

## **A comparison of four farming systems in central-western NSW**

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### **Abstract**

Central West Farming Systems (CWFS) is a farmer group based at Condobolin in the central west of NSW. One area of research for CWFS is a systems comparison where four farming systems are being compared in a 160 ha trial. The systems are - perennial pasture including livestock; reduced tillage including livestock; tillage including livestock (traditional); and no tillage, no livestock. The cropping portions of the systems commenced in 1998 with livestock entering the system in 2000. The systems are on a five-year rotation and this paper presents the first four years of cropping results. Average wheat yield for the three cropping systems was between 2.26 and 2.41 t/ha. Gross margins, for the cropping portion only, indicated that the no till, no livestock system had greater annual fluctuations than the traditional system.

### **Key Words**

zero till; reduced till; conventional; co-learning; gross margins; sustainable

### **Introduction**

CWFS is a farmer group where farmers drive research. The systems comparison trial commenced in 1998 to investigate the management, profitability and sustainability of four farming systems that vary in cropping intensity and use of perennial species. The trial balanced the needs of research and farmers to ensure the results were significant. Therefore the trial is not managed exactly as a farmer would manage his own farm but imitates a farming system as much as possible.

### **Methods**

The trial occupies 160 ha, located at Condobolin, NSW. Four systems are compared, using four replicates of each system with every rotational phase within each system present in every year. Each system has a farmer committee to make management decisions. All on-ground operations are undertaken by CWFS staff, directed by the four committees. The four systems are: (1) Perennial Pasture system - cell-grazing principle. Each of the four replicates is approximately 10 ha. Sheep are rotationally grazed with weekly intervals on each of the 12 segments, (2) Tillage including livestock system (Traditional) - similar to that used for many years by farmers. The five-year rotation consists of long fallow wheat (LFW), followed by short fallow wheat undersown with a lucerne-based pasture (SFWu/s), then three years of grazed pasture, (3) Reduced tillage including livestock system - wheat crops grown on long fallow. The rotation is long fallow wheat (LFW), skip a year (stubble is maintained, weeds controlled by grazing and spray-fallowed in August), long fallow wheat undersown with a lucerne-based pasture (LFWu/s), then two years grazed pasture and (4) No tillage, no livestock system - continuous cropping system. The five-year rotation is canola, wheat (SFWaC), pulse, wheat (SFWaP) and a green manure crop. Each plot, in the three cropping systems is about 2 ha in size.

To maintain consistency throughout the trial, an early and a late variety wheat are sown in each cropping system. Crops are sown at optimum times, weather permitting, using the district average seed and fertiliser rates. Weed control and herbicide applications are directed by each system and no limits are placed on these. Crop and soil moisture data is collected throughout the season.

## Results

The average wheat yield (Table 1) over the four years from the Traditional system is 2.26 t/ha, Reduced tillage including livestock system 2.41 t/ha. From the No tillage, no livestock system wheat yield is 2.28 t/ha, canola 1.33 t/ha and peas 0.8 t/ha. District average yield for wheat is 2 t/ha, for canola 1 t/ha and for peas 1.4 t/ha. In 2000 peas were windrowed but heavy rains flattened the windrows making harvest impossible.

**Table 1: Grain yield (t/ha) and protein (%) of the Systems Comparison Trial from 1998 to 2001.**

	1998	1998	1999	1999	2000	2000	2001	2001
	Yield	Protein	Yield	Protein	Yield	Protein	Yield	Protein
<b>Traditional</b>								
LFW	3.37	11.7	2.3	13.8	2.4	10.9	2.06	16.2
SFWu/s	2.67	11.8	1.12	15.2	2.5	10.6	1.67	13.7
<b>Reduced Till</b>								
LFW	3.35	11.8	1.98	14.6	2.2	10.6	1.69	14.8
LFWu/s	2.71	11.8	1.9	15.2	2.4	10.6	3.03	14.3
<b>No Till</b>								
SFWaC	3.17*	11.8*	1.18	15.1	2.9	10.5	1.89	13.8
SFWaP	3.17*	11.8*	1.38	14.2	2.6	11.2	1.92	12.4
Canola	1.04		0.36		1.5		1.21	
Peas	1.71		0.77		0		0.71	

\* The wheat in 1998 was not separated between the two plots in the no tillage, no livestock system.

Annual rainfall (Table 2) is a major influence on grain yield and protein. Long fallows are widely adopted by farmers in the area however summer rainfall is highly variable (eg. 2000 and 2001 cropping seasons). In 2000 little difference between yields of long- and short-fallow wheat were detected as a result of a particularly wet summer whereas yields in 2001 were between 20% and 80% higher under long-fallow crops compared with short-fallow crops for the traditional and reduced tillage systems respectively.

**Table 2: Monthly rainfall at Condobolin ARAS (1997 - 2001) - average annual rainfall = 442 mm**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AAR
1997	21.6	6.0	4.1	0.9	44.6	16.3	15.7	27.4	122	24.0	27.8	6.6	317
1998	35.8	4.5	4.4	53.7	56.3	48.0	75.3	82.0	79.0	47.9	50.9	14.2	552
1999	37.2	16.3	73.3	34.5	7.0	26.9	53.2	41.9	16.8	122	16.9	128	574
2000	8.8	30.6	76.1	45.0	95.0	17.8	14.9	58.7	12.5	64.0	63.2	16.7	503
2001	2.2	39.9	38.2	16.3	27.4	51.0	28.6	19.6	42.0	25.4	46.6	2.8	340

The gross margins (Table 3) for each system have been calculated using only the cropping income and variable costs. However this penalised the Traditional and Reduced tillage systems which have a significant livestock component. Patton and Mullen (1) demonstrated that in a mixed farming and livestock system in central-western NSW, approximately 30% of the total gross margin was contributed by the livestock component. Regardless, there are still some interesting results. The No tillage, no livestock system shows greater variability in the annual gross margins than either of the other systems. The Traditional system generates the least variable income.

**Table 3: Average and Cumulative Gross Margins (\$/ha) for each cropping system 1998-2001**

SYSTEM	average annual gross margin				4-year	cumulative
	1998	1999	2000	2001	average	98-01
Traditional	+104.52	+ 51.85	+ 64.26	+ 78.63	+ 74.82	+299.25
Reduced tillage	+113.13	+ 31.67	+ 36.75	+107.81	+ 72.34	+289.35
No tillage	+247.53	- 40.35	+108.92	+ 57.99	+ 93.52	+374.08

### Conclusions

Average wheat and canola yields from the systems comparison trial are slightly above district levels but pea yields are lower. Peas have been replaced with lupins in 2002. Long fallows benefited wheat yields only in dry years. Gross margin analysis on the cropping portion has shown only a slight difference between the 3 cropping systems. The no tillage, no livestock system has the greatest variability of annual gross margin. The next five-year rotational cycle should see a true comparison between the four systems and sustainability indices will be further monitored.

### References

(1) Patton, D. and Mullen, C. (2001) Farm Budget Handbook 2001. NSW Agriculture.