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Cotton rising from the ashes

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Two hundred thousand dollars worth of top quality cotton was deliberately destroyed by burning in the Kimberley last December. The same thing will probably happen again this year, but there will be no cries of arson and police will not be seeking the perpetrators. Georgina Wilson reports on the emerging cotton industry on the Ord.

The cotton has grown on trial plots at the Frank Wise Institute at Kununurra but could not be sold for the lack of a cotton gin, although sale proceeds would go far to finance the research program that began in 1994.

Those with long memories cannot forget the failure of the Ord's first cotton crops in the 1960s and early 1970s. Despite excellent trial results commercial farming was beaten by insects, mainly the heliothis moths which appeared in the millions, rapidly developing resistance to whatever chemicals were thrown against them in the shortest generation intervals known anywhere. And when spraying against such pests had reached about 40 applications a season, even the most tenacious growers accepted it was a battle they could not win.

Cotton Project Manager Geoff Stickland says prospects for the new industry are looking exceptionally good, and it will be radically changed from that which failed more than 20 years ago. Major differences will be fourfold:

- cotton will be a dry season rather than wet season crop;
- it will be integrated into rotations with chickpeas, maize, melons, sugar cane and other crops;
- most plantings will be new transgenic varieties with resistance to heliothis;
- spraying will be minimal.

By the new millennium, the net result of these changes should be a viable cotton industry of about 10,000 hectares with a local cotton gin to separate the lint from the seed.

Revival of interest in cotton began late in 1993 after a joint feasibility study with CSIRO to investigate the possibilities for new transgenic varieties developed overseas by Monsanto. This study was followed by cultivation of 12 hectares on the Frank Wise Institute in winter 1994. Three different management systems were compared: completely unsprayed, state of the art spraying programs from the Eastern States, and low spraying where pest numbers had to be maintained for three or four days at threshold levels before action was taken.

Yields and quality were very encouraging. Even more encouraging was the discovery that while 13 separate sprays were required under the conventional management (vastly better than that which drove the industry to the wall in the 1970s) only five were used for the low chemical system, where yields were almost as high.

In 1995 and 1996 plantings expanded to 50 hectares and results have continued to impress while attracting national interest.

Compared with Eastern States crops, yields are high, uniformity of fibre is outstanding, strength is good to average and micronaire (a special measure of fineness and maturity) is excellent.

Fibre length was the one factor that was down – probably due to the relatively cool growing conditions compared with traditional industries. But with modern rotor spinning technology this is becoming less important and small discounts by buyers for length should be more than overcome by the higher yields, if they are not overcome by agronomists.
Fields of cotton on the Frank Wise Institute.

In the past two years some cotton seed has been grown commercially on the Ord as a source of transgenic cotton seed for the Eastern States industry. This has provided some growers with useful experience, and profits and helped win the cynics over to the idea that a cotton industry can be a winner for everyone.

The next stage will include on-farm trials and researchers are hoping that three farmers prepared to grow about 40 hectares each will become involved next year. While they will have to bear some of the costs, it will give them an opportunity to get in on the ground floor of the new industry and adjust to new systems of pest management.

"You can’t develop integrated pest management on 10-metre plots,” Geoff Strickland commented. “But 40 hectare areas will get closer to a commercial situation and we can then evaluate pest management strategies. It will be one-on-one work with the farmers, who’ll need to monitor insect numbers closely, learn about the thresholds for spraying, provide refuges to encourage beneficial insects and use new techniques."

Test crops on farms will also give a more reliable estimate of yields, although Geoff Strickland is confident that commercial yields should, at worst, be only 20 per cent lower than research trials — not the much lower results that usually occur with wheatbelt cereals.

“Here under flood irrigation farmers have very precise crop management. Winter cropping provides uniform growing conditions which enable accurate management unlike a wheat crop where farm soil and other factors may vary considerably from the typical research plot.”

This next phase will also allow time to screen for varieties with better length and other agronomic research in collaboration with CSIRO. Stephen Yeates, a CSIRO agronomist, is based at the Frank Wise Institute and works closely with Stewart Addison of Agriculture Western Australia in the joint research effort. A substantial financial contribution is made to the project by CSIRO and it is linked to their cotton program underway in Narrabri, New South Wales.

Long-term strategies against heliothis will probably harness its presence all over the Kimberley horticultural areas where it attacks almost every crop except sugar cane. Maize, chickpeas, sorghum, millet and melons are all good sources of heliothis, which could be an asset in resistance management. Maize for example is never sprayed for heliothis but frequently hosts about one caterpillar per plant. This provides about 50,000 heliothis from each hectare and a huge susceptible population of moths to overwhelm any individuals which develop resistance to transgenic varieties.
High hopes for transgenic cottons

Breeding of cotton with resistance to its major predator, the heliothis moth, has been achieved by the Monsanto Corporation in America in the last few years. Through the addition of a gene from a bacteria, *Bacillus thuringiensis* (Bt) the cotton plant produces a crystal protein, fatal to the emerging grubs of the moth which feed on the plant. It binds with the gut wall of the insect preventing absorption of food and causing starvation.

The first commercial crops will be grown in the United States this year and New South Wales and southern Queensland cotton growers hope to plant 30,000 hectares in October as well — if official approvals are granted in time.

Standing between commercial growers and any new genetically engineered plant is the Genetic Manipulation Advisory Committee (GMAC) and the National Registration Authority. Although both CSIRO and Deltapine, a U.S.-based company, have purchased the rights to the Ingard® gene and Bt cotton, GMAC is very cautious about granting approval for commercial plantings.

The National Registration Authority regards the extra gene as similar to a new insecticide and requires a resistance management strategy to be in place to prevent or at least slow the development of possible resistant individual heliothis. One likely condition is that for every hectare of transgenic cotton grown there should be a similar area of normal susceptible cotton, or 5 per cent of completely unsprayed cotton to provide a pool of susceptible moths with whom any resistant survivors would be likely to breed thus delaying the development of resistant populations.

Another GMAC concern in northern Australia, which includes the Kimberley and north Queensland, is possible outcrossing of the new genetically engineered cotton with wild cotton plants. Chances of this happening are remote when native cottons have half the number of chromosomes (haploid) compared with the commercial cotton (diploid) but CSIRO scientists are now involved in laboratory tests to eliminate any doubts.

CSIRO currently supplies about 90 per cent of fresh seed to the Australian cotton industry and has already incorporated the Ingard® gene into at least five varieties. Deltapine also has several varieties awaiting the green light.

Scientists are also working on other gene constricts including one involving the heliothis stunt virus.

When approvals are granted, sowing Bt cotton will not be cheap. Monsanto has invested heavily in the new technology and isn’t into giving it away. It’s expected that seed of the new transgenic varieties will cost at least 20 times that of normal varieties. Added to this will be the extra costs of growing susceptible varieties to maintain the population of the susceptible moths.

But with savings from greatly reduced spraying and environmental benefits, the industry everywhere is keen to give it a try.
Mixed cropping in the Ord River valley.

The worst prospect for pest control of cotton, according to Geoff Strickland, would be two parallel monocultures, sugar cane and cotton, which do not share the same pests. But the marketplace may be the ultimate decision maker over how much of each is grown.

Gazing into his crystal ball, Geoff Strickland sees Kimberley cotton as quite different from the established industry in inland New South Wales and Queensland, which has been troubled lately by droughts.

Kimberley experimental yields at 9 to 11 bales per hectare should translate to slightly higher commercial yields than the Eastern States where the average commercial yield is 8 bales per hectare, the highest in the world. (A bale is 227 kg or 500 lb in the United States.)

Good varieties in the east have also proved to be good varieties in the west, and while at first short season varieties were expected to suit the cooler growing conditions, these types have proved disappointing while traditional full season varieties have thrived.
Plantings of 10,000 hectares would be large enough to support a local cotton gin before the lint is exported to countries such as Indonesia, Korea and Japan. (At present Australia exports 90 per cent of its raw cotton and there’s little hope that this will change whatever happens on the Ord.)

Some cotton could be grown under flood irrigation on existing farms of Stage 1 of the Ord River Irrigation Area (ORIA), he suggests, but other pockets could be on currently undeveloped black cracking clays of the Stage 2 areas or the Fitzroy basin.

It’s even possible that cotton could be grown near Broome on the red pindan sands. A private developer is already trying small areas here using ‘T-tape’ technology which supplies water, fertiliser and other necessities for plant growth through drip irrigation.

Cotton planting will be in April, allowing crop growth over the cooler winter months and harvest in October, using the large modern machines and some of the casual labour available from harvesting melons and mangoes. Contractors could be attracted to truck harvesting equipment to the Kimberley because of its opposite season to the Eastern States.

Again, this would be in stark contrast to the earlier industry where the harvest extended for up to six months. Using the large modern machines the harvest could be completed in only three weeks enabling the crop to be stored safely before the wet season.

Crop rotations are still to be determined, but it seems likely that cotton will be integrated with the chickpeas, maize, melons and other crops, unlike in the Eastern States where it is grown largely as a monoculture.

Precise shape of the industry will probably depend on policy decisions on how the Stage 2 irrigation areas are to be developed, a very expensive business even though soils are suitable and there is ample water. In the 1960s 500-acre farms were developed and sold by the Government, but in the late 1990s large private corporations rather than individuals may control the next land releases.

In August 1995 the Minster for Primary Industry and Fisheries, Monty House, announced the formation of a Cotton Strategy Group “to responsibly progress the establishment of a cotton industry”. Its members are: David Farley from Colli Farms in NSW; Brian Hearn a retired CSIRO researcher; George Gardiner, a Kununurra consultant; and Alan Castlemann from Western Metals.

Within Agriculture Western Australia the cotton project involves two entomologists and three technical officers under the New Industries Program.

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