

Sunflower Benchmarking – current industry practice and trends which lead to higher yield and oil contents

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NSW DEPARTMENT OF **PRIMARY INDUSTRIES**

Sunflower benchmarking project

Joint AOF and NSW DPI funded project over 3 seasons:

Moree, Gunnedah and Southern Queensland

- 2003/4 – 30 paddocks
- 2004/5 – 50 paddocks
- 2005/6 – 60 paddocks (still to be completed)

Sowing Windows

■ Moree

- Early Plant: 10th August – 25th Sept
- Late Plant: 15th Dec – 6th Jan

■ Gunnedah

- Early Plant: 13th Sept – 20th Oct
- Late Plant: 12th Dec – 20th Jan

■ Southern Queensland

- Early Plant: 13th Sept -29th Oct
- Late Plant: 25th Nov – 20th Jan

Sowing Practices

Sowing Depth

- Moree – 2.5 – 8cm
- Gunnedah – 2.5 -7.5cm
- Southern Qld – 3.75 – 7.5cm

Row Spacing

- Moree- 0.5m – 1.5m
- Gunnedah – 0.75m -1.0m
- Southern Qld- 0.75m – 1.0m



Variety Selection

Variety % of paddocks visited	03/04	04/05	05/06
Hyoleic 41	40	43	30
Sunoleic 04	23	Min	0
Sunoleic 06	0	16	21
Ausigold 61	0	16	13
Ausigold 62	0	0	11
Ausigold 50	0	Min	3
Ausigold 4	0	Min	11
Sunbird 7	36	Min	11

– Other varieties grown in the benchmarked paddocks were Hysun 38 and Hysun 47

Tillage practices

- 75% of the paddocks benchmarked were sown into no tillage situations in the 03/04 and 04/05 seasons.
- In the 05/06 season 61% of paddocks sown were no tillage, 26% minimum tillage and 13% conventional.



Rotations

■03/04

- 68% of paddocks were sown into a long fallow situation from a cereal.

■04/05

- Higher proportion were sown into a short fallow or double crop situation due to good December rainfall.

■05/06

- High proportion were sown into a long fallow situation, mostly due to the lack of opportunity for a winter crop.

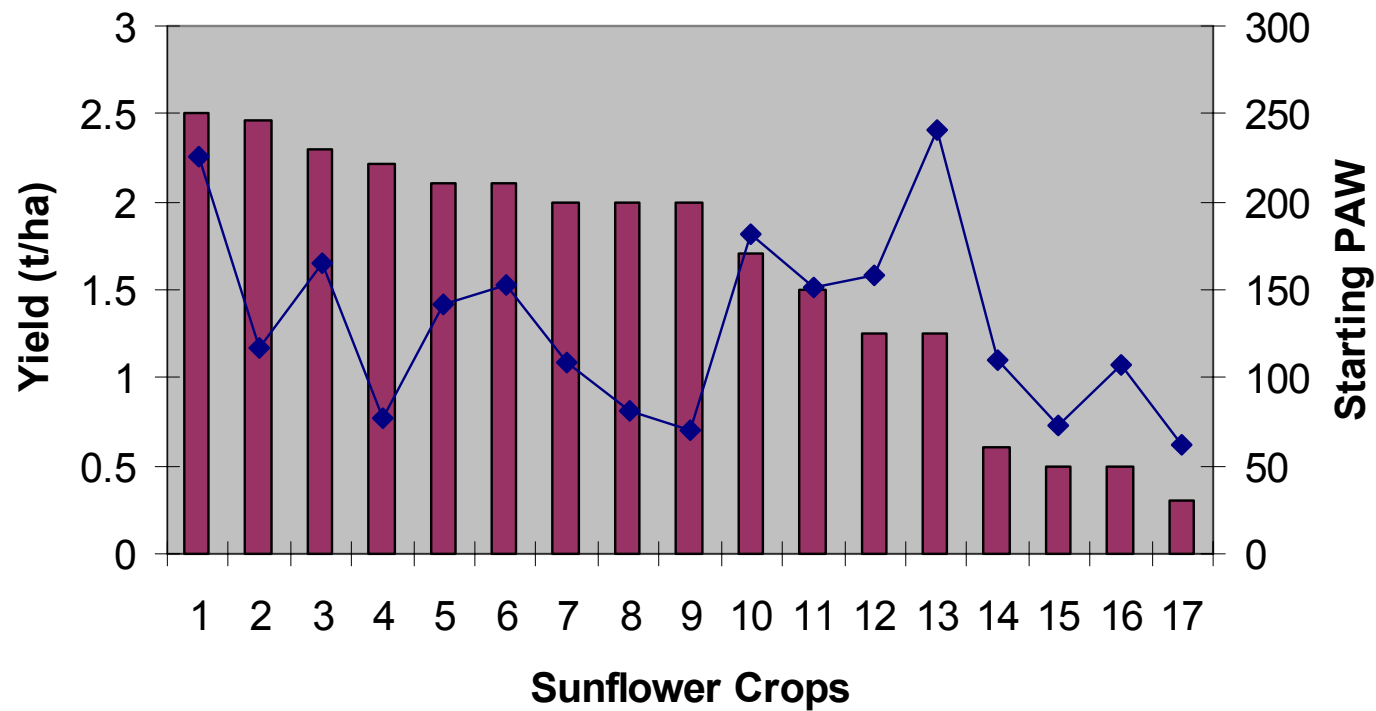
Most sunflowers were sown into a long fallow following a cereal (sorghum, wheat or barley) – as a break crop option.

Rotations cont'd

- 03/04 season
 - 30% long fallowed from sorghum
 - 23% long fallowed from wheat
 - 15% long fallowed from barley
 - 7% short fallowed from sorghum
 - 19% double cropped from wheat
- 04/05 season
 - 23% short fallowed from sorghum
 - 23% fallow
 - 13% double cropped from wheat
 - 13% long fallowed from wheat
- 05/06 season
 - 76% long fallowed from winter cereal
 - 13% short fallowed from sorghum
(incl 1 cotton)
 - 8% long fallowed (2yrs) – 2 from sorghum, 1 from barley

Soil Water vs Yield trends

Dryland Sunflower Crops Northern Grains Region



Comparison of Starting PAW with Yield

- Two adjoining paddocks were soil cored.
 - Paddock 1- Short Fallow from Sorghum
 - Paddock 2 – Long Fallow from Wheat
- P1 = 61mm PAW (moisture to 0.6m)
P2 = 157mm PAW (moisture to 1.2m)
Paddock 2 started with 91mm of more PAW

Yields

P1 = 0.3t/ha vs P2 = 1.25t/ha (4 x the yield)

Income = \$120/ha vs \$500/ha (\$380/ha difference)

Every mm of PAW = \$4.17 extra in income



- Every additional mm of PAW = additional 10kg of Sunflower seed harvested.
- In this case, the threshold for planting moisture would have been another 20mm of PAW or soil wet to a depth of 80cm.
- This would have been a breakeven yield of 0.5t/ha.
- Growers need to be able to identify critical thresholds for starting soil water to reduce the risk of crop failure/ uneconomic production.

Plant Population Trials

2004/5

2 trials harvested in the Gunnedah district.

5 different populations – 15000, 25000, 35000, 45000 and 55000 plants/ha.

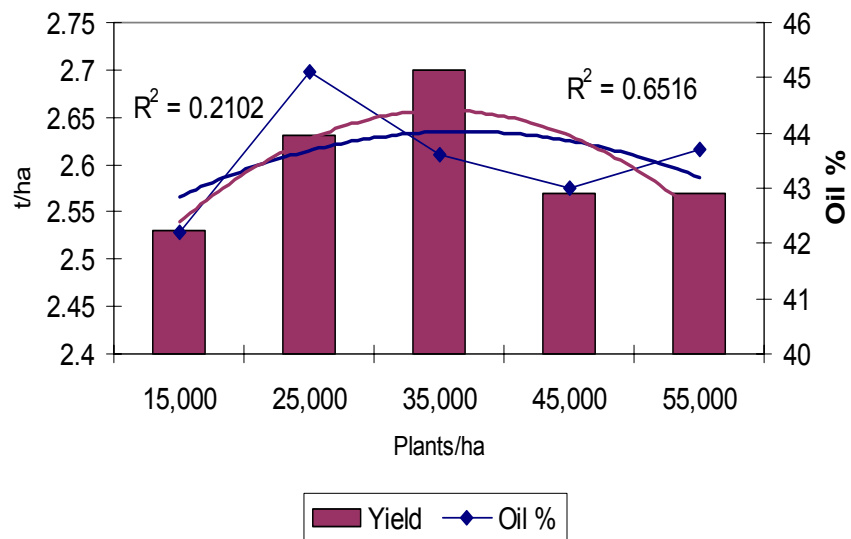
2005/6

3 trials – Moree East, Moree West, Gunnedah

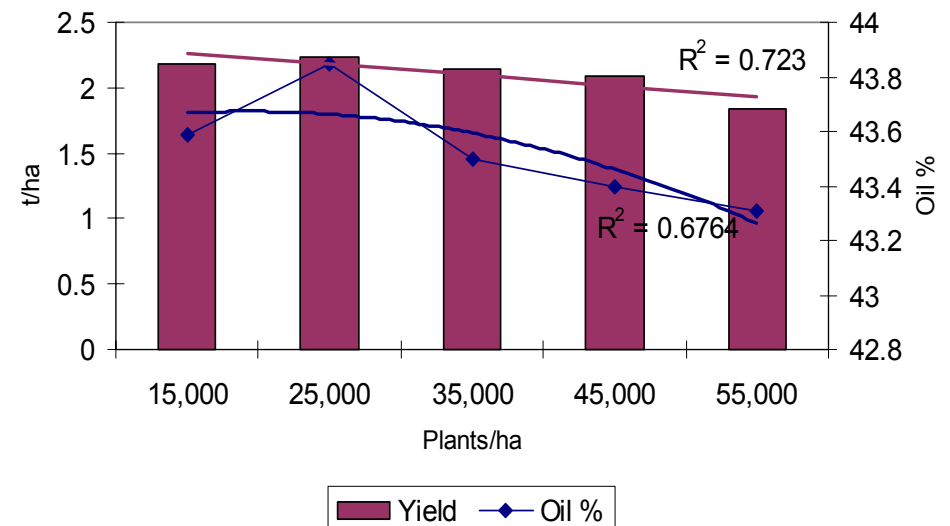
5 different populations – 15000, 25000, 35000, 45000 and 55000 plants/ha.

Gunnedah 2004/5 Trial Results

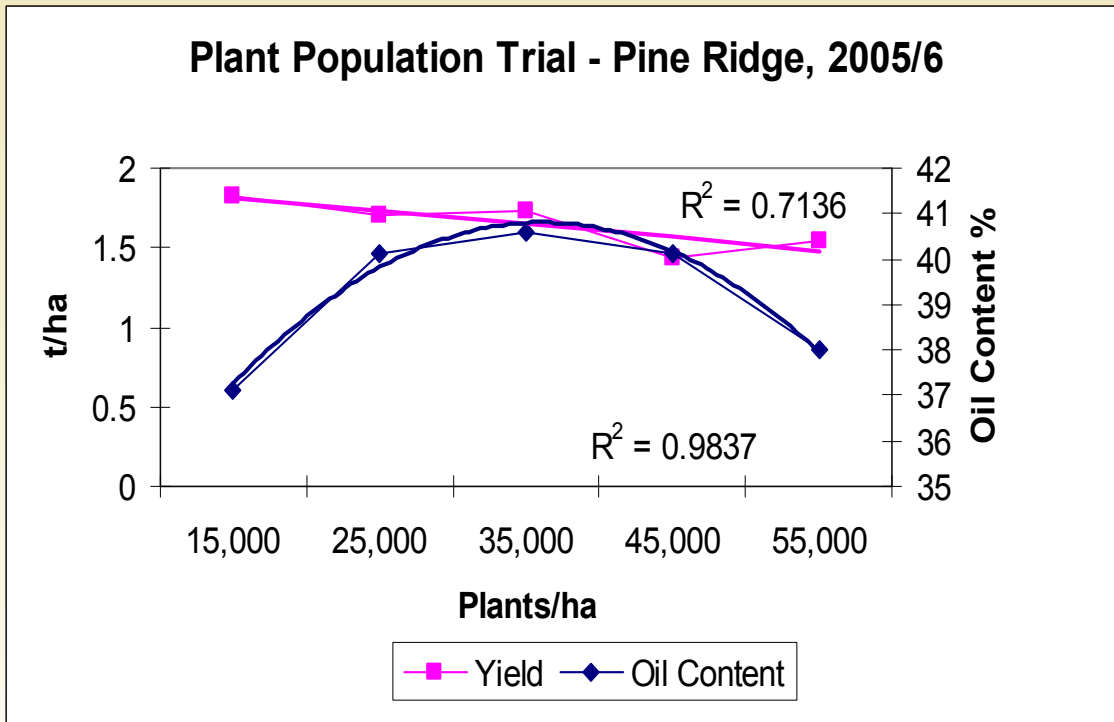
Pine Ridge Gunnedah 2004/5



Tamarang Gunnedah 2004/5



Pine Ridge, Gunnedah

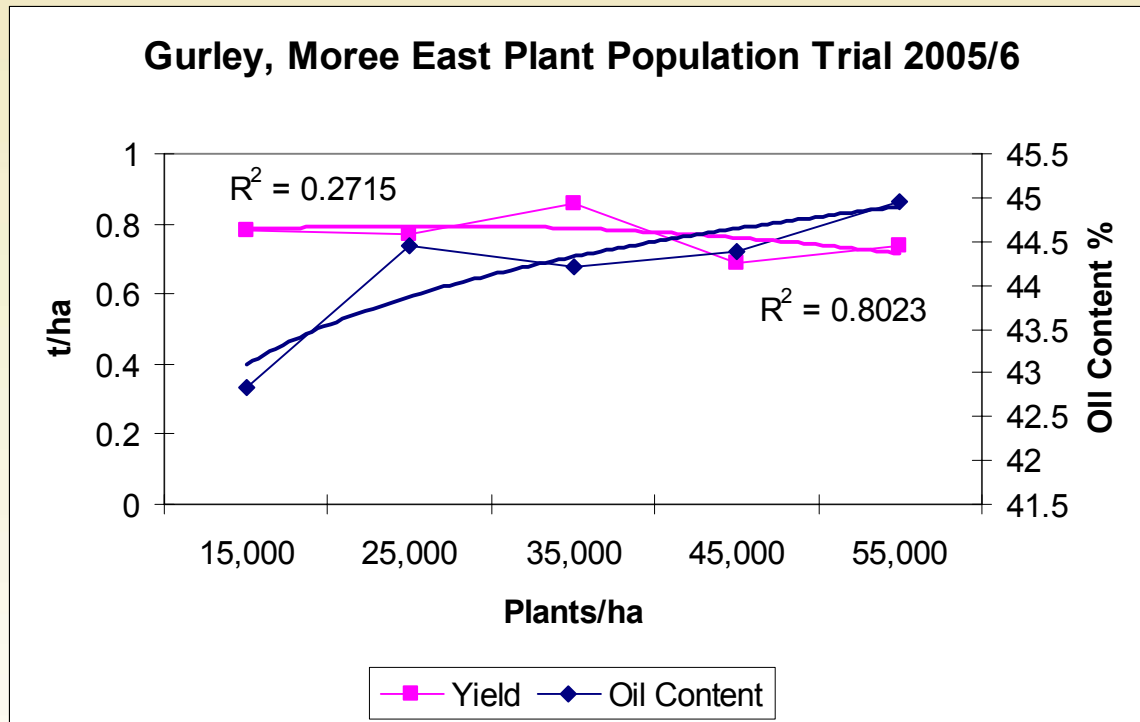


- No significant difference in yield, oil content or plant height

- The head diameters were significantly smaller in all populations than 15,000

- Head arc lengths were significantly smaller in all populations than 15,000 and 25,000

Gurley, Moree East



■ No significant difference for yield, oil or plant heights.

■ Oils tend to increase with plant population

■ All populations had significantly smaller head diameters than 15000 plants/ha.

■ 35000, 45000 and 55000 plants/ha had significantly smaller heads than 25000 plants/ha.

A little or a lot of N??

- The 2003/4 benchmarking data highlighted variances in nitrogen (N) rates applied across the three regions of Moree, Gunnedah and Southern Queensland.
- The amount of nitrogen applied to paddocks in each of the three regions was averaged and compared to the average sunflower crop yield for that region.
 - Moree Paddocks - 7 Units N = Yield of 1.19 t/ha
 - Southern Qld Paddocks - 60 Units N = Yield of 1.53 t/ha
 - Gunnedah Paddocks - 68.1 Units N = Yield of 1.62 t/ha

Nitrogen Rate Trials

2004/5

- 2 trials harvested in the Gunnedah district.
- 4 rates of N – 0,50, 100,150units

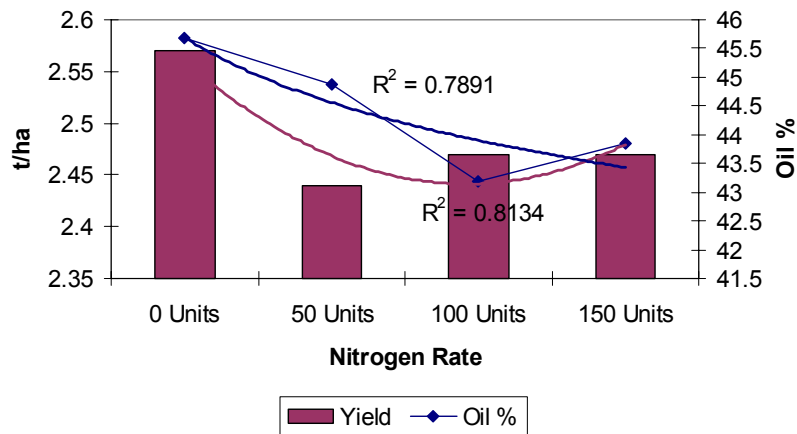
2005/6

- 3 trials – Moree East, Moree West, Gunnedah
- 7 rates of N – 0,50, 75,100,125,150 and 200 units
- Starting N measured

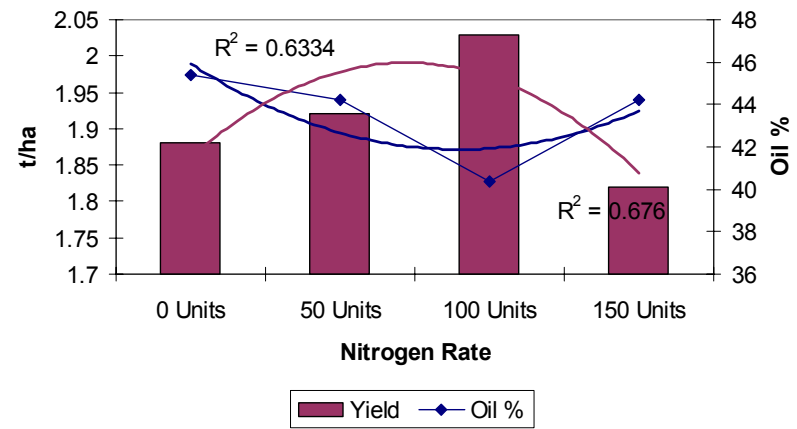


Gunnedah 2004/5 Results

Pine Ridge Gunnedah 2004/5



Tamarang Gunnedah 2004/5



■ Pine Ridge

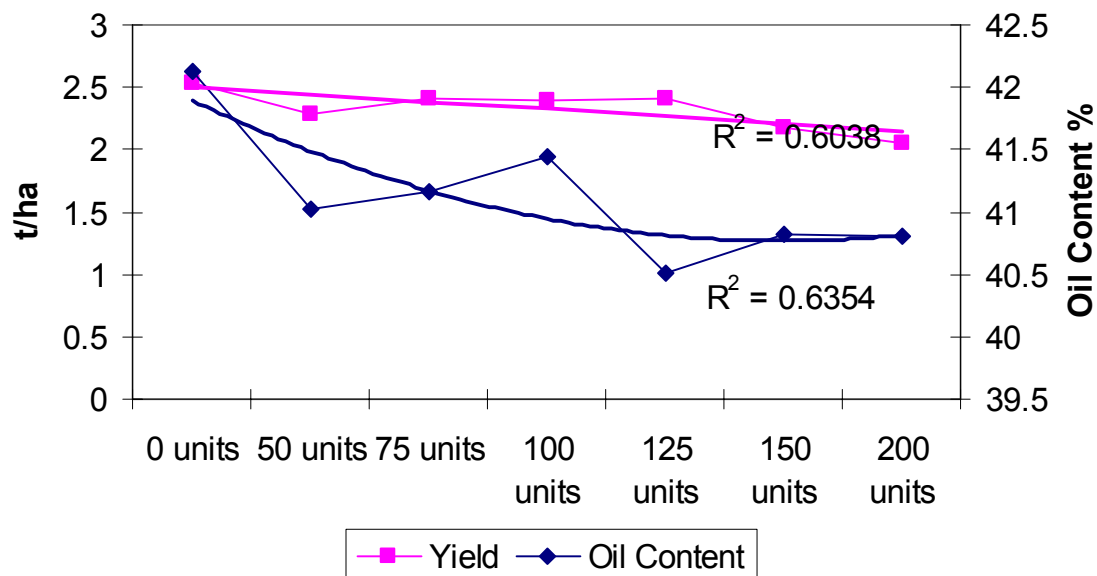
- Declining yield with increasing N, except 150 units
- Declining oil with increasing Nitrogen

■ Tamarang

- Yield peaked at 100 units N
- Oil was lowest at 100 units of Nitrogen

Pine Ridge, Gunnedah 2005/6

Pine Ridge, Gunnedah Nitrogen Rate Trial



- Starting N level of 143 units = 2.86t/ha @50units/t of soil N

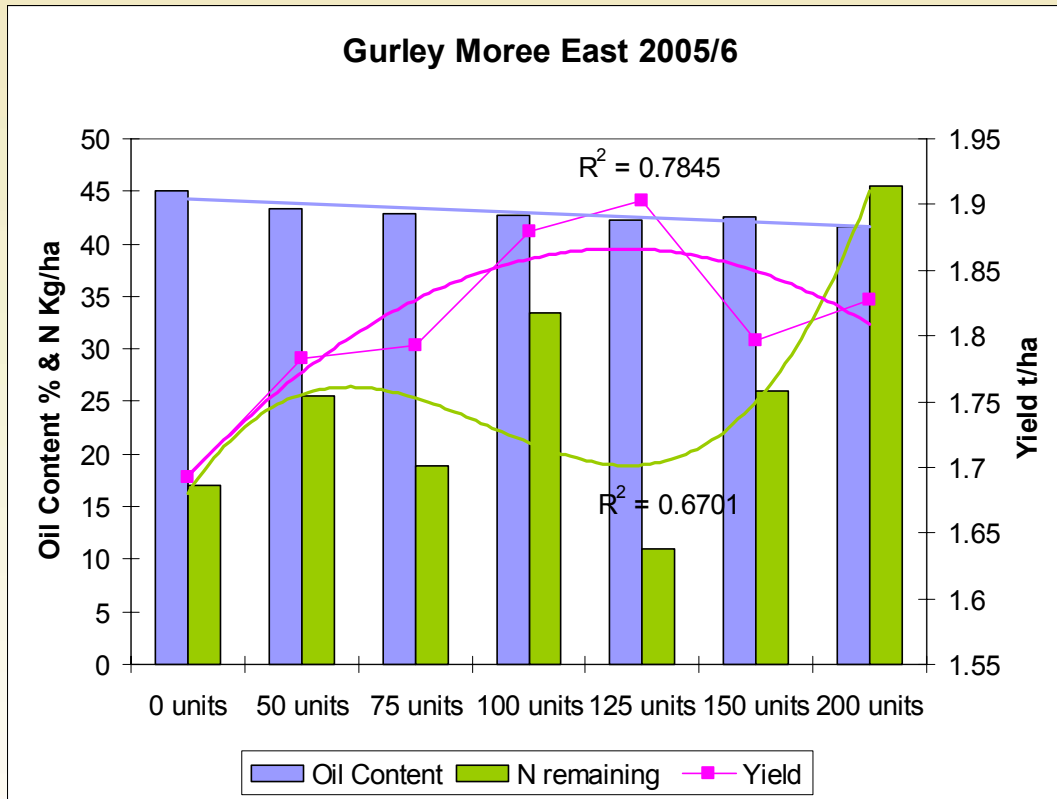
- Yield slight decline with increasing N.

- Oil Declining with increasing N

- No significant difference for plant height

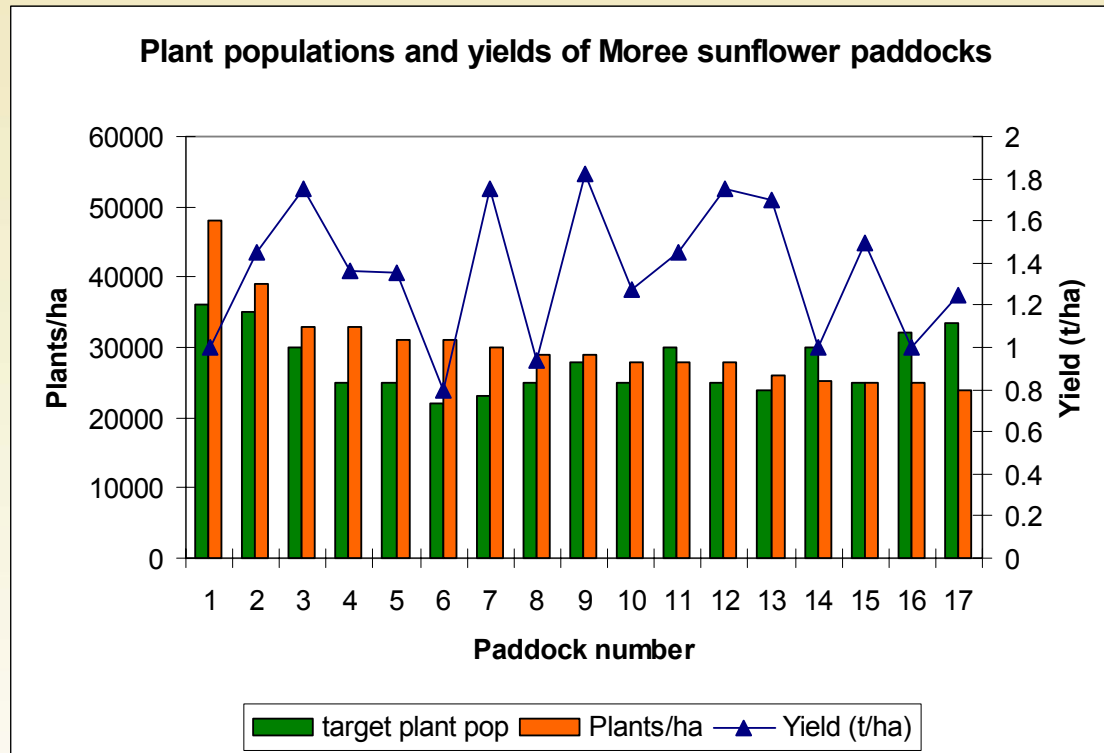
- 200 units of N produced significantly smaller head diameter and head arc length.

Gurley, Moree East



- Starting Soil N level of 52 units = 1t/ha @ 50units soil N
- Declining oil with increasing N
- Yield peaked at 125 units N and had the least N remaining
- Remaining N in all plots after harvest

Grower paddocks – Moree 05/06



- There is no direct relationship between plant populations (24-48,000/ha) and yield (0.8 – 1.82t/ha)
- Generally more plants are established than the target population.
- This means growers are either:
 1. underestimating the establishment % or
 2. not calculating sowing rate using seeds/kg on the bag.

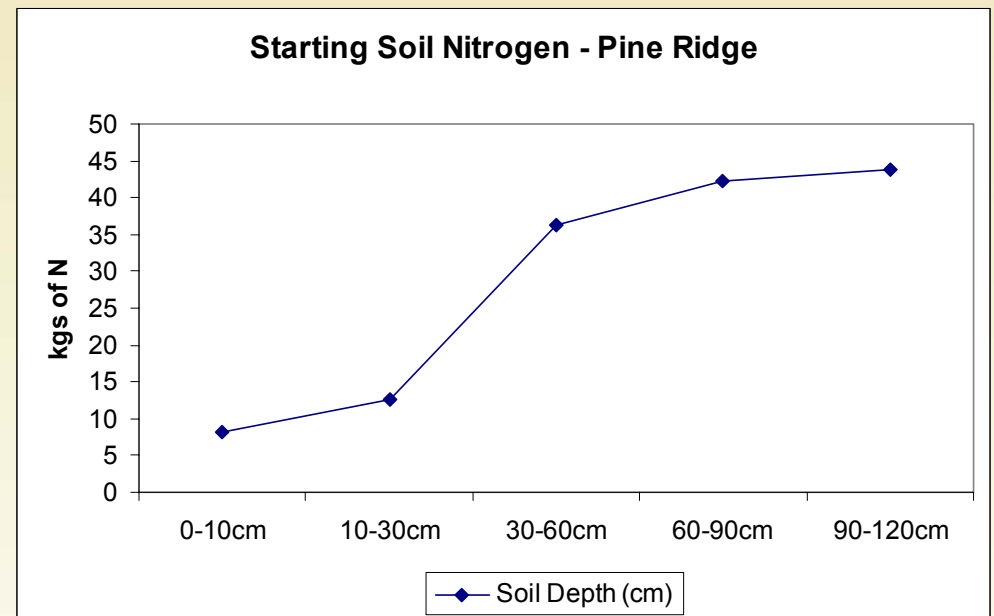
N rate trials summary

■ Pine Ridge Site

- need assessment of starting N prior to sowing
- N bulge at 30-120cm

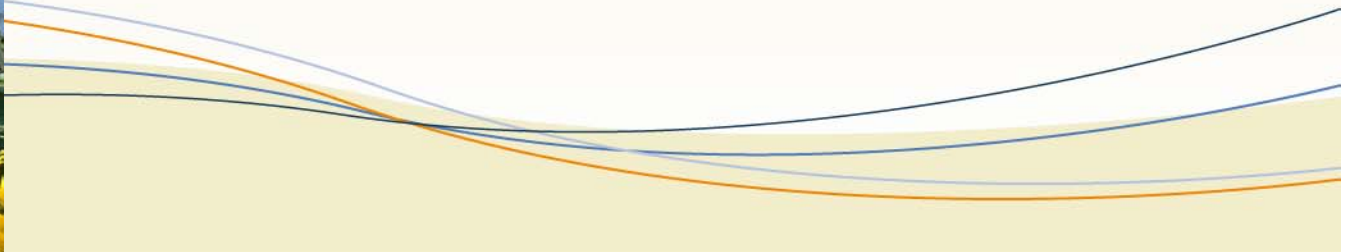
■ Gurley Site

- Application of N required to target more than 1t/ha yield
- 0N applied was significantly lower yielding than 125 units N applied (1.693t/ha vs 1.903t/ha)



Take home message/ key points

- Nitrogen Budgeting is critical to ensure the water: N ratio is in sync and nitrogen application is not excessive.
- Eg 2.5t/ha requires 125units of N. Not many people achieve 2.5t/ha in a dryland situation on a regular basis.
- Too much N reduces oil contents
- Establishing starting soil water is only a useful indicator of potential yield if you predict nil in crop rainfall.
- As plant population increases, head diameter decreases



Funding for this project was provided by the following industry bodies:

