

## Biological control of weeds - modest investments can give large returns

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Biological control has developed considerably since the first spectacular success in Australia when the Argentinian moth Cactoblastis cactorum freed some 10 million hectares from prickly pear. There have now been programmes mounted against more than 80 weeds around the world (Harris 1979). In Australia since 1960, useful reductions have been achieved in infestations of St. John's wort, lantana, skeleton weed, harrisia cactus and alligator weed, while research is also underway on another ten weeds (Waterhouse 1979). Stringent testing for host-specificity has ensured that there has not been a single case of an introduced agent becoming a pest of non-target plants. The experience accumulated in these programmes is continuously increasing the probability of early success in future projects.

Economic appraisal of biological control is difficult. The harm done by weeds is difficult to evaluate, as is the reduction in that harm caused by biological agents, sometimes operating together with mechanical and chemical controls. The benefits of biological control accumulate indefinitely so that complete estimates of costs and benefits must incorporate such predictions as future inflation rates, prices of agricultural produce and returns on alternative investments. The only rigorous appraisal to date is that of the programme against skeleton weed in Australia: calculated to the year 2000 in 1975 values discounted at 10%, costs were \$A 2.39 million and benefits were \$A 264.4 million (Waterhouse 1979). The average cost of a biological control programme against a weed was estimated by Andres (1979) to be about 12 scientist-years or \$US 1 million in the USA and by Harris (1979) to be about 21 scientist-years or \$C1.35 million in Canada. Such 'once only' investments are becoming increasingly attractive when compared with the repeated expenditure required by alternative control methods. The rising price of oil will inexorably increase the cost of herbicides and fuel while labour is likely to continue to be expensive. In addition, hidden costs of alternative methods such as damage to soil structure and presence in the environment of toxic chemicals are becoming apparent. Apprehension about unwanted side effects has increased the cost of developing a new herbicide to more than \$A 10 million (Benstead 1978).

Biological control is not the answer to all weed problems; minor weed problems do not justify investment of the order outlined above and only weeds of foreign origin are particularly amenable to control by imported agents. Nevertheless, Waterhouse (1979) lists 22 weeds in Australia as potential targets in addition to those already receiving attention. Biological control can sometimes be integrated with, and can occasionally replace, other control methods and it should always be considered as an option in weed control campaigns.

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