



Eyes on herbicides



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Growers will be very aware of the increasing scrutiny the sugarcane industry is under regarding herbicide run-off from farms.

Concerns over the level of herbicides, particularly PSII herbicides (diuron, atrazine, hexazinone and ametryn) that target the cane plant's photosynthetic pathway (also known as photosystem 11) in waterways and in the Great Barrier Reef lagoon, contributed to the Federal Government review of diuron. These concerns also led to the introduction of the Queensland Reef Regulations in 2009 and the development of the industry's Best Management Practices (BMP) program led by CANEGROWERS Australia that is currently being rolled out.

Continued water quality monitoring will measure our success

- > **Reef Plan** is a collaborative program between the Federal and Queensland governments. Reef Plan has a target of reducing the PSII herbicide pollutant load within the Great Barrier Reef lagoon by **60 per cent**, by 2018. The main concerns are the effects of these herbicides on seagrass beds and phytoplankton.
- > Water quality monitoring and modelling to date indicates:
 - * The Wet Tropics account for 61 per cent of total PSII herbicide pollutant loads while accounting for only five per cent of the total Great Barrier Reef catchment.
 - * Freshwater wetlands in the Lower Burdekin are considered to be at high risk from PSII herbicides.
 - * The Mackay-Whitsunday region contributes 12 per cent of total PSII herbicide pollutant loads while accounting for only two per cent of the Great Barrier Reef catchment.
 - * The Mary-Burnett region contributes slightly more than nine per cent of the total PSII herbicide load while accounting for 13 per cent of the Great Barrier Reef catchment.

What the science is showing

- > An increasing body of research evidence shows that herbicide losses into waterways can be reduced by modifying the way herbicides are applied:
 - * Trials conducted by CSIRO and the Centre for Tropical Water and Aquatic Ecosystem Research in the Burdekin cane-growing district measured herbicide levels in run-off from **furrow irrigation**.

The trials demonstrated that band spraying over raised beds decreased the total load of atrazine and diuron by **90 per cent** or more, compared to conventional blanket spraying of those herbicides. This was despite the area being covered with those herbicides by the banded application being only **60 per cent** less than the blanket application.

- * Sugar Research Australia, the Queensland Government and the National Centre for Engineering in Agriculture compared herbicide losses in **rainfall run-off** between banded spray application and blanket spray coverage in the Burdekin cane-growing district.

The trials showed that using band spraying to reduce the percentage of area sprayed to 50 per cent also decreased the amount of herbicide in rainwater run-off by 50 per cent. The research supports the use of PSII residuals and the more soluble knockdowns as banded sprays, rather than blanket sprays. In this trial, the percentage loss of 2,4-D in run-off was much higher than either glyphosate or fluroxypyr (Starane®).

- * Trials in the Mackay region by the same research organisations compared losses of residual herbicides in rainwater run-off with that of knockdown herbicides.

In a blanket spray situation, the percentage loss of residual herbicides (diuron, hexazinone, metolachlor) was 60 per cent and 24 per cent higher than for glyphosate and 2,4-D, respectively.

In a banded spray situation, the percentage loss of the residuals was 32 per cent and 29 per cent higher than for glyphosate and 2,4-D, respectively.

Importantly, incorporation of residual herbicides by rainfall or irrigation (without causing run-off) and timing of application at least 20 days before rainfall run-off occurred gave the highest reduction in herbicide losses.

- * Trials conducted in the Herbert cane-growing region by the Queensland Government, Herbert Cane Productivity Services Limited, James Cook University, and Terrain Natural Resource Management compared the losses of residual and knockdown herbicides in rainwater run-off.

The effect of a trash blanket on herbicide loss was also measured. On **no-trash ratoons** the percentage losses in run-off of residual herbicides ranged from six to 24 per cent, compared to knockdown herbicide losses of between zero and 18 per cent. Utilising a **trash blanket** reduced these losses by 43 per cent and 24 per cent for residuals and knockdowns, respectively.

Opportunities for the Australian sugarcane industry

The opportunities for the sugarcane industry in achieving the 60 per cent reduction of PSII herbicides by 2018 lie in:

- > Refining banded spray strategies that target the application of residual herbicides to the cane bed so that the inter-row is also kept weed free, at a low cost and with crop safety.
- > Minimising the risk of losing residual herbicides in rainfall run-off by:

- * incorporating residual herbicides by rainfall or irrigation, without run-off

- * timing the application of herbicides so that the risk of rainfall run-off within 20 days after rainfall is minimal.

- > Understanding the options for other herbicides that give good weed control and minimise environmental risk.
- > Developing more robust integrated weed management systems that potentially reduce reliance on herbicides.

References and further reading

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Above: Rainfall simulator being used to measure herbicide in runoff trials.

