



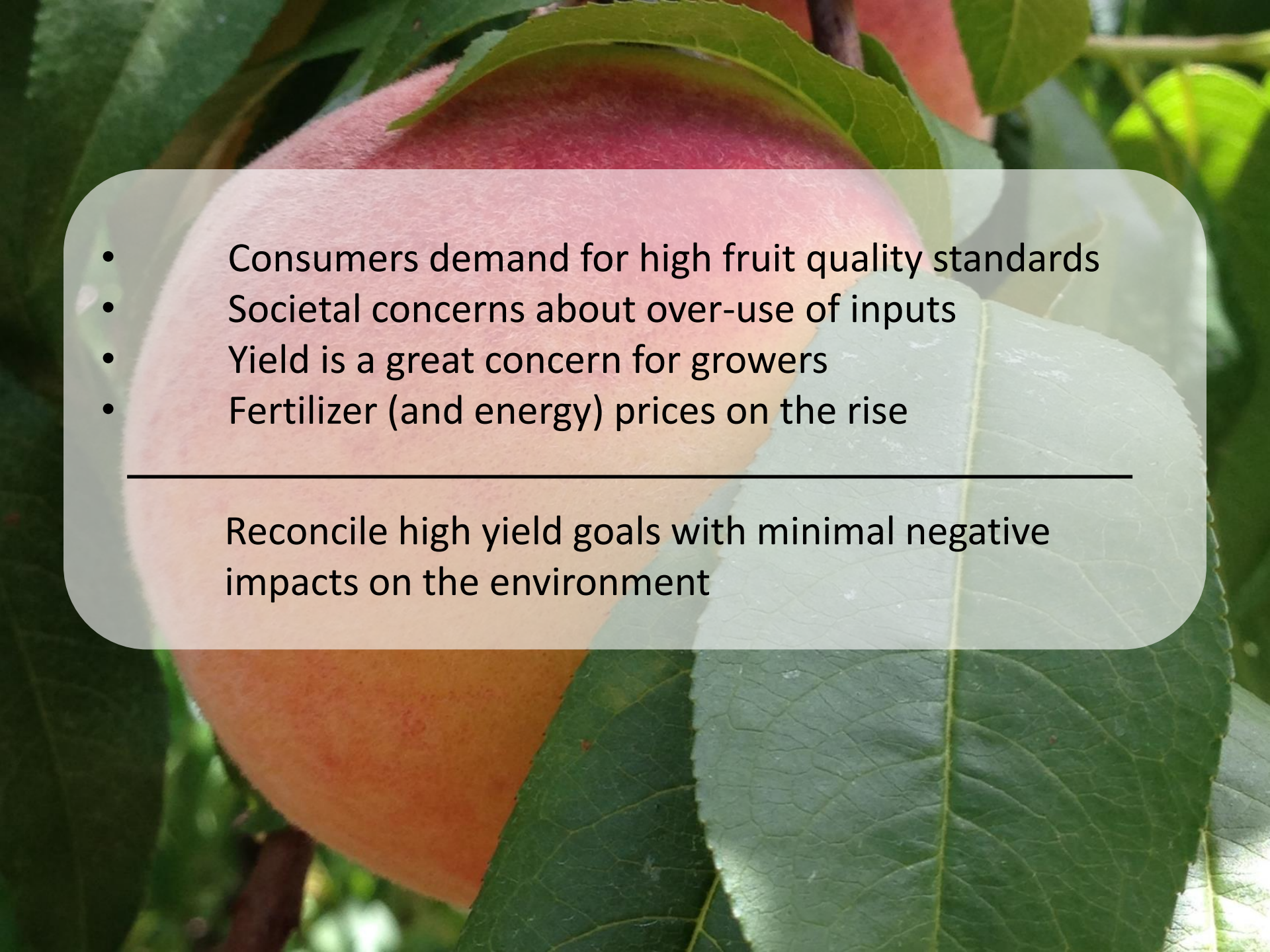
Nutrient management of peach orchards

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**STONE
FRUIT**
Field Day

- 
- Consumers demand for high fruit quality standards
 - Societal concerns about over-use of inputs
 - Yield is a great concern for growers
 - Fertilizer (and energy) prices on the rise
-

Reconcile high yield goals with minimal negative impacts on the environment





Published: January 1995

Nitrogen fertilization management in orchards to reconcile productivity and environmental aspects

[M. Tagliavini](#), [D. Scudellazi](#), [B. Marangoni](#) & [M. Toselli](#)

[Fertilizer research](#) **43**, 93–102 (1995) | [Cite this article](#)

183 Accesses | **53** Citations | [Metrics](#)

Causes and Consequences of Overfertilization in Orchards

in HortTechnology

Authors: Steven A. Weinbaum ¹, R. Scott Johnson ¹, and Theodore M. DeJong ¹

[View Less](#) —

¹ Department of Pomology, University of California, Davis. CA 95616-6683.

DOI: <https://doi.org/10.21273/HORTTECH.2.1.112b>

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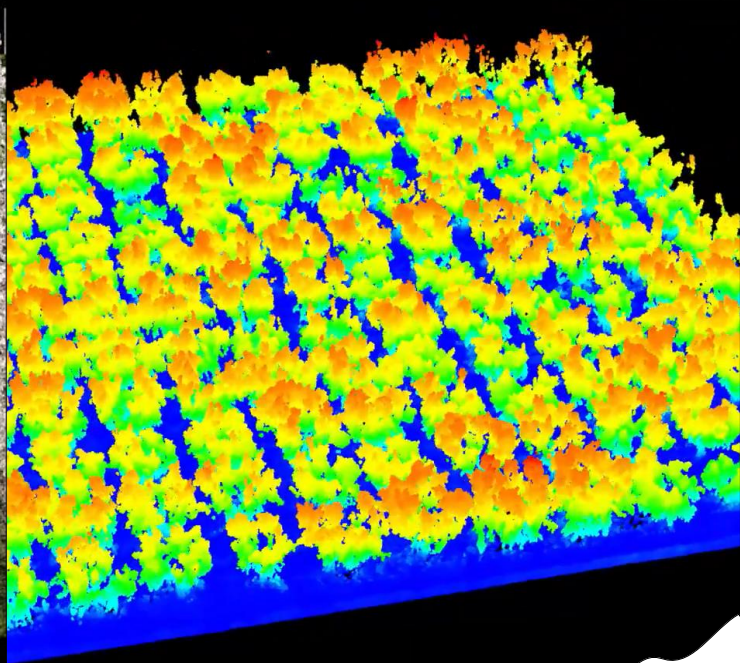
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Volume/Issue: Volume 2: Issue 1



Fertilizer (N) = f_x (... ..)

- fertilization management
(timing, number of applications)
- crop load/yield
- ripening season
- pruning
- tree age and health
- environmental conditions
- soil health/management



Artificial intelligence
and precision
agriculture technology

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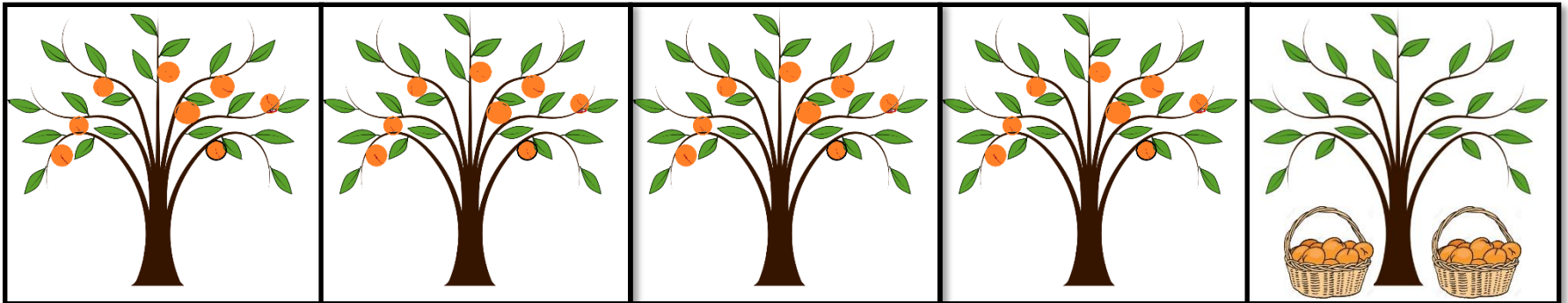
May

June

July

August

September



Nutrient concentration (% D.W.) in fruit

	N	P	K	Ca	Mg
Early	0.9 a	0.2 a	2.0 a	0.03	0.3 a
Mid	0.6 b	0.2 b	1.4 b	0.03	0.2 a
Late	0.6 b	0.1 b	1.4 b	0.03	0.2 a

Nutrient allocation (%)

		N	P	K	Ca	Mg
Pruning wood	Early	55.7	50.3	43.0	53.9	41.6
	Mid	50.0	45.9	32.4	58.6	36.6
	Late	49.6	44.9	27.4	53.3	32.5
Fruit	Early	-	-	-	-	-
	Mid	27.1	29.3	42.2	1.0	23.4
	Late	27.3	32.5	45.0	1.1	23.7
Fallen leaves	Early	23.2	24.3	29.6	45.5	44.0
	Mid	20.0	22.2	23.3	40.4	38.9
	Late	19.9	18.1	25.5	45.6	42.6

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An orchard in autumn. The trees are mostly bare, with some remaining yellow and orange leaves. The ground is covered in a thick layer of fallen yellow leaves. A dirt path winds through the orchard. The sky is clear and blue.

Resorbed N provide up to 70% of the N requirement of forming fruits and shoots





Potassium concentration in mature and old trees

		2015	2016	2017
Pruning wood	Mature	0.9 a	0.4 b	0.7 a
	Old	0.8 a	0.6 a	0.8 a
Fallen leaves	Mature	1.9 a	2.6 a	2.9 a
	Old	1.6 b	1.6 b	1.7 b

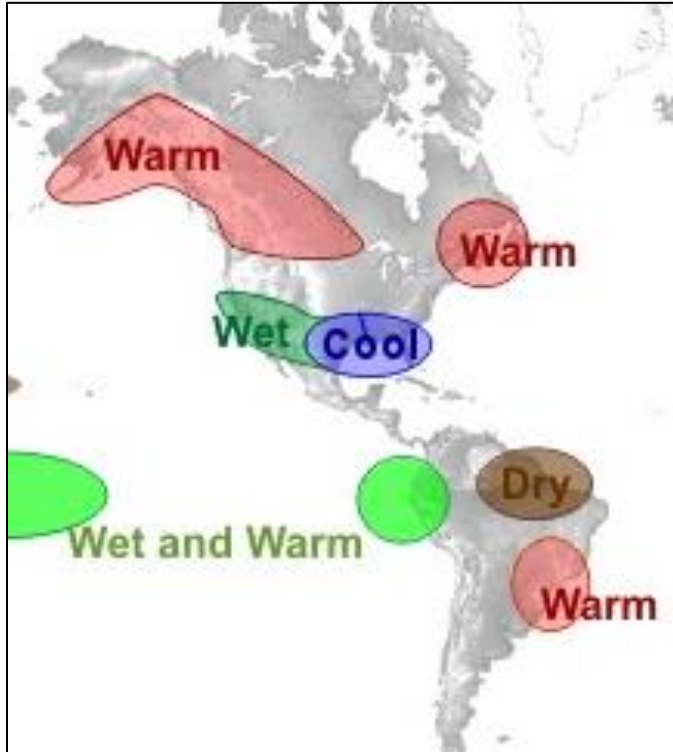
Older trees have an increased potential storage and seem to be more efficient at resorbing nutrients

How do environmental conditions affect nutrient remobilization and reserves?



El Niño/La Niña Southern Oscillation

El Niño year



La Niña year



Source: <http://www.srh.noaa.gov/jetstream/>



What Happens to Peaches When the Chill is Gone?

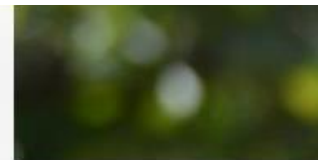
By *Edgefield Advertiser* on January 24, 2013 · Comments Off on What Happens to Peaches When the Chill is Gone?



CROPS > ORCHARD CROPS

Lack of winter chill temps a concern for fruit growers

Apple growers in Texas, New Mexico and Arizona say winter chill hours, loosely defined as the number of winter hours the temperature lingers between 32 and 45 degrees, are critical in order for trees to bud. Peaches also at risk.

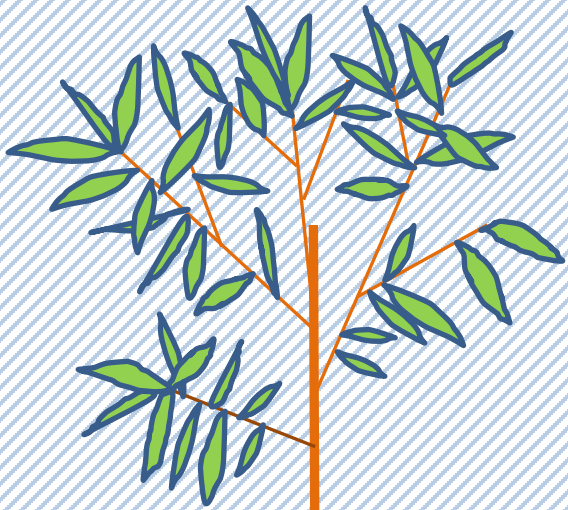


Apples may be in short supply in the Southwest this year following a warmer than usual winter and limited chilling hours.

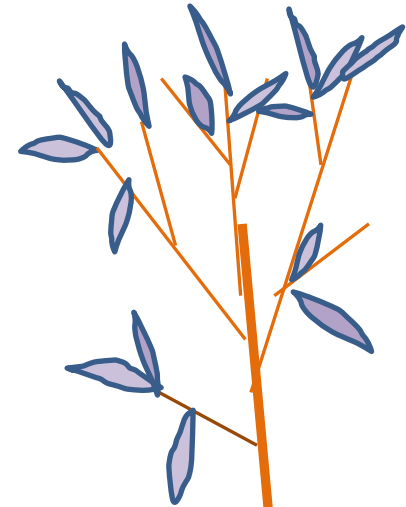
September-December

Greenhouse

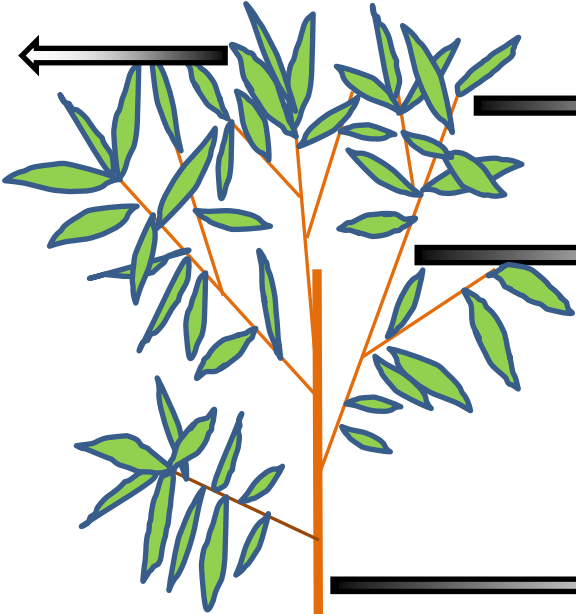
Outside



↑ 5 °C



Leaves



First year shoots



Second year shoots



Stem



Below graft union



Large roots



Fibrous roots

Effect of delayed senescence in N concentration in reserve tissues during winter

Tissue	Greenhouse	Outside
1-year shoots	1.86***	1.57
2-year shoots	0.97**	0.85
Stem	0.72***	0.61
Below graft union	0.92***	0.73
Large roots	1.77***	1.39
Fibrous roots	2.61	2.29

n = 60-63. Analyzed with analysis of variance (ANOVA)

*** P < 0.001 ** P < 0.01

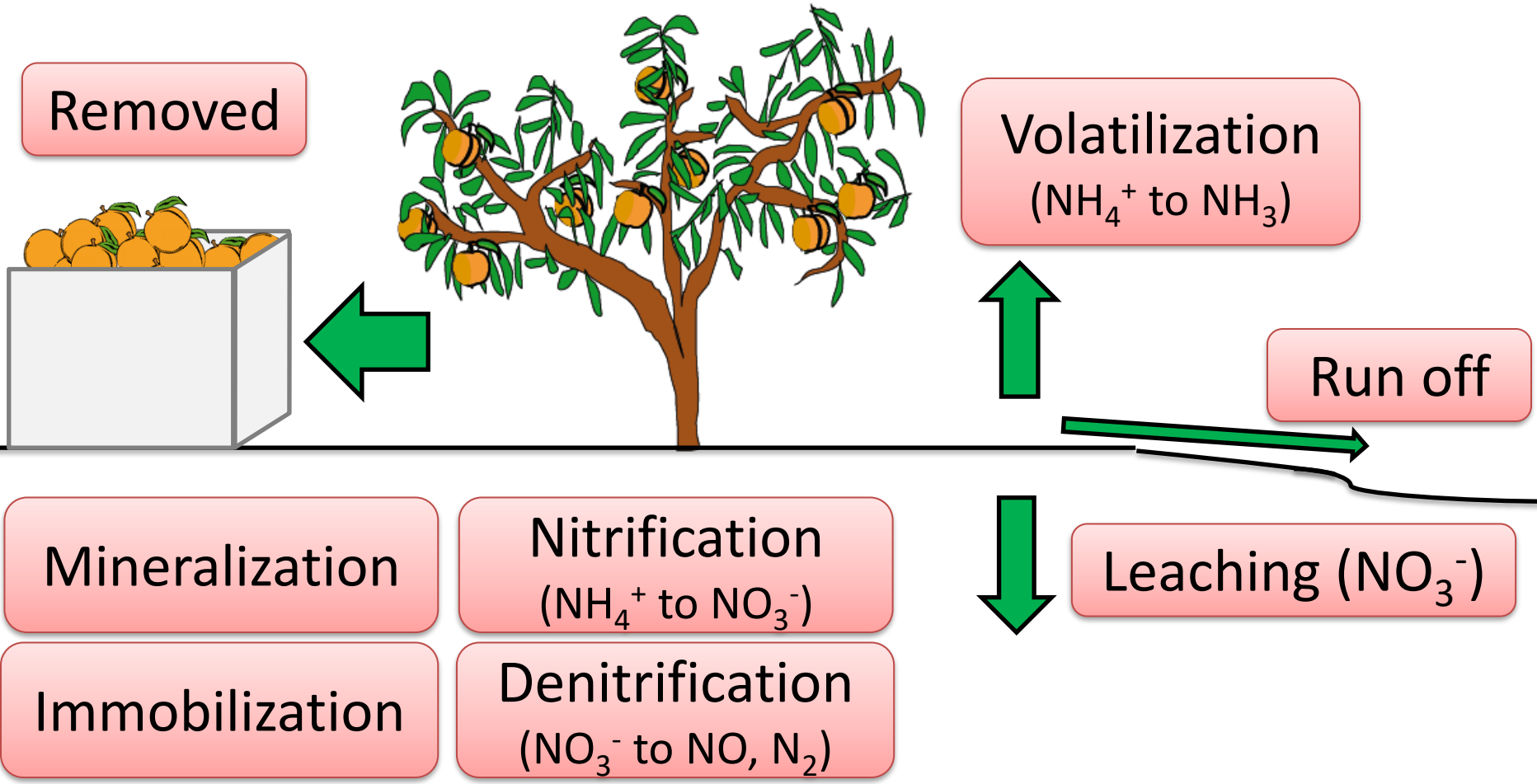
Effect of soil moisture in N concentration in reserve tissues during winter

Tissue	100% ET	50% ET
1-year shoots	1.63	1.80*
2-year shoots	0.86	0.95*
Stems	0.62	0.72***
Below graft union	0.76	0.89***
Large roots	1.48	1.68*
Fibrous roots	2.27	2.64***

n=60-63. Analyzed with analysis of variance (ANOVA)

*** P < 0.001

* P < 0.05



Removed

Volatilization
(NH_4^+ to NH_3)

Run off

Mineralization

Nitrification
(NH_4^+ to NO_3^-)

Leaching (NO_3^-)

Immobilization

Denitrification
(NO_3^- to NO , N_2)



A photograph of a peach orchard. The trees are arranged in neat, parallel rows on both sides of a central dirt path. The trees are lush green, and some small, round fruits are visible on the branches. The ground is covered with dry straw or mulch. In the background, there are rolling hills under a blue sky with light clouds. A black irrigation pipe runs along the base of the trees on the right side.

No single formula for **sustainable** fertilization
but all options go through **rational** fertilization

Acknowledgments



SC Peach Council

Southern SARE

SC Department of
Agriculture

Musser Farm crew

Qi Zhou, Brian Lawrence



Questions?

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