



Uptake and internal allocation of nitrogen in apple trees



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TIA is a joint venture of the University of Tasmania and the Tasmanian Government

Nitrogen - What do we want to know?

- Internal tree dynamics
- Efficiency of application, pre vs post harvest, impact on fruit quality
- Relative contribution of pre harvest N to fruit, vegetative growth
- Contribution of post harvest N to storage and next season's growth
- Leaching of N and emissions of N



Apple orcharding in southern Tasmania



Objectives

- Does timing of N application influence the efficiency of N uptake?
- Does timing of N application influence the partitioning of N and the quantity of N stored?
- Does the distribution of N vary between the fruiting season (at commercial harvest) and at dormancy?



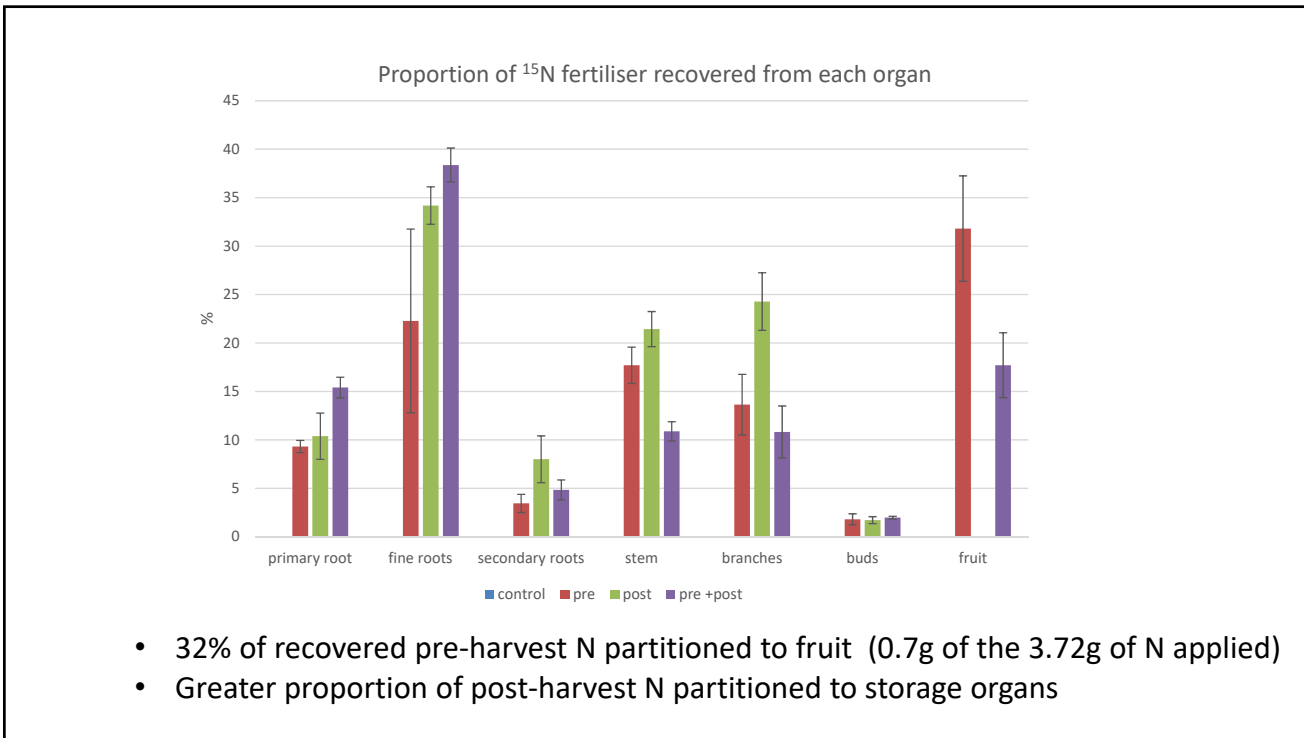
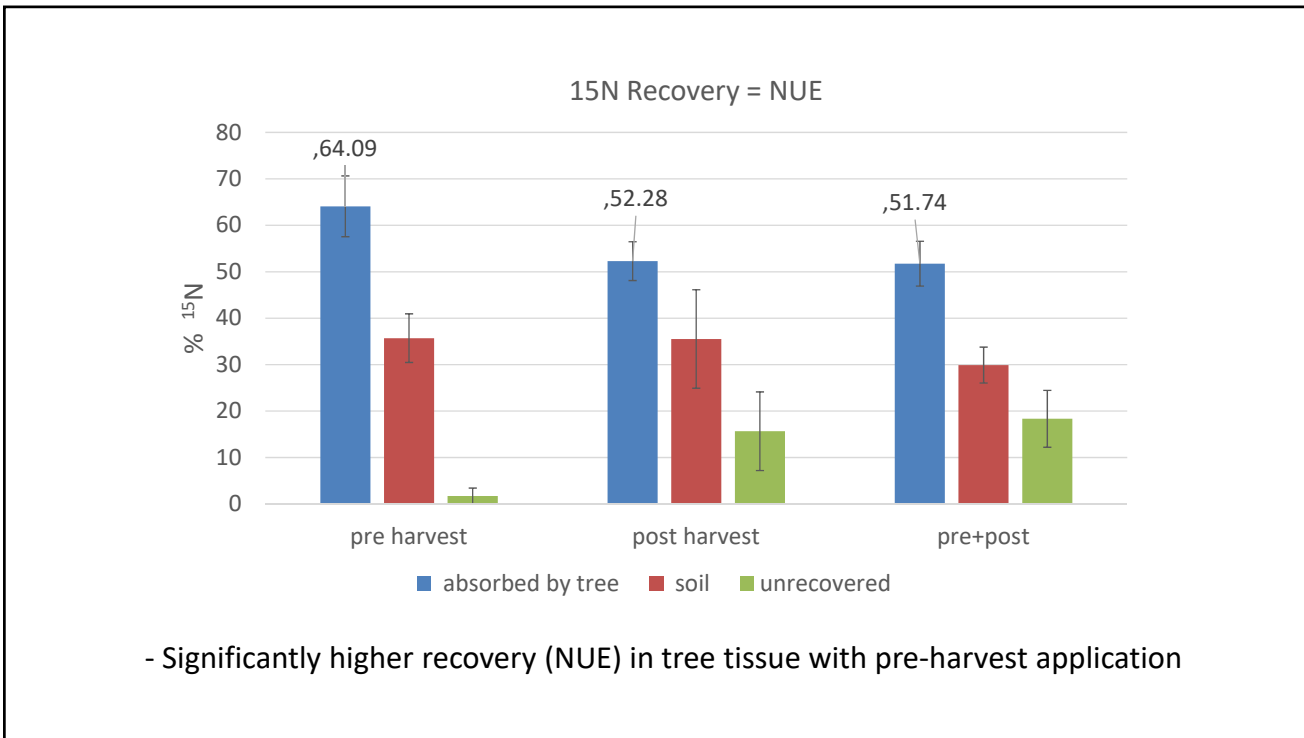
Treatment application and harvest

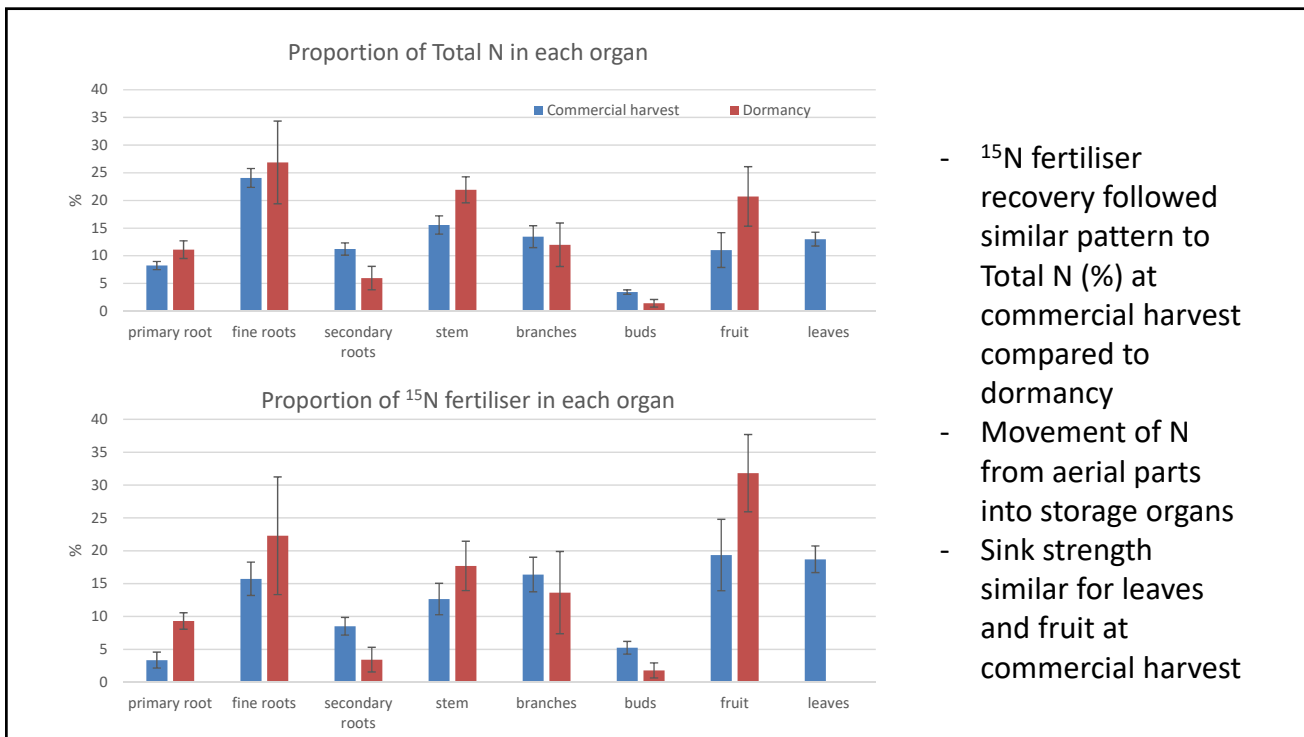
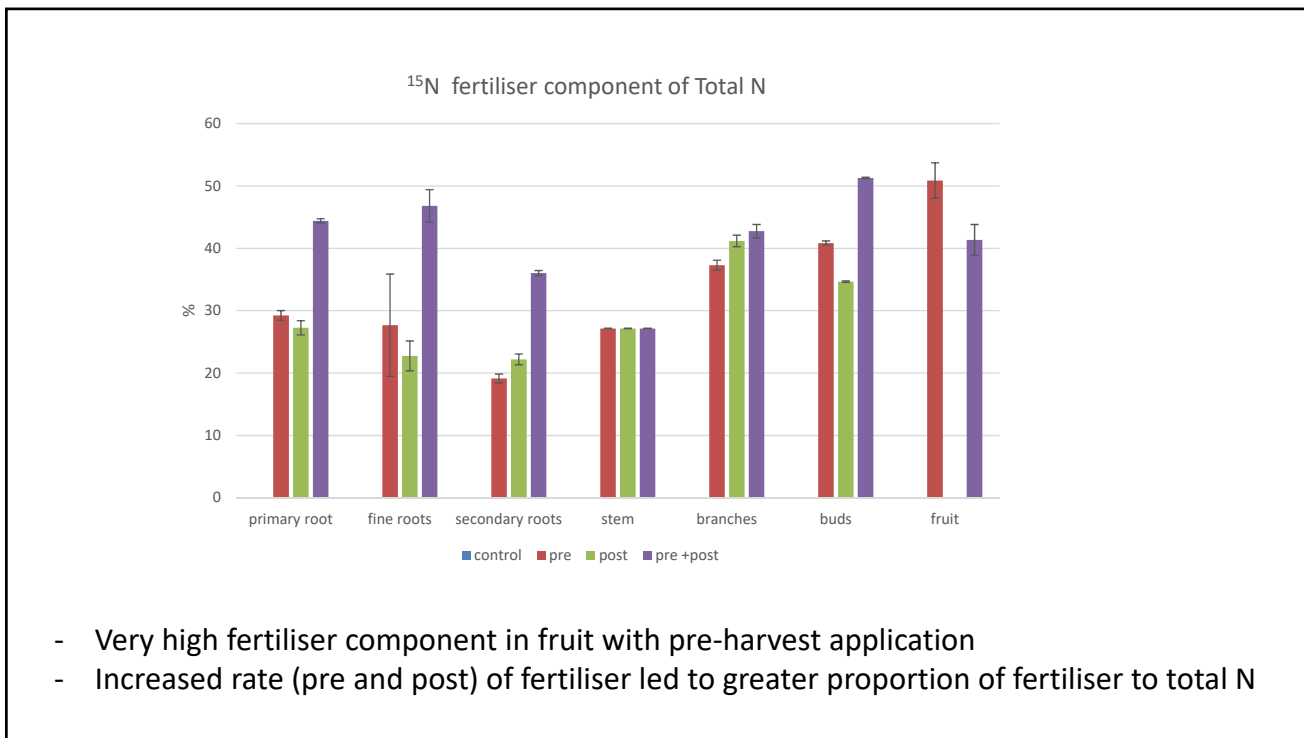
- 24 jonagold trees (15-year-old in 60L pots)
- Pre harvest (4 x weekly applications in November)
 - 4 trees for monthly destructive harvest
 - 4 trees for destructive harvest at commercial harvest
 - 4 trees for destructive harvest at dormancy
- Post harvest (4 x weekly applications in March)
 - 4 trees for destructive harvest at dormancy
- Pre and post harvest (4 x pre (Nov) and 4 x post (March) weekly applications)
 - 4 trees for destructive harvest at dormancy
- Control (1 L water)
 - 4 trees for destructive harvest at commercial harvest (March)
 - 4 trees for destructive harvest at dormancy (July)

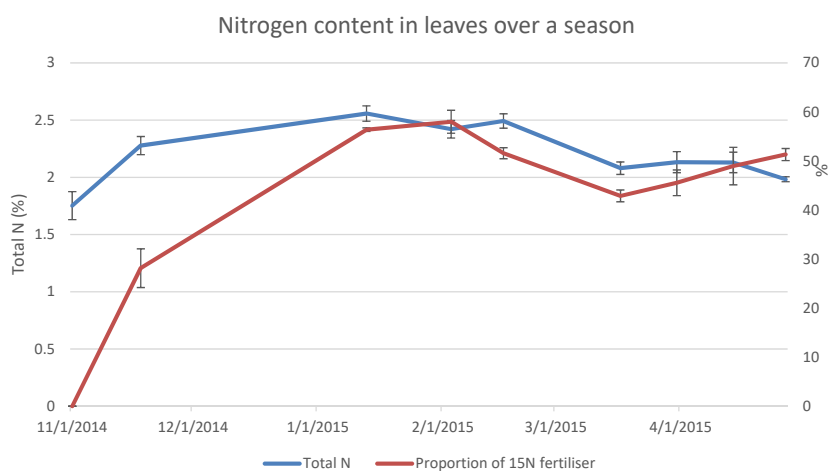
N treatment - weekly applications of 4.8g Calcium nitrate (5% enriched ^{15}N) in 1 L water = approx. 40kg N/ha











- Pre-harvest fertiliser component of leaves comprises < 50% of total N
- Significant loss of N at the end of the season, not as much withdrawn as expected
- Could this chart be manipulated with earlier or later fertiliser application?

Outcomes for growers

- Highest NUE achieved with pre-harvest N application
- Growers desiring contribution of N to tree growth and fruit – require pre-harvest N but impact on fruit quality?
- Greater potential with post-harvest N but seasonal constraints?
- Increased N rate had an overall impact with more N uptake but less efficiency
- Next steps – apply to whole tree in orchard over multiple seasons with fruit quality assessments.