Using Compost in Almond Orchards

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Increasing interest in compost

- Fertilizer savings
- Improve establishment
- Manage waste streams
- Carbon farming
- Whole orchard recycling

- Invest for high value crop

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What about the orchard floor?

- Application at establishment
- Injection technology
- Doesn’t interfere with harvest

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AgriFutures scoping study

- Single season
- Existing experiments and commercial orchard
- Focus on trial at the Almond Centre of Excellence

- Tree size and yield
- Tree nutrition
- Soil water nitrogen
- Soil fertility
  - Sampling strategy

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Almond Centre of Excellence

- Long term trial - established 2018
- Standard fertigation program
- Carina on Garnem

    - Control – no amendment
    - Compost at establishment (Peats)
        - Commercial product @ 50t/ha
        - Equivalent 350 t/ha to application strip

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- Long term trial - established 2018
    - Annual applications of 10t/ha (Peats)
        - Incorporated in year 1
        - Then banded adjacent to the drip line
        - Total 50 t/ha prior to sampling season

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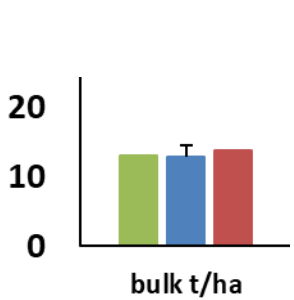
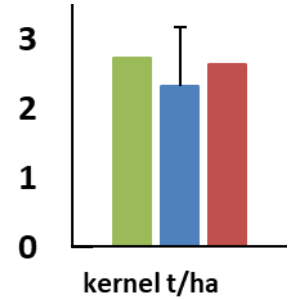
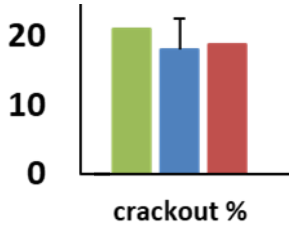
Compost and yield

- ACE trial
- Limited effect
  - Bulk yield
  - Kernel
  - Crackout
- Similar in commercial orchard







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Tree size

- ACE trial
- No effect on tree height
- Small increase in trunk diameter
- Compost applied at planting

Treatment	Tree height (m)	Butt diameter (mm)
Control	3.61	166
Annual	3.63	165
High	3.58	175
p value	0.78	0.06

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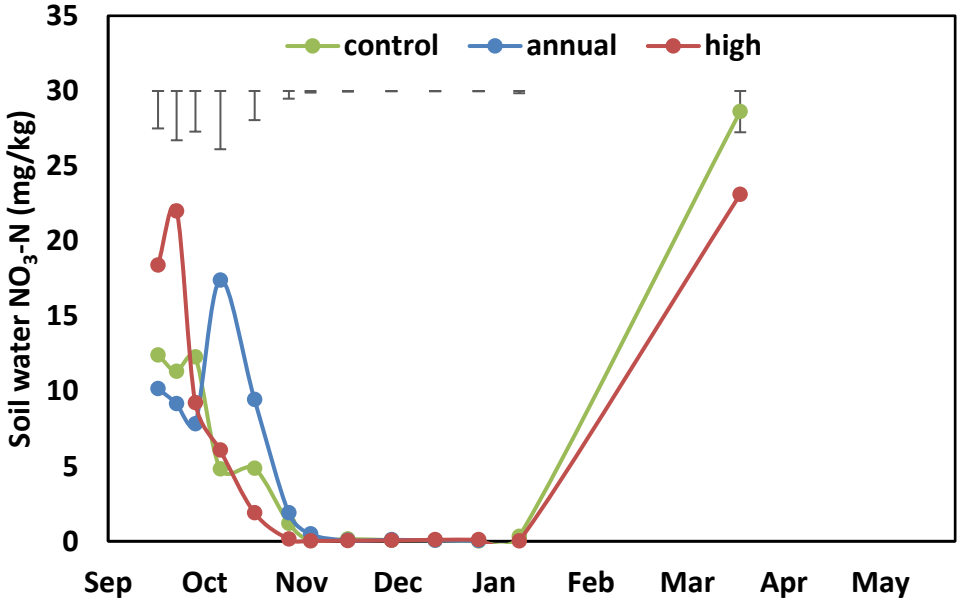
Compost and tree nutrition - ACE

- Soil water extractors
- 30cm depth

- Soil water nitrate
  - Establishment and annual
  - Potentially higher
  - Early season

- Uniformly low at depth



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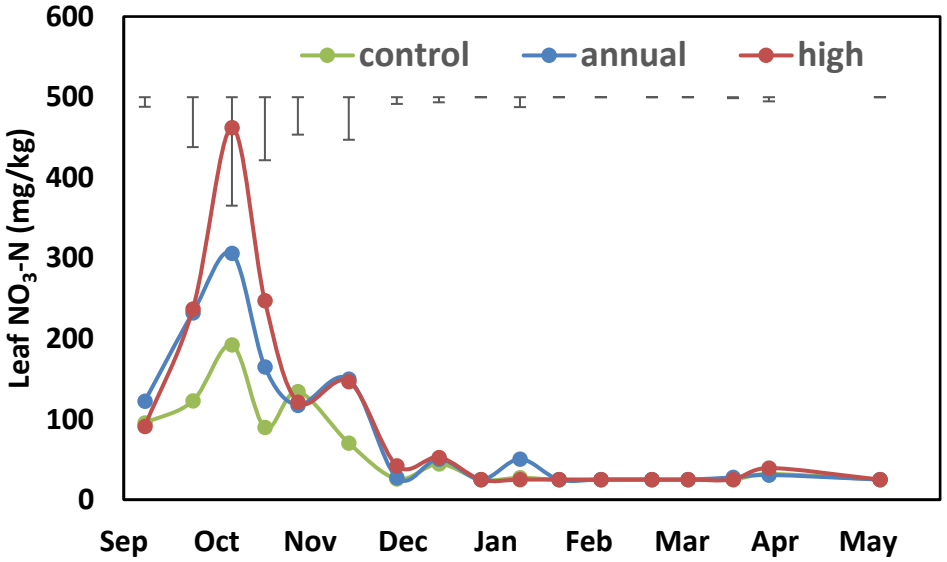
Compost and tree nutrition - ACE

- Regular leaf samples
- Leaf nitrate

- Leaf nitrate
  - Establishment and annual
  - Higher early season



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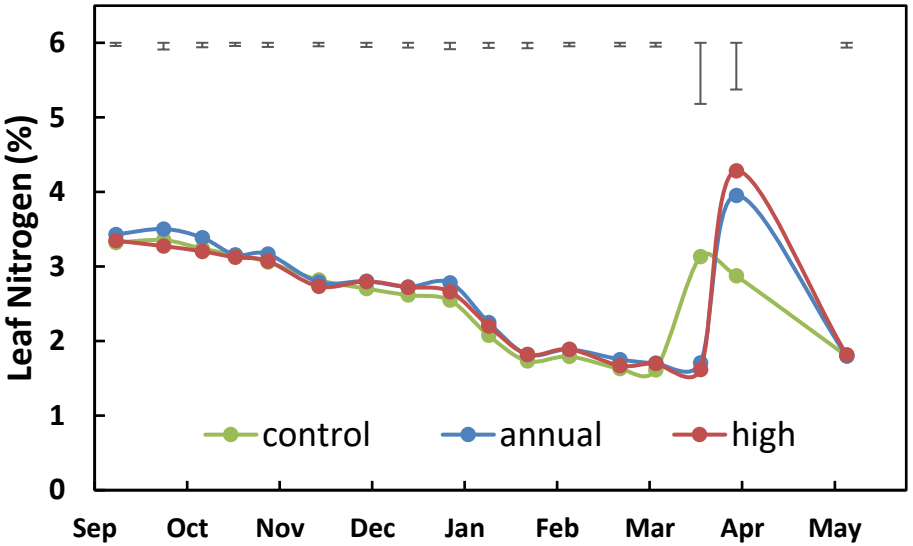
Compost and tree nutrition - ACE

- Regular leaf samples
- Limited effect
  - Leaf N



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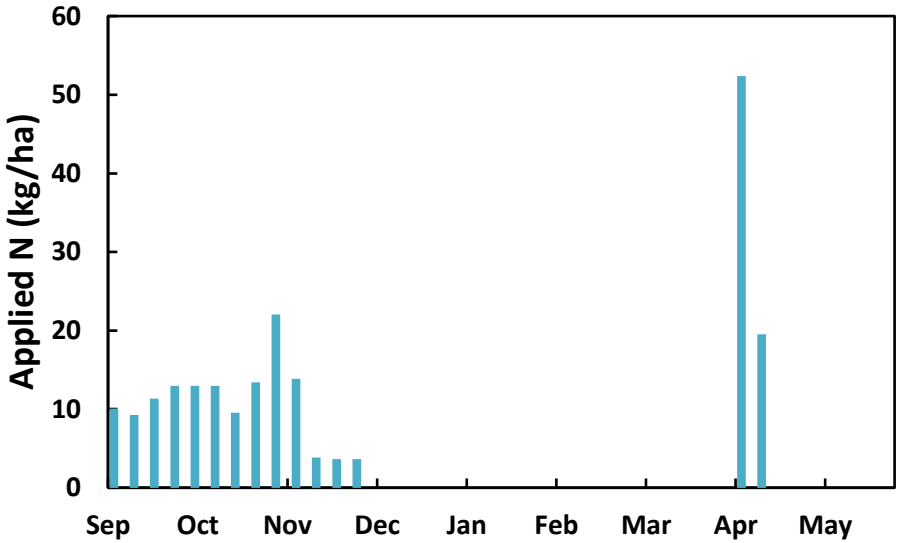
Fertigation schedule - ACE

- Approximately 222 kg/ha N
- Trees needs well met

- <u>Limited opportunity for response to compost</u>



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Soil sampling zones

- Tree line
  - Between the trees
  - No direct irrigation
  - Residual compost

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Soil sampling zones

- Dripper zone
  - Fertigation
  - Drip line is missing

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Soil sampling zones

- Amended strip
  - Annual compost application
  - Adjacent to drip line
  - Narrow strip

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Soil sampling zones

- Mid row
  - Between the rows
  - No inputs

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Soil sampling pre harvest

- No fertigation

- Distinct and very different soil zones (strips)
- Very difficult to sample - two methods
- Point sampling (auger)
  - Four zones
- Trench sampling (chain trencher)
  - Three zones
  - Amended and drip zones combined

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Soil samples

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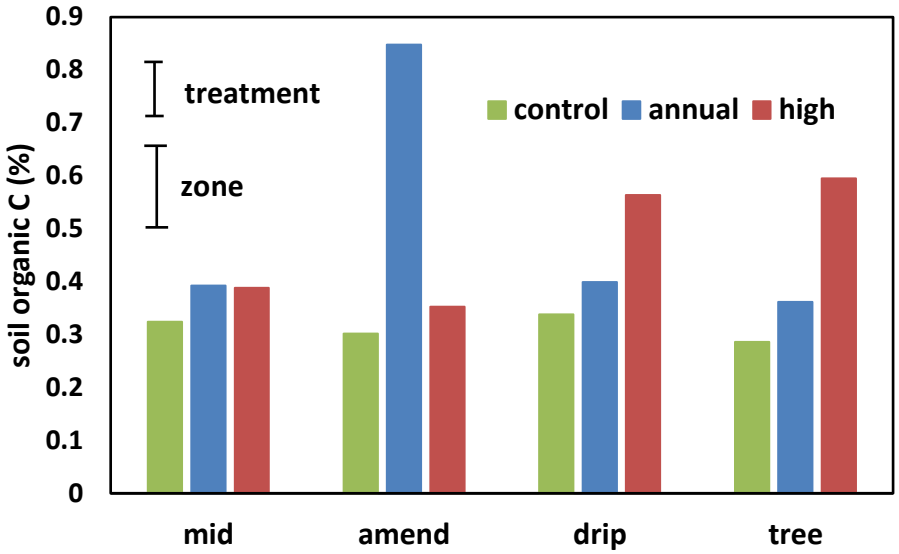
Soil organic carbon – point samples - ACE

- Compost increased soil carbon
- Annual application in amended zone
- Establishment application in the drip and tree line
- Maintained for 5 years
- Whole orchard recycling



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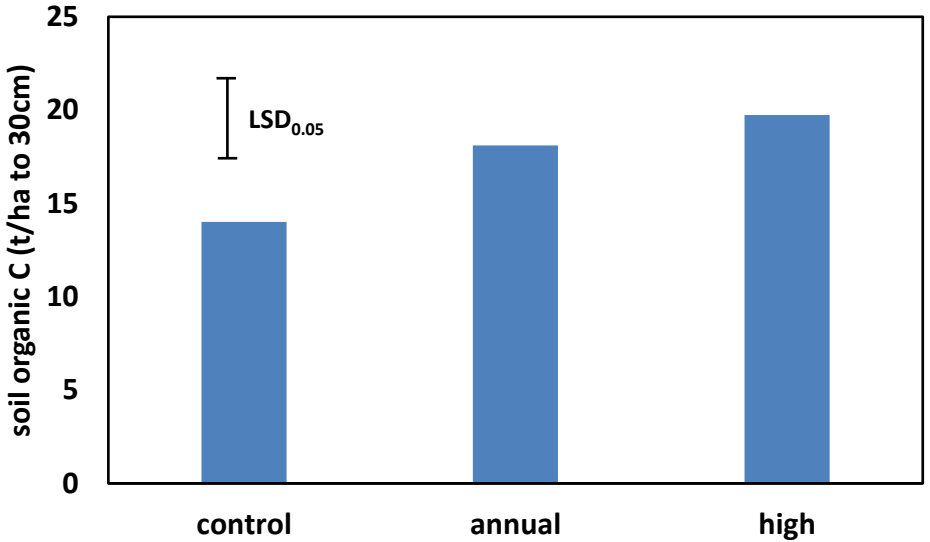
Soil organic carbon stocks - ACE

- Compost increased soil carbon
- Both application methods

- Trench samples
- Similar for point samples



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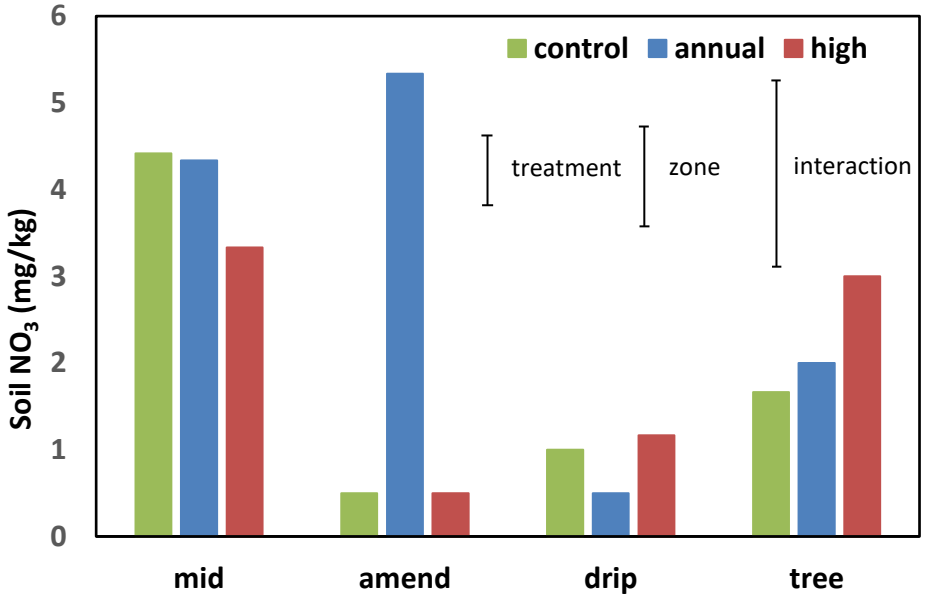
Soil nitrate – point samples - ACE

- Compost increased soil NO_3
- Annual application in amended zone
- Establishment application in the tree line
- Elevated in the mid-row



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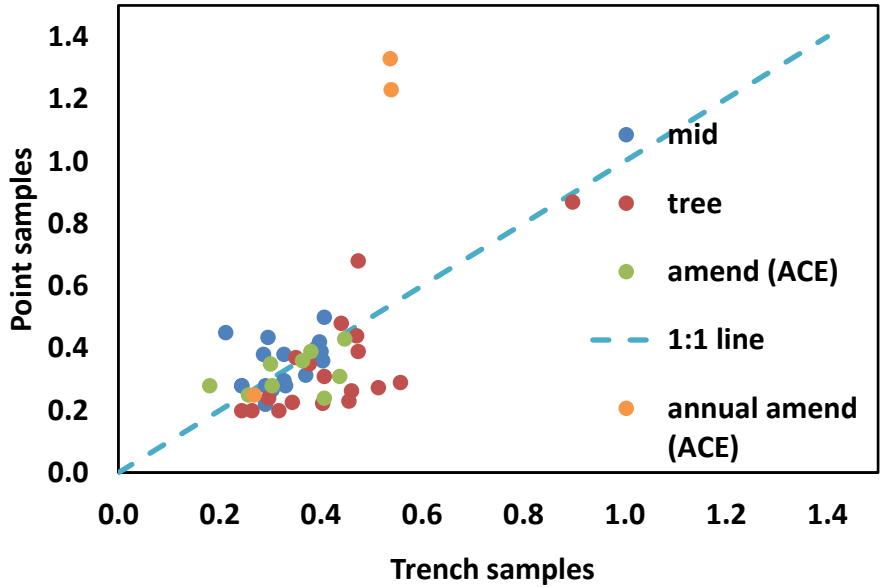
Soil Carbon – trench vs point samples - ACE

- Most trench samples lower than point samples
- Annual amendment higher than equivalent trench zone
- Except where the sample missed
- Challenges for tracking soil carbon



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Conclusions

- Mechanics for regular compost application well developed
- Limited compost impact on yield and tree growth
  - Well fertilised system
- Increased nitrate availability
  - Soil, soil water and leaf

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Conclusions

- Potential for carbon accumulation
  - Establishment and annual applications
  - Implications for WOR
  - Manage a significant waste stream
  - Monitoring soil C may be difficult

Acknowledgements

AgriFutures® Australia

Using compost to improve nitrogen use efficiency and productivity of Almonds

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