

# Walnut Nitrogen Budget

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# Objectives

1. **Nutrient demand model** for walnut.
2. **Leaching & soil interactions.**
3. **Validate leaf critical values.**
4. **Sampling protocols** - # trees, early season model.
5. **Nitrogen budget decision support tool, BMP** pubs, etc

# Key Findings To Date

- **N/ton closer to 30 lbs** than previous research's 40 lbs.
- **Fruit N** accum **even** over season.
- **Leaf sampling protocol** to achieve test results are within 0.1% of the true orchard N status 95% of the time:
  - 23 trees should be sampled
  - 30 yards apart or more

# Methods – NPK Demand Model



# Nitrogen in Fruit - Totals

Lbs N / ton of nuts (in-shell, 8% moist) and assoc. hulls.

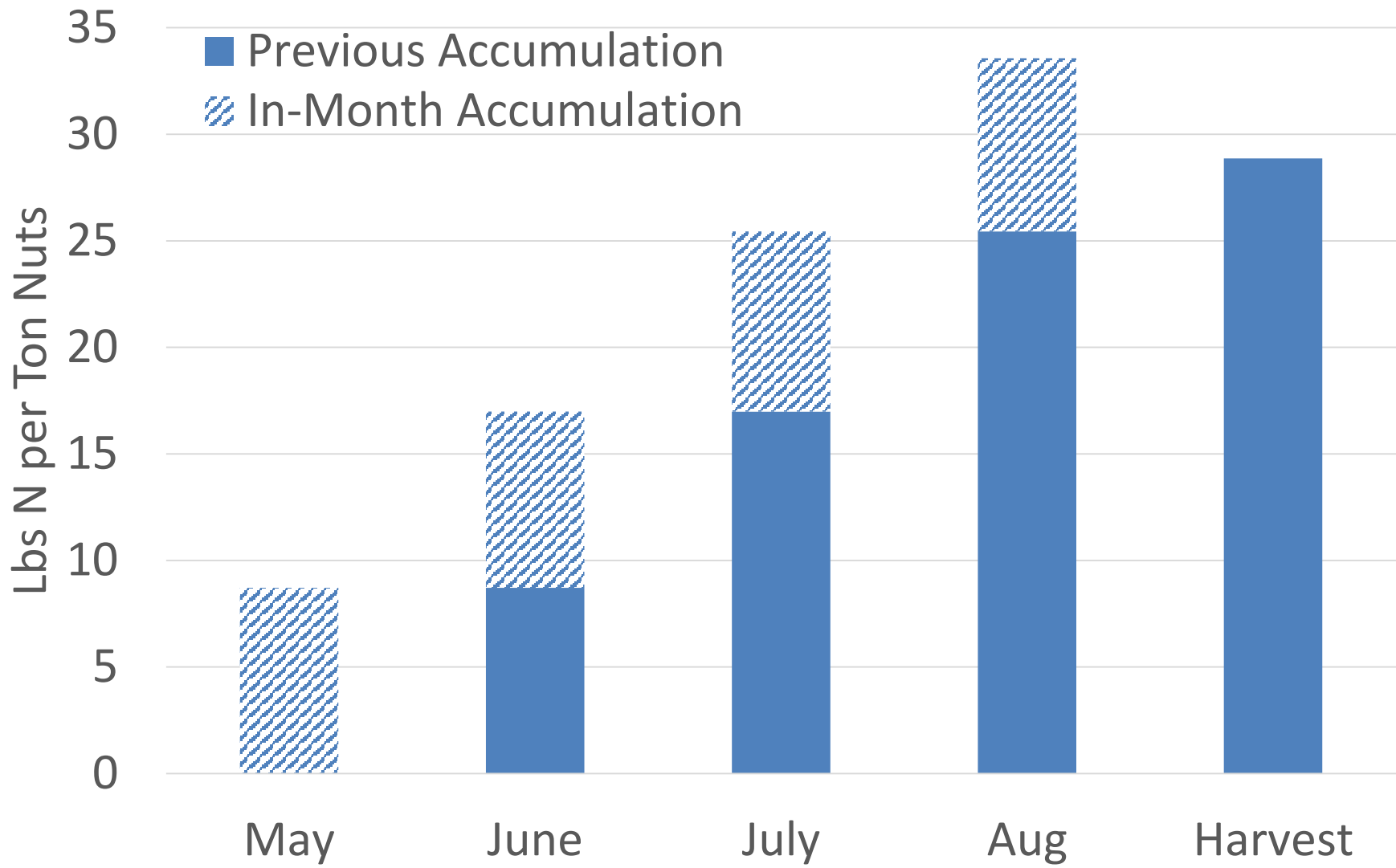
Site	2013	2014	2015
N Chandler	25	28	28
C Chandler	29	30	34
S Chandler	23	29	32
N Tulare	27	29	23
C Tulare	30	31	31
S Tulare	26	27	35
<b>GRAND MEAN</b>		<b>29</b>	

# Nitrogen in Fruit - Monthly

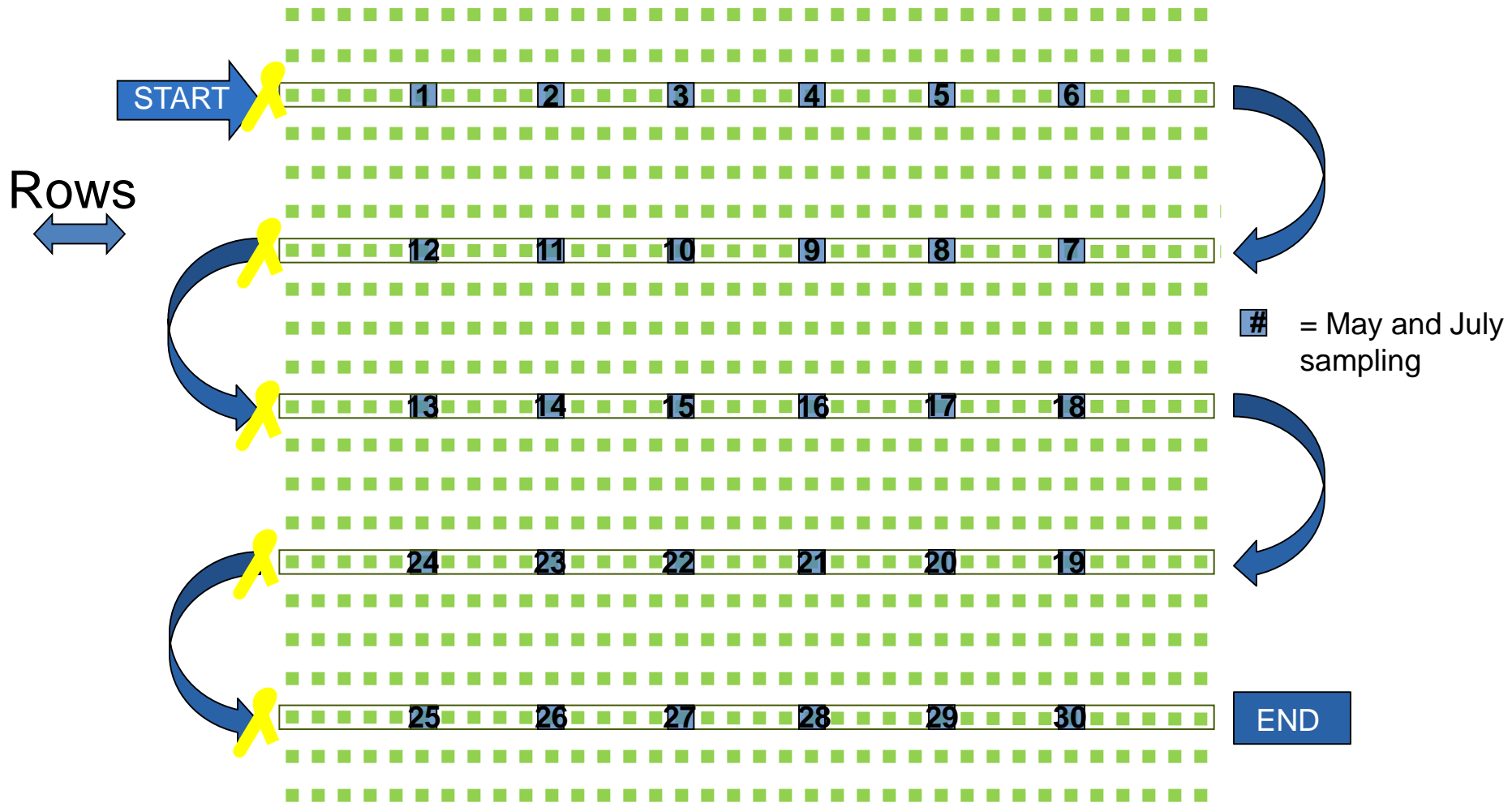
Nitrogen allocated per month to the fruit for every 1 ton of harvested nuts.

Year	Region	Cultivar	May	June	July	Aug	Harvest
2013	North	Chandler	8.0	14.9	24.4	27.4	25.4
2013	Central	Chandler	5.5	11.8	19.5		29.1
2013	South	Chandler		14.3	20.8	31.9	23.2
2013	North	Tulare	5.8	12.9	16.4	20.0	27.4
2013	Central	Tulare	6.0	13.7	19.7		30.2
2013	South	Tulare		15.9	22.5	27.5	26.0
2014	North	Chandler	8.3	14.0	21.7	27.7	28.4
2014	Central	Chandler	9.7	17.3	28.1	34.4	30.4
2014	South	Chandler	11.6	19.8	27.5	41.9	29.3
2014	North	Tulare	9.5	15.1	29.8	28.4	28.5
2014	Central	Tulare	10.0	15.0	26.4	34.9	31.1
2014	South	Tulare	13.3	19.5	28.4	30.7	26.5
2015	North	Chandler	7.4	16.5	20.9	32.8	28.0
2015	Central	Chandler	7.3	13.4	31.3	41.2	34.2
2015	South	Chandler	8.4	21.9	26.4	46.4	32.4
2015	North	Tulare	7.8	15.9	19.2	34.9	23.4
2015	Central	Tulare	6.8	25.4	35.5	45.2	30.5
2015	South	Tulare	14.1	28.3	39.6	31.9	35.4
<b>Chandler Mean</b>			8.3	16.0	24.5	35.4	29.0
<b>Tulare Mean</b>			9.1	18.0	26.4	31.7	28.8
<b>Grand Mean</b>			8.7	17.0	25.4	33.6	28.9

# Nitrogen Added per Month 2013-2015, Chandler & Tulare



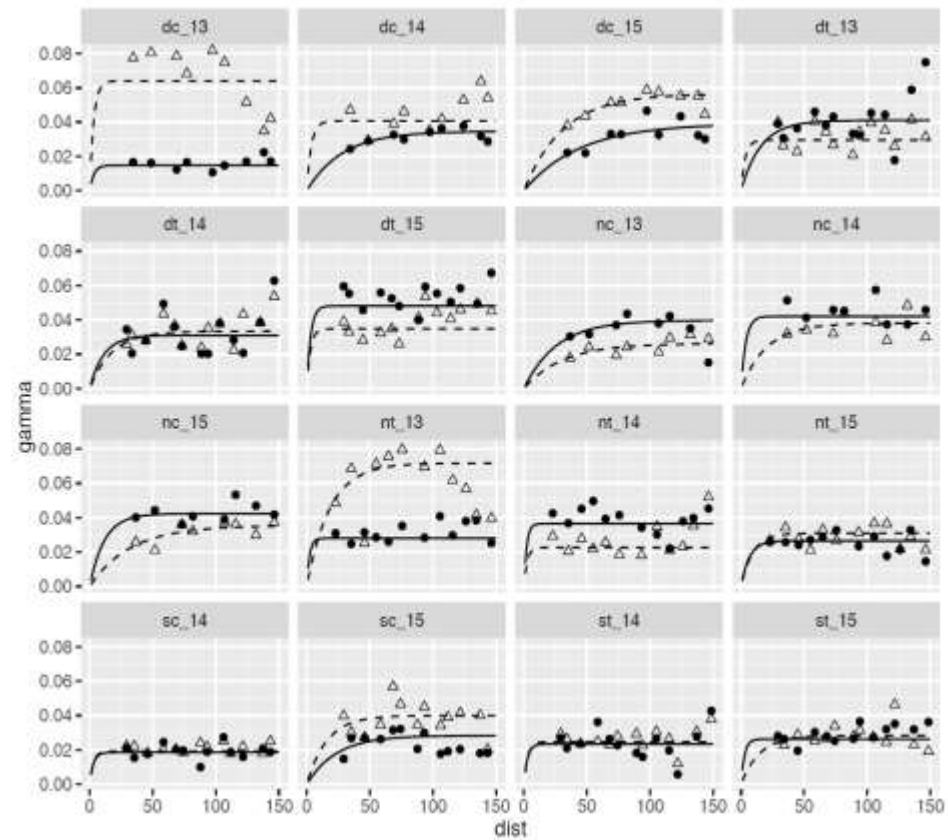
# Leaf Sampling – How Far Apart?





# Leaf Sampling – How Far Apart?

- “Semivariance” plateaus when leaf N is no longer correlated between trees.
- Trees more than 30 meters apart were independent.
- For reliable results, sample trees at least 100 feet apart (every 4<sup>th</sup> or 5<sup>th</sup> tree)



# Leaf Sampling – How Many?

- How many trees to sample and pooled to estimate %N within 0.1% with 80%, 90% and 95% confidence
- Confirmed with simulation of 100,000 sampling events
- Use variance of most variable site-month-year
- *Previous protocol: 50*

Confidence Level	Tree Sample Size Necessary
80%	10
90%	16
95%	23



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THANKS