

# Flexible farming systems

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## Take Home Messages

- Less intensive farming systems incorporating fallow (tilled or chemical) have been more profitable in dry years, but the timing of benefits from reducing crop intensity need to be considered.
- Small adjustments to the way things are done can have a big influence on profitability without requiring a wholesale change in farming system.
- Zero phosphorus rates are a short-term cost-cutting opportunity in the Farming Systems Trial.
- Cashflow and cost-cutting should not stand in the way of adopting technology with proven better returns (eg. Better varieties).

## Introduction

Many farmers in the Victorian Wimmera and Mallee are facing up to a challenging year in 2009. Three or more years of below-average or poorly timed growing season rainfall are starting to make even optimists question whether someone might have slipped a loaded dice into the machine that decides the weather. If so, are we in for more of the same, or is 2009 likely to be somewhere near normal? And what if it does get wet? These are the sorts of the questions that must be considered as farmers and advisers put together plans for the year, and work out where to put scarce resources. This paper aims to use results from the BCG/Vic No Till Flexible Farming Systems project to demonstrate some of the effects of different farming systems on profitability, and how that relates to type of year, to consider where to reduce costs and what the effects will be, and what can be done to remain profitable.

## Methods

The BCG Farming Systems trial has been running since 1999 and contains four main farming systems: Fuel burner (tilled fallow, full-cut sowing, less intensive cropping and sheep),

Hungry sheep (full-cut sowing, intensive cropping and sheep, fed if necessary),

No till (knife point/press-wheel sowing, 80% cropping, chemical fallow), and

Reduced till (flexible, generally similar to No till but with wider range of crops).

Since 2006 no-till variations of Fuel burner and Hungry sheep have also been introduced, and we have monitored the effects of single tillage in no-till and reduced till plots, and the addition of extra straw. There is also a 'standard' rotation, which estimates the level of spatial variability between plots. Apart from the 'standard', all decisions are made by farmer champions (rather than having a fixed rotation), so there are aspects of skill and luck evident in the results. It is also possible to consider each plot separately. A strength of the data is common rainfall, and a reasonably uniform soil type (Calcarosol = clay, with gilgais/crab-holes and subsoil limitations). More details can be found on the project website, [www.flexiblefarming.com.au](http://www.flexiblefarming.com.au).

The economics of each system in each year of the trial have been worked through using an estimate of prices for 2009, and the assumption that each of the 5 plots of a system represents 400ha of a 2000ha farm. Operation and machinery costs, and hours worked have been estimated using a machinery inventory allocated to each system on the basis of actual use of machinery in the trial between 2003 and 2008. All other crop results are based on actual input use and crop production in the trial. Sheep results use actual stocking rates with an assumed flock structure, adjusted pro-rata for actual days spent on the trial. Production is based on weights achieved, at a fixed meat price. Feeding and shifting sheep also add to hours worked. Checking sheep and crops are excluded from hours worked.

# Results

## ***Different farming systems, profitability and season***

The gross margin (Table 1) and crop/yield (Table 2) histories for each system summarise most of what needs to be understood about the difference between systems, what causes success and failure. Until 2008, the Fuel burner system stood out as the system that most reliably produced a return, even if it was not the highest. This was due to presence of 20 – 40% fallow in the system. Given the high cost of sowing a crop, it is important to get a return when a crop is sown and fallow (in this environment) generally achieves this whether chemical (as in No till) or mechanical (Fuel burner). The key to successful fallow effects at this site seems to be killing weeds and conserving moisture. Even after a loss in 2008, the Fuel burner system has been, of the systems, closest to breaking even over 2006-8.

The Reduced till system has also stood out, as being a 'high opportunity' system, in wetter years (2003, 2005, Table 1). This is because of the high intensity of cropping, with good yields in those years (Table 2). Because of the high intensity, there is also a high cost each year to put crop in, and in drier years, Reduced till has lost money. On average over all years Reduced till is still ahead even after higher machinery costs are accounted for. Unless the large profits from 2003 and 2005 were well invested, however, cash flow would be becoming a problem in this system.

No till has been an interesting contrast to Reduced till because crop choice and sowing practice have been similar since 2003 (Table 2), but the average gross margin results are opposite (Table 1). No till has often had crop yields among the highest at the site, but has not had the consistency across paddocks of Reduced till. Apart from 2006, gross crop income each year has been higher in Reduced till, and costs often similar or lower than in No till.

The cause of these differences between Reduced till and No till appears to be a complex of issues. In 2003, 40% break crops were sown in No till and yielded little (Table 1), whereas in 2005, 40% break crops were sown in Reduced till and yielded well. Grass control has been a concern for the No till champion, which has led (perhaps unnecessarily) to delayed sowing when dry sowing would have been ideal, and higher in-crop herbicide costs in 2007. The Reduced till champion has used inexpensive Group B herbicides on two plots (20 g/ha chlorsulfuron (Glean) pre-emergent in 2003, 3 and 19), which may have had some residual benefits on the alkaline soil type. The Reduced till champion has also used occasional tillage between 2003 and 2005. Continued use of Vic Sloop barley in the No till system, which yields poorly in dry years, is also likely to have been a factor, particularly in 2008 (other systems used Hindmarsh, Buloke and Gairdner).

The Hungry sheep system has intensive livestock (2-5 ewes/ha depending on season, trade sheep over summer/autumn) and 80% cropping in most recent years, and has produced similar results (Table 1) to Fuel burner (less intensive cropping and livestock in some years, 2 ewes/ha). The contrast between the two systems (as with No till/Reduced till) is interesting. The Hungry sheep system feeds livestock, in the paddock or in a containment area, to maintain high stocking rates during the autumn feed gap, before lambing in July. In years with reasonable autumn rainfall this gap is 'covered' by early sown forage (oats or oats/medic) and feeding is low and sometimes even unnecessary. In these years the livestock part of the Hungry sheep system has had a gross margin of about \$100,000. In years with poor autumn rainfall (2005, 2006) and high stocking rate, the feed bill is high, leaving gross margin of \$20-30000, less than for the less intensive Fuel Burner flock in the same years. The balance between Hungry sheep and other systems shifts with the balance between meat and grain prices; a change in favour of meat over grain would see Hungry sheep being more profitable than Fuel Burner and *vice versa*.

The Hungry sheep system benefits from lower machinery and chemical costs than Fuel Burner (by using sheep to control weeds), but also has crop yields compromised by pasture growth before cropping, and delayed sowing to allow sheep feed. The Fuel burner is not constrained only to use fallows, and has used grazed or brown manured vetch or medic, fallowed in October-November. In 2007, with an early break, vetch hay provided a big income boost to the Fuel burner. In 2008, the break was poor, no hay was made and there was also little fallow benefit from the 2007 vetch paddock.

Both Fuel burner and Hungry sheep have been more time-consuming systems to run (Table 3), due to tillage in Fuel burner and sheep feeding in Hungry sheep. No-till versions of both, operated since 2006, have required less time but produced very similar economic results (not shown here).

**Table 1. Gross margin and growing season rainfall histories for systems in the BCG Farming Systems Trial, 2003-2008.**

System	Gross margin for year:						
	2003	2004	2005	2006	2007	2008	Average
Fuel burner	\$ 500,591	\$ 106,350	\$ 492,795	\$ (53,868)	\$ 185,889	\$ (108,323)	\$ 187,239
Hungry sheep	\$ 498,137	\$ 66,697	\$ 583,375	\$ (142,900)	\$ 78,161	\$ 53,190	\$ 189,443
No till	\$ 381,337	\$ (27,115)	\$ 575,205	\$ (134,291)	\$ (4,194)	\$ (127,334)	\$ 110,601
Reduced till	\$ 870,499	\$ 11,973	\$ 619,167	\$ (131,811)	\$ 41,996	\$ (1,499)	\$ 235,054
Including machinery ownership cost:							
Fuel burner	\$ 457,480	\$ 63,239	\$ 449,684	\$ (96,979)	\$ 142,778	\$ (151,434)	\$ 144,128
Hungry sheep	\$ 455,223	\$ 23,782	\$ 540,461	\$ (185,815)	\$ 35,247	\$ 10,276	\$ 146,529
No till	\$ 327,820	\$ (80,632)	\$ 521,689	\$ (187,808)	\$ (57,711)	\$ (180,851)	\$ 57,085
Reduced till	\$ 814,965	\$ (43,561)	\$ 563,633	\$ (187,344)	\$ (13,538)	\$ (57,033)	\$ 179,520
Apr-Oct RF mm	200	155	198	94	142	113	150

**Table 2. Crops and yields for systems in the BCG Farming Systems Trial, 2002-2008.**

Year	Crop (Yield, t/ha)						
	2002	2003	2004	2005	2006	2007	2008
Plot	<i>Fuel burner</i>						
8	Wheat (0.3)	Wheat (1.9)	Fallow	Wheat (2.3)	Barley (0.0)	Vetch	Wheat (0.2)
10	Fallow	Wheat (1.7)	Barley (0.7)	Fallow	Wheat (0.2)	Wheat (0.5)	Barley (0.4)
18	Fallow	Barley (2.3)	Medic/Fallow	Wheat (2.1)	Fallow	Wheat (0.7)	Barley (0.0)
21	Wheat (0.2)	Wheat (2.0)	Barley (0.8)	Fallow	Wheat (0.4)	Wheat (0.9)	Vetch
29	Pasture	Medic/Fallow	Wheat (1.1)	Barley (1.8)	Vetch	Barley (0.7)	Fallow
	<i>Hungry sheep</i>						
2	Wheat (0.0)	Wheat (1.2)	Barley (0.7)	Oats	Wheat (0.0)	Wheat (0.1)	Wheat (0.1)
5	Pasture	Barley (3.0)	Oats/Medic	Wheat (2.0)	Wheat (0.0)	Wheat (0.6)	Barley (0.3)
13	Lentil	Lentil (0.2)	Wheat (0.5)	Barley (2.0)	Oats	Oats	Wheat (0.1)
26	Barley (0.0)	Pasture	Wheat (0.3)	Wheat (2.1)	Barley	Barley (0.2)	Oats
32	Wheat (0.0)	Wheat (1.4)	Oats/Medic	Wheat (1.9)	Barley (0.0)	Wheat (0.2)	Wheat (0.3)
	<i>No till</i>						
6	Wheat (0.0)	Pea (0.0)	Wheat (0.3)	Barley (2.4)	Wheat (0.0)	Fallow	Wheat (0.6)
11	Lentil	Wheat (2.1)	Barley (0.8)	Fallow	Wheat (0.3)	Wheat (0.5)	Wheat (0.3)
16	Barley (0.0)	Vetch (0.2)	Wheat (0.4)	Barley (2.4)	Wheat (0.0)	Barley (0.8)	Barley (0.0)
22	Fallow	Wheat (1.6)	Barley (0.8)	Wheat (1.6)	Fallow	Wheat (0.8)	Barley (0.1)
27	Wheat (0.0)	Barley (3.1)	Fallow	Wheat (2.6)	Barley (0.0)	Barley (0.8)	Fallow
	<i>Reduced till</i>						
3	Wheat (0.0)	Wheat (1.7)	Wheat (0.5)	Canola (0.6)	Wheat (0.1)	Pea (0.1)	Wheat (1.1)
14	Wheat (0.0)	Wheat (1.7)	Barley (0.7)	Pea (1.6)	Wheat (0.1)	Wheat (0.7)	Wheat (0.1)
19	Barley (0.3)	Wheat (2.0)	Barley (0.7)	Wheat (2.0)	Barley (0.1)	Barley (0.9)	Fallow
24	Pasture	Barley (2.5)	Fallow	Barley (2.3)	Barley (0.1)	Wheat (1.0)	Barley (0.2)
30	Wheat (0.0)	Barley (2.6)	Wheat (0.7)	Barley (1.7)	Fallow	Wheat (0.8)	Barley (0.4)

**Table 3. Annual hours worked for systems in the BCG Farming Systems Trial, 2003-8.**

Rotation	Hours worked per year						
	2003	2004	2005	2006	2007	2008	Average
Fuel burner	994	569	727	413	600	506	635
Hungry sheep	854	617	827	532	520	738	681
No till	575	386	564	280	496	314	436
Reduced till	708	397	567	287	522	350	472

## Discussion

### *Where to reduce costs*

In common with many farms in the Wimmera and Mallee, all systems are coming off a cost-cutting phase that began when many paddocks were re-sown after the 2002 drought. Phosphorus fertiliser rates have long been around 40 kg/ha MAP and in 2008 were dropped by most champions to 20-30 kg/ha

MAP. Recent Colwell P and PBI measurements at the site suggest that many plots are close to the 'critical' level for cereal crops (for the soil) of about 30 mg/kg. A phosphorus budget exercise estimates 'fixation' of phosphorus of about 5 kg/ha/yr, but also showed some evidence of reasonable phosphorus mineralisation in wetter seasons. Phosphorus nutrition compromising crop growth and yield in wetter years has been a concern for a 'zero rate' P strategy, but this may be a more long-term issue (after a couple of better years). Zero P is one cost-cutting option at this site, subject to reasonable Colwell P in 2009 soil tests, but in practice there is a conflict here between needing to have early soil tests (to make decisions and order fertiliser) and soil test accuracy. We have also found that Colwell P soil tests post-harvest can underestimate levels closer to sowing.

Herbicides costs and efficacy have been an issue, particularly in the No till and Reduced till systems, because of constraints on when things can be done (including effects on surrounding plots), and delays between noticing a problem and getting a recommendation to solve it. The champions are also constrained to use label rates. Improving the timing of herbicide jobs may allow reduced rates, but this is something to discuss with an agronomist. Some components of mixes (eg. oxyfluorfen - Goal) may be unnecessary, particularly if herbicides such as glyphosate are used at the correct time. Similarly, thought should be given to tillage operations and whether they are really necessary. Inexpensive group B herbicides such as triasulfuron (Logran) are an underutilised resource at the Systems trial and may also be an opportunity for some farms. An issue that does not come up (practically) in the systems trial is patchiness of weeds, particularly with variations in soil type and germination. This provides opportunities to make savings through patching out.

Reducing the number of paddocks sown is a certain cost-cutting measure, and is one feature of the Fuel burner system that has led to better performance in drier years, but the yield benefits from fallowing those paddocks (the other component of better profit) will only be realised in the 2010 crop, and possibly only if there is a wet growing season in 2009. Paddocks known to be problem crop paddocks will easily be fallowed in 2009. If, given good summer rain and weed control in 2009, there is a realistic prospect of a profitable crop yield off a paddock, there is little sense in not cropping it. If the number of paddocks sown is constrained by cashflow, putting the paddocks that give greatest return per unit cost (of sowing and managing the crop to harvest) will result in the best return.

Sheep may be an opportunity for many farmers, particularly with feed grade grain stored on farm and less prospect of good feed prices in the 2009 season. They are also a large capital investment and if cash flow is an issue (particularly if part of the 2008 crop is still unsold) the prospects of a return in the short to medium term need to be weighed against any opportunities that might be foregone on the cropping and/or grain marketing side. Buying stock that are good value will help to offset this risk.

Farmers and advisers, while striving to reduce costs, should not forget that costs are also attached to opportunities for profit. The effect of adopting Hindmarsh barley in 2008 (yields of 0.3 – 0.4 t/ha compared with 0.05) demonstrates this well. If there is a reliably profitable improvement to be had, it would be better to leave an unproductive part of an otherwise good paddock unsown in order to adopt it than to continue farming without.

## ***Profitability***

The Farming System Trial results show that profitability in dry years is a characteristic of systems, but also that it is heavily influenced by seasons and (as demonstrated by the difference between Reduced till and No till) that small differences in the way things are done can have a big influence, particularly when costs are high compared to income. Finding these opportunities to improve the way things are done on a particular farm may take some reflection and perspective, which may be difficult for some to achieve. Outside assistance may be required.

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