

Legumes boost cotton profits

A nine year research program at the Australian Cotton Research Institute has shown that the inclusion of legume rotation crops in cotton production systems provides not only substantial nutritional benefits to cotton and improved soil structure, but also a greater economic return.

The final segment of this cropping systems research, an economic analysis, was conducted by student Emma Williams from the University of Queensland Gatton Campus, guided by Dr Ian Rochester and Dr Greg Constable from CSIRO Plant Industry and the new Cotton Catchment Communities Co-operative Research Centre.

Emma is the first student to take the opportunity of a short internship to work with a research team as part of the new CRC's education program.

The research, funded by the Cotton Catchment Communities CRC and the CRDC showed:

- Cotton yields were higher in legume-based systems;
- Continuous cotton produced lower yields than rotation systems;
- Legume systems required zero to little N fertiliser to produce optimum economic yields, whereas non-legume systems required more N fertiliser;
- Gross margins were higher for legume-based systems for both \$ per hectare and \$ per ML; and,
- All costs associated with growing and incorporating legume crops (\$76 per hectare) were offset by the N fixed by the legume crops (valued at \$130 per hectare).

Gross margins for the five systems were evaluated at the end of each two-year



Ian Rochester and Emma Williams.

cycle for the whole of the experiment. Rotation crops were not fertilised or irrigated. The systems were:

- Continuous cotton;
- Continuous cotton-vetch;
- Cotton-wheat;
- Cotton-wheat-vetch; and,
- Cotton-faba bean.

Gross margins were assessed using the following prices: cotton lint at \$500 per bale, fuzzy cottonseed at \$176 per tonne, wheat grain at \$150 per tonne, faba bean grain at \$220 per tonne and input of N from the legumes was valued at the price of N fertiliser — \$0.89 per kg.

Comparison of the five cropping systems indicated that legume based systems produced higher gross margins than non-legume (fallow) systems (Table 1).

Gross margins \$ per hectare

In the continuous cotton system, the

gross margins per hectare increased 23 per cent with the addition of vetch into the cropping system. In the cotton-wheat system, the addition of vetch increased the gross margin per hectare by 12 per cent.

Profits were increased through higher yields, and lower variable costs associated with not having to purchase or apply N as it was added by the vetch. So for growers with limited land, the best option to maximise economic profit would be the continuous cotton-vetch system as it has the highest gross margin per hectare of all the systems compared.

Gross margins \$ per megalitre (ML)

All rotation crops were rain-grown. In dry winters such as 2002, rotation crops were established but were not very productive.

In the continuous cotton system, the gross margins per ML of irrigation applied increased by 23 per cent with the addition of vetch into the cropping system. In the cotton-wheat system, the addition of vetch increased the gross margin per ML by 13 per cent.

The cotton-faba bean system was slightly better than the cotton-wheat-vetch system. This is because the faba bean produced slightly higher grain yields than wheat crops, fixed N (reducing fertiliser costs for the following cotton crop), and had lower planting and cultivation costs. Cotton farmers with limited water could increase profits by adopting either the cotton-faba bean system or the cotton-wheat-vetch system.

Best options

The research concluded that the best option for growers to achieve a high return with minimal land is to grow continuous cotton, with a vetch green manure crop each winter, which will increase yield, require less nitrogen, and increase gross margin by about 23 per cent. This system has the highest gross margin per hectare.

For growers who have limited water, the best option is to use a cotton-wheat-vetch or cotton-faba bean system as these systems have the best gross margin per ML.

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TABLE 1: Lint yields, N fertiliser requirements and gross margins averaged over four rotation cycles (eight years, two year cycles) in a legume cropping systems experiment at Narrabri

System	Average yield bales/ha	Optimum N fertiliser needed kg/ha	Gross margin \$/ha	Gross margin \$/ML
Continuous cotton	6.52	104	\$3,356	2
Continuous cotton-vetch	7.13	41	\$4,131	1
Cotton-wheat	7.60	93	\$2,315	5
Cotton-wheat-vetch	7.82	0	\$2,615	4
Cotton-faba bean	7.83	0	\$2,627	3