# Merriwagga CWFS trial results 1999-2005.

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**Key Messages**

- Continuous cropping has remained the most profitable rotation since the trial began, especially continuous wheat. This system however will not last, and will be less profitable in the next few years, as suggested by the GM variations in figures 6 and 7. For continuous cropping to be sustainable, a break crop is needed to keep the system working.
- The trial has shown that no till farming can be profitable on our sandy loam soils, especially in a continuous cropping rotation (or sowing into stubble). Over the last three seasons, no-till has performed significantly better than conventional tillage in continuous cropping rotations.
- Using no-till following a long fallow has not been as productive in our trial, probably because of herbicide efficacy during the hot, dry summer months, and also lower water infiltration into uncultivated, stubble-free ground.

**Background and aims of the trial:**

A long term farming systems trial was established in 1999 aiming to investigate the *sustainability* and *profitability* of *cropping rotations* and *tillage methods* on Merriwagga soils. The paddock chosen has had a long history of traditional low input cropping. Soils are alkaline red earths (pH 7.2 $CaCl_2$), with a layer of limestone within 60cm of the topsoil. These soils are composed of about 20% clay, 10% silt, 42% course sand and 28% fine sand, categorising them as sandy loam surface textures. Average annual rainfall is about 370mm.

The trial is situated on Geoff and Ian Barber's property "Sylvanham" on the corner of Black Stump Rd and Greenhills Rd, approximately 10kms SW of Merriwagga. The Barbers have allowed the Merriwagga CWFS group to share-farm the trial site, allowing other trial work to be conducted around the core site. The trial is designed so that all operations are conducted using growers equipment to make it realistic. The trial has been set up with 3 replications of all treatments, totalling 30ha in area.

**System treatments:**

Continuous rotation cropping: This system involves continuous cropping by rotating crop types. When the trial began, this system was not common practice, and it is designed to see if it can be done economically in this environment. Since the beginning of the trial, more growers are now using break crops. In general, a break crop is grown every second or third year after wheat. The choice of the break crop is mainly determined by the time of break, and disease risks.

Continuous Wheat: This treatment is not common in the area, however growers wanted to see what happens if wheat is grown over a long period of time.

Wheat/Ley/Fallow/Wheat: This system has traditionally been practiced, however is declining as stock numbers reduce. After harvest the paddock is left as a ley, where naturalised grasses and legumes emerge. The paddock is grazed until it is brought into fallow the following year. Cropping occurs every third year in this system. As of 2006, we will delete the Ley so that this rotation is in alternation with W/F/W (below).

**Wheat/Fallow/Wheat:** This is also a traditional cropping system still practiced by some growers. The paddock is cropped every second year and fallowed in between aiming to conserve soil moisture, mineralise nitrogen, and break disease cycles.

**Tillage treatments:**

Each system treatment is divided into two tillage treatments.

No tillage: This treatment involves sowing with narrow points into an unprepared seedbed. Weed control is by herbicides and if absolutely necessary burning. Harrowing may occasionally be practiced to remove excess stubble that may hinder sowing.

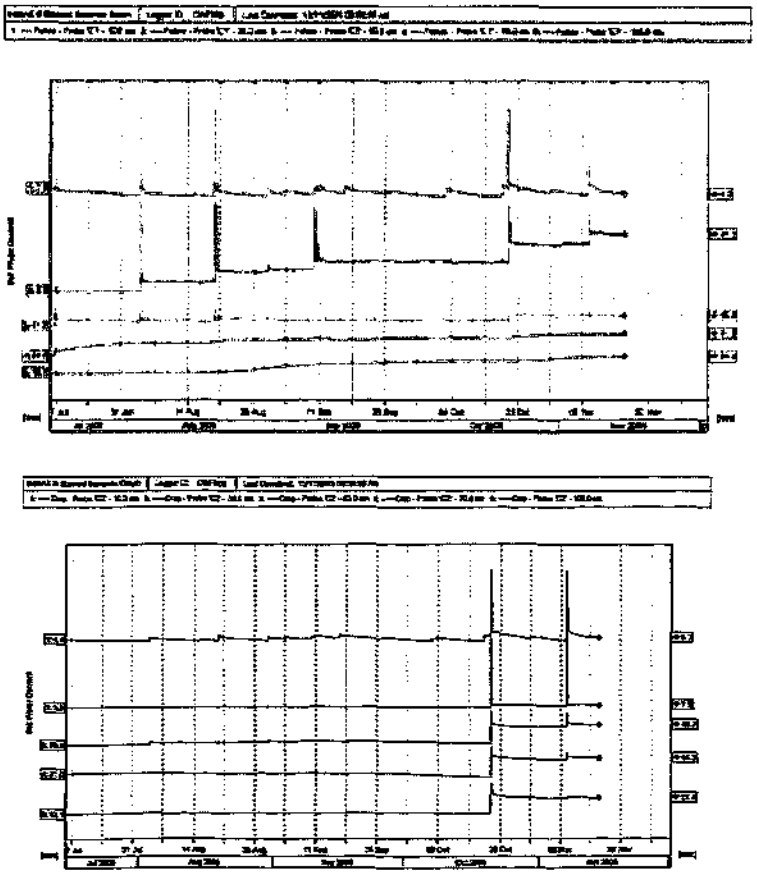
Conventional tillage: This system uses conventional tillage fallows and tillage to prepare the seedbed and remove/incorporate stubbles. Herbicides are still used in this system, however cultivation is the primary method of weed control. This treatment aims to emulate common tillage practices of the district when the trial began.

**Results from 2005:**

2005 started out as a very dry beginning to the season. The first rain allowing sowing to commence occurred in mid June. It then kept raining until early August, making sowing operations wet and sticky. Rainfall for the year totalled 3472mm, with 269mm falling between April and October. Temperatures in the spring were lower than average, which helped later crops finish without too much stress.

2005 was the first year that we started measuring soil moisture using enviroscan moisture probes. We did this in a chemical fallow and also a wheat crop.

Figure 1: Graphs below show the changes in soil moisture to 1m from the period 5th July to the 16th Nov 2005.



The top graph shows soil moisture in a chemical fallow, and the bottom graph in a wheat crop.
The fallow started with about 100mm of soil moisture in the top 1m, and finished with 165mm, meaning we stored approximately 65mm since the probes were installed.
The wheat crop started with about 85mm of stored moisture in the top 1m, and finished with approximately 130mm, meaning we only had 45mm extra since the probes were installed (most of this may have been used afterwards anyway).
It is important to note that not ail of this moisture would be available to the plant, as the soil can hold onto soil moisture stronger than what the plant can withdraw.

Note: As of Feb 2006, four probes will be installed that will download to the CWFS homepage daily, so you can watch rainfall influences on soil moisture at different depths.

**2005 Cropping Details**

Wheat sown with Flexi coil airseeder using knife points on 22.5cm rows.
Barley and peas (no-till) as above Barley and peas (conv) as above with 25cm sweeps

**Table 1:Crop details 2005.**

| Crop | Variety | Sowing Rate | Fertiliser | Sowing Date | GSR (Apr-Oct) | Average Yield |
|---|---|---|---|---|---|---|
| **Wheat** | Drysdale | 40kg/ha | 50kg/ha MAP | 18th June | 269mm | 2067kg/ha |
| **Barley** | Cowabbie | 40kg/ha | 80kg/ha S8 | 28th June | 269mm | 2104kg/ha |
| **Peas** | Kaspa | 110kg/ha | 80kg/ha S8 | 28th June | 269mm | 1048kg/ha |

Table 2: 2005 grain quality and prices.

| | | Retention | SCR | Prot | Price (del MW) | Grade |
|---|---|---|---|---|---|---|
| **Barley** | Conv | 74.8 | 22.1 | 14.4 | $107.55 | F2 |
| | No till | 75.4 | 21.7 | 13.6 | $107.55 | F2 |
| **Cont Wheat** | Conv | | 35.9 | **9.2** | $126.50 | ASW |
| | No till | | 34.2 | **9.9** | $126.50 | ASW |
| **WLFW** | Conv | | 34.5 | 12.3 | $157.30 | H2 |
| | No till | | 31.5 | 12.8 | $161.45 | H2 |
| **Peas** | *Conv* | | | | $220.00 | Feed |
| | *No till* | | | | $220.00 | Feed |

**Figure 2: Treatment yields 2005.**

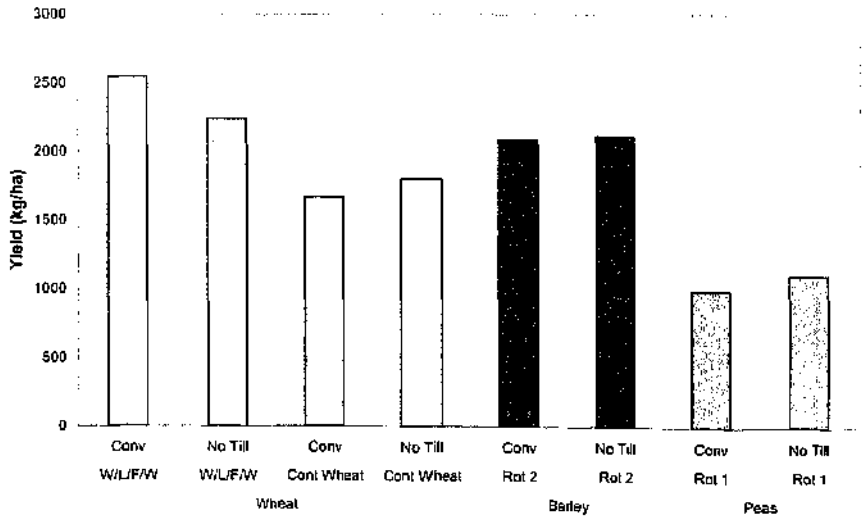


**Table 3: Budgets for each treatment 2005 (note all costs are calculated at contract rates).**

| | | Pre crop expenses | Crop Expenses | Fallow Expenses (to 20th Jan 06) | Income | GM (at harvest) | GM (20th Jan) |
|---|---|---|---|---|---|---|---|
| **WLFW (wheat)** | No Till | $34.00 | $149.00 | $22.00 | $358.42 | $175.42 | $153.42 |
| | Conv | $34.00 | $149.00 | $11.00 | $401.12 | $218.12 | $207.12 |
| **Cont Wheat (wheat)** | No Till | $34.00 | $149.00 | $22.00 | $227.70 | $44.70 | $22.70 |
| | Conv | $31.00 | $149.00 | $11.00 | $211.25 | $31.25 | $20.25 |
| **Rot1 (peas)** | No Till | $34.00 | $189.00 | $17.00 | $250.81 | $27.81 | $10.81 |
| | Conv | $31.00 | $189.00 | $11.00 | $217.80 | -$2.20 | -$13.20 |
| **Rot 2 (barley)** | No Till | $34.00 | $122.00 | $22.00 | $228.01 | $72.01 | $50.01 |
| | Conv | $31.00 | $122.00 | $11.00 | $224.78 | $71.78 | $60.78 |
| **WFW (fallow)** | No Till | | | $78.00 | $0.00 | | -$78.00 |
| | Conv | | | $66.00 | $0.00 | | -$66.00 |

**Figure 3: GM analysis for treatments at harvest 2005.**

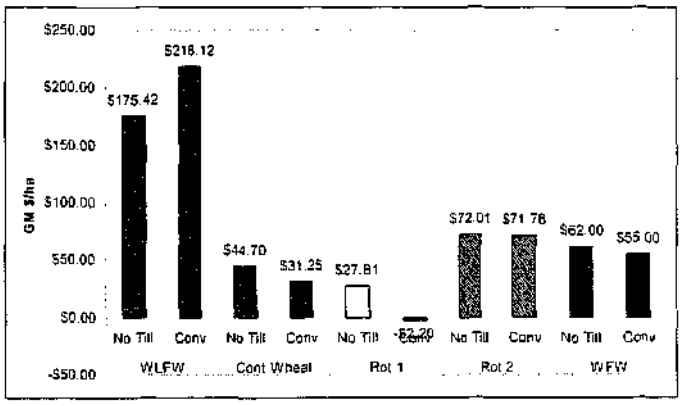



**Figure 4: Rhizoctonia levels apparent in all treatments from 2003 to 2005 measured by Predicta B root disease tests.**

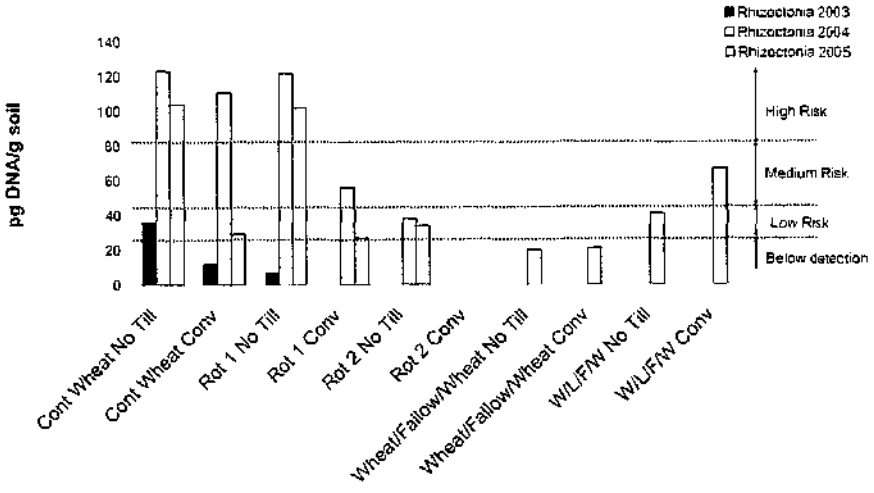
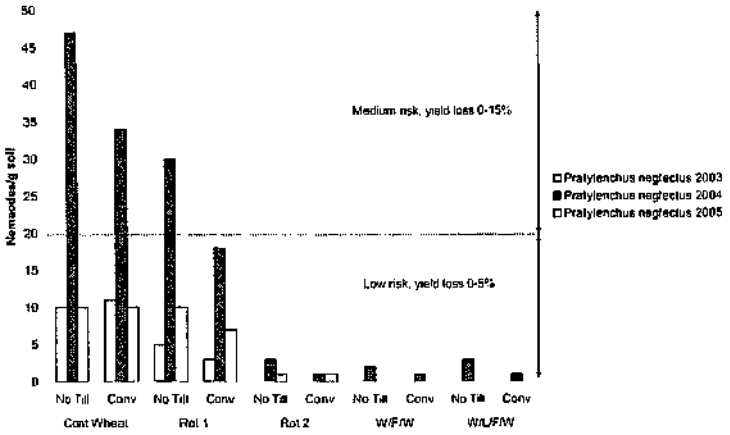


**Figure 5: Nematode levels (P.neglectus) in all treatments from 2003 to 2005 measured by Predicta B root disease tests.**




**Discussion:**

As shown by the results above, 2005 was only an average year for yields at the site.

Main points from 2005:

The crops finished before good rain occurred in October. This lowered yield potential, however allowed excellent wheat and pea grain quality. The barley suffered from high screenings, which could have been due to high tiller numbers.

Grain prices were extremely low, however increments in protein seemed to boost grain prices in some rotations.

Across all plots in 2005 there was no significant difference between tillage treatments. It is important to note that the WLFW rotation under the conventional system was actually direct drilled into stubble. This rotation missed it's cultivation as we were originally going to fallow these plots, but decided to sow them so that we would have an alternating rotation with the Wheat/Fallow/Wheat. The only difference between the two WLFW plots (no-till vs conv) is that the Conv plots were sown into much higher stubble load from the previous year. The result has shown the importance of stubble in no-till situations.

The continuous wheat plots are now being affected by increased weed levels. Weeds such as rye grass are becoming difficult to kill with group A herbicides, which may/may not be a suggestion of resistance. This rotation also showed nutrient deficiency symptoms (mainly N), which will need to be addressed next season.

Disease levels are now becoming extremely evident in continuous cereals. A strong relationship between Rhizoctonia and P.neglectus nematodes seems evident. We are finding that by adding either a fallow and/or cultivation and/or a field pea crop both Rhizoctonia and nematodes remain below detection in most cases. For disease levels to remain below detection using field peas, the crop must be grown once every three years in rotation.

**Summary of Results from the trial 1999-2005:**

**Table 4: Cropping history for the site.**

| Farming System Treatments | Cropping Timetable | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *1999* | *2000* | *2001* | *2002* | *2003* | *2004* | *2005* | 2006 |
| **Wheat/Fallow/Wheat** | Fallow | Wheat | Fallow | Wheat | Fallow | Wheat | Fallow | Wheat |
| **Rotation 1** | Peas | Wheat | Canola | Wheat | Wheat* | Barley | Peas | Wheat |
| **Continuous Wheat** | Wheat | Wheat | Wheat | Wheat | Wheat | Wheat | Wheat | Wheat |
| **Wheat/Ley/Fallow/Wheat** | Ley | Fallow | Wheat | Ley | Fallow | Wheat | Wheat* | Fallow |
| **Rotation 2** | Wheat | Peas | Wheat | Peas | Peas* | Wheat | Barley | Canola/Peas |

*Note change of cropping sequence as a result of failed crops in 2002, and changes to WLFW rotation.

**Figure 6: Long term gross margins/ha from 1999 to 2005**

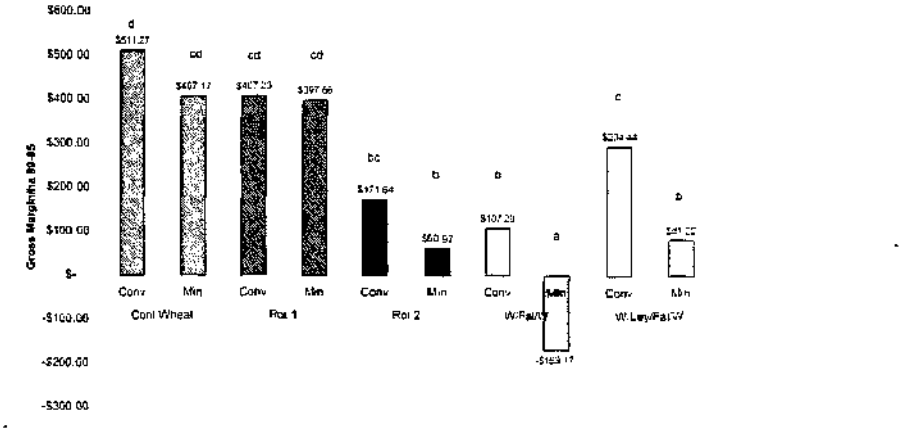
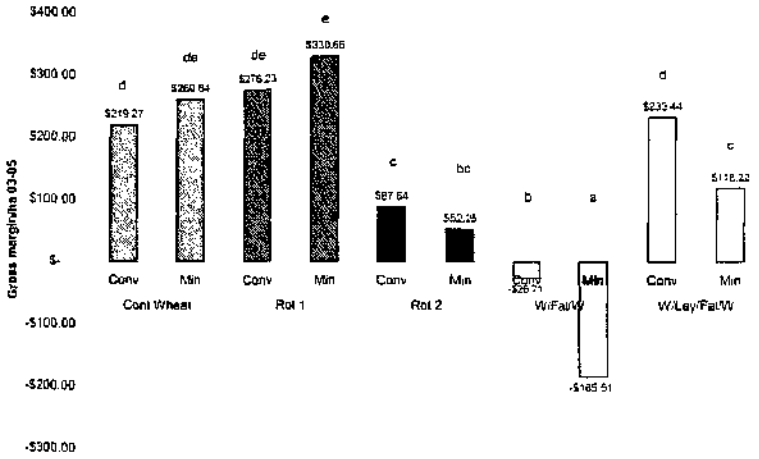



**Figure 7: Gross margins from 2003 to 2005, showing the increase in the profitability in no-till farming in continuous cropping.**




**Main points**

- Continuous cropping is remaining the most profitable rotation since the trial began, especially continuous wheat. This system however will not last, and will be less profitable in the next few years, as suggested by the GM variations in figures 6 and 7. For continuous cropping to be sustainable, a break crop is needed to keep the system working.
- The trial has shown that no-till farming can be profitable on our sandy loam soils, especially in a continuous cropping rotation (or sowing into stubble). Over the last three seasons, no-till has performed significantly better than conventional tillage in continuous cropping rotations.
- Using no-till following a long fallow has not been as productive in our trial, probably because of herbicide efficacy during the hot, dry summer months, and also lower water infiltration into uncultivated, stubble-free ground.

**Site Sponsors**

A huge thank you to the Barber family, the dedicated committee, and the local site sponsors who donate time, money and products that allow this trial to progress into what we have today.

NSW DPI, Elders, Rawlinson and Brown, Landmark Griffith, Yenda Producers, Agrichem, AWB Seeds, Bayer, Case Intersales, CropCare, Codemo Machinery, Commonwealth Bank, ECOM Commodities, Dow AgroSciences, Dupont, Farmoz, Harrison Spray Contracting, Harry Shaddock Seed Grading, HiFert, Incitec/Pivot, Mobil, Nufarm, Pioneer Seeds, Plant Tech, RABO Bank, Pioneer, Syngenta, Vic Chemical Co, Murrumbidgee and Lachlan CMA's.