

*Crop & Food Research Confidential Report No. 1899*

***Annual report to ERMA on the GM onion  
field trial***

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*A report prepared for the  
**Environmental Risk Management Authority and the  
Māori Consultative Group***

*Copy 1 of 8*

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# Contents

1	<i>Executive summary</i>	1
1.1	<i>Trial design</i>	2
1.2	<i>Onion growth and development</i>	4
1.3	<i>Onion plants displaying pipes</i>	4
1.4	<i>Weed diversity</i>	4
1.5	<i>Weed control</i>	4
1.6	<i>Harvest</i>	5
2	<i>Compliance issues</i>	6
3	<i>Continuing viability of the project and proposed activities for next year</i>	6

# 1 *Executive summary*

This report describes progress to the end of June 2007 on the field trial approved by ERMA of genetically transformed onion seedlings.

1. The 2006/07 field trial planned to test 2 lines with a total of 420 transgenic transplants from backcrossed material. The two lines were selected on the basis of good performance from the 2004/05 season both here and by our collaborators in the US. The lines were tested against 0, x2, x4, and x6 field application rates of glyphosate to determine tolerance levels and performance of the plants. Measurements of growth and development and weed control were taken throughout the growing season. At harvest bulbs were weighed and compared against non-transgenic siblings that had been hand weeded.
2. Transplanting was successful due to cool wet conditions reducing transplant shock.
3. Weed establishment appeared consistent from plot to plot. This made accurate assessment of weed control efficacy between treatments easy. Generally weed growth was diverse and dense, suggesting that there was a large weed seed bank in the soil.
4. Glyphosate herbicide was applied 3 weeks after transplantation. By 3 weeks after application all weeds were dead except for a few clovers that were severely stunted. One treatment was sufficient to keep plots clear of weed until harvest.
5. Pest control and disease control was greatly improved over previous years thanks to a more active management strategy.
6. Harvested material was returned to the PC2 glasshouse, cured and stored. This material will be returned to our collaborators for further development.
7. Security measures were refined during the trial to prevent false alarms from being triggered. This worked much better than in previous years with many fewer false alarms.
8. Onions continue to represent a relatively safe initial starting crop for testing GM systems in New Zealand and for developing methodologies that will reassure industry, regulatory bodies and other interested groups that the testing is efficient and effective.
9. All ERMA controls were complied with and ERMA and MAF communication channels were greatly improved compared to preceding years.

## 1.1 Trial design

The field trial site was situated at least 2 km from any commercially grown onions and no flowers were allowed to develop on the test onions within the field site. The planting of a field site is shown below (Figure 1) in relation to the 2004/05 and 2005/06 site.

The 2006/07 trial plan had two transgenic lines planted within three replicate randomised blocks of 12 plots per block including control non-transgenic material (figure 2). All material was transplanted successfully on 26 October.

Seed from line A contained far fewer transgenic siblings than seed from line B and subsequently only one block contained transgenic line A material. Furthermore, plots of line A were reduced to contain only 15 plants per block (same density as other plots) compared with 30 plants per block in all other plots. Three weeks after transplantation, plots were sprayed with x2, x4, or x6 field application rates of glyphosate as indicated in Figure 2. Non-transgenic non-sprayed control plots were hand-weeded so that comparative growth and yield data could be gathered. Bulbs were successfully harvested on 16 March.

Figure 1: Field site planting location for 2006/07.

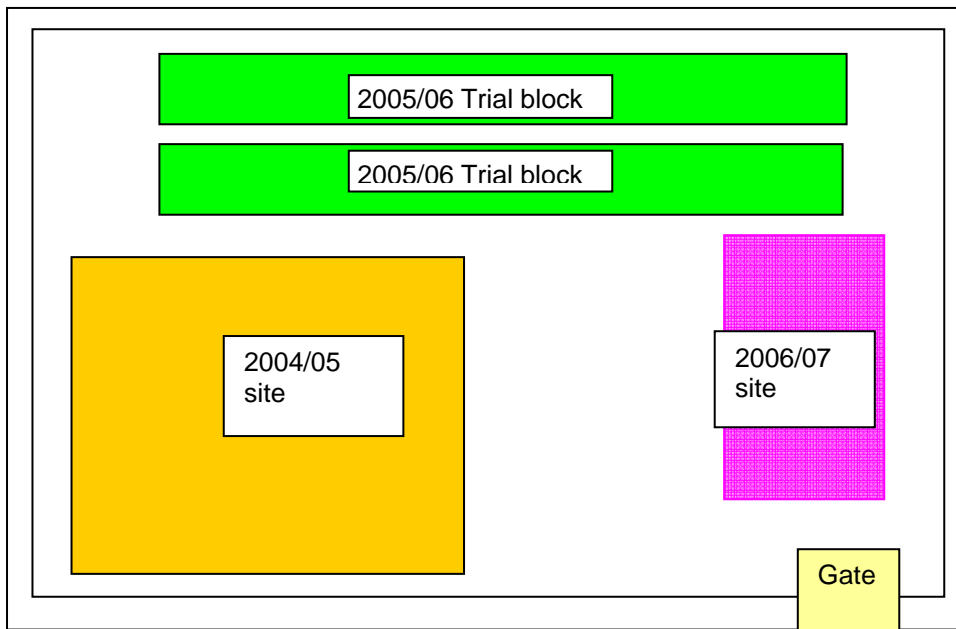


Figure 2: Onion trial design - Onion Trials, Colin Eady, 2006/07.

**Design:** Ruth Butler, Sept 2006; modified Oct 2006 PLK and Bnt plots added; A plots changed because of lack of transgenic seed.

Block 1		Block 2		Block 3	
1 B4x	7 A0	13 Ant0	19 B0	25 Ant0	31 B2x
2 PLK	8 Bnt	14 B6x	20 B2x	26 Ant4x	32 Bnt
3 PLK	9 A2x	15 Ant4x	21 PLK	27 PLK	33 B0
4 A4x	10 B6x	16 Bnt	22 Bnt	28 Bnt	34 PLK
5 A6x	11 B0	17 Ant2x	23 Ant6x	29 B6x	35 Ant2x
6 B2x	12 Bnt	18 B4x	24 PLK	30 Ant6x	36 B4x

Small numbers (eg 2) are plot numbers

Lines	Rates	Design:
A	0	3 replicates of 12 treatments, lines laid out in a resolvable block design)
B	2x	
Ant: non-transgenic	4x	
Bnt non-transgenic	6x	
PLK		

Green blocks represent hand-weeded plots  
 Plots contain 30 plants, (5 rows of 6)  
 Except A plots (plots 4, 5, 7, & 9), when only 15 plants



*Figure 3: 2006/07 trial site with buckwheat buffer rows.*

## **1.2**     *Onion growth and development*

All onion lines grew as well. Very few plants were lost due to transplant shock. No easily discernable difference could be observed between transgenic plants and control non-transgenic siblings.

## **1.3**     *Onion plants displaying pipes*

No onion plants displayed pipes.

## **1.4**     *Weed diversity*

Weed diversity profiles for each plot were recorded by photographic recordings of each plot throughout the season.

## **1.5**     *Weed control*

Glyphosate herbicide was applied 3 weeks after transplantation. Ten days after this, all weeds had stopped growing and most had started to die off. By 3 weeks after spraying, all weeds were dead except for a few clovers that were severely stunted. The transgenic onions were not affected by the treatment. Control non-transgenic plots were either sprayed as for the transgenic lines, hand weeded, or received no weed control

The amount of glyphosate used was x2, x4, and x6 the effective required dose for broad-spectrum weed control. This dose was used in order to test the level of transgene expression in the selected lines.

## 1.6 *Harvest*

All material that survived transplantation and spray was harvested and returned to the PC2 glasshouse. Bulbs were weighed, cured, and stored. This material is being sent to the US for continued research.

## **Unanticipated events and interference**

Essentially there were no major problems with the trial this season.

1. Security – Many fewer false alarms. No deliberate breaches of the site were noted.
2. Resources – No resource issues.
3. Transplants – Cool wet conditions at time of transplant insured reduced transplant shock.
4. Interference – there was no observed interference of the site.

## **2** *Compliance issues*

Controls 1-1.12: controls concerning the containment facility were all adhered to correctly.

Amended control 6.4: this made keeping registers of plant material much easier during the transfer from field to glasshouse and throughout the trial.

Sections 1.16-1.18: specification of the plants to be field-tested. These controls were adhered to.

Sections 2 and 3: controls governing the exclusion of unauthorised people and other organisms were adhered to.

Section 4: The definition of “traces of onion material or soil potentially harbouring onion material” could be interpreted as referring to many different degrees of cleanliness. In reality it did remove the requirement to clean footwear if they were only perceived to be dusty.

Section 5: controls governing accidental release or escape were adhered to.

Section 6: controls addressing monitoring requirements were adhered to.

Section 7: all additional controls were adhered to. The amendment allowing for alternative buffer row species considerably eased the ability of the operator to account for all the onion material on the site.

## **3** *Continuing viability of the project and proposed activities for next year*

This season's trial and results clearly demonstrated the efficacy of these two lines of transgenic glyphosate tolerant onions. No yield penalty was detectable even at high rates of glyphosate application. We believe that these data provide important support toward demonstration of the commercial viability of glyphosate tolerant onions. However, the commercialisation of glyphosate tolerant onions ultimately depends upon continued collaboration with government and industry partners.