- **Nitrogen planning for all growers**
- **Nitrogen reporting for those in 'high vulnerability' areas**

NITROGEN MANAGEMENT PLAN WORKSHEET

1. Crop Year (Harvested): _____	4. APN(s):	5. Field(s) ID	
2. Member ID# _____			
3. Name: _____			

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	26. Recommended/ Planned N	27. Actual N
6. Crop		15. Nitrogen Fertilizers		
7. Production Units		16. Dry/Liquid (lbs/ac)		
8. Projected Yield (Units/Acre)		17. Foliar N (lbs/ac)		
9. N Recommended (lbs/ac)		18. Organic Material N		
10. Acres		19. Available N in Manure/Compost (lbs/ac estimate)		
Post Production Actuals				
11. Actual Yield (Units/Acre)		20. Total Available N Applied (lbs per acre)		
12. Total N Applied (lbs/ac)		21. Nitrogen Credits (est)		
13. ** N Removed (lbs N/ac)		22. Available N carryover in soil; (annualized lbs/acre)		
14. Notes:		23. N in Irrigation water (annualized, lbs/ac)		
		24. Total N Credits (lbs per acre)		
		25. Total N Applied & Available		
PLAN CERTIFICATION				
28. CERTIFIED BY:		29. CERTIFICATION METHOD	X	
		30. Low Vulnerability Area, No Certification Needed		
		31. Self-Certified, approved training program attended		
DATE:		32. Self-Certified, UC or NRCS site recommendation		
		33. Nitrogen Management Plan Specialist		

NITROGEN MANAGEMENT PLAN WORKSHEET

1. Crop Year (Harvested):

4. APN(s):

5. Field(s) ID

Objectives:

- Require growers to give more attention to efficient N use
- Allow the Board to estimate the 'Nitrogen balance' for important crops

CROP NITROGEN MANAGEMENT PLANNING		N APPLICATIONS/CREDITS	26. Recommended/ Planned N	27. Actual N
6. Crop		15. Nitrogen Fertilizers		
7. Production Units		16. Dry/Liquid (lbs/ac)		
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		24. Total N Credits (lbs per acre)		
		25. Total N Applied & Available		
PLAN CERTIFICATION				
30. Low Vulnerability Area: No Certification Needed				
31. Self-Certification: No N Application or N Management				
32. Self-Certification: N Application or N Management				
33. Nitrogen Management Plan Specialist				

Basic assumption of a 'nitrogen balance' :

- N applied to a field but not removed in harvested products is at risk of **eventual** loss to the environment, *mostly through nitrate leaching*

Volatilization

Denitrification

AIR

Ammonia

Nitrogen gas

Nitrous
Oxide

Nitric
Oxide



Fertilizer
Organic amendments
Irrigation water $\text{NO}_3\text{-N}$



Harvested
products



Nitrate
WATER

Runoff

Leaching





Evidence for nitrate leaching?

- tile drain effluent nearly always above the Federal drinking water limit of 10 PPM $\text{NO}_3\text{-N}$, commonly in the range of 40-100 PPM



Bottom line:

- Within some level of uncertainty, evaluating agricultural N management on a nitrogen balance basis (inputs - outputs) does estimate potential environmental N loading



Bottom line:

- Within some level of uncertainty, evaluating agricultural N management on a nitrogen balance basis (inputs - outputs) does estimate potential environmental N loading
- *At similar yield levels*, a grower consistently applying substantially more N than his neighbor is probably releasing more N to the environment *over time*

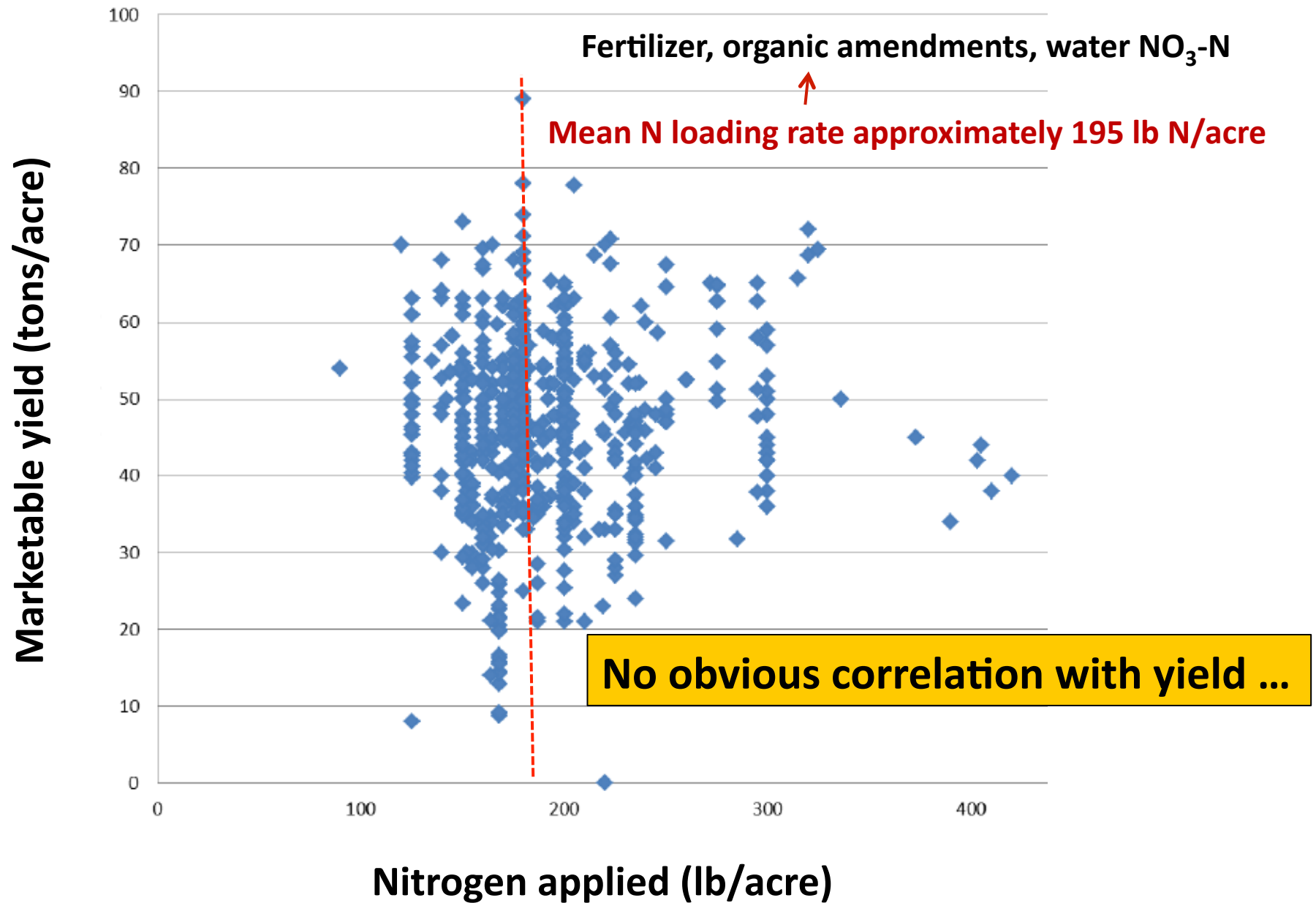


What does the nitrogen balance for processing tomatoes look like?

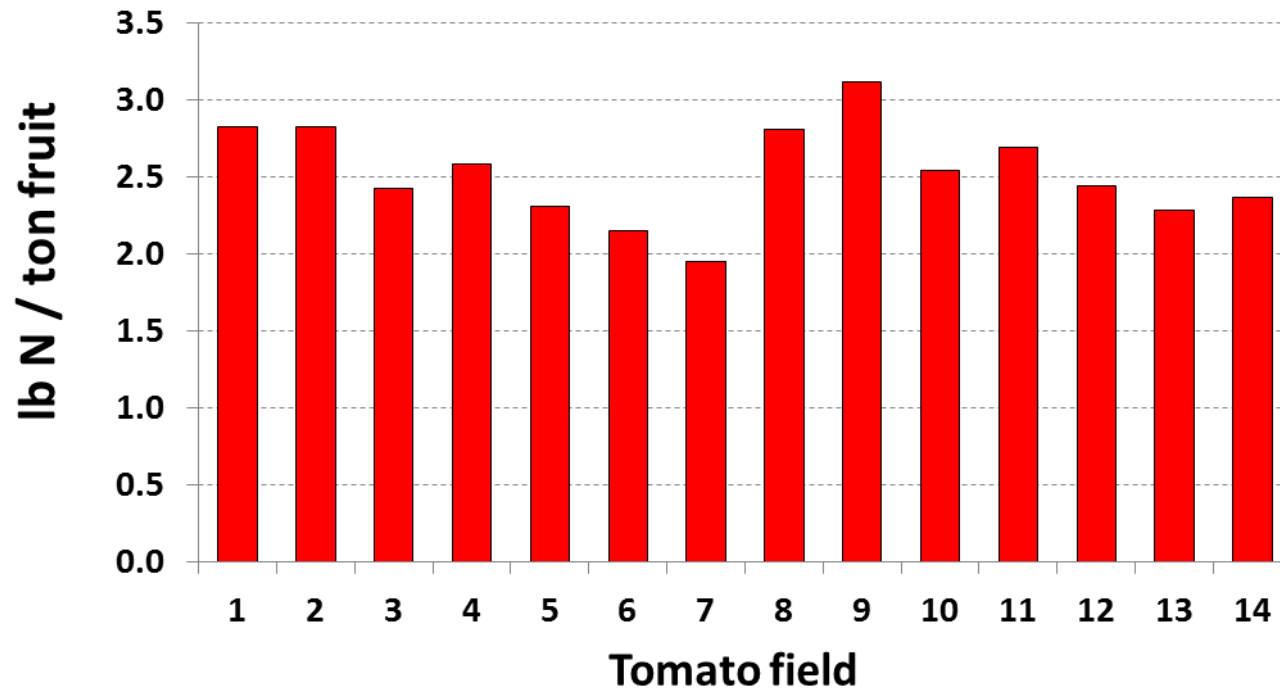
It depends on:

- Amount of N loading (fertilizer, amendments, irrigation water $\text{NO}_3\text{-N}$)
- Fruit yield
- How you do the calculation
 - simplest form (seasonal N input - harvest N removal)

2013 Survey of processing tomato growers:



Sampling in many commercial fields provides crop N uptake information:



- Fruit varies in N content, averaged approximately 2.6 lb/ton; other estimates slightly higher (up to 3 lb N/ton?)
- Harvested fruit averaged 55-65% of total crop N uptake

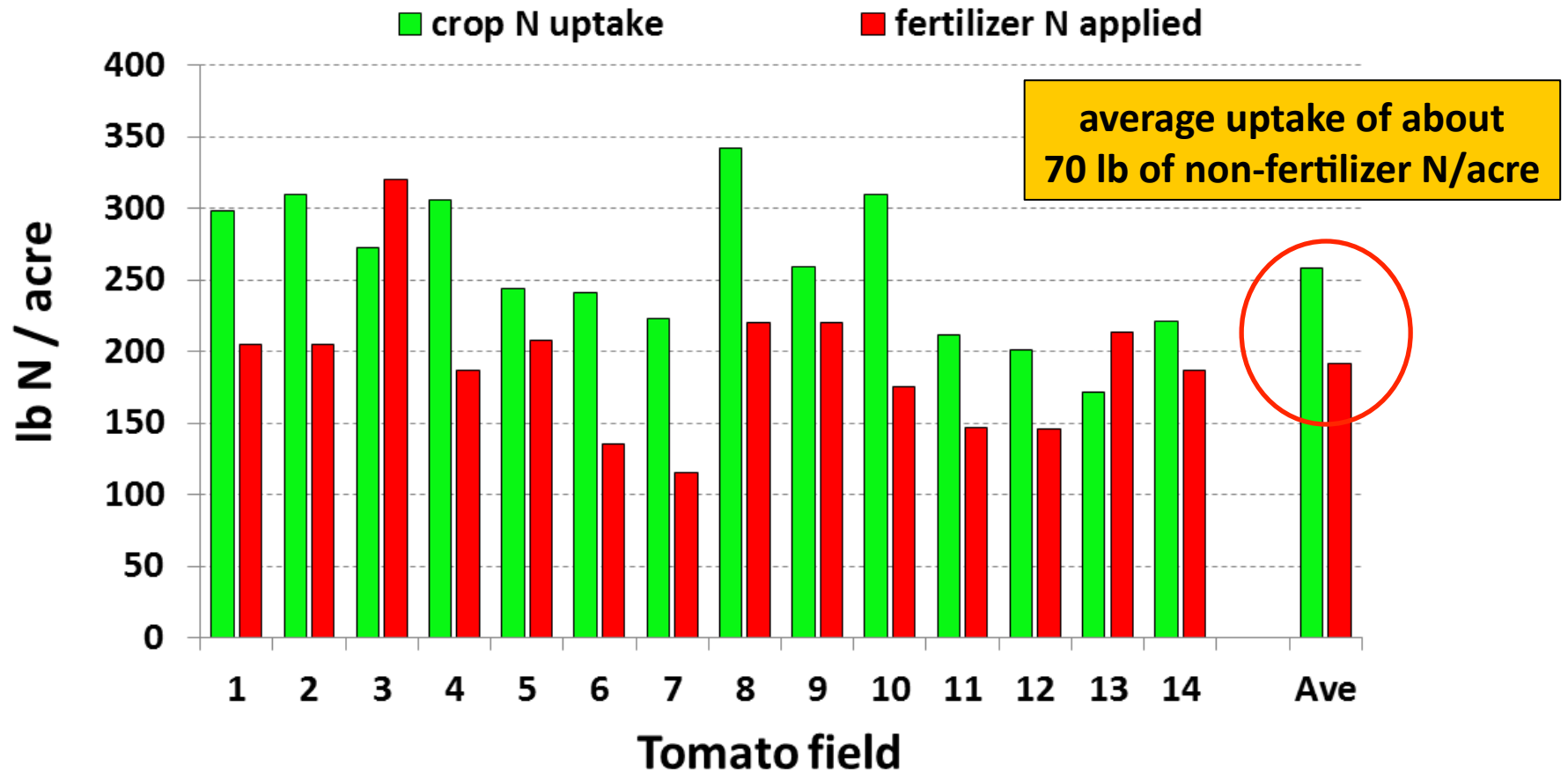


Yield effects on N dynamics:

	<i>Approximate amount of N/acre</i>		
Yield (tons/acre)	Crop N uptake	N in harvested fruit	N in residue
40	200	110	90
50	230	140	90
60	270	170	100
70	310	200	110

Tomatoes take up a significant amount of non-fertilizer N

Non-fertilizer N contributes substantially to crop N uptake:



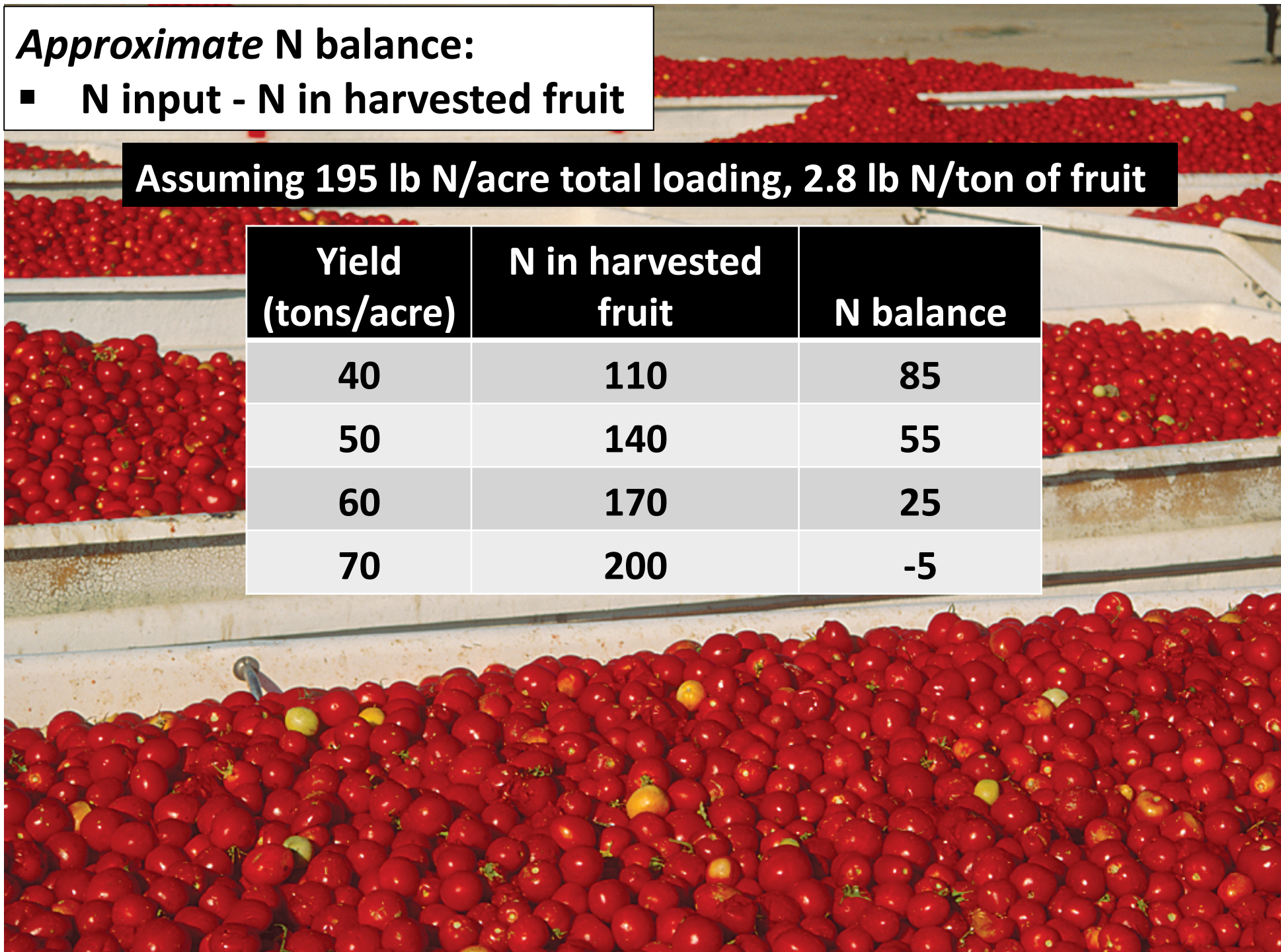
Residual soil NO₃-N is the major source of non-fertilizer N

Approximate N balance:

- **N input - N in harvested fruit**

Assuming 195 lb N/acre total loading, 2.8 lb N/ton of fruit

Yield (tons/acre)	N in harvested fruit	N balance
40	110	85
50	140	55
60	170	25
70	200	-5



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- **N input - N in harvested fruit**

Assuming 195 lb N/acre total loading, 2.8 lb N/ton of fruit

Yield (tons/acre)	N in harvested fruit	N balance
40	110	85
50	140	55
60	170	25
70	200	-5

This is not all lost to leaching !!!

- **There are other N loss mechanisms**
- **Typically 80-100 lb N/acre is in the vines; much of that N can be captured by a succeeding crop *if the management of that succeeding crop accounts for this carry-over N***



In summary:

- Many tomato growers are in *relative* balance with their current N programs
- Growers consistently using higher N rates per ton of harvested fruit are likely to be releasing more N to the environment over time
- Improvement in N balance will come from increased attention to non-fertilizer sources of N, and strategic rotational management

