OPTIMUM INPUTS MAY BE LOWER INPUTS FOR WHEAT

For the Corowa GRDC Farmer Update (Feb 2010)

John Sykes,
Consultant Albury
johnsykes3@bigpond.com
02-60231666

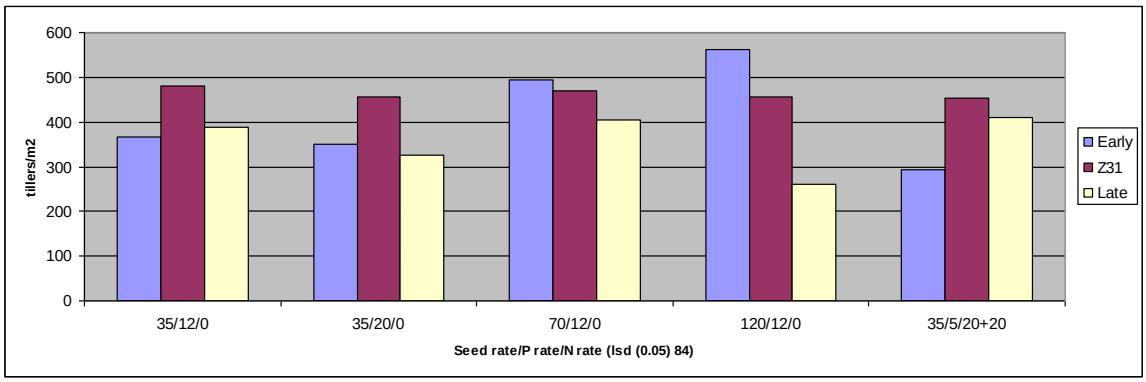
Take Home Messages

- Optimum sowing inputs are about 70 plants/m^2 (about 35 kg/ha) of wheat seed and use 5-10 kg/ha of phosphate fertiliser at sowing, depending on original P soil test levels. This is about half the recommended amount of seed and fertiliser used prior to the current run of dry seasons.
- Using these lower inputs is optimal due to the lower cost of production and higher gross margin in average to below average growing season rainfall (GSR) years and lower risk and higher yield in low rainfall years.
- Optimum tiller numbers for average to below average GSR years is 250-350 tillers/m^2 (t/m^2), not 500 t/m^2 as previously targeted.
- 70 kg/ha of seed and 5 kg/ha of P can still produce 500 t/m^2 by using early N fertiliser to boost tiller numbers.
- There may be opportunities to split the P fertiliser use by using low inputs at sowing and applying P in crop.

In 2008, as part of the final year of the GRDC funded Third Crop Program, Riverine Plains Incorporated Cropping Systems Group carried out an experiment to investigate whether seed could be substituted for P and N fertiliser in wheat. The experiment was undertaken in response to high fertiliser prices in 2007 and 2008 and followed on from unpublished work done by Mr Geoff Pitson and Dr John Angus at Cootamundra in the early 1990s. The experiment was planted at the Third Crop site at Balldale NSW. The site had a high P (Colwell P 83 mg/kg) level, low N (73 kg/ha DSN) level and had previously grown wheat in 2007. The variety was VenturaA and the GSR was 145 mm (average GSR 319 mm) but the site had about 70 mm of stored moisture prior to sowing on the 23rd May. The results (Figures 1 and 2) showed that

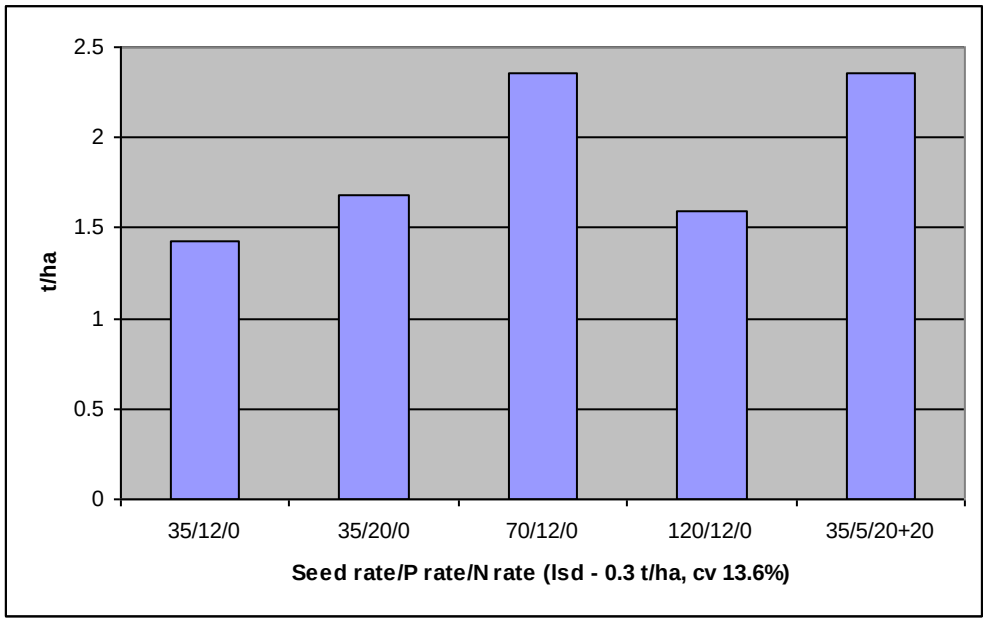
- Higher seed rates can be used to produce extra early tillers but these may not be maintained alive in low rainfall conditions.
- Using lower inputs will produce lower tiller numbers but the number finally produced at Z31 could be boosted by using early N fertiliser.
- Lowering the inputs to 35 kg/ha of seed to produce about 70 plants/m^2 and 5 kg/ha of P fertiliser resulted in the best yields in drought conditions.
- Lower inputs produced significantly better yields than the recommended sowing treatment prior to 2006 of 70 kg/ha of seed to produce about 150 plants/m^2 and 20 kg/ha of P.
- Optimum tiller numbers were 300-350 t/m^2.

Figure 1.
Tiller Numbers at Various Growth Stage Produced from a Number of Treatments in the 2008 Wheat Input Experiment (Early – Z15, Z31 – Zadok growth stage Z31, Late – Z65)



See comments under Table 1 for further explanations of treatments

Figure 2. Yield (t/ha) Produced from a Number of Treatments in the 2008 Wheat Input Experiment



2009 Results

In 2009 the experiment was repeated using private resources with expanded treatments to investigate P and N responses at various seeding rates and to incorporate a number of treatments suggested at the February 2009 GRDC Corowa Update.

The site was again at Balldale. The paddock chosen had medium to high P (46 mg/kg), high N (110 kg/ha DSN) and had grown canola in 2008 that was cut for hay, following a number of years of pasture. The variety was VenturaA, treated for Stripe Rust control using an incrop fungicide, the GSR was 281 mm and there was minimal stored moisture at the beginning of April. The sowing date was the 21st May and there was no visible frost effect at the site.

The results (Table 1) show that

- Low sowing inputs (35 kg/ha of seed and 10 kg/ha of P) gave a non significant yield response to using the recommended sowing inputs of 70 kg/ha of seed and 10-20 kg/ha of P (treatments 3 and 4).

- 60-80 plants/m^2 (35 kg/ha of seed) did not yield significantly differently to 150 plant/m^2 (70 kg/ha of seed).
- Optimum tiller numbers to produce maximum yield was 250-350 t/m^2 at Z15 to Z31. This is about half the previously recommended number of 500 t/m^2.
- 400-500 t/m^2 could be produced from 35 kg/ha of seed and 10 kg/ha of P fertiliser at sowing by applying 20 kg/ha of early N at Z15.
- Using more seed is the most economic way to increase tillers.
- The site responded to split applications of P (treatments 16 and 17) as 5 kg/ha of P at sowing with 15 kg/ha applied at Z15. This is not the expected response to P. If it is repeatable, it may suggest that a crop can be sown with very low P inputs which can be added as the season progresses similar to the way that N is applied.

Overall the results show that lower inputs will reduce costs in below average to average rainfall GSR years and should be tried. It may not be recommended where weed resistance is an issue or for crops that are to be grazed. The experiment comes to no conclusion about the inputs needed to optimise yields in high GSR years when high yields are possible or whether low inputs can be manipulated to produce these high yields. The tiller number production, however, suggests that high yields may be achievable from lower inputs with suitable manipulation.

Table 1 2009 Results for the Wheat Inputs Experiment

Number	Treatment Summary	Plants (plants/m^2)	Tillers (t/m^2, Z15)	Tillers (t/m^2, Z30)	Yield (t/ha)	GM ($/ha)
1	70/0/0[1]	156	308	346	1.9	$243
2	70/5/0	163	423	403	2.4	$297
3[4]	70/10/0	141	414	442	2.9	$361
4[4]	70/20/0	154	541	550	3.2	$383
5	70/20/20	141	549	485	2.8	$287
6	35/0/0	70	152	166	1.9	$244
7	35/5/0	70	178	235	2.6	$341
8[4]	35/10/0	74	213	242	3.0	$406
9[4]	35/20/0	74	259	298	3.2	$403
10	35/5/20+20[2]	71	190	401	2.6	$289
11	35/5/20	78	178	190	2.7	$310
12[4]	35/10/20+20[2]	64	224	449	3.4	$414
13	35/10/40	68	219	247	3.0	$332
14[4]	35/20/20+20[2]	66	242	497	3.5	$391
15[4]	35/20/40	70	239	283	3.6	$410
16[4]	35/5+15/20+20[2,3]	70	213	523	3.5	$389
17[4]	35/5+15/40[3]	67	224	262	3.5	$387
18	150/20/0	258	708	953	1.4	$27
19	15/20/20+20[2]	35	150	391	2.4	$202
20	70/0/20[5]	140	463	490	2.3	$267
21	70/10SS[6]/20	143	506	487	2.5	$270
LSD[7]	(0.05)	48	139	154	0.4	

1- Seed Rate/P rate/N rate. Seed and P (Triple Super) applied at sowing and N (Urea) at Z31 unless otherwise stated. 2- N applied as a split at Z15 and Z31. Numbers show the rate applied at Z15 (before the +) and at Z31. 3- P applied as a split at sowing and at Z15. 4 - These treatments were not significantly different in yield to the recommended sowing treatment (treatment 4). 5 – N as urea applied at sowing. 6 - SS – Single Super instead of triple to supply S as well as P. 7- Preliminary analysis. Yield CV – 16.9%.