MACQUARIE AND NAMOI VALLEY COTTON FARM MANAGEMENT AUDITS.

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INTRODUCTION

The DLWC (Department of Land and Water Conservation) has operated the Central and North West Regions Water Quality Program for the past 5 seasons in the Namoi, Gwydir, Macquarie and Border Rivers catchments. The program has covered 4 main areas of study: pesticides, nutrients, biological monitoring and trace metals and their relationship to the growing of irrigated cotton (Cooper, 1995).

The cotton industry is highly reliant on the use of chemicals, particularly insecticides used for control of the *Heliothis* sp. With some farmers spraying crops as often as 10-12 times per season for pest control and a large percentage of growers farming within 300 metres of riverine systems, it is inevitable that pesticides will be traced in waterways. There are a number of transport routes operating to move pesticides off-target and into the neighbouring environment. The most common pathways include storm runoff and tailwater discharges into river systems, and aerial transport including spray drift, volatilisation and wind blown dust (Cooper, 1994). Endosulfan, the most common insecticide detected in the central and north western rivers of New South Wales, is often found in irrigation tailwater and storm runoff as it is tightly bound to the sediment fraction of top soil (Hugo, *et al.*, 1996). Endosulfan occurrence in the river systems studied is highly seasonal, matching that of the cotton spraying season. Endosulfan is regularly used for the control of the *Heliothis* sp. during the early stages of the cotton growing season.

The DLWC, as the state manager of land and water resources, undertook to review and audit irrigated cotton farm management in the valleys studied in an attempt to identify and promote accepted best management practices aimed at reducing environmental contamination by pesticides. These audits were seen by the cotton industry as an impartial assessment of where the industry was currently in terms of environmental management. This paper presents findings from the two valleys involved to date, the Macquarie and Namoi.

THE MACQUARIE VALLEY

The Macquarie River has been shown to exhibit lower levels of endosulfan residues during the peak spray season compared to the more northern valleys studied in the program. In response to this finding, the Department of Land and Water Conservation carried out an audit of the cotton industry within the Macquarie Valley during the 1994/95 growing season to identify current farm management practices and their role in reducing river endosulfan levels. All riparian cotton farmers (farming within 5 kilometres of the Macquarie River and Bulgeraga Creek) between Narromine and Oxley were interviewed concerning their farm management practices, with special emphasis placed on pesticide spraying techniques and tailwater management. All aerial operators in the valley were also interviewed concerning their application practices, with emphasis on the spraying of pesticides near waterways.

Results from the survey found that some progressive farmers were undertaking management practices that would be considered eco-friendly and were uncommon as recently as three years ago. Examples include the spraying of softer option chemicals or EC formulations near waterways, the use of helicopters for precision target spraying close to rivers and the physical relocation of fields away from the river and creek systems. The farm management practices used in the Macquarie are currently considered a benchmark for the industry until such time as data is collected to compare the more

northern valleys practices with that of the Macquarie. This presumption is based on the lower endosulfan levels in the Macquarie River. However there are other considerations that must not be ignored as they play an important role in determining the quality of water. Most important is the flow of water in the Macquarie River. The Macquarie River has for the past 4 seasons had a constant flow of water that rarely fell below 400 megalitres per day at Warren Weir. There is an obvious dilution factor available with large flows. In contrast, the more northern valleys have had lower flow regimes for much of the time as a result of continuing drought conditions.

THE NAMOI VALLEY

A study of the Namoi Valley was carried out for the 1995/96 season of production. Thirty lower Namoi farmers, 35 upper Namoi farmers, 20 dryland farmers and 13 "other" farmers (farmers that use pesticides as part of their pest management but not for cotton production) were interviewed with regard to the same issues as researched in the Macquarie. Aerial operators servicing targeted farmers in the valley were also interviewed.

The lower Namoi is the longer established section of the valley and is consequently more developed. Irrigation development in the upper Namoi has increased considerably over the past few years as has the area planted to dryland cotton. The industry is still an unknown for a large number of new farmers, with many of them visualising cotton to be another 'opportunistic' rotation crop. As cotton production only makes up a small percentage of the entire farms income in these cases, some smaller farmers see little reason to understand the science and the management of the cotton crop and therefore cannot economically justify the instalment of expensive tailwater re-circulation systems. Also, the farming of dryland crops in areas that are susceptible to flooding is extending to the planting of crops that will bring in higher returns, and are more pesticide dependent (i.e. cotton). Periodic floods wash through fields - lifting and depositing top soil (and therefore leading to pesticide movement off-farm).

RESULTS

All cotton farmers interviewed were aware of the potentially adverse impacts on the environment that many of the available chemicals can cause. Eighty five percent (11) of non-cotton farmers were also aware. Awareness of the environmental dangers linked to using endosulfan was not as wide spread, with the lower Namoi exhibiting 97% awareness, the upper Namoi 100%, Namoi dryland farms 90%, Macquarie Valley 95.5%, and 69% of Namoi non-cotton farmers. Some farmers have changed their management practices as a result of this awareness; 50% changing in the lower Namoi, 63% in the upper, 55% for dryland farmers, and 73% in the Macquarie Valley. Changes include an increase in groundrigging, an increase in the use of EC formulations, having higher thresholds on crops and establishing more stringent stormwater management. The location of cotton fields in relation to waterways is presented in Table 1.

Table 1: Proximity of cotton fields to waterways of those growers interviewed.

Distance	Lower Namoi n=30	Upper Namoi n=35	Dryland n=20	Macquarie Valley n=44	Other Farms n=13
0-50 metres	10%	14%	15%	27%	46%
51-100 metres	13%	17%	5%	11.5%	15%
101-300 metres	13%	17%	10%	11.5%	8%
301-500 metres	13%	6%	10%	7%	-
501 metres - 1 kilometre	19%	17%	15%	4.5%	8
1-3 kilometres	22%	26%	45%	16%	23%
3-5 kilometres	10%	3%	-	22.5%	-

One farmer from each cotton irrigation group was not aware that irrigation licences were issued from the DLWC on the condition that tailwater did not return to the river. Two of

the 7 non-cotton irrigators (29%) did not know. All dryland cotton farms interviewed did not have a tailwater system in place.

The ability of farmers to contain storm runoff after an irrigation is indicated in Table 2.

Table 2: Percentage of farmers unable to contain stormwater on-farm after 1 inch, 2 inches and 5 inches of rainfall following an irrigation.

Amount of rainfall	Lower Namoi	Upper Namoi	Dryland	Macquarie Valley	Other Farms (Irrigation only)
1 inch	3.3%	31%	n/a (100%)	6%	100%
2 inches	30%	61%	n/a (100%)	21.5%	100%
5 inches	77%	94%	n/a (100%)	78.5%	100%

Current farmer awareness on buffer zones and their attitudes towards the establishment of these zones on farm is presented in Table 3.

Table 3: Buffer zone attitude and awareness

	Lower Namoi	Upper Namoi	Dryland	Macquarie	Other
Consider establishing buffer zones on farm	67%	83%	75%	68%	38%
Aware that certain species of tree that are more/most effective at catching spray drift and wind blown dust	43%	31%	45%	50%	38%

Table 4 presents an approximate percentage of the ratio of aerial spraying to groundrigging of insecticides on those farms interviewed.

Table 4: Comparison of the use of aerial spraying as a percentage of the total spray management between the different valleys (insecticide's only).

	Lower Namoi	Upper Namoi	Dryland	Macquarie Valley	Other
0-49%	-	-	35%	16%	-
50-59%	10%	11.5%	15%	-	-
60-69%	27%	17%	10%	-	-
70-79%	20%	17%	5%	23%	-
80-89%	23%	31.5%	20%	27%	-
90-99%	13%	14%	5%	32%	-
100%	7%	9%	10%	2%	100%

Note: The 1995/96 growing season was unusually wet at the beginning which restricted many groundrigs from being used in the early stages.

Forty three precent of Macquarie Valley farmers check for *Heliothis* sp. pupation's over the winter season. There were similar results in the upper Namoi irrigators (43%), Namoi dryland farmers with 50% and the lower Namoi irrigators with 47%.

CONCLUSION

Our audit and review has highlighted the fact that in some areas of environmental management, improvements are still highly desirable and possible. Whilst acknowledging the changing attitudes and improved practices in some areas of the Macquarie and Namoi, the inability of some farms to effectively contain pesticides on farm will continue to lead to environmental contamination. The presence of pesticides in our river systems also highlights the importance of Ingard® cotton and the conscious decision needed by farmers to choose Ingard® over conventional cotton in environmentally sensitive areas. Ingard® cotton has the potential to reduce pesticide use in the industry by up to two

thirds (Cameron, 1995). Even with the Ingard® technology, farmers will still be dependent on high chemical doses for pest management for some years yet. Therefore the key to sustainability in the industry is 'responsible' spray practices and management. A balance needs to be created between the environmental and social concerns of the community, and the economics of cotton farming.

The compilation of a 'best management guideline' for cotton farmers (by the ACGRA and ACF) is the industry's pro-active attempt at dealing with its own environmental problems from within. Farm management lies at the core of the industry's environmental focus and its effective industry-wide adoption is essential to ensuring the industry's continued viability. Without industry-wide adoption of the Code of Practice, the likelihood of continuing residues of pesticides in the State's waterways is very real, and its potential to adversely impact on the industry's viability is also very real.

REFERENCES

Cameron, J. (1996) Bt Cotton: Just how will it impact our industry? *The Australian Cotton Grower.* 17:(2) 32-33.

Cooper, B (1994) Central and North West Regions Water Quality Monitoring Program 1993/94 Pesticide Findings. Department Water Resources, Technical Services Division.

Cooper, B (1995) Central and North West Regions Water Quality Monitoring Program 1994/95 Pesticide findings. Department of Land and Water Conservation, Technical Services Division.

Hugo, L. Caldwell, R. and Kennedy, I. (1996) Reducing pesticide runoff with polyacrilamide. *The Australian Cotton Grower.* 17:(1) 52-54.

O'Brien, J.M. (1995) Central and North West Regions Water Quality Program. 1994/95 Macquarie Cotton Industry Benchmarking. N.S.W. Department of Land and Water Conservation. TS 95.029.