

The Pesticide Impact Rating Index (PIRI)

CSIRO Centre for Environmental Contaminants Research (CECR)



Assess the relative risks posed by different pesticides or cropping systems on water quality - choose benign pesticides to protect water quality and ecosystem health with 'PIRI'.

The Pesticide Impact Rating Index (PIRI) is a free software package developed by CSIRO with support from Land & Water Australia and other agencies, both here and overseas.

PIRI combines information about properties and toxicity of pesticides to aquatic organisms with information about their environmental fate and behaviour under chosen soil and environmental conditions, to predict the potential for pesticides to move off-site and pollute adjacent waterways.

Uses for PIRI

- Rate different pesticides at the farm scale – in terms of their pollution potential
- Identify 'windows of opportunity' for spraying pesticides, to minimise off-site impacts
- Support the development of targeted monitoring programs
- Make a comparative assessment of different land uses at catchment/subcatchment scale
- Appreciate the risk profile of individual pesticides for different groups of aquatic organisms, from vertebrates (fish, mammals), to invertebrates



(*Daphnia*), and even those at the base of food chain (algae) – or for drinking water

- Audit or benchmark practices for environmental management system
- Enhance awareness about risks associated with pesticides and to communicate risk.

Key features

The PIRI software draws on information from inbuilt databases, such as pesticide properties, toxicity to organisms and

recommended rates of pesticide application. It combines this with user inputs, including soil type, pesticide use rate, frequency and timing of pesticide application, to show risk categories for water quality.

Key features are:

- User-friendly software
- A risk indicator for water quality only
- Comprehensive in terms of transport pathways and classes of biota
- Economical in terms of the number of input parameters
- Data required are generally available
- Tested in a number of cases against monitoring data
- Can be customised, or used 'as is'
- Allows for updates with local input data and new pesticides
- Based on sound science

Note: PIRI rates pesticides in terms of relative risk to the environment. It is not designed to predict the actual concentrations of pesticides likely to reach surface or groundwater.



Australia and overseas

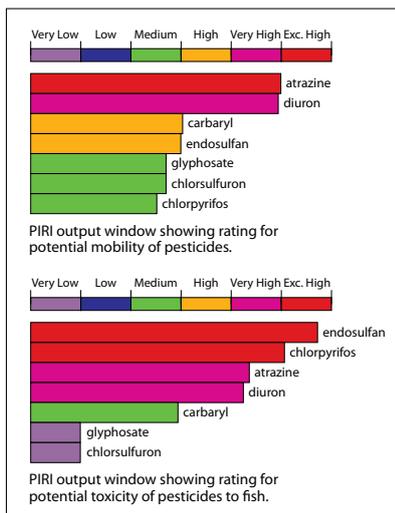
PIRI is used across Australia. A customised version of PIRI has been developed for Tasmania (PIRI-Tas) using locally-developed pesticide use and environmental fate data. PIRI-Tas was tested against water quality data from several forestry sites in Tasmania and gave satisfactory predictions.

PIRI is also used internationally. Land & Water Australia, the Australian Centre for International Agricultural Research (ACIAR) and the International Atomic Energy Agency (IAEA) – under the FAO/IAEA Food and Environment Program – have sponsored overseas research projects involving PIRI.

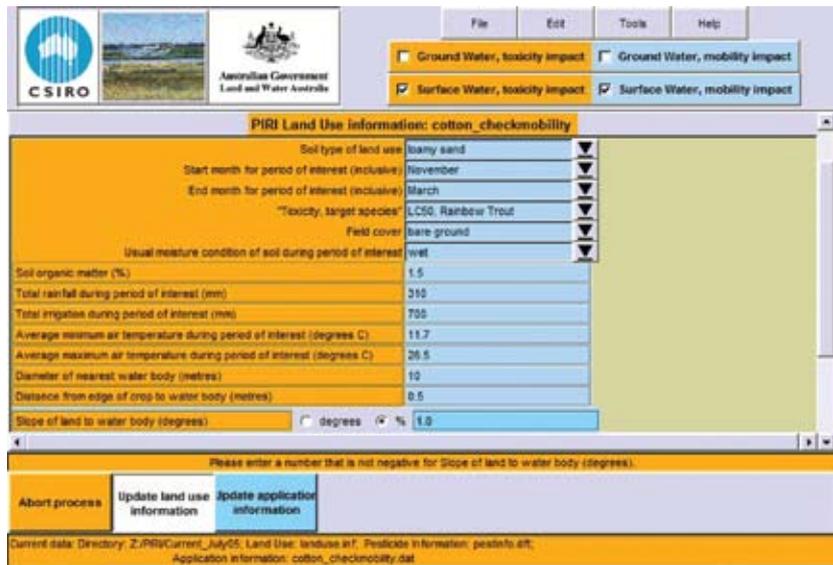
Currently an IAEA project is utilising PIRI in 12 South American countries to identify pesticides for further research and monitoring.

Proven results

PIRI has been shown to produce reliable results in several case studies where good-quality data on both pesticide use and residues were available.



> PIRI output windows showing rates for potential mobility and toxicity of pesticides.



> Users select various options from a series of dropdown menus. The results are clearly defined in tables and graphs.

Case 1: PIRI was validated against a pesticide-use inventory for several different land uses, as well as monitoring data gathered by CSIRO. In a NSW cotton production system, the PIRI rating was consistent with the monitoring data available for 14 out of 16 pesticides (87.5%). As predicted, pesticides rated as having 'high' to 'medium' pollution potential by PIRI were detected in monitoring programs, whereas those pesticides rated as 'low' to 'very low' pollution potential by PIRI were not detected.

Case 2: Pesticide use data and residue monitoring taken from the Murrumbidgee Irrigation Area, for a variety of land uses (rice, citrus, sorghum, soybean and some horticultural production systems) were compared to the outputs from PIRI. The results were generally successful in predicting whether a pesticide would be detected in the surface water or not (with a match in 16 out of the 19 pesticides tested).

Case 3: Historical water quality monitoring data collected by Forestry Tasmania was compared against PIRI-Tas risk ratings and out of a total of 67 cases that were used for PIRI-Tas evaluation, there was a good agreement in 50 cases.

For further information:

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