

Do organic amendments improve soil quality?

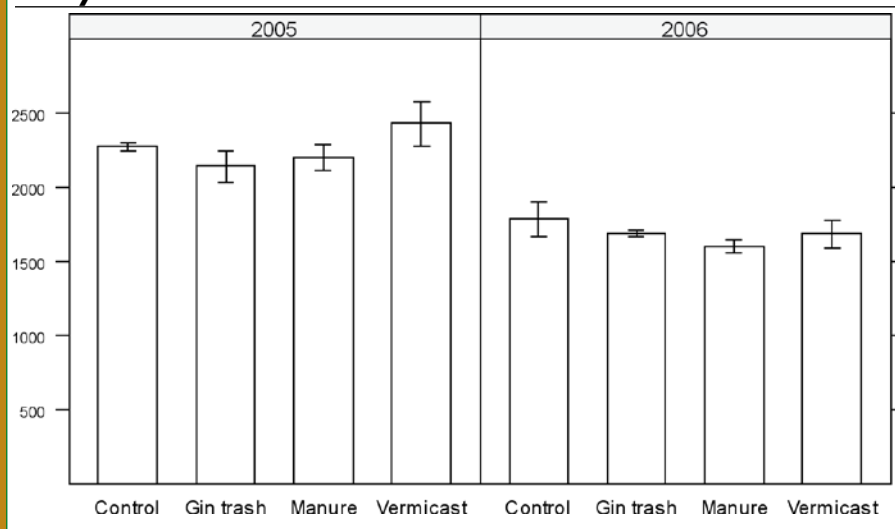
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The production efficiency of the Australian cotton industry has increased significantly over the past two decades and this increase can be attributed to genetic crop improvement and advances in production techniques, such as irrigation, agronomy, integrated pest management and the nutritional management of the crop.

Soil organic matter plays an important role in influencing soil's different physical, chemical and biological properties. There is currently a lack of information for cotton growers regarding the benefits of using different organic amendments on heavy clay soils, such as the cracking clays used for irrigated cotton production systems in Australia.

So quantitative information on the effects of organic amendments on soil physical and chemical fertility is urgently required to enable cotton growers to make informed decisions on soil management

FIGURE 1: Effect of organic amendments on cotton lint yield in two years



when considering application of organic input materials.

EXPERIMENTAL DETAILS

A two year field experiment was conducted at the Australian Cotton Research Institute at Narrabri over the 2004–05 and 2005–06 growing seasons. The organic amendments used were cattle manure, cotton gin trash and a commercial liquefied vermicompost (or vermicast).

This study used similar rates of amendments to those in current use by cotton farmers. We applied 10 tonnes per hectare

...48 ▷

TABLE 1: Effect of organic amendments on nutrient availability

Treatment	Phosphate-P ($\mu\text{g/g}$)			Exchangeable-K ($\text{cmole(p+)}/\text{kg}$)		
	Baseline	AG-05	AG-06	Baseline	AG-05	AG-06
Control	42.5	36.5	30.2	1.50	1.50	1.38
Gin trash	42.5	52.4	39.0	1.52	1.68	1.33
Manure	41.8	94.2	40.3	1.45	1.74	1.41
Vermicast	44.5	48.4	34.1	1.67	1.56	1.39

**Baseline = before application of the amendments; AG-05 = active growth stage of cotton, 20004–05; AG-06 = active growth stage of cotton, 2005–06



Trial plots at the ACRI field at harvest.



Strong cotton plant vigor during the 2004–05 season.

ture of cattle manure, 7.5 tonnes per hectare of cotton gin trash and 50 litres per hectare of liquefied vermicast. Cattle manure and gin trash were applied once in two years, whereas vermicast was applied in both years.

The organic amendments did not have any significant effect on the short-term microbiological properties measured by microbial biomass and respiration. Soil nitrate-N content was not affected by the addition of organic materials, but addition of cattle manure produced higher exchangeable potassium and phosphorus concentration over two years (Table 1). Higher nutrient uptake was observed by mature cotton, leaving the soil depleted of these nutrients during that period.

Cotton physiological characteristics (such as plant height, number of plants, number of bolls, flowers, squares per plant and dry matter) and lint yield were not affected by the addition of organic amendments in two years of study, although strong plant vigor was visible in the field in the 2004–05 season compared to adjacent trial sites. There was a significant reduction in the yield in the 2005–06 growing season which was likely due to cotton boll worm attack and weather hazards during the later growth stage.

CONCLUSIONS AND ONGOING RESEARCH

- Short-term application of cotton gin trash (at 7.5 t/ha) and liquefied vermicast (at 50 L/ha) did not have any immediate effect on selected soil properties.
- Seasonal parameters had a strong impact.
- Good agronomy involves understanding soil nutrient status, so an appropriate rate of amendments can be designed for cracking clay soils. Higher rates might help in releasing more nutrients to the soil.
- Additionally, we conducted another field trial at Goondiwindi (farmer's field), and different pot experiments using 12 different organic amendments available locally. Some potential amendments were screened out and another rate trial was conducted to evaluate the best possible rate for the amendments for cotton production. Results will be reported in forthcoming issues.

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Innovative cotton in Northern Australia

An innovative and successful approach to growing cotton in Northern Australia has been developed.

The Cotton Catchment Communities CRC partners have been undertaking research at Kununurra in the Ord River irrigation area of Western Australia for the past 10 years and the results are captured in a new publication NORpak.

The publication was launched by the Western Australian Chief Scientist Professor Lyn Beazley at the Cooperative Research Association Conference in Perth.

Cotton CRC Chief Executive Officer Guy Roth said: "A novel production system is proposed based on transgenic varieties to control caterpillar pests, and switching from a summer wet season crop to a winter dry season system which relies on integrated pest management, rather than the use of insecticides.

"Over \$10 million has been invested in this research, exploring many facets of cotton production including crop husbandry, pest management and environmental issues.

"This has been an intensive on-ground research program rather than a desktop model, and was led by Geoff Strickland, Department of Agriculture and Food in Western Australia and Stephen Yeates at CSIRO.

"The result is that the world's best cotton yields can be grown with yields from 9.5 to 10.5 bales per hectare. This compares favourably with the world average of five bales per hectare and with Australian yields elsewhere that are the highest in the world.

"NORpak captures results from commercial scale research, conducted over the past decade, investigating dry season cotton production in the Ord River Irrigation Area. It will be an invaluable resource for everyone discussing irrigated agriculture in northern Australia.

"Cotton is a feasible and sustainable crop for farmers to grow, and would provide significant employment and infra-

structure investment opportunities in the Kimberley region of Western Australia and the Northern Territory.

"It is proposed that cotton could be grown in rotation with other crops such as sugar, horticulture and grains, as all are vital to the economic progress of the Ord. Farmers will need crop choices and systems to help them compete in the world market and local farmers should decide which crops to grow.

"This report is timely as the Federal Government's Task Force on Agriculture in Northern Australia considers its options, and the Western Australian Government's review on transgenic crops needs robust information for public debate and policy formation.

"This 10-year research program is a great example of how Cooperative Research Centres bring together expertise of Government and commercial partners.

"Key amongst these are the Department of Agriculture & Food, CSIRO, the Australian Cotton CRC, Cotton Research & Development Corporation, Colly Cotton, Ord River District Cooperative, Cotton Seed Distributors and Monsanto Australia" Guy Roth concluded.

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Ten years of research have been invested in NORpak.