Farm Management 500 and Sustainable Technology (FAST) Project
Saving the best 'till last

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The season 1995

The 1995 cropping season was the final season that will be monitored by the FAST Project, and ironically it was also the best. 1995 provided a combination of good yields and prices, returning good gross margins to farmers, as well as adding another full year of excellent data to the large database that has been collected over the last four cropping seasons. The season was a mild one, with better than average growing season rainfall (GSR), although it did tend to fall in heavy patches. This caused some emergence problems in low lying areas due to waterlogging and some anxiety during spring when it looked as though the season would finish early and yields would only be average. Heavy rain on the 22nd of October came a bit late for the early sown barley crops in the southern Mallee but proved to be very beneficial to the wheat crops, effectively providing enough moisture to take them to maturity.

FAST paddock performance

There are five paddocks monitored by the FAST Project in the southern Mallee. Peter and Bronwyn Martin at Brim and the Smith family at Birchip both have two FAST paddocks and John and Judy Jones at Birchip have one FAST paddock. Table 1 shows the performance summary of these paddocks for 1995.

The most outstanding crop was the Cocamba wheat crop in Martin Flat which was high yielding, had good protein content, good water use efficiency (WUE) and was sown into the stubble of a Cocamba crop which yielded 0.8 t/ha in 1994. There didn't appear to be any problem with Cereal Cyst Nematode (CCN) in this paddock but the adjacent paddock of Ouyen (Martin Woolshed) did have some patches of nematode damage and was sown at a low rate, which may account for its relatively lower yield and WUE.

The Barunga crop in Jones Demo was sown into the stubble of a field pea crop that yielded 0.2 t/ha in 1994. The Barunga achieved a good yield but could have done better if the nitrogen uptake efficiency had been better than 35% (see Table 2), which in turn would show a better WUE. The canola crop in Smith Dam yielded well and had a reasonable WUE, but even though there wasn't a shortage of available N (100 kg/ha of urea was topdressed in August), the uptake efficiency at flowering was only 36% (see Table 2), indicating some other factor was limiting yield. The Desavic chick peas in Smith House didn't yield well considering the GSR and being sown into a failed chick pea crop, but waterlogging in June prevented good emergence and hence the crop was always fairly light.

Table 1. Performance summary for the FAST paddocks in the southern Mallee in 1995.

Paddock	Crop 1994	Crop 1995	'95 GSR (mm)	'95 Yield (t/ha)	'95 Protein %	'95 WUE (kg/mm/ha)
Martin Flat	Cocamba wheat	Cocamba wheat	418	4.0	12.68	11.11
Martin Woolshed	Tyson chick peas	Ouyen wheat	418	2.9	11.20	9.39
Jones Demo	Dundale field peas	Barunga wheat	389	2.8	9.97	8.94
Smith House	Tyson chick peas	Desavic chick peas	361	1.3	19.37	5.76
Smith Dam	Paraggio medic pasture	Oscar canola	361	1.9	41.4*	6.51

* % oil content

Nitrogen balance

Part of the analysis procedure of the FAST data involves trying to 'balance' the nitrogen in each paddock. This means that the amount of nitrogen in the soil is measured at sowing and harvest, the amount of nitrogenous fertiliser applied to the paddock is measured and the amount of N that is exported from the paddock in grain and straw is also measured. Ideally all these measurements would balance, but in reality it very rarely happens. This is mainly due to the unknown quantities of N that are volatilised (lost to the atmosphere as ammonia) or leached through the soil profile out of reach of the plant roots and below the depth of the soil sample. These amounts can be estimated but the results are dependent on the clay content, organic matter and moisture of the soils. The N balance has been done for the FAST wheat and canola crops for the past three seasons.

Table 2 shows the figures for the wheat and canola crops monitored in the southern Mallee. All the values are measured except the mineralised N which is calculated from GSR and organic carbon. These results show that the Barunga crop in Jones Demo had taken up 35% of the available N at flowering and the Ouyen crop in Martin Woolshed had taken up 53%. They both had similar final yields though the Ouyen had about 1.2% more protein. Because the total amount of N supplied was similar for the two paddocks, there is a positive correlation between N uptake at flowering and final grain protein.

Table 2. Nitrogen budget for the FAST wheat and canola crops.

Paddock	Sowing NO3 (kg/ha)	N mineralised under crop (kg/ha)	Available fertiliser N (kg/ha)	Total avail. N supply (kg/ha)	N uptake at flowering (kg/ha)	N harvested (kg/ha)	Uptake efficiency (N uptake/ N supply)
Jones Demo	50.70	48.63	22.16	121.49	42.03	48.65	0.346
Martin Flat	151.00	44.31	26.72	222.03	99.79	88.80	0.449
Martin Woolshed	50.10	46.40	30.40	126.90	66.85	57.92	0.527
Smith Dam	67.65	63.02	65.28	195.95	71.24	78.91	0.364

Nitrogen mineralisation

Soil microbes help to break down organic N (unavailable to plants) to mineral N (available to plants) in the presence of moisture, heat and soil organic matter, in a process called mineralisation. Nitrogen mineralisation occurs in summer and autumn and it can be surprising how much N can become available during the drier months of the year. All the paddocks in Table 3 contained a legume in 1994, except Martin Flat. They all received at least 86 mm of rain during the summer/autumn period and mineralised about 40 kg/ha of N. This equates to the amount of N needed to grow about 1 t/ha of wheat. The Smith House paddock had relatively low organic matter and this would probably have reduced the rate of mineralisation.

Table 3. Nitrogen mineralised due to summer/autumn rainfall 1994/95.

Paddock	Rainfall from Dec 20 1994 to Apr 30 1995 (mm)	Available Nitrogen at harvest 1994 (0 - 60 cm, kg/ha)	Available Nitrogen at sowing 1995 (0 - 60 cm, kg/ha)	Nitrogen mineralised (kg/ha)
Martin Flat	88	40	197*	157
Martin Woolshed	88	20	57	37
Jones Demo	122	26	61	35
Smith House	86	20	33	13
Smith Dam	86	37	77	40

* soil sample was taken only days after urea application of 70 kg/ha

FAST - the future

The next three months for the FAST Project will be very exciting because now that all the data has been collected the job of analysing it becomes the priority. In addition to the N balance work that has been discussed, the water balance will also be calculated for all the paddocks. This work will prepare regional specific guidelines on water use and nitrogen management to help make the job of planning and preparing paddocks a simpler one. The collected data will also be used to prepare production guidelines such as optimum sowing date, desired shoot density, growth stage development and crop N status (using sap nitrate and NIR). The final stage of the FAST Project is the linking of the farm management strategies with their profitability (from the FAST Systems Economic Analysis). This analysis will show which strategies are the most profitable in each region for the four year period and hopefully help farmers plan their future rotations, type of crops and methods of production that they feel are the most sustainable.

For a project like FAST to succeed there has to be a lot of input from the farmers and I'd like to thank all the FAST farmers for their co-operation over the years. Hopefully the next few months will enable us to produce some guidelines to simplify the decision making process for their 1996 cropping season.