

**Ian Willoughby\*** and **Alan Thomson\*\*** outline the development of a web-based expert system to assist in herbicide selection.

Planning a herbicide weeding operation isn't always easy, but there's plenty of information around in the form of guides and labels for different products. The tricky bit can be actually synthesising it all to make an appropriate decision.

Various Forestry Commission publications have been produced that aim to give unbiased comparative information on different herbicides but for the occasional or novice users, they can sometimes prove daunting. Some users contact professional advisors to give them additional help on specific problems. In the future, computer-based expert systems may also have a role to play.

The principle behind expert systems is that they can shorten and refine the decision making process by guiding users more quickly to the most appropriate options. Based on the information the user enters, they actually attempt to behave as an electronic expert, providing possible solutions to the problem rather than simply providing a list of information.

## A new expert system

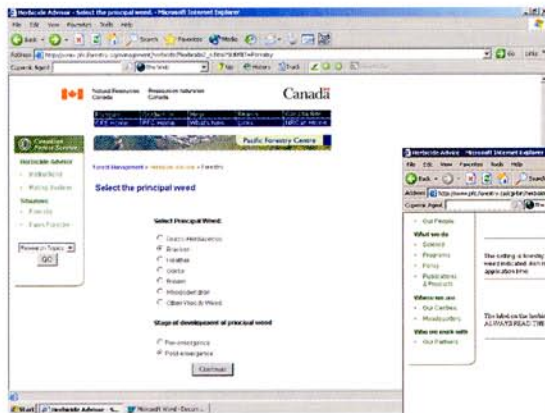
The Canadian Forest Service and the Forestry Commission have recently collaborated in the production of a web-based expert system advising on herbicide selection based on 'Forestry Commission Field Book 8, *The Use of Herbicides in the Forest*', and 'Forestry Commission Field Book 14, *Herbicides for Farm Woodlands and Short Rotation Coppice*'.

The system assumes that managers have already correctly identified the problem and decided that weed control must take place. It also assumes that non-chemical alternatives have been considered and rejected as impractical, leaving herbicide use as the only option left available.

Users enter the situation as defined by the Pesticide Safety Directorate (either forest or farm forestry), then select the principal category of weed and its stage of development. For woody weeds and grass/herbaceous weeds, a list of candidate species is presented.

Next, the user specifies other weed species, tree species if present, and the desired timing of the herbicide application. The expert system then produces a relative suitability index for each herbicide, as well as a list of further information such as crop tolerance,

# Expert help on herbicide selection



Above: Example input screen for the Canadian Forest Service/Forestry Commission expert service.

timing, possible tank mixes, and constraints. It also provides page references to the printed publications, to allow users to investigate the herbicides further.

## Advantages and disadvantages

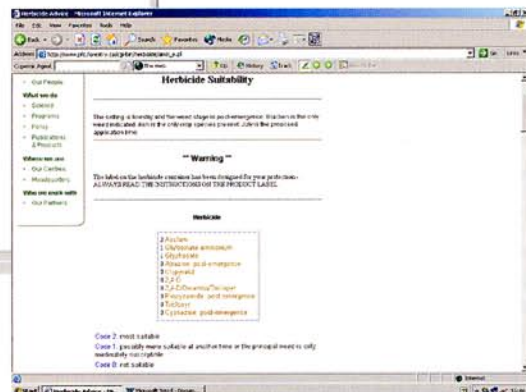
If used without reference to printed manuals, a disadvantage of expert systems can be that in producing automated results, they take away an element of reasoned professional judgement, iteration and self-learning. On the other hand, expert systems can be a valuable resource in building that self-learning.

If a forest manager develops a prescription using the manuals, that prescription can be checked against the expert system to see if a significant element has been overlooked. Whether the manuals or the expert system are used, **reference should always be made to product labels before making any decisions on herbicide use.**

As with any guidance, the system requires updating and the costs involved in producing the technology may outweigh a marginal gain in efficiency compared to a well designed printed publication. However, publications can also have high production costs and cannot always be updated as easily as on-line material.

In addition, the expert system only

Below: Example output from the expert system showing suitability coding based upon weed susceptibility and proposed timing.



currently uses timing and efficacy to select herbicides, not crop tolerance, and it does not cover the other steps involved in an integrated approach to vegetation management such as: assessing and predicting impact of the perceived problem; consideration of non-chemical alternatives; determining suitable herbicides based upon cost and environmental risk; and, selecting the most appropriate method of application.

However, all of these factors could potentially be covered by an expert system, if the cost-benefit analysis proved favourable.

The technology demonstrator expert system is freely available for test at: [www.forestry.gov.uk/fr/GGAE-5JQKFD](http://www.forestry.gov.uk/fr/GGAE-5JQKFD)

Please note that this system is still under development, and users are advised to refer to herbicide product labels for definitive guidance on efficacy and safety.

We would welcome comments on the usefulness of the current system, as well as people's thoughts on the desirability, given the potential costs involved, of developing it further.

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