## 5.6 EARLY SOWN (MARCH) WHEAT – EFFECT OF PLANT DENSITY (NILE TAS)

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**Location:** "Waddymore", Nile

**Acknowledgements:** Michael Chilvers, Rob Bradley.

**GSR:** (Feb – Nov) 577 mm (including 65 mm irrigation)

**Summary:**
The effects of plant density (50, 125, 200 plants/m$^2$) on growth and grain yield of early sown wheat were evaluated. Early in the growing season the low density plots looked very sparse but by September had largely caught up whereas the highest density plots looked visually good during early tillering but later in the season tillers were visually thinner and prone to lodging.

Surprisingly, there was an increase in grain yield with plant density. Yields tended to increase from 50 through to 200 plants/m$^2$ and both the higher rates produced significantly greater yields than for the 50 plants/m$^2$ density. Canopy disease was largely controlled with two fungicides. Excess vegetative growth may have not have been such an problem in 2005 as the wet spring probably resulted in reduced moisture stress in higher density plots compared with a more typical spring. The higher density plots would also have extracted more soil moisture from the soil profile prior to the high rainfall in spring resulting in less waterlogging stress and possibly less root diseases.

**Background/Objectives:**
In the UK planting dates for grain-only wheat crops have progressively moved back to September ie comparable with March in Australia. This enables development of a strong vigorous plant entering winter and would have the added advantage of removing moisture from the soil profile in Tasmania. Lower plant densities are recognised as essential to reduce the canopy size and minimise leaf disease and lodging. In Tasmania these potential problems can be reduced through stock canopy management but given the high grain yields overseas it would be valuable to evaluate early sowing of a grain-only wheat crop.
There is particular potential for early sowing in Tasmania where the crop can be watered up in a dry summer/autumn. The major limiting factor will be excess vegetative growth and greater disease pressure due to the longer growing season.

The objective of this trial was to compare a commercial plant density for dual purpose and grain-only production with reduced rates comparable to that used for early sowing in the UK.

**Background:**

**Variety:** Mackellar

**Treatments:** normal – 200 plants/m$^2$ (approx 90 kg/ha)
reduced – 125 plants/m$^2$
UK early sowing – 50 plants/m$^2$

Given the dry summer and autumn it was fortunate the trial was sown under a centre pivot and could be watered up. The trial consisted of four replicates in randomised complete blocks.

The trial was sown on 18$^{th}$ March 2005 with 4:13:7:9 fertiliser at 250kg/ha and followed a green pea crop in 2004. Nitrogen (50kgN) was top-dressed on 7$^{th}$ September and with the favourable season a further 50kgN was applied on 17$^{th}$ October. A two spray straddle fungicide schedule was used (GS34 and GS45-51). The plots were harvested for grain on 13$^{th}$ January 2006.

### Results and Discussion

**Growth:**
With irrigation, establishment was good and not significantly different to target densities. Nevertheless early growth was probably reduced by the dry autumn (Decile 2) and early winter (Decile 3). The mild and wet spring (Decile 8) resulted in good growth later in the season. Prior to the first fungicide application there was some stripe rust present and surprisingly the 50 plants/m$^2$ treatment scored higher than the 125 and 200 plant/m$^2$ treatments in both replicates scored for disease.

The low density plots at 50 plants/m$^2$ looked very sparse early in the season but by September had tillered well and had largely caught up. A solarimeter was used in mid October to measure the amount of light intercepted by the leaf canopy and there was a trend for the low density plots to absorb less light but this difference was only marginal and not significant. In contrast the highest density plots looked good during early tillering but later in the season the high population of tillers were visually thinner stemmed and prone to lodging.

**Table 5-12: Effect Of Varying The Plant Density Of Early Sown Wheat (Mackellar) On Grain Yield And Lodging, Nile, 2005-06.**

| Plant density ( $/m^2$) | Yield (t/ha) | Lodging score |
|---|---|---|
| 50 | 6.93 | 48.3 |
| 125 | 7.41 | 55.8 |
| 200 | 7.74 | 67.9 |
| **LSE (0.05)** | **0.45** | **13.47** |
| **CV%** | **3.5** | **13.6** |

Lodging was extensive throughout the trial, even at the 50 plants/$m^2$ density. Lodging scores are based on an index calculated as $^1/3$ (proportion of plants leaning at an angle between 5° and 45°) + $^2/_3$ (% plants at angle between 45° and 80°) + (% plants lying flat). There was a strong trend towards increased lodging with increase in plant density but lodging at 50 plants/$m^2$ was only significantly lower than 200 plants/$m^2$.

**Grain yield:**
Surprisingly, there was an increase in grain yield with plant density. Yields tended to increase from 50 through to 200 plants/$m^2$. Both the higher rates produced significantly greater yields than for the 50 plants/$m^2$ density. Statistically, there was no significant difference between 125 and 200 plants/$m^2$. While this response is not unusual for a May sowing it was expected that the earlier March sowing would have created too much vegetative growth and associated disease problems. While two fungicide applications were sprayed, this is not excessive and is already current practice in at least some May – June sown crops.

The higher level of rust on the low density plots (only 2 replicates scored) was surprising and also suggests that rust control was not a major limitation. Alternatively, excess vegetative growth may have not have been such an problem in 2005 as the wet spring probably resulted in reduced moisture stress in higher density plots compared with a more typical spring.

The higher density plots would also have extracted more soil moisture from the soil profile prior to the high rainfall in spring resulting in less waterlogging stress. In addition, with the wet spring, root diseases were commonplace in many paddocks and a small amount of take-all was observed at this site. This may have reduced tiller vigour and with regular rainfall in the latter part of the season, symptoms were masked. It is possible that low density plots were more prone to root diseases due to more waterlogging.

Insufficient nitrogen is unlikely to be the explanation due to the soil type and cropping history. One complete replicate accidentally received over 300kg of N and there was no additional grain yield compared with other replicates. The low density plot also did not respond any differently.

One explanation for the response to plant density may be an overall reduction in tiller and ear numbers due to eyespot infection. There was some eyespot observed in the cut plots of an adjacent trial and this may have reduced grain yield. However visually there did not appear to be any/very little eyespot in uncut plots.

Samples from quadrats are yet to be processed to determine treatment effects on the number of ears/$m^2$, grains/ear and grain weight and this may help explain the result.